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[Intervention Review]

Mindfulness-based interventions for substance use disorders

Simon B Goldberg[1], Brian Pace[2], Matas Griskaitis[3], Reinhard Willutzki[4], Nicole Skoetz[5], Sven Thoenes[6a], Aleksandra E Zgierska[7], Susanne Rösner[8]

[1]Department of Counseling Psychology, University of Wisconsin, Madison, WI, USA. [2]Lyssn.io, Seattle, WA, USA. [3]Institute of Medical Biostatistics, Epidemiology, and Informatics (IMBEI), University Medical Center of the Johannes Gutenberg University Mainz, Mainz, Germany. [4]Private medical practice for Psychiatry and Psychotherapy, Zürich, Switzerland. [5]Cochrane Cancer, Department I of Internal Medicine, Center for Integrated Oncology Aachen Bonn Cologne Duesseldorf, Faculty of Medicine and University Hospital Cologne, University of Cologne, Cologne, Germany. [6]Department of Psychology, Johannes Gutenberg-Universität Mainz, Mainz, Germany. [7]Departments of Family and Community Medicine, Pennsylvania State University College of Medicine, Hershey, PA, USA. [8]Forel Klinik, Ellikon an der Thur, Switzerland

[a]Deceased

Contact: Simon B Goldberg, sbgoldberg@wisc.edu.

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ABSTRACT

Background

Substance use disorders (SUDs) are highly prevalent and associated with a substantial public health burden. Although evidence-based interventions exist for treating SUDs, many individuals remain symptomatic despite treatment, and relapse is common.Mindfulness-based interventions (MBIs) have been examined for the treatment of SUDs, but available evidence is mixed.

Objectives

To determine the effects of MBIs for SUDs in terms of substance use outcomes, craving and adverse events compared to standard care, further psychotherapeutic, psychosocial or pharmacological interventions, or instructions, waiting list and no treatment.

Search methods

We searched the following databases up to April 2021: Cochrane Drugs and Alcohol Specialised Register, CENTRAL, PubMed, Embase, Web of Science, CINAHL and PsycINFO. We searched two trial registries and checked the reference lists of included studies for relevant randomized controlled trials (RCTs).

Selection criteria

RCTs testing a MBI versus no treatment or another treatment in individuals with SUDs. SUDs included alcohol and/or drug use disorders but excluded tobacco use disorders. MBIs were defined as interventions including training in mindfulness meditation with repeated meditation practice. Studies in which SUDs were formally diagnosed as well as those merely demonstrating elevated SUD risk were eligible.

Data collection and analysis

We used standard methodological procedures expected by Cochrane.

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Main results

Forty RCTs met our inclusion criteria, with 35 RCTs involving 2825 participants eligible for meta-analysis. All studies were at high risk of performance bias and most were at high risk of detection bias.

Mindfulness-based interventions (MBIs) versus no treatment

Twenty-four RCTs included a comparison between MBI and no treatment. The evidence was uncertain about the effects of MBIs relative to no treatment on all primary outcomes: continuous abstinence rate (post: risk ratio (RR) = 0.96, 95% CI 0.44 to 2.14, 1 RCT, 112 participants; follow-up: RR = 1.04, 95% CI 0.54 to 2.01, 1 RCT, 112 participants); percentage of days with substance use (post-treatment: standardized mean difference (SMD) = 0.05, 95% CI -0.37 to 0.47, 4 RCTs, 248 participants; follow-up: SMD = 0.21, 95% CI -0.12 to 0.54, 3 RCTs, 167 participants); and consumed amount (post-treatment: SMD = 0.10, 95% CI -0.31 to 0.52, 3 RCTs, 221 participants; follow-up: SMD = 0.33, 95% CI 0.00 to 0.66, 2 RCTs, 142 participants). Evidence was uncertain for craving intensity and serious adverse events. Analysis of treatment acceptability indicated MBIs result in little to no increase in study attrition relative to no treatment (RR = 1.04, 95% CI 0.77 to 1.40, 21 RCTs, 1087 participants). Certainty of evidence for all other outcomes was very low due to imprecision, risk of bias, and/or inconsistency. Data were unavailable to evaluate adverse events.

Mindfulness-based interventions (MBIs) versus other treatments (standard of care, cognitive behavioral therapy, psychoeducation, support group, physical exercise, medication)

Nineteen RCTs included a comparison between MBI and another treatment. The evidence was very uncertain about the effects of MBIs relative to other treatments on continuous abstinence rate at post-treatment (RR = 0.80, 95% CI 0.45 to 1.44, 1 RCT, 286 participants) and follow-up (RR = 0.57, 95% CI 0.28 to 1.16, 1 RCT, 286 participants), and on consumed amount at post-treatment (SMD = -0.42, 95% CI -1.23 to 0.39, 1 RCT, 25 participants) due to imprecision and risk of bias. The evidence suggests that MBIs reduce percentage of days with substance use slightly relative to other treatments at post-treatment (SMD = -0.21, 95% CI -0.45 to 0.03, 5 RCTs, 523 participants) and follow-up (SMD = -0.39, 95% CI -0.96 to 0.17, 3 RCTs, 409 participants). The evidence was very uncertain about the effects of MBIs relative to other treatments on craving intensity due to imprecision and inconsistency. Analysis of treatment acceptability indicated MBIs result in little to no increase in attrition relative to other treatments (RR = 1.06, 95% CI 0.89 to 1.26, 14 RCTs, 1531 participants). Data were unavailable to evaluate adverse events.

Authors' conclusions

In comparison with no treatment, the evidence is uncertain regarding the impact of MBIs on SUD-related outcomes. MBIs result in little to no higher attrition than no treatment. In comparison with other treatments, MBIs may slightly reduce days with substance use at post-treatment and follow-up (4 to 10 months). The evidence is uncertain regarding the impact of MBIs relative to other treatments on abstinence, consumed substance amount, or craving. MBIs result in little to no higher attrition than other treatments. Few studies reported adverse events.

PLAIN LANGUAGE SUMMARY

Mindfulness-based interventions for substance use disorders

What is the aim of this review?

The aim of this Cochrane Review was to determine whether mindfulness-based interventions (MBIs) i.e. interventions involving training in mindfulness meditation improve symptoms of substance use disorders (SUDs) (i.e. alcohol and/or drug use, but excluding tobacco use disorders). Cochrane researchers searched, selected and analyzed all relevant studies to answer this question. We found 40 randomized controlled trials,that assessed MBI as a treatment for SUDs.

Key messages

SUD outcomes were monitored at different time points: directly following completion of the MBIs, and at follow-up time points, which ranged from 3 months to 10 months after the MBI ended. Relative to other interventions (standard of care, cognitive behavioral therapy (CBT), psychoeducation, support group, physical exercise, medication), MBIs may slightly reduce days with substance use, but it is very uncertain whether they reduce other SUD-related outcomes. The effects of MBIs relative to no treatment was very uncertain across all SUD-assessed outcomes, as was the risk for adverse events.

What was studied in this review?

SUDs are very common and associated with negative physical and psychological health outcomes. Although evidence-based interventions exist for treating SUDs, the standard treatments may not be sufficient and many individuals relapse to substance use. In the past several decades, MBIs have been examined for the treatment of SUDs. MBIs involve training in mindfulness meditation practice, which emphasizes the cultivation of present-moment, non-judgmental awareness. MBIs may improve many of the psychological variables involved in substance use and relapse (i.e. depression, anxiety, stress, attention). We studied whether MBIs benefit individuals with SUDs.

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We searched for studies that compared an MBI to no treatment or to another treatment (e.g. cognitive behavior therapy, psychoeducation). We studied the results at the end of the intervention and at follow-up assessments, which occurred 3 to 10 months following the end of the intervention.

What are the main results of this review?

The review authors found 40 relevant studies, of which 45% were focused on individuals with various SUDs with the remaining studies including participants using a specific substance (e.g. alcohol, opioids). Of these 40 studies, 23 were conducted in the USA, 11 were conducted in Iran, two were conducted in Thailand, one was conducted in Brazil, one was conducted in China, one was conducted in Taiwan, and one was conducted in both Spain and the USA. We were able to analyze results of 35 studies composed of 2825 participants; the other five did not report usable results, and requests to the authors for more information were unsuccessful.

When MBIs were compared with other treatments, our review and analysis showed that MBIs may slightly reduce days with substance use at post-treatment and follow-up, and show similar study retention. The evidence is uncertain for other SUD-related outcomes we assessed (continuous abstinence, consumed amount, craving intensity). When MBIs were compared with no treatment, the evidence was uncertain for all SUD-related outcomes, although MBIs showed similar treatment retention. Adverse effects were only reported on in four studies. However, the available evidence did not suggest MBIs result in adverse events or serious adverse events.

How up-to-date is this review?

The review authors searched for studies published up to April 2021.

Study funding sources

Sixteen studies reported no funding. The remaining studies reported one or more sources of funding and support. Nineteen acknowledged federal sources, seven acknowledged internal grants, four acknowledged non-profit entities, and two acknowledged clinics.

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SUMMARY OF FINDINGS

Summary of findings 1. Summary of findings: mindfulness-based interventions (MBIs) compared with no treatment for substance use disorders (SUDs)

Outcomes	Anticipated absolute effects (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Comments
Continuous abstinence rate at post-treatment RR < 1.00 favors MBI	RR = 0.96 [0.44, 2.14]	112 (1 RCT)	Very low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to no treatment on continuous abstinence rate at post-treatment.
Continuous abstinence rate at follow-up (4 months) RR < 1.00 favors MBI	RR = 1.04 [0.54, 2.01]	112 (1 RCT)	Very low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to no treatment on continuous abstinence rate at follow-up.
Percentage days with substance use at post-treatment Lower SMD favors MBI	SMD = 0.05 [-0.37, 0.47]	248 (4 RCTs)	Very low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to no treatment on percentage days with substance use at post-treatment.
Percentage days with substance use at follow-up (3 to 4 months) Lower SMD favours MBI	SMD = 0.21 [-0.12, 0.54]	167 (3 RCTs)	Very low[b, c, d]	The evidence is very uncertain about the effect of MBIs relative to no treatment on percentage days with substance use at follow-up.
Consumed amount at post-treatment Lower SMD favors MBI	SMD = 0.10 [-0.31, 0.52]	221 (3 RCTs)	Very low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to no treatment on consumed amount at post-treatment.
Consumed amount at follow-up (3 to 4 months) Lower SMD favors MBI	SMD = 0.33 [0.00, 0.66]	142 (2 RCTs)	Very low[b, c, d]	The evidence is very uncertain about the effect of MBIs relative to no treatment on consumed amount at follow-up.
Craving intensity at post-treatment Lower SMD favors MBI	Could not be pooled because of heterogeneity. Range = -4.84 to -0.32.	128 (2 RCTs)	Very Low[a, b, c, e]	The evidence is very uncertain about the effect of MBIs relative to no treatment on craving intensity at post-treatment.
Treatment acceptability (attrition) RR < 1.00 favors MBI	RR = 1.04 [0.77, 1.40]	1087 (21 RCTs)	High	MBIs result in little to no increase in attrition relative to no treatment.

CI: confidence interval; **MBI:** mindfulness-based interventions; **RCT:** randomized controlled trial; **RR:** risk ratio; **SMD:** standardized mean difference.

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

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Low certainty: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

[a]95% CI includes both an appreciable benefit and an appreciable harm. Downgraded one point downgraded for imprecision.
[b]Sample size <400 (less then minimum optimal information size [OIS] recommended for continuous outcomes). Downgraded one point downgraded for imprecision.
[c]Outcome assessment was unblinded. Downgraded one point for risk of bias.
[d]95% CI includes both an effect not relevant to participants and an appreciable harm. Downgraded one point downgraded for imprecision.
eEffect sizes were highly heterogeneous (e.g., $I^2 \geq 90\%$). Downgraded one point for inconsistency.

Summary of findings 2. Summary of findings: mindfulness-based interventions (MBIs) compared with other treatments for substance use disorders (SUDs)

Outcomes	Anticipated absolute effects (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Comments
Continuous abstinence rate at post-treatment RR < 1.00 favors MBI	RR = 0.80 [0.45, 1.44]	286 (1 RCT)	Very Low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to other treatments on continuous abstinence rate at post-treatment.
Continuous abstinence rate at follow-up (10 months) RR < 1.00 favors MBI	RR = 0.57 [0.28, 1.16]	286 (1 RCT)	Very Low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to other treatments on continuous abstinence rate at follow-up.
Percentage days with substance use at post-treatment Lower SMD favors MBI	SMD = -0.21 [-0.45, 0.03]	523 (5 RCTs)	Low[c, d]	The evidence suggests that MBIs reduce percentage of days with substance use slightly relative to other treatments at post-treatment.
Percentage days with substance use at follow-up (4 to 10 months) Lower SMD favors MBI	SMD = -0.39 [-0.96, 0.17]	409 (3 RCTs)	Low[c, d]	The evidence suggests that MBIs reduce percentage of days with substance use slightly relative to other treatments at follow-up.
Consumed amount at post-treatment Lower SMD favors MBI	SMD = -0.42 [-1.23, 0.39]	25 (1 RCT)	Very Low[a, b, c]	The evidence is very uncertain about the effect of MBIs relative to other treatments on consumed amount at post-treatment.
Craving intensity at post-treatment Lower SMD favors MBI	Could not be pooled because of heterogeneity. Range from SMD = -1.43 to 1.00	971 (9 RCTs)	Very low[c, d, e]	The evidence is very uncertain about the effect of MBIs relative to other treatments on craving intensity at post-treatment.
Craving intensity at follow-up (3 to 6 months) Lower SMD favors MBI	Could not be pooled because of heterogeneity. Range from SMD = -2.07 to -0.14	415 (4 RCTs)	Very low[c, d, e]	The evidence is very uncertain about the effect of MBIs relative to other treatments on craving intensity at follow-up.

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Treatment acceptability (attrition) RR < 1.00 favors MBI	RR = 1.06 [0.89, 1.26]	1531 (14 RCTs)	High	MBIs result in little to no increase in attrition relative to other treatments.

CI: confidence interval; **MBI:** mindfulness-based interventions; **RCT:** randomized controlled trial; **RR:** risk ratio; **SMD:** standardized mean difference.

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

[a]95% CI includes both an appreciable benefit and an appreciable harm. Downgraded one point downgraded for imprecision.
[b]Sample size < 400 (less then minimum optimal information size [OIS] recommended for continuous outcomes). Downgraded one point downgraded for imprecision.
[c]Outcome assessment was unblinded. Downgraded one point for risk of bias.
[d]95% CI includes both an effect not relevant to participants and an appreciable benefit.
[e]Effect sizes were highly heterogeneous (e.g., $I^2 \geq 90\%$). Downgraded one point for inconsistency.

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BACKGROUND

Description of the condition

Substance use disorders (SUDs, see Table 1 for a list of all acronyms) are a disease category with a chronic and relapsing nature, characterized by dysfunctional patterns of tobacco, alcohol, prescription or illicit drug use, leading to specific psychophysical, affective and cognitive symptoms and consequences for psychosocial well-being and health. While the major classification systems Diagnostic and Statistical Manual of Mental Disorders (DSM) (APA 2000) and International Classification of Diseases (ICD) (WHO 2010) have subdivided SUDs into dependence and a secondary category, called "abuse" in Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) and "harmful use" in
International Classification of Diseases, Tenth Revision (ICD-10) (Hasin 2006), the latest version of the DSM system, the DSM-V (APA 2013) integrates both categories into a single substance use disorder concept that ranges along a continuum from mild to severe (Hasin 2013; Rehm 2013).

SUDs are highly prevalent and have a profound public health and economic impact (Degenhardt 2018; Vega 2002). It is estimated that about 4.2% of the global burden of disease as measured in disability adjusted life years (DALYs) is attributable to alcohol and 1.3% to illicit drugs (Degenhardt 2018). Together with mental disorders, SUDs constitute the fifth leading cause of death and disability worldwide (Whiteford 2013). Statistics vary between regions, with higher prevalence of some psychoactive substance use in more highly-developed, compared to less-developed, countries (Degenhardt 2018; WHO 2002a). Nevertheless, with the improved industrialization and centralization of alcohol production, alcohol consumption is increasingly becoming a problem in many developing regions (WHO 2002b). Regional shifts also seem to have reshaped the patterns of illicit drug use in the world (Uchtenhagen 2004; UNODC 2013). While some improvements for heroin use are registered in Western Europe, there is a rapid growth of the heroin market in the Afghanistan region and, further, in Central Asia, the Russian Federation and Eastern Europe. With the USA remaining the world's largest market for cocaine, there has been an increase in cocaine trafficking towards Western Europe (UNODC 2013).

The contribution of SUDs to the worldwide burden of disease and the costs to individuals, families and to society associated with substance use are rising (Whiteford 2013). As a large part of the substance-attributable burden is assumed to be potentially avoidable through the implementation of preventive and therapeutic strategies (Rehm 2009), further effective strategies need to be developed that help individuals with SUDs to discontinue or reduce substance use in a way that increases health and well-being.

Description of the intervention

Mindfulness is the English translation of *Sati* in Pali, an ancient language from northern India (Pali Text Society 1992). Rooted in 2500-year-old Buddhist philosophy and practice, mindfulness meditation practices such as Vipassana and Zen meditation are mind-body practices promoting mindfulness as a state of consciousness attending to one's moment-to-moment experience (Brown 2003); and "paying attention in a particular way, on purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn 1994). Practices like "focused attention meditation", entailing voluntary and sustained attention on a selected object and "open monitoring meditation", involving a meta-cognitive monitoring of automatic cognitive and emotional processes contribute to a mindfulness content of experience with acceptance, patience, and compassion (Lutz 2008; Travis 2010; Vago 2012). By purposefully and nonjudgementally paying attention to the present moment, mindfulness meditation is often distinguished from concentrative meditation, which entails voluntary and sustained attention on a chosen object (Goleman 1988). Nevertheless, current neuroscientific evidence indicates that different types of attentional processes are activated in both meditation types (Lutz 2008). Furthermore, emphasis has been given to further classification criteria such as the role of self-referential processes in different meditation types (Chiesa 2011).

There are various contemporary definitions of mindfulness in the psychological literature. Bishop 2004 has proposed a two-component definition, with the first component focusing on self-regulation of attention towards the immediate present moment and the second as an orientation marked by curiosity, openness and acceptance as fundamental features of mindfulness. Brown 2003 suggests a one-dimensional definition of mindfulness, focusing on the "receptive attention to and awareness of the present moment", while Shapiro 2006 developed a three-component model by adding a motivational factor to Bishop's components (for an overview see Chiesa 2011). Even though, to date, no consensus has been reached on how to define mindfulness, the two-factor conceptualization (Bishop 2004) is often applied as an operational definition in research.

Mindfulness meditation was adapted for use in Western cultures in a variety of ways and has been incorporated into psychological treatment, constituting the "third wave" of behavior therapy (Hayes 2004). Combining mindfulness practice with components from mostly behavior and cognitive therapy, mindfulness-based interventions (MBIs) have been explored to treat a variety of physical and psychological problems and disorders. Mindfulness-based stress reduction (MBSR), developed by Jon Kabat-Zinn in 1979 (Kabat-Zinn 1985; Kabat-Zinn 1990; Kabat-Zinn 1992; Kabat-Zinn 1994; Kabat-Zinn 2003), integrates mindfulness meditation techniques into a structured clinical program designed to help facilitate adaptation to the stressors of medical illness and assist people in managing pain and stress (Whitebird 2009). By combining Kabat-Zinn's MBSR with elements of cognitive therapy for depression (Beck 1979), Segal, Williams, and Teasdale developed mindfulness-based cognitive therapy (MBCT), a program that particularly targets "modes of mind" characteristic for mood disorders (Teasdale 2002). Mindfulness-oriented recovery enhancement (MORE) - a program integrating mindfulness with reappraisal and savoring skills - has been developed to enhance recovery in people struggling with addiction and the underlying conditions (Garland 2012b). Mindfulness-based relapse prevention (MBPR) is another MBI designed to target addiction. It integrates mindfulness practices with relapse-prevention strategies (Witkiewitz 2014b). Dialectical Behavior Therapy (DBT) and Acceptance and Commitment Therapy (ACT) are both innovative behavioral treatments that incorporate mindfulness practices and acceptance-based interventions into their treatment programs (Chapman 2006). Major influences on DBT derive from behavioral science, dialectical philosophy and Zen

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practice, while a non-judgemental observation and experience of thoughts constitutes one of the main elements of ACT. However, ACT and DBT do not emphasize formal training in mindfulness meditation. Following Crane 2017, we considered MBIs to be those that involved "sustained intensive training in mindfulness meditation practice" (p. 993).

Critical issues have been raised about mixing Buddhist elements with current psychological theories in modern MBIs and the resulting consequences for practitioners` aims and attitudes and the underlying psychological mechanism (Chiesa 2011). Some authors considered that influences of ancient Buddhist philosophy are only marginally acknowledged in modern MBIs and even identified misunderstandings of the concept of mindfulness in some modern ways of practicing mindfulness (Rapgay 2009; Chiesa 2011). In turn, it has been called into question whether mindfulness by itself can influence psychopathology without matching the type of mindfulness to a specific form of psycyhopathology (Teasdale 2003).

How the intervention might work

Teaching an attitude of non-judgement and acceptance with an emphasis on substance use and craving, MBIs are increasingly recognized for their ability to enhance recovery from substance use disorders (Khanna 2013). The idea of experiencing urges without fighting against them has given rise to the term “urge surfing” (Marlatt 1985), in which cravings are conceptualized like waves in the ocean and individuals are encouraged to “surf on”, allowing it to pass instead of being wiped out by giving in to it (Murphy 2014). Through both cognitive behaviorally-based exercises and mindfulness practices, MBPR practices share the common intention of bringing greater awareness to one’s experiences, with specific emphasis on the sequence of reactions that follow substance-related cues (Witkiewitz 2014b). For explaining how MBIs may affect substance use, several plausible mechanisms of action emerge from both the addiction as well as the mindfulness perspective. By fostering an increasing ability to “stay in touch” with experiences rather than attempting to escape or distance oneself from unpleasant feelings and sensations, mindfulness practices might help individuals with substance use problems to increase the awareness of habit-linked, minimally conscious and affective states linked to craving and relapse (Chiesa 2014). By strengthening the ability to “step back” from overwhelming emotions and sensations, while slowing down the chain of automatic processes of substance seeking, mindfulness practices increase the chance to interrupt the cycle of cognitive, affective, and psychophysiological mechanisms underlying craving, relapse and excessive drinking (Witkiewitz 2014b).

Referring to neuropsychological models of craving and self-control, mindfulness practices have also been put into a neurocognitive perspective (Garland 2014c; Hölzel 2011; Witkiewitz 2014b). Neurocognitive models of self-regulation hypothesize that the resolving of motivational conflicts to the benefit of intentions requires efficient top-down control from the prefrontal cortex over subcortical regions, while self-regulatory failure occurs whenever the balance is tipped in favor of subcortical areas, either due to prefrontal function impairments or particularly strong impulses (Heatherton 2011). Considering that substance-related cues have acquired exaggerated salience in the course of substance use disorders – a process mainly attributable to neuroadaptive sensitization in the mesolimbic reward system (Robinson 2008) - individuals with SUDs are faced with high demands on top-down inhibitory control. As a strategy to control strong upwelling motivational drives, individuals with the intention to cut down their drinking often try to inhibit craving through the suppression of substance-related thoughts (Bowen 2007; Garland 2012b). Thought suppression, in turn, has been shown to have the inverse effect, resulting in an increase, rather than decrease, of unwanted thoughts (Wegner 1994), causing a “behavioral rebound” with greater enactment of consummatory behaviors (Erskine 2010; Garland 2012a). Instead of trying to control strong upwelling motivational drives and to inhibit craving through the suppression of substance-related thoughts, MBIs prevent swinging “the pendulum of prefrontal regulation from a context of under-control to one of over-control” (Garland 2014c), which might “snowball” minor lapses in self-control into self-regulatory collapse (Erskine 2010; Garland 2012a; Heatherton 2011).

Why it is important to do this review

MBIs currently receive a lot of attention worldwide and are increasingly suggested as therapeutic approaches for substance use and misuse (Chiesa 2014). In fact, from a theoretic perspective, MBIs appear to bring about meaningful advantages compared to first and second wave therapies. Even though MBIs show promise in the treatment of substance use disorders, findings are rather inconsistent (Murphy 2014). While several studies found positive treatment effects of mindfulness interventions, including reduced quantity and frequency of substance use, a number of studies did not report positive findings. This Cochrane Review on MBIs for SUDs aims to provide a systematic integration of the available evidence to health-decision makers, therapists and patients; and to offer illustrative measures for estimating the relative benefits of MBIs compared to alternative types of psychotherapy, while indicating gaps of knowledge and methodological demands for future clinical research.

OBJECTIVES

To determine the effects of mindfulness-based interventions (MBIs) for substance use disorder (SUD) (including alcohol and/or drug use disorders but excluding tobacco use disorders) in terms of substance use outcomes, craving and adverse events compared to standard care, further psychotherapeutic, psychosocial, or pharmacological interventions or instructions, waiting lists, and no treatment.

METHODS

Criteria for considering studies for this review

Types of studies

Randomized controlled trials (RCTs) comparing MBIs for SUDs with other treatments or no intervention were eligible for inclusion in the review. Trials employing a cross-over design were also eligible, using data from the first active treatment stage only to encounter the risk of carry-over effects.

Types of participants

RCTs with patients suffering from SUDs including individuals with alcohol, prescription-, illicit- and poly-substance use disorders were considered as eligible for the review. There was no limitations

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on age or other participant characteristics. Besides accepted SUD diagnostic criteria including DSM-III (APA 1980), DSM- III-R (APA 1987), DSM-IV-TR (APA 2000), DSM-V (APA 2013) and ICD-10 (WHO 1992; WHO 2010), we also included studies in which SUD was not formally diagnosed, acknowledging that diagnostic systems are not consequently used in primary research.

Types of interventions

In accordance with the definition by Bishop and colleagues (Bishop 2004) of mindfulness, we consider as mindfulness-based all approaches which promote a) an individual's attention towards the immediate present moment experience and b) an open and accepting orientation irrespective of the applied technique. In order to isolate the effects of mindfulness meditation practice specifically, we excluded interventions that involve solely the concept of mindfulness and do not include formal instruction in mindfulness meditation practice e.g. Acceptance and Commitment Therapy (ACT), Dialectical Behaviour Therapy (DBT). This definition of MBIs is in keeping with that proposed by Crane 2017 and widely implemented in the meta-analytic literature (see Goldberg 2021).

Accordingly, the following experimental interventions were included in the review:

- ancient Buddhist meditations such as Vipassana meditation and Zen meditation;
- other mindfulness meditation;
- modern standardized group-based meditation practices including mindfulness-based stress reduction (MBSR), mindfulness-based cognitive therapy (MBCT) and mindfulness-based relapse prevention (MBRP) and mindfulness training.

Any type of manually-based and face-to-face treatment delivery including individual therapy and group session format were considered. Media- and CD-supported interventions were accepted as complementary formats of treatment support (e.g. home-practice formats), but not as exclusive modes of treatment delivery.

All comparators were eligible, with the exception of comparisons with other MBIs or similar mind-body approaches. Comparisons could include standard care, further psychotherapeutic, psychosocial or pharmacological interventions or instructions, waiting list or no treatment. Comparisons were categorized into no treatment (which included standard care when both the mindfulness and non-mindfulness arms received this) and other treatment (which included standard care when only the comparison condition received this).

Types of outcome measures

The study endpoints of the primary outcomes were considered essential to determine the effectiveness of MBIs, while secondary outcomes have only complementary value in the interpretation of results. If a study met the inclusion criteria, but did not provide necessary information for estimating effect sizes, while such data were also not available from the authors, the study was excluded from the meta-analysis, but included in the qualitative analyses.

Primary and secondary outcomes were selected with regard to clinical relevance and conceptual considerations. With the "rate of continuous abstinence", the "per cent days with substance use" limited to non-abstinent individuals and "consumed amount" limited to days with substance use, primary efficacy outcomes of the review assess conceptually-distinct achievements in substance use control (Keller 1972); including an individual's ability to a) achieve and maintain continuous abstinence; and b) their ability to refrain from substance use on individual days; and c) to stop substance use once started. Evaluation of adverse effects, serious adverse effects, and treatment acceptability was included to allow evaluation of the safety and acceptability of MBIs relative to controls.

Primary outcomes

1. Continuous abstinence rate
2. Percentage of days with substance use
3. Consumed amount
4. Adverse event rate

Rate of continuous abstinence is a binary variable comprising the information whether a participant remained fully abstinent until the end of treatment or returned to substance use after detoxification. Accordingly, any substance use irrespective of the consumed amount or frequency of use was considered as treatment failure in the determination of the outcome. *Percentage of days with substance use* is a continuous measure calculated as the ratio of the total sum of substance use days related to possible exposure days during the treatment phase multiplied by the factor 100. If 'exposure days', representing days at which participants had a chance to use the substance (e.g. not incarcerated or hospitalized), are not available, substance use days were related to the study duration. *Consumed amount* is also a continuous measure and calculated by dividing the total consumed amount to the number of possible exposure days (or alternatively the entire study duration). Both outcomes, *percentage of days with substance use* and *consumed amount,* are measures representing substance use in the entire sample including all participants irrespective of their status of abstinence. Besides efficacy outcomes, harms were assessed with *adverse events* (AEs), which are binary variables comprising the information if an unfavorable event or symptom occurred during the course of the study or not.

To allow conclusions on the sustainability of treatment effects, post-treatment efficacy outcomes (follow-up after treatment termination) were evaluated. Indicators of substance use were considered irrespective of measurement including self-reports, self-report questionnaires, documentation templates (substance use diary, monitoring sheets), standardized interviews, observer-reported measures, laboratory testing and breathalyzer tests. The validation of patient-reported substance use by objective measures was entered in the risk of bias tables (susceptibility to bias).

Secondary outcomes

1. Craving intensity
2. Treatment acceptability (i.e. attrition)
3. Serious adverse events

Craving intensity occurring in natural settings and in laboratory paradigm was considered as assessed with a standardized tool (visual analog scale (VAS), questionnaire) or by an objective parameter of cue-reactivity. *Treatment acceptability* was considered by either a) the number of participants dropping out from treatment for any reason; or b) subjective ratings of acceptance or satisfaction with care; or c) both measures. *Serious adverse events* (SAEs) were considered to be binary variables

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comprising the information if a serious unfavorable event such as, for example, suicide, suicide attempts or relapse requiring hospitalization.

Search methods for identification of studies

Electronic searches

The Cochrane Drugs and Alcohol Group Information Specialist conducted systematic searches in the following databases for randomized controlled trials and controlled clinical trials without language, publication year or publication status restrictions:

- Cochrane Drugs and Alcohol Group's Specialised Register of Trials (searched on 26 April 2021);
- The Cochrane Central Register of Controlled Trials (CENTRAL; 2021, Issue 3);
- PubMed (January 1966 to 26 April 2021);
- Embase (OVID) (January 1974 to 26 April 2021);
- CINAHL (Cumulative Index to Nursing and Allied Health Literature) (EbscoHOST) (1982 to 26 April 2021);
- Web of Knowledge, Web of Science (1990 to 26 April 2021);
- PsycINFO (OVID) (1806 to 26 April 2021).

The Information Specialist modeled subject strategies for databases on the search strategy designed for PubMed. Where appropriate, they were combined with subject strategy adaptations of the highly sensitive search strategy designed by the Cochrane Collaboration for identifying randomized controlled trials and controlled clinical trials (as described in the *Cochrane Handbook for Systematic Reviews of Interventions* Chapter 6, Lefebvre 2011). Search strategies for major databases are provided in Appendix 1; Appendix 2; Appendix 3; Appendix 4; Appendix 5; Appendix 6.

We searched the following trials registries on 26 April 2021:

- the ISRCTN registry (www.isrctn.com);
- ClinicalTrials.gov (clinicaltrials.gov).

Searching other resources

Key informants, primary authors and review authors were contacted with the request to indicate further studies of potential relevance. For this purpose, reference lists with identified studies and criteria of inclusion and exclusion of the review were provided. Finally, handsearching of reference lists of included studies and current reviews was conducted to complete the searches.

Data collection and analysis

Selection of studies

Two review authors independently assessed the eligibility and relevance of trials on the basis of their abstracts retrieved from the electronic searches. For studies that met the inclusion criteria according to the abstract information, we obtained full-text versions for closer inspection. Full-text versions were also obtained if review authors differed in their judgement. Again, the relevance and eligibility of studies on the basis of full-text versions was independently assessed by two review authors. In case of disagreements, the eligibility will be discussed with an additional consultant. The process of study identification and its results are outlined as flow diagrams according to the PRISMA statement (Moher 2009).

Data extraction and management

The review authors had full access to details about authors, institutions, and journals at all times. Information related to the study design and setting, the study participants, the interventions and comparators as well as the outcomes and methods for their assessment was abstracted from the original reports and entered into the study tables. The following information was extracted in detail:.

1. Study design and setting: design, principle of analysis, setting, study sites, country
2. Study sample: sample size, diagnosis, specific characteristics, age, gender
3. Interventions: description of the type of experimental and control intervention, treatment duration, treatment adherence
4. Outcomes: outcomes, methods of measurement, time points for assessment, compliance

Two review authors independently extracted all relevant outcome data onto pre-specified data extraction forms and compared data value by value. In case of disagreements, the following sequential procedures were undertaken in descending order.

1. Comparison of published and extracted information to identify transcription and comprehension errors
2. Explanation of the coding decisions by each review author, followed by consensus discussion and arbitration

Any disagreement was discussed with an additional expert, and, when necessary, the authors of the studies were contacted for further information. Finally, after comparisons and corrections are concluded, we entered data into the Review Manager software (RevMan 2008).

Assessment of risk of bias in included studies

The risk of bias assessment for RCTs and CCTs in this review was performed using the criteria recommended by the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). The recommended approach for assessing risk of bias in studies included in Cochrane Reviews is a two-part tool, addressing seven specific domains, namely sequence generation and allocation concealment (selection bias), blinding of participants and providers (performance bias), blinding of outcome assessor (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias), and other sources of bias. The first part of the tool involves describing what was reported to have happened in the study. The second part of the tool involves assigning a judgement relating to the risk of bias for that entry, in terms of low, high or unclear risk. To make these judgements we used the criteria indicated by the *Cochrane Handbook for Systematic Reviews of Interventions* adapted to the addiction field. The criteria considered as constitutive for the rating of bias risks are outlined in Appendix 7.

The domains of sequence generation and allocation concealment (avoidance of selection bias) were addressed in the tool by a single entry for each study. We planned to consider blinding of participants, personnel and outcome assessor (avoidance of performance bias and detection bias) separately for objective outcomes (e.g. dropout, substance use measured by urine-analysis, participants who relapsed at the end of follow-up,participants

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engaged in further treatments), and subjective outcomes (e.g. duration and severity of signs and symptoms of withdrawal, patient self-reported use of substance, side effects, social functioning as integration at school or at work, family relationship). Incomplete outcome data (avoidance of attrition bias) were considered for all outcomes except for the dropout from the treatment, which is very often the primary outcome measure in trials on addiction. We considered the equivalence of baseline characteristics an additional indication of selection bias.

Measures of treatment effect

We measured treatment effects for dichotomous effectiveness outcomes (abstinence rate, retention rate) with a risk ratio (RR). For continuous outcomes (days with substance use, consumed amount per day, craving intensity), we planned to asses treatment effects using the mean differences (MD) for outcomes measured on the same scale.We used the standardized mean difference (SMD) for outcomes measured on different scales. We calculated all treatment effects within 95% confidence intervals (CIs). When effects on binary outcomes reached statistical significance, we calculated the number needed to treat for an additional beneficial outcome (NNTB). A P value of 0.05 and below was chosen to indicate statistical significance of effects.

Unit of analysis issues

Only individually-randomized trials with the individual participants constituting the unit of analysis were included in the review. To control unit of analysis errors in studies with multiple treatment groups of the same type (e.g. multiple alternative treatment comparisons; Bowen 2014), we combined interventions to create single-pair comparisons.

Dealing with missing data

Outcome statistics were included as intent-to-treat (ITT) analyses. Sample sizes for continuous outcomes which were not explicitly provided in the trial publication were imputed by the size of treatment-received samples or - if not available - by the size of the randomized sample. An exception was if samples were from analyses explicitly specified as completer analyses, which exclusively reported on patients who completed the trial. For differences in means, missing serious adverse events (SEs) were obtained from standard deviations (SDs), CIs or t values and P values. If only the medians were provided in the trial publications, the outcome statistics were not be included in the meta-analyses, but we considered the information on the significance of effects in the qualitative discussion of results.

Assessment of heterogeneity

We quantified inconsistency across studies with the I^2 statistic (Higgins 2003), using threshold values for substantial heterogeneity as outlined by Deeks 2001. The Tau^2 statistic was additionally considered to provide an estimate of between-study variance (Rücker 2008) independent of the sample size. A value of P < .10 was considered as significant statistical heterogeneity.

Assessment of reporting biases

When there were more than 10 included studies, we graphically illustrated the risk of publication bias with the funnel plot method (Light 1984; Egger 1997).

Data synthesis

For synthesizing outcome measures, we used a random-effects model (DerSimonian 1986), with study effects being weighted using the Mantel-Haenszel approach (Mantel 1959). For outcomes with low effect heterogeneity (I^2 < 30%), we applied a fixed-effect model within the scope of sensitivity analyses (see Sensitivity analysis).

Subgroup analysis and investigation of heterogeneity

Inconsistency across studies was quantified as described above (see Assessment of heterogeneity).

Sensitivity analysis

When the number of included studies was sufficient (> 10), we conducted sensitivity analyses to determine the influence of the following variables on the primary outcomes:

1. the underlying statistical model, by comparing effect sizes for low heterogeneity outcomes (I^2 < 30%) based on random-effects models versus fixed-effect models;
2. the method of measurement, by comparing effect sizes measured by breathalyzer or laboratory tests versus self-reported data on alcohol use.

Summary of findings and assessment of the certainty of the evidence

Findings were presented as summarized narrative and by summary of findings tables (GRADE); and the certainty of evidence was assessed with the GRADE approach for each outcome individually.

We created two summary of findings tables using the following outcomes: continuous abstinence, percentage days with substance use, consumed amount, craving intensity, treatment acceptability (attrition). We used the five GRADE considerations (study limitations, consistency of effect, imprecision, indirectness and publication bias) to assess the quality of a body of evidence as it relates to the studies which contribute data to the meta-analyses for the prespecified outcomes (Atkins 2004). We used methods and recommendations described in Chapter 14 of the Cochrane *Handbook for Systematic Reviews of Interventions* (Higgins 2019) using GRADEproGDT software (GRADEpro GDT 2015). We justified all decisions to down-grade or up-grade the certainty of studies using footnotes, and we made comments to aid the reader's understanding of the review where necessary.

The GRADE system uses the following criteria for assigning grades of evidence.

High: we are very confident that the true effect lies close to that of the estimate of the effect. Moderate: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different. Low: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect. Very low: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

RESULTS

Description of studies

The literature search and included studies are described below.

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Results of the search

The searches of the seven databases (see Electronic searches) retrieved 5555 records. Our searches of other resources (Grant 2017, Li 2017, Goldberg 2018) identified no additional studies that appeared to meet the inclusion criteria. Our screening of the reference lists of the included publications did not reveal additional randomized controlled trials (RCTs). We therefore had a total of 5555 records.

Once duplicates had been removed, we had a total of 3762 records. We excluded 3598 records based on titles and abstracts. We obtained the full text of 173 records. Of these, 68 records were not eligible to be included (see Characteristics of excluded studies table). We identified 23 studies awaiting classification and 11 ongoing studies reported in 13 references.

We included 40 studies reported in 69 references (as some studies were reported across multiple references). For a further description of our screening process, see the study flow diagram (Figure 1).

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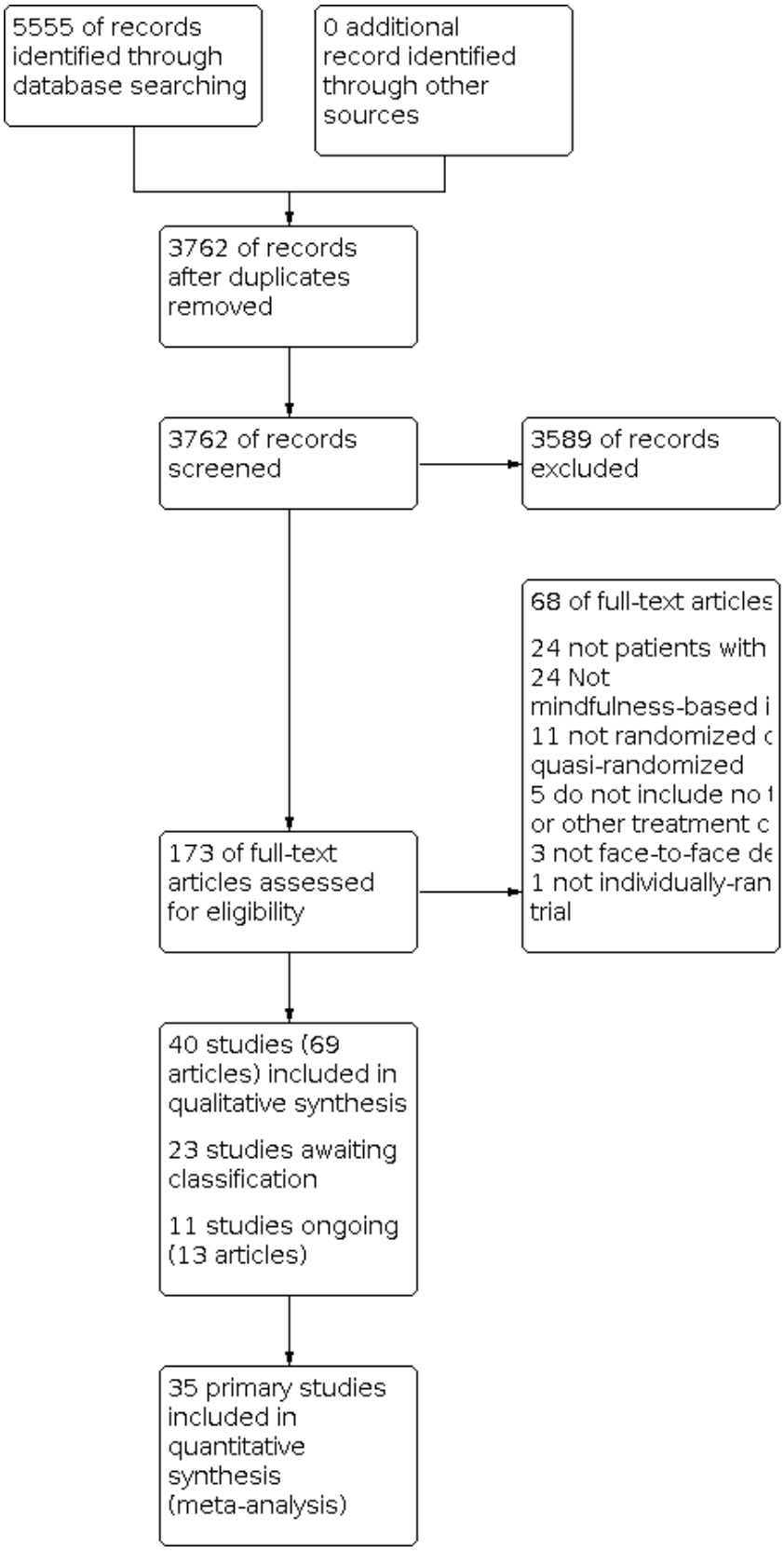
Figure 1. Study flow diagram.



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Included studies

Forty trials published in 69 publications met our inclusion criteria. Data eligible for meta-analysis were available from 35 studies (2825) participants (Abed 2019; Alegria 2019; Alizadehgoradel 2019; Alterman 2004; Asl 2014a; Asl 2014b; Bein 2015; Bevan 2012; Black 2019; Bowen 2009; Bowen 2014; Brewer 2009; Brown 2017; Davis 2013; Davis 2018; de Dios 2012; Foroushani 2019; Garland 2010; Garland 2016; Garland 2019; Glasner 2017; Jenaabadi 2017; Imani 2015; Lee 2011; Machado 2020; Marfurt 2007; Margolin 2006; Mermelstein 2015; Shorey 2017; Vowles 2020; Witkiewitz 2014; Wongtongkam 2019; Yaghubi 2017; Zemestani 2016; Zgierska 2017). However, 18 trials only reported data usable for assessing acceptability (i.e. attrition) and did not provide eligible data for assessment of other primary or secondary outcomes. Five trials did not report any outcomes eligible for meta-analysis (Esmaeili 2017; Himelstein 2015; Ramezani 2019; Wongtongkam 2018; Zhang 2019).

All studies used a randomized controlled trial design. Sixteen studies used an intention-to-treat analysis. Principle of analysis was unclear for three studies. In 17 studies, interventions and/or recruitment occurred in a residential treatment setting, while 19 studies did not involve a residential treatment setting. Setting was unclear in four studies. Of the 40 eligible studies, 23 were conducted in the USA, 11 were conducted in Iran, two were conducted in Thailand, one was conducted in China, one was conducted in Taiwan, one was conducted in Brazil, and one was conducted in Spain and the USA. Sample sizes ranged from eight (Bein 2015) to 341 (Alegria 2019), with an average of 76.08 (SD = 71.38).

Details of all 40 studies are available under Characteristics of included studies.

Participants

Eighteen studies included individuals with various substance use disorders (SUDs), 12 were focused on opioids, five on alcohol, three on stimulants, one on marijuana, and one on alcohol and/or cocaine use. Eighteen studies involved a formal diagnosis while 22 did not. Participants were on average 35.38 years old (SD = 8.27, range = 16.45 to 50.50). Samples were on average 31% female (SD = 34%, range = 0% to 100%). Samples were on average 34% non-Hispanic White (SD = 36%, range = 0% to 100%).

Interventions

Studies implemented a variety of mindfulness-based interventions (MBIs). Sixteen studies involved mindfulness-based relapse prevention (MBPR), or an adaptation of this intervention (e.g. mindfulness-based relapse prevention for alcohol dependence; Zgierska 2017). Four studies involved mindfulness-oriented recovery enhancement (MORE) or an adaptation of this intervention (e.g., mindfulness-oriented recovery enhancement for child welfare; Brown 2017). Two studies involved mindfulness-based cognitive therapy (MBCT), and one study involved mindfulness-based stress reduction (MBSR). The remaining studies involved other interventions that included mindfulness meditation training.

Three studies included multiple comparison conditions, with two including a second other treatment control conditions (Bowen 2014; Garland 2016) and one including a no treatment control (Jenaabadi 2017). Comparisons were made between MBIs and 19 other treatment conditions and 24 no treatment control conditions. Among the other treatment conditions, seven were standard of care (i.e. treatment as usual), six6 were based on cognitive behavioral therapy (CBT), three were psychoeducation, one was a support group, one was physical exercise, and one was medication. Treatment as usual (TAU) was considered another treatment condition when the control group received treatment that was not also provided to the experimental group (e.g. control group received support group sessions while the experimental group received MBI).

MBIs lasted between one and 12 weeks, with an average duration of 7.17 weeks (SD = 2.49). Other treatment controls lasted between one and 19 weeks, with an average duration of 7.14 weeks (SD = 3.35). The majority (n = 32) of the MBIs used a group delivery format with five using an individual delivery format, and one using a combination of individual or individual and group (Margolin 2006). Delivery format was unclear in two studies. Thirteen of the other treatment control conditions used a group delivery format with two using an individual delivery format. Delivery format was unclear for four other treatment control conditions. Adherence to the MBI was reported in eight studies. All eight studies used a version of outside practice (e.g. minutes of practice, number of practice sessions). Fourteen studies included a mechanism to support provider adherence to the MBI protocol (e.g. recording of sessions, clinical supervision, fidelity checklist). Three studies included a mechanism to support provider adherence to the other treatment control condition protocols (e.g. recording of sessions, clinical supervision).

Outcomes

Primary outcome measures

Two studies reported eligible data for assessing continuous abstinence rate. The specific outcomes assessed included any drug use (Bowen 2014) and any heavy drinking (Zgierska 2017). Nine studies reported eligible data for assessing percentage days with substance use. The specific outcomes assessed included alcohol and other drug use days (Bowen 2009), drug use days (Bowen 2014; Witkiewitz 2014), percentage of days with alcohol use (Brewer 2009), Substance Frequency Scale (Davis 2018), marijuana use days (de Dios 2012), drinking episodes (Mermelstein 2015), and percentage heavy drinking days (Machado 2020; Zgierska 2017). Four studies reported eligible data for assessing consumed amount. The specific outcomes assessed included drinks per week (Davis 2013; Mermelstein 2015), drinks per day (Zgierska 2017), and alcohol consumption (Machado 2020). Four studies reported occurrence of adverse events (Bowen 2014; Brewer 2009; Zemestani 2016; Zgierska 2017). None of the primary outcomes were assessed objectively.

Secondary outcome measures

Eleven studies reported eligible data for assessing craving intensity. The specific outcomes assessed included desire to use from the Heroin Craving Questionnaire (Abed 2019), Alcohol Craving Questionnaire Revised (Bevan 2012), Penn Alcohol Craving Scale (Black 2019; Bowen 2009; Bowen 2014; Garland 2010; Garland 2016; Shorey 2017; Zemestani 2016), subjective craving during stress provocation (Brewer 2009), and the Craving Scale from the GAIN assessment (Davis 2018). Thirty-four studies reported eligible data for evaluating treatment acceptability in the form of study attrition. Four studies reported occurrence of serious adverse events (Bowen 2014; Brewer 2009; Zemestani 2016; Zgierska 2017). Treatment

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acceptability in the form of study attrition was the only outcome that was assessed objectively.

Studies awaiting classification and ongoing studies

Twenty-three studies were identified as awaiting classification. Eleven studies (13 articles) were identified as ongoing studies.

Excluded studies

The full-text screening resulted in 68 references being excluded due to ineligible criteria. Reasons for exclusion included:

- not patients with SUD (24 references);
- not MBI (24 references);
- not randomized or quasi-randomized (11 references);
- did not include no treatment or other treatment comparison (5 studies);
- not face-to-face delivery (3 studies);
- not individually randomized (1 study);.

Risk of bias in included studies

Results of risk of bias assessment is displayed in Figure 2 and Figure 3.

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Figure 2.

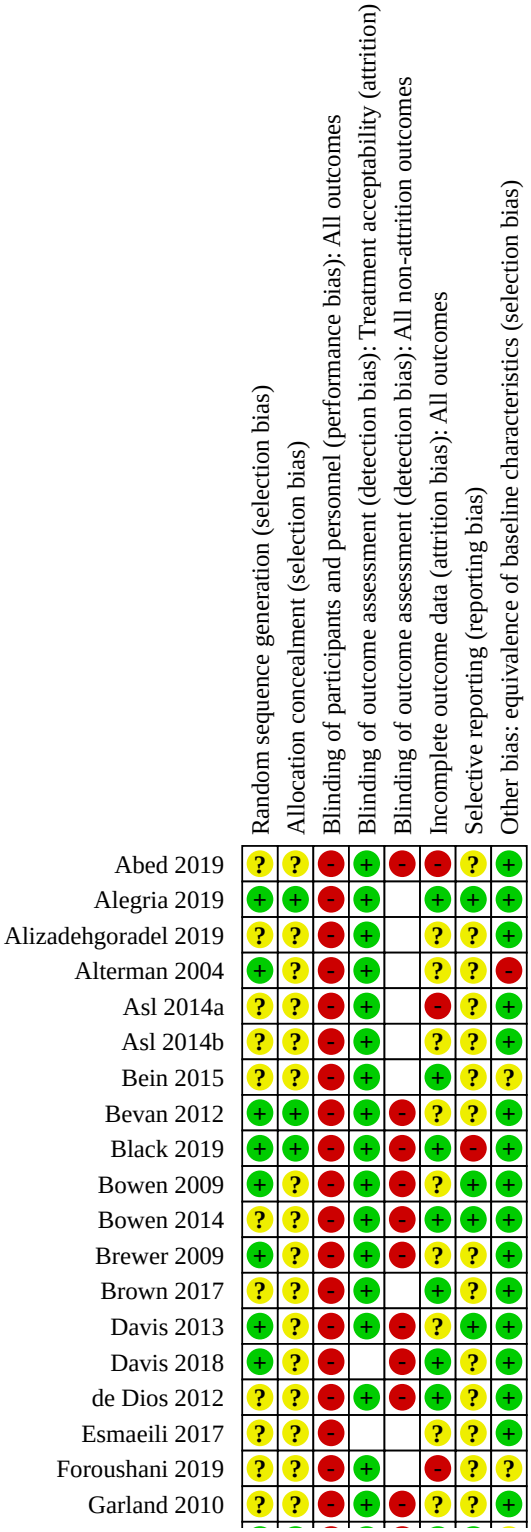

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Figure 2. (Continued)

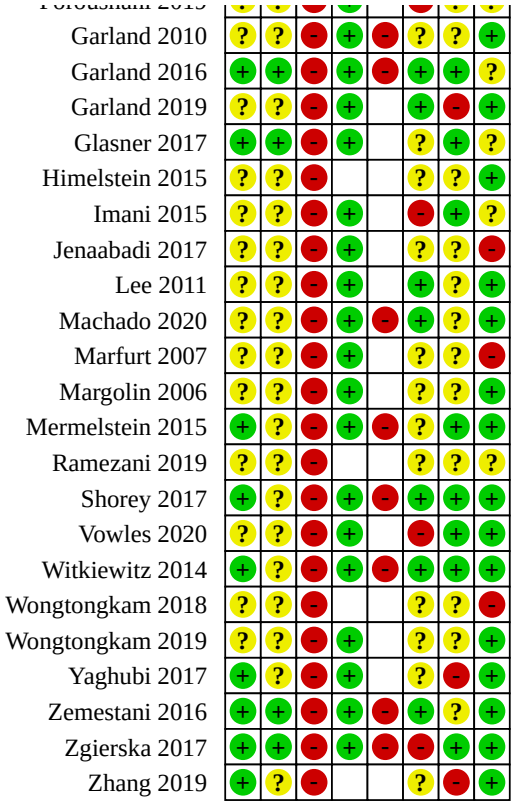
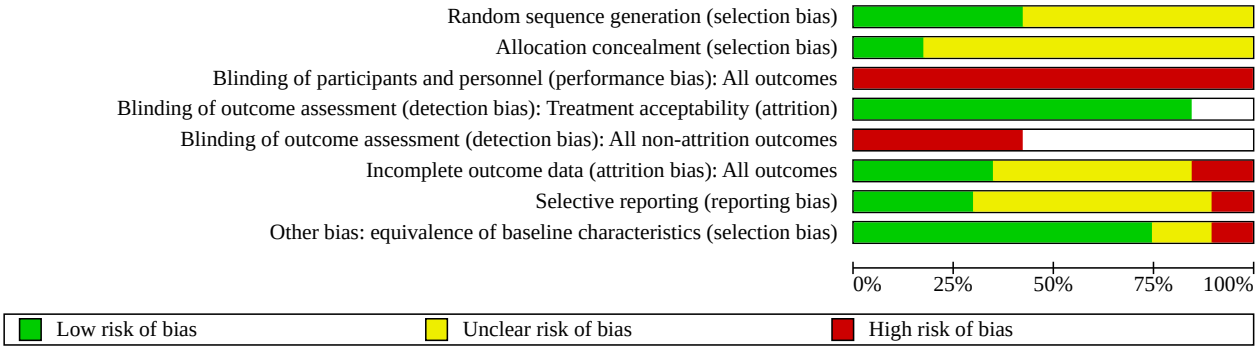


Figure 3.



Allocation

Seventeen studies were at low risk for allocation bias based on reporting adequate methods of sequence generation. The remaining 23 studies were at unclear risk for allocation bias due to insufficient reporting of sequence generation methods. Seven studies were at low risk for allocation bias based on reporting adequate methods of allocation concealment (Alegria 2019; Bevan 2012; Black 2019; Garland 2016; Glasner 2017; Zemestani 2016; Zgierska 2017). The remaining 33 studies were at unclear risk for allocation bias due to insufficient reporting of allocation concealment.

We examined equivalence of baseline characteristics as an additional source of selection bias. Twenty-nine studies were at low risk for bias due to non-equivalence of baseline characteristics, with mindfulness-based intervention (MBI) and control conditions matched at baseline. Five studies were at high risk for bias due to non-equivalence of baseline characteristics. This source of bias was unclear in six studies.

Blinding

All studies were at high risk for performance bias due to a lack of participant blinding, which is unsurprising given the behavioral nature of the MBIs being evaluated. With the exception of treatment

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acceptability in the form of attrition, all outcomes were assessed subjectively via self-report and were therefore at high risk for detection bias (17 studies). Attrition was assessed objectively in all studies were it was assessed (34 studies). Five studies did not include an eligible outcome.

Incomplete outcome data

Fourteen studies were at low risk for attrition bias due to a lack of missing outcome data, adequate treatment of missing outcome data (e.g. through multiple imputation), balanced missingness across groups, and/or similar reasons for missingness across groups. Risk for attrition bias was unclear in 20 studies and high in six studies due to the reasons noted (e.g. missing outcome data that differed in reason and/or amount across conditions).

Selective reporting

Twelves studies were at low risk for reporting bias due to the availability of a study protocol or preregistration with all of the outcomes reported or through the identification of plausible primary outcomes within the published report itself. Risk for reporting bias was unclear in 24 studies. Risk of reporting bias was high in four studies due to the availability of a study protocol but a lack of reporting of pre-specified outcomes.

Other potential sources of bias

No other potential sources of bias were considered.

Effects of interventions

See: **Summary of findings 1** Summary of findings: mindfulness-based interventions (MBIs) compared with no treatment for substance use disorders (SUDs); **Summary of findings 2** Summary of findings: mindfulness-based interventions (MBIs) compared with other treatments for substance use disorders (SUDs)

Mindfulness-based interventions (MBIs) versus no treatment

Twenty-four studies included a comparison between MBI and no treatment. As noted, these comparisons may have included standard of care interventions which were received by both the MBI and no treatment conditions (i.e. no additional treatment was provided to the control group).

Primary outcome measures

Continuous abstinence rate

One study with 112 participants (Zgierska 2017) provided results for comparisons with no treatment controls at post-treatment and follow-up (four months post-treatment). The evidence is very uncertain about the effect of MBIs relative to no treatment on continuous abstinence rate at post-treatment (Analysis 1.1;risk ratio (RR) = 0.96, 95% confidence interval (CI) 0.44, 2.14) and follow-up (Analysis 1.2; RR = 1.04, 95% CI 0.54, 2.01).

Percentageof days with substance use

Four studies with 248 participants (de Dios 2012; Machado 2020; Mermelstein 2015; Zgierska 2017) provided results for comparisons with no treatment controls at post-treatment and three studies with 167 participants (de Dios 2012; Zgierska 2017) provided results for comparisons with no treatment controls at follow-up (three to four months post-treatment). The evidence is very uncertain about the effect of MBIs relative to no treatment on percentage days with substance use at post-treatment (Analysis 1.3; standardized mean difference (SMD) = 0.05, 95% CI -0.37, 0.47) and follow-up (Analysis 1.4; SMD = 0.21, 95% CI -0.12, 0.54).

Consumed amount

Three studies with 221 participants (Machado 2020; Mermelstein 2015; Zgierska 2017) provided results for comparisons with no treatment controls at post-treatment and two studies with 142 participants (Machado 2020; Zgierska 2017) provided results for comparisons with no treatment controls at follow-up (three to four months post-treatment). The evidence is very uncertain about the effect of MBIs relative to no treatment on consumed amount at post-treatment (Analysis 1.5; SMD = 0.10, 95% CI -0.31, 0.52) and follow-up (Analysis 1.6; SMD = 0.33, 95% CI 0.00, 0.66).

Adverse event rate

One study with 112 participants (Zgierska 2017) provided results for comparisons with no treatment controls. No adverse events were reported in either condition.

Secondary outcome measures

Craving intensity

Two studies with 128 participants (Abed 2019; Bevan 2012) provided results for comparisons with no treatment controls at post-treatment. The evidence is very uncertain about the effect of MBIs relative to no treatment on craving intensity at post-treatment (Analysis 1.7; SMD range = -4.84 to -0.32). Results could not be pooled due to high heterogeneity ($I^2 \geq 90\%$).

Treatment acceptability (attrition)

Twenty-one studies with 1087 participants (Abed 2019; Alizadehgoradel 2019; Alterman 2004; Asl 2014a; Asl 2014b; Bein 2015; Bevan 2012; Brown 2017; de Dios 2012; Foroushani 2019; Imani 2015; Jenaabadi 2017; Machado 2020; Marfurt 2007; Margolin 2006; Mermelstein 2015; Shorey 2017; Vowles 2020; Wongtongkam 2019; Yaghubi 2017; Zgierska 2017) provided results for comparisons with no treatment controls (Figure 4). MBIs result in little to no increase in study attrition relative to no treatment (Analysis 1.8; RR = 1.04 95% CI 0.77 to 1.40); high-certainty evidence.

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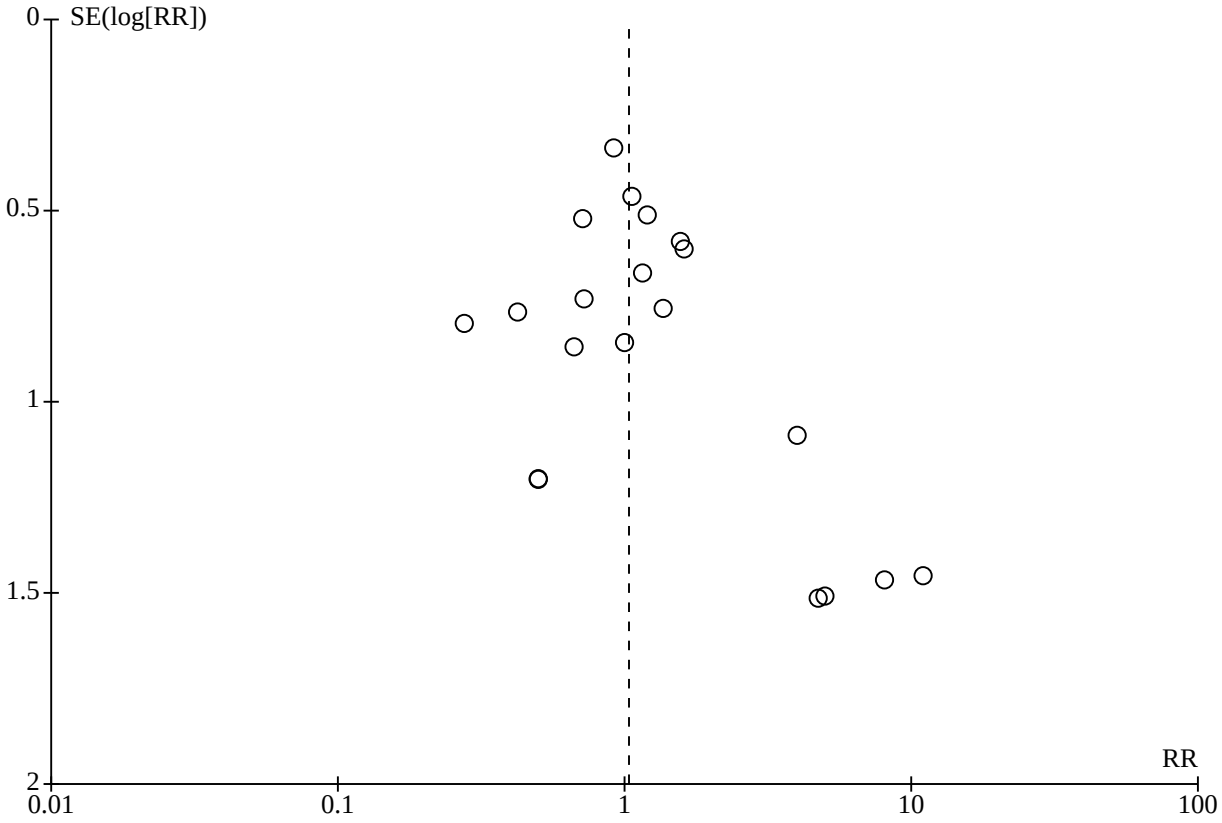
Figure 4.



Serious adverse event rate

One study with 112 participants (Zgierska 2017) provided results for comparisons with no treatment controls. No serious adverse events were reported in either condition.

Sensitivity analyses

Sufficient studies to conduct a fixed-effect model sensitivity analysis (>10 studies) were available only for treatment acceptability. Results indicated that MBIs result in little to no increase in study attrition relative to no treatment (Analysis 1.9; RR = 1.13 95% CI 0.84, 1.50).

Mindfulness-based interventions (MBIs) versus other treatments

Nineteen studies included a comparison between MBI and another treatment.

Primary outcome measures

Continuous abstinence rate

One study with 286 participants (Bowen 2014) provided results for comparisons with other treatment controls at post-treatment and follow-up (10 months post-treatment). The evidence is very uncertain about the effect of MBIs relative to other treatment controls on continuous abstinence rate at post-treatment (Analysis 2.1; RR = 0.80, 95% CI 0.45, 1.44) and follow-up (Analysis 2.2; RR = 0.57, 95% CI 0.28, 1.16).

Percentage days with substance use

Five studies with 523 participants (Bowen 2009; Bowen 2014; Brewer 2009; Davis 2018; Witkiewitz 2014) provided results for comparisons with other treatment controls at post-treatment and three studies with 409 participants (Bowen 2009; Bowen 2014; Davis 2018) provided results for comparisons with other treatment controls at follow-up (4 to 10 months post-treatment). The evidence suggests that MBIs reduce percentage of days with substance use slightly relative to other treatments at post-treatment (Analysis 2.3; SMD = -0.21, 95% CI -0.45, 0.03) and follow-up (Analysis 2.4; SMD = -0.39, 95% CI -0.96, 0.17); both results low-certainty evidence.

Consumed amount

One study with 25 participants (Davis 2013) provided results for comparisons with other treatment controls at post-treatment. The evidence is very uncertain about the effect of MBIs relative to other treatments on consumed amount at post-treatment (Analysis 2.5; SMD = -0.42, 95% CI -1.23 to 0.39).

Adverse event rate

Two studies with 322 participants (Bowen 2014; Brewer 2009) provided results for comparisons with other treatment controls. No adverse events were reported in either condition. One study with 74 participants (Zemestani 2016) included an other treatment control but results were only available for the MBI condition. No adverse events were reported.

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Secondary outcome measures

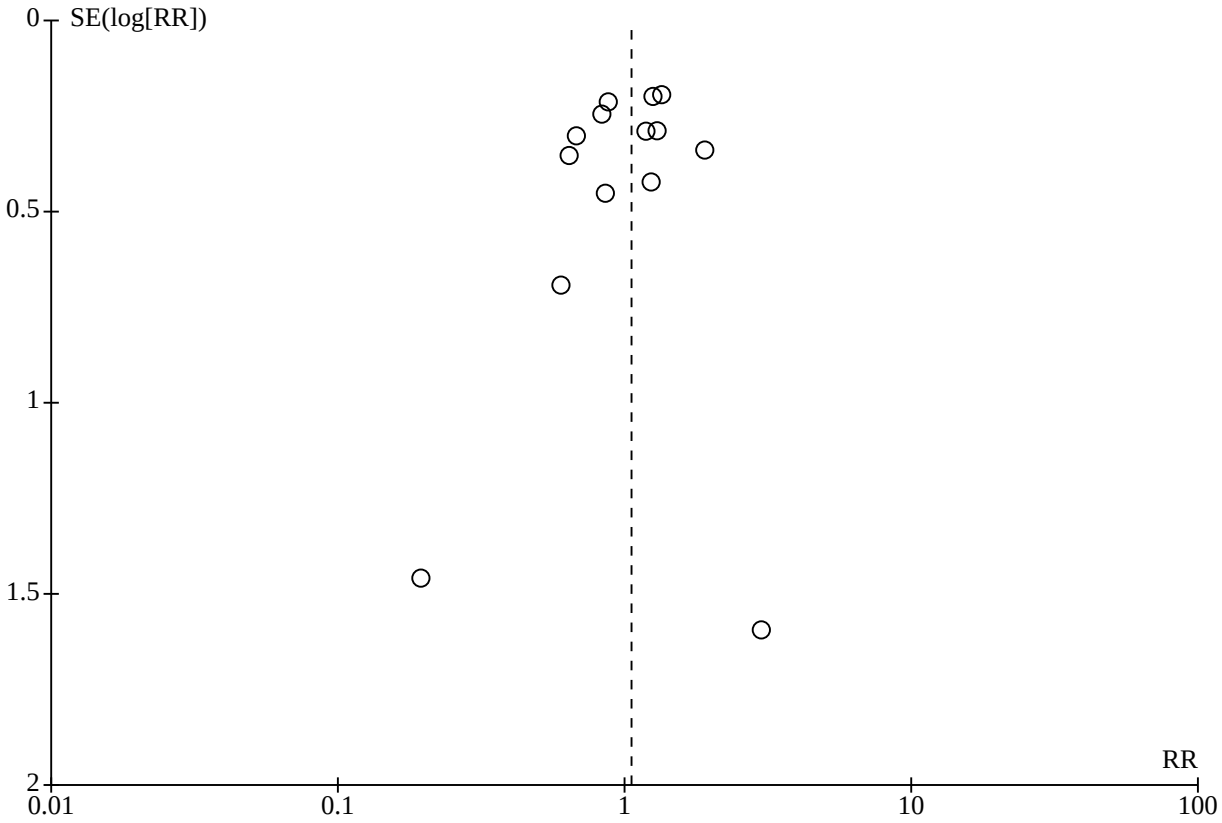
Craving intensity

Nine studies with 971 participants (Black 2019; Bowen 2009; Bowen 2014; Brewer 2009; Davis 2018; Garland 2010; Garland 2016; Shorey 2017; Zemestani 2016) provided results for comparisons with other treatment controls at post-treatment. Results could not be pooled due to high heterogeneity ($I^2 \geq 90\%$) (Analysis 2.6; SMD range = -1.43 to 1.00). Four studies with 415 participants (Bowen 2009; Bowen 2014; Davis 2018; Zemestani 2016) provided results for comparisons with other treatment controls at follow-up (three to six months post-treatment) (Analysis 2.7; SMD range = -2.07 to -0.14). Results could not be pooled due to high heterogeneity ($I^2 \geq 90\%$).

Treatment acceptability (attrition)

Fourteen studies with 1531 participants (Alegria 2019; Black 2019; Bowen 2009; Bowen 2014; Brewer 2009; Davis 2013; Garland 2010; Garland 2016; Garland 2019; Glasner 2017; Jenaabadi 2017; Lee 2011; Witkiewitz 2014; Zemestani 2016) provided results for comparisons with other treatment controls (Figure 5). MBIs result in little to no increase in study attrition relative to other treatment controls (Analysis 2.8; RR = 1.06 95% CI 0.89 to 1.26); high-certainty evidence.

Figure 5.



Serious adverse event rate

Two studies with 322 participants (Bowen 2014; Brewer 2009) provided results for comparisons with other treatment controls. No serious adverse events were reported in either condition. One study with 74 participants (Zemestani 2016) included an other treatment control but results were only available for the MBI condition. No serious adverse events were reported.

Sensitivity analyses

Sufficient studies to conduct a fixed-effect model sensitivity analysis (>10 studies) were available only for treatment acceptability. Results indicated that MBIs result in little to no increase in study attrition relative to no treatment (Analysis 2.9; RR = 1.07 95% CI 0.91, 1.25).

DISCUSSION

Summary of main results

Mindfulness-based interventions (MBIs) were compared with no treatment or other treatments on four primary outcomes (continuous abstinence rate, percentage of days with substance use, consumed amount, adverse event rate) and three secondary outcomes (craving intensity, treatment acceptability, serious adverse events).

Twenty-four studies included a comparison between MBIs and no treatment. Relative to no treatment, the evidence was very uncertain about the effects of MBIs on all primary and secondary outcomes with the exception of treatment acceptability

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(differential attrition). MBIs resulted in little to no increase in study attrition relative to no treatment.

Nineteen studies included a comparison between MBI and another treatment. Relative to other treatments, MBIs may reduce percentage of days with substance use slightly at post-treatment and follow-up (4 to 10 months). However, the confidence intervals are compatible with both an improvement and little to no difference. MBIs result in little to no increase in study attrition relative to other treatments. The evidence is very uncertain regarding other outcomes including continuous abstinence rate, consumed amount, and craving intensity.

Four studies reported data on adverse events, with all reporting the absence of adverse events.

Overall completeness and applicability of evidence

Of the eligible 40 studies, 35 provided data usable for at least one meta-analysis. However, no study included data on all outcome measures and many studies included data on only one outcome measure (typically acceptability in the form of differential attrition). Only one study (Foroushani 2019) reported eligible data in a form that did not allow estimation of an effect size. It is possible that other studies measured outcomes that would have been eligible, but data were not available. The limited number of published protocols or preregistrations makes it difficult to determine precisely how much unpublished data may exist.

The majority of studies were conducted in the USA with several also occurring in Iran as well as Thailand, China, Taiwan, and Spain. Studies were conducted between 2004 and 2020. Almost half of the studies included individuals with various substance use disorders (SUDs) with a large proportion focusing on opioids and several focusing on alcohol. Almost half of the studies required a formal SUD diagnosis of some kind for inclusion. Slightly less than half of the studies investigated mindfulness-based relapse prevention (MBRP) or an adaptation of MBRP with several investigating mindfulness-oriented recovery enhancement (MORE) or an adaptation of MORE. Most interventions were delivered in a group and were similar in duration to mindfulness-based stress reduction (MBSR) (i.e. eight weeks). The samples were predominantly male. Given the diversity in study characteristics in terms of the samples and interventions, results of this review can theoretically be applied to MBIs for SUDs generally.

Limited information was available regarding the safety of MBIs for SUDs. However, no adverse events were reported in the four studies including this information.

Quality of the evidence

All studies were at high risk for performance bias due to an inability to blind participants engaging in a behavioral intervention. No studies assessed a substance use outcome objectively, so these outcomes were coded as at high risk for detection bias. Study attrition is by definition an objective (i.e. non-self-report) outcome, so treatment acceptability in the form of attrition was assessed as low risk for detection bias. Risk for selection bias due to randomization or allocation procedures was often unclear due to a lack of reporting. Risk of bias due to non-equivalence at baseline was considered as another source of selection bias and was assessed as high in five studies. Risk of attrition bias was high in six studies. Risk of reporting bias was high in four studies and unclear in 24 studies.

Based on GRADE, the certainty of evidence was high for treatment acceptability (i.e. attrition). Certainty was low for percentage of days with substance use at post-treatment and follow-up for comparisons with other treatments due to inconsistency (sample size <400) and risk of bias (unblinded outcome assessment). For all other outcomes, certainty was very low due to inconsistency (sample size <400, 95% CI including both an appreciable benefit and an appreciable harm, 95% CI including both an effect not relevant to participants and an appreciable harm), risk of bias (unblinded outcome assessment), and/or inconsistency ($I^2 \geq 90\%$).

Potential biases in the review process

Publication bias was not evaluated as 10 studies were not available for any of the primary outcomes. We sought to minimize publication bias through an extensive search process of both peer-reviewed studies and dissertations, reviewing other recent meta-analyses in this area, as well as contacting authors of ongoing randomized controlled trials (RCTs) of MBIs for SUDs. Nonetheless, publication bias remains a plausible source of bias, particularly given the frequency at which studies were found to be of unclear risk for reporting bias (i.e. selective reporting).

Due to the limited number of available studies for estimating substance use outcomes, we used the last available follow-up for each study. While this was viewed as providing the most robust estimate of sustained effects by maximizing the amount of data used and follow-up periods were typically within two to three months of each other, separating follow-up data into other groupings (e.g. short-term follow-up, medium-term follow-up, long-term follow-up) may have resulted in different results.

Our review protocol prespecified our primary and secondary outcomes. The outcomes assessed did not include some potentially meaningful outcomes (e.g. negative effects of substance use). A future review that includes additional outcome measures may arrive at differing conclusions.

Agreements and disagreements with other studies or reviews

Three meta-analyses have evaluated the effects of MBIs on SUD outcomes. Li 2017 conducted a meta-analysis of 34 RCTs, 15 of which were included in the current review. However, Li 2017 included studies focused on smoking cessation as well as interventions that did not emphasize formal mindfulness meditation practice (e.g. Murphy 1986). Li 2017 also did not require a formal or informal SUD diagnosis for inclusion (e.g. Garland 2014a) and analyses collapsed across-control condition types. Li 2017 reported greater reductions in substance use (standardized mean difference (SMD) = -0.33) and craving (SMD = -0.68) at post-treatment for MBIs relative to control conditions.

Grant 2017 conducted a meta-analysis of nine RCTs testing MBRP for substance abuse. Eight of the included studies were also included in the current review (Uhlig 2009 was not individually randomized). Grant 2017 also collapsed across-control condition types. Grant 2017 reported that MBRP did not differ from controls on relapse to substance use (odds ratio([OR) = 0.72), frequency of use (SMD = 0.02), quantity of use (SMD = 0.26), or treatment dropout (OR = 0.81). Grant 2017 reported that MBRP was associated

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with larger reductions in withdrawal and craving symptoms (SMD = -0.13) and negative consequences (SMD = -0.23).

Goldberg 2018 conducted a meta-analysis of 142 RCTs testing MBIs for various psychiatric conditions. Effects were estimates for SUDs at post-treatment and follow-up. Twelve of the included studies were also included in the current review. Although Goldberg 2018 reported results separated by control condition type, results were collapsed across SUD outcome measure types. Goldberg 2018 included outcomes that were not eligible for inclusion in the current review (e.g. Addiction Severity Index). Goldberg 2018 reported that MBIs did not differ from no treatment on SUD outcomes at post-treatment (SMD = 0.35), showed larger improvement relative to other treatment controls at post-treatment (SMD = 0.27), but not at longest follow-up (SMD = 0.38).

AUTHORS' CONCLUSIONS

Implications for practice

Results of this review provide low-certainty evidence that mindfulness-based interventions (MBIs) reduce percentage of days with substance use slightly relative to other treatments and high-certainty evidence that MBIs result in little to no increase in attrition relative to no treatment or other treatments. The evidence for all other outcomes is very uncertain. Data on harm were minimal, although the available data showed no evidence of adverse effects. Indication of slight superiority to other treatments on one substance use outcome (percentage of days with substance use) may support inclusion of MBIs within the available treatment options for substance use disorders SUDs.

Implications for research

With the exception of estimates related to treatment acceptability (i.e. differential attrition), evidence related to substance use outcomes were of low or very low certainty due to imprecision and inconsistency. It is possible that an updated review with additional studies could result in more reliable estimates of treatment effects.

One of the most notable limitations of the current review is that few studies provided data necessary for estimating substance use outcomes. While it is certainly worthwhile to examine other outcomes within this population (e.g. depression, quality of life), assessing and reporting substance use (e.g. continuous abstinence, percentage of days used, consumed amount) will allow more rigorous evaluation of the effects of MBIs on these key dimensions. It would also be worth examining effects on other dimensions of substance use (e.g. negative effects of substance use). Future studies could more consistently report study design features (e.g. randomization and allocation procedure) and employ procedures to minimize risk of bias (e.g. blind outcome assessment, preregistration). It could be useful in a future and more highly-powered review to examine moderators such as MBI type (e.g. mindfulness-based relapse prevention (MBRP), mindfulness-oriented recovery enhancement (MORE)), substance (e.g. various SUDs, alcohol), and country (e.g. USA, Iran) as well as patient-level demographic characteristics (e.g. gender, race/ethnicity). Such analyses could determine whether effects vary along these dimensions and could guide decisions regarding when MBIs may or may not be indicated. Efforts to understand the efficacy of MBIs specifically in vulnerable populations (e.g. racial/ethnic minorities) is warranted. Larger RCTs and consistent reporting of adverse effects will also strengthen the certainty of evidence related to the use of MBIs for SUDs.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Abed 2019

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 30 Control 1 • *Number randomized*: 30 Overall • *Number randomized*: 60 **Included criteria:** undergoing MMT, having at least 2 lapses during MMT **Excluded criteria:** none **Number missing:** 5 **Reason missing:** left the study **Baseline differences:** no differences **Age:** 36.6 **Percent female:** 0% **Race/Ethnicity:** 100% Iranian
Interventions	**Intervention characteristics**

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Abed 2019 *(Continued)*

	Mindfulness-based intervention • *Group name*: MBRP • *Theory*: Witkiewitz et al. (2013) • *Duration*: 8 weeks • *Timing*: 1x week for 2 hours • *Delivery*: group • *Providers*: study first author • *Co-intervention*: methadone • *Integrity*: not reported • *Compliance*: not reported Control 1: no intervention • *Co-intervention*: methadone
Outcomes	*Desire to use* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment *Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** n/a **Country:** Iran **Setting:** not residential **Authors name:** Abed **Institution:** Islamic Azad University **Email:** mohammadrezaabed777@gmail.com **Address:** Department of Psychology, Najafabad Branch, Islamnic Azad University, Najafabad, Iran **COI:** none **Diagnosis tool:** received methadone maintenance treatment **Diagnosis type:** informal **Funding:** none reported **Journal:** Journal of Substance Abuse **Publication type:** published report **Secondary publications:** none
Notes	

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Abed 2019 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report outcomes
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition and higher attrition in MBI, used completer analysis
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	quote: "no differences in pre-test scores" p. 640

Alegria 2019

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 172 Control 1 • *Number randomized*: 169 Overall • *Number randomized*: 341

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Alegria 2019 *(Continued)*

Included criteria: elevated mental health concerns and substance misuse, 18 to 70 years old, self-identified as Latino, not receiving or about to receive specialty behavioral health services in the previous 3 month or upcoming month

Excluded criteria: lacked capacity to consent, reported imminent suicidal ideation

Number missing: 83

Reason missing: not reported

Baseline differences: no differences

Age: 33.9

Percent female: 51%

Race/Ethnicity: 100% Latin

Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Integrated Intervention for Dual Problems and Early Action • *Theory*: Teasdale et al. (2000); Shonin & Van Gordon (2016) • *Duration*: 3 to 6 months • *Timing*: 10 to 12 sessions, 45 to 75 minutes each • *Delivery*: individual • *Providers*: trained clinicians with MS degree or higher • *Co-intervention*: usual care • *Integrity*: yes, audio recorded sessions • *Compliance*: not reported Control 1 • *Group name*: Enhanced treatment as usual • *Theory*: not reported • *Duration*: 6 months • *Timing*: 5 telephone calls • *Delivery*: individual • *Providers*: care manager • *Co-intervention*: usual care • *Integrity*: not reported • *Compliance*: not reported
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** n/a **Country:** USA and Spain **Setting:** not residential **Authors name:** Alegria

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Alegria 2019 *(Continued)*

Institution: Harvard Medical School

Email: malegria@mgh.harvard.edu

Address: Department of Medicine and Psychiatry, Harvard Medical School, Boston, Massachusetts

COI: none

Diagnosis tool: elevated symptoms on AC-OK screener

Diagnosis type: informal

Funding: this study was funded in part by grant R01DA034952 from NIDA of the National Institutes of Health; grant R01MH100155-01S1 from NIMH; and grants ISCII PI13/02200 and PI16/01852 from Instituto de Salud Carlos III, grant 20151073 from Delegación del Gobierno para el Plan Nacional de Drogas, and grant LSRG-1- 005-16 from the American Foundation for Suicide Prevention (Dr Baca-García).

Journal: JAMA Network Open

Publication type: published report

Secondary publications: yes

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Stratified block-randomization
Allocation concealment (selection bias)	Low risk	Blinded project coordinator randomized after baseline
Blinding of participants and personnel (performance bias) All outcomes	High risk	Research assistant blinded but not participants
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar attrition rates, reasons not given but ITT analyses used
Selective reporting (reporting bias)	Low risk	Protocol available and reported primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	No baseline differences

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Alizadehgoradel 2019

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** methamphetamines **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 20 Control 1 • *Number randomized*: 20 Control 2 • *Number randomized*: Overall • *Number randomized*: 40 **Included criteria:** (1) age range of 18 to 21 years, (2) diagnosis a methamphetamine use disorder based on DSM-V criteria including at least 12-month history of methamphetamine use before beginning of the experiment, (3) lack of other substance-related use disorders except for tobacco smoking, as verified by a urine drug screen, (4) lack of other psychiatric disorders except for substance use disorder assessed via a Structured Clinical Interview for DSM-5 Disorders by an experienced psychiatrist of rehabilitation center for addiction, (5) and not to be on psychotropic medications during the study. **Excluded criteria:** none reported **Number missing:** 5 **Reason missing:** MBSAT: 2 Discontinued MBSAT. Control: 3 Discontinued MBSAT. **Baseline differences:** no demographic differences, not reported for outcomes **Age:** 19.5 **Percent female:** 0% **Race/Ethnicity:** Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-Based Substance Abuse Treatment • *Theory*: Himelstein & Saul (2015) • *Duration*: 6 weeks • *Timing*: 2x weekly, 50-60 minutes • *Delivery*: group • *Providers*: not reported • *Co-intervention*: none • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control

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Alizadehgoradel 2019 *(Continued)*

- *Co-intervention*: none

Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none **Country:** Iran **Setting:** unclear **Comments:** **Authors name:** Jaber Alizadehgoradel **Institution:** Shahid Beheshti University **Email:** j_alizadehgoradel@sbu.ac.ir **Address:** Department of Clinical and Health Psychology, Faculty of Psychology and Educational Sciences, Shahid Beheshti University, P.O. Box: 1983963113, 193954716, Tehran, Iran **COI:** The authors declare that they have no conflict of interest. **Diagnosis tool:** DSM-5 **Diagnosis type:** formal **Funding:** none **Journal:** Neurology Psychiatry and Brain Research **Publication type:** published report **Secondary Publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias)	Low risk	Objective measure

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Alizadehgoradel 2019 *(Continued)*

Treatment acceptability (attrition)		
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Reasons for dropout not reported, although amount was similar between groups
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	No demographic differences (p. 16) and figure suggests no differences on outcomes at baseline

Alterman 2004

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 18 Control 1 • *Number randomized*: 13 Overall • *Number randomized*: 31 **Included criteria:** residents at recovery house **Excluded criteria:** patients with a psychiatric diagnosis of schizophrenia or borderline personality disorder were excluded **Number missing:** 6 **Reason missing:** not reported **Baseline differences:** mindfulness group higher addiction severity, more recent days of use and years of use, higher ASI psychiatric composite score, medical composite score **Age:** 36.5 **Percent female:** 55% **Race/Ethnicity:** 58.1% were African American; other 41.9% were Caucasian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness meditation

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Alterman 2004 *(Continued)*

- *Theory*: Kabat-Zinn (1990)
- *Duration*: 8 weeks
- *Timing*: 1x week for 2 hours, 7-hour workshop
- *Delivery*: group
- *Providers*: Penn Stress Management Program
- *Co-intervention*: standard recovery house treatment based on 12-step, behavioral modification, HIV counseling
- *Integrity*: not reported
- *Compliance*: not reported

Control 1: no treatment control

- *Co-intervention*: standard recovery house treatment based on 12-step, behavioral modification, HIV counseling

Outcomes

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: none reported

Country: USA

Setting: residential

Authors name: Arthur I. Alterman

Institution: University of Pennsylvania

Email: alterman@mail.trc.upenn.edu

Address: Treatment and Evaluation Center, 3440 Market Street, Suite 370, Philadelphia, PA 19104, USA

COI: not reported

Diagnosis tool: receiving substance use treatment at recovery house

Diagnosis type: informal

Funding: none reported

Journal: Journal of Substance Use

Publication type: published report

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A random number sequence, apportioning subjects to the experimental and control conditions in a 3:2 ratio, was employed

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Alterman 2004 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Reasons for dropout not reported, although amount was similar between groups
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	High risk	Baseline differences not controlled in analyses

Asl 2014a

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized: 18* Control 1 • *Number randomized: 17* Overall • *Number randomized:* 35 **Included criteria:** receiving treatment, BDI-II score ≥ 14 **Excluded criteria:** none **Number missing:** 2 **Reason missing:** failed to attend 2 sessions **Baseline differences:** no differences at baseline **Age:** 29.5

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Asl 2014a *(Continued)*

	Percent female: 0% **Race/Ethnicity:** 100% Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBCT • *Theory*: Segal et al. (2002) • *Duration*: 8 weeks • *Timing*: 1x week for 2 hours. • *Delivery*: group • *Providers*: not reported • *Co-intervention*: methadone therapy • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control • *Co-intervention*: methadone therapy
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** Turkey, Iran **Setting:** unclear **Authors name:** Navidreza Hosseinzadeh Asl **Institution:** Hacettepe University **Email:** navidrha@yahoo.com **Address:** Navidreza Hosseinzadeh Asl, PhD student, Hacettepe University, Ankara, Turkey. **COI:** not reported **Diagnosis tool:** receiving treatment through addiction treatment center **Diagnosis type:** informal **Funding:** none reported **Journal**: Archives of Psychiatric Nursing **Publication type:** published report **Secondary publications:** none
Notes	
Risk of bias	

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Asl 2014a *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: attrition in mindfulness intervention only
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no differences on BDI (p. 316) or SF-36 (p. 2) at baseline

Asl 2014b

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 28 Control 1 • *Number randomized*: 25 Overall • *Number randomized*: 53 **Included criteria:** receiving treatment, BDI-II score ≥ 14 **Excluded criteria:** none **Number missing:** 4

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Asl 2014b *(Continued)*

	Reason missing: did not continue **Baseline differences:** no differences on SF-36 **Age:** 36.8 **Percent female:** 0% **Race/Ethnicity:** 100% Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBSR • *Theory*: Kabat-Zinn (1990) • *Duration*: 8 weeks • *Timing*: 1x week for 1.5 hours • *Delivery*: group • *Providers*: not reported • *Co-intervention*: methadone therapy • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control • *Co-intervention*: methadone therapy
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** Addiction Treatment Clinic of Milad **Country:** Iran **Setting:** unclear **Authors name:** Navid Reza Hosseinzadeh Asl **Institution:** Hacettepe University **Email:** navidrha@yahoo.com **Address:** Institute of Social Sciences, Hacettepe University, Ankara, Turkey **COI:** not reported **Diagnosis tool:** receiving treatment through addiction treatment center **Diagnosis type:** informal **Funding:** Addiction Treatment Clinic of Milad **Journal:** Iranian Red Crescent Medical Journal **Publication type**: published report

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Asl 2014b *(Continued)*

	Secondary publications: none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: it appears there was no dropout, although not explicitly stated
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences on SF-36 (p. 2)

Bein 2015

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 4 Control 1 • *Number randomized*: 4 Overall • *Number randomized*: 8

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Bein 2015 *(Continued)*

	Included criteria: participants were English-speaking patients who experienced at least one cluster of criteria for PTSD. Participants also met full criteria for substance dependence to at least one substance in the past year. **Excluded criteria:** current psychotic disorder **Number missing:** 0 **Reason missing:** n/a **Baseline differences:** not reported **Age:** 50.1 **Percent female:** 0% **Race/Ethnicity:** 62.5% White, 25% African American, 12.5% mixed ethnicity
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: mindfulness treatment • *Theory*: adapted from mindfulness treatments for anxiety and PTSD (Rapgay et al. 2011) • *Duration*: 8 weeks • *Timing*: 1x week, time not reported • *Delivery*: group • *Providers*: psychologist-in-training who is trained mindfulness instructor • *Co-intervention*: inpatient TAU • *Integrity*: supervised by licensed psychologist • *Compliance*: not reported Control 1: no treatment control • *Co-intervention*: inpatient TAU
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** USA **Setting:** residential **Authors name:** Zachary Bein **Institution:** Alliant International University Los Angeles **Email:** not reported **Address:** not reported **COI:** not reported **Diagnosis tool:** met full criteria for substance dependence **Diagnosis type:** formal

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Bein 2015 *(Continued)*

	Funding: none reported **Journal:** dissertation **Publication type:** dissertation **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: no attrition
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Unclear risk	Judgement comment: not reported

Bevan 2012

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • Number randomized: 35 Control 1

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Bevan 2012 *(Continued)*

	• Number randomized: 40 Overall • Number randomized: 75 **Included criteria:** receiving treatment at inpatient facility **Excluded criteria:** psychotic symptoms **Number missing:** 13 **Reason missing:** not reported **Baseline differences:** waitlist more likely to be employed **Age:** 42 **Percent female:** 42.86% **Race/Ethnicity:** 97% White, 1% Black, 1% Asian, 1% unspecified
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: mindfulness-based treatment • *Theory*: based on Tang et al. (2007) 5-day protocol • *Duration*: 5 days • *Timing*: 1x daily for 3 to 45 minutes • *Delivery*: group • *Providers*: psychologist-in-training, with minimal training in mindfulness-based interventions • *Co-intervention*: inpatient TAU • *Integrity*: not reported • *Compliance*: yes Control 1: no treatment control • *Co-intervention*: inpatient TAU
Outcomes	*Alcohol Craving Questionnaire Revised* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment *Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** USA **Setting:** residential

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Bevan 2012 *(Continued)*

Authors name: Edward Bevan

Institution: Marywood University

Email: not reported

Address: not reported

COI: not reported

Diagnosis tool: receiving treatment at inpatient facility

Diagnosis type: informal

Funding: none reported

Journal: dissertation

Publication type: dissertation

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "table of random numbers" (p. 31)
Allocation concealment (selection bias)	Low risk	Blind randomizer
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Group assignment for dropout not reported
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Treatment-as-usual control

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Black 2019

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping: p**arallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 114 Control 1 • *Number randomized*: 111 Overall • *Number randomized*: 225 **Included criteria:** client at site, female, age 18 to 65, diagnosed with SUD in clinical record, fluent in English **Excluded criteria:** inability to comprehend or sign consent, cognitive impairment, untreated psychotic disorder or severe chronic mental health conditions, suicidality during the prior 30 days, current prisoner, more than 6 months pregnant, not willing to sign a HIPAA form or be audio-recorded **Number missing:** 41 **Reason missing:** missed first class, not found, passive decline, prison **Baseline differences:** none **Age:** 32.5 **Percent female:** 100% **Race/Ethnicity:** 58% Latina, 19.5% non-Hispanic Black, 21% non-Hispanic White, 1.5% other
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Moment-by-Moment in Women's Recovery • *Theory*: MBSR and Vallejo and Amaro (2009) • *Duration*: 6 weeks • *Timing*: 2x week for 80 minutes • *Delivery*: group • *Providers*: experienced MBSR and MMWR teacher with on-site masters-level clinician with SUD experience • *Co-intervention*: residential TAU • *Integrity*: yes • *Compliance*: not reported Control 1 • *Group name*: Neurobiology of Addiction • *Theory*: Amaro et al. (2016) • *Duration*: 6 weeks • *Timing*: 2x week for 80 minutes

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Black 2019 *(Continued)*

- *Delivery*: group
- *Providers*: Masters-level educator with background and training in NA with on-site masters-level clinician with SUD experience
- *Co-intervention*: residential TAU
- *Integrity*: yes
- *Compliance*: not reported

Outcomes	*Penn Alcohol Craving Scale* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment *Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** NIDA, NIAAA **Country:** USA **Setting:** residential **Authors name:** David S. Black **Institution:** University of Southern California **Email:** davidbla@usc.edu **Address:** Keck School of Medicine of the University of Southern California, Los Angeles, CA, 90032. **COI:** none **Diagnosis tool:** DSM-5 **Diagnosis type:** formal **Funding:** NIDA, NIAAA **Journal:** Behaviour Research and Therapy **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: urn randomization (p. 4)

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Black 2019 *(Continued)*

Allocation concealment (selection bias)	Low risk	Judgement comment: concealed until first group meeting
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding of participants, but blinding of staff
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report measure
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: similar attrition across groups
Selective reporting (reporting bias)	High risk	Judgement comment: not all pre-specified outcomes reported
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no statistically significant differences at baseline

Bowen 2009

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 93 Control 1 • *Number randomized*: 75 Overall • *Number randomized*: 168 **Included criteria:** 18 to 70 years old, fluent in English, completed intensive outpatient or inpatient treatment in previous 2 weeks, medically cleared for participation **Excluded criteria:** psychosis, dementia, imminent suicide risk, withdrawal risk, need for more intensive treatment **Number missing:** 65.52

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Bowen 2009 *(Continued)*

Reason missing: not reported

Baseline differences: MBRP higher proportion White, no other demographic or outcome differences

Age: 40.5

Percent female: 32.3%

Race/Ethnicity: 51.8% White, 28.6% African American, 15.3% multiracial, 7.7% Native American

Interventions

Intervention characteristics

Mindfulness-based intervention

- *Group name*: Mindfulness-based relapse prevention
- *Theory*: Bowen, Chawla, and Marlatt
- *Duration*: 8 weeks
- *Timing*: 1x week for 2 hours
- *Delivery*: group
- *Providers*: master's degrees in psychology or social work, experienced in delivery of CBT, received several weeks of intensive training
- *Co-intervention*: none
- *Integrity*: not available
- *Compliance*: not available

Control 1

- *Group name*: treatment-as-usual
- *Theory*: 12-step, process-oriented format
- *Duration*: not reported
- *Timing*: 1- to -2x week, depending on client need
- *Delivery*: group
- *Providers*: licensed chemical dependency counselors with varying levels of experience
- *Co-intervention*: none
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

AOD days

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment, 2- and 4-month follow-up

Penn Alcohol Craving Scale

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction:**
- **Data value**: endpoint
- **Time point**: post-treatment, 2- and 4-month follow-up

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**:fully reported
- **Direction**:lLower is better

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Bowen 2009 *(Continued)*

- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** none reported **Country:** USA **Setting:** not residential **Authors name:** Sarah Bowen **Institution:** University of Washington **Email:** swbowen@u.washington.edu **Address:** Department of Psychology, University of Washington, Box 351629, Seattle, WA 98195-1525, USA **COI:** not reported **Diagnosis tool:** received substance abuse treatment **Diagnosis type:** informal **Funding:** none reported **Journal:** Substance Abuse **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: quote: "computerized random number generator" p. 298
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: no reasons given although attrition did not differ between groups

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Bowen 2009 *(Continued)*

Selective reporting (reporting bias)	Low risk	Judgement comment: clear definition of primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: differences in race/ethnicity, but controlled for in analyses (p.300)

Bowen 2014

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • Number randomized: 103 Control 1 • Number randomized: 88 Control 2 • Number randomized: 95 Overall • Number randomized: 286 **Included criteria:** 18+, English fluency, medical clearance, ability to attend sessions, agreement to random assignment and follow-up assessment, completion of initial intensive outpatient or inpatient care **Excluded criteria:** current psychotic disorder, dementia, suicidality, imminent danger to others, or participation in previous MBRP trials. **Number missing:** 53 **Reason missing:** withdrew from study, enrolled as inpatient, incarcerated, refused, unable to contact, died **Baseline differences:** TAU reported lower severity on SDS **Age:** 38.4 **Percent female:** 29.7 **Race/Ethnicity:** 64% white, 24% black, 12% Hispanic
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBRP • *Theory*: Mindfulness-based relapse prevention (Bowen et al., 2010) • *Duration*: 8 weeks

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Bowen 2014 *(Continued)*

- *Timing*: 1x week for 2 hours.
- *Delivery*: group
- *Providers*: doctoral degree in clinical psychology, also treatment developer, meditation practice and retreat experience, CBT and group experience, 2-day intensive
- *Co-intervention*: none
- *Integrity*: weekly supervision, review of sessions, competence and adherence scales
- *Compliance*: not reported

Control 1

- *Group name*: Relapse Prevention
- *Theory*: Relapse Prevention (Daley & Marlatt, 2006)
- *Duration*: 8 weeks
- *Timing*: 1x week for 2 hours.
- *Delivery*: group
- *Providers*: doctoral degrees in clinical psychology or in training, experience with CBT and group, 2-day intensive, ongoing training and weekly supervision
- *Co-intervention*: none
- *Integrity*: weekly supervision, review of sessions, competence and adherence scales
- *Compliance*: not reported

Control 2

- *Group name*: TAU
- *Theory*: Based on Alcoholics/Narcotics Anonymous 12-step program
- *Duration*: unclear
- *Timing*: 1 to 2 xs per week for 1.5 hours.
- *Delivery*: group
- *Providers*: licensed chemical dependency counsellors with varying professional degrees and outpatient aftercare experience
- *Co-intervention*: none
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Any drug use

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value: e**ndpoint
- **Time point**: post-treatment, 1- and 4-, and 10-month follow-up

Any heavy drinking

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value:** endpoint
- **Time point**: post-treatment, 1- and 4-, and 10-month follow-up

Drug use days

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint

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Bowen 2014 *(Continued)*

- **Time point**: post-treatment, 1- and 4-, and 10-month follow-up

Heavy drinking days

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment, 1- and 4-, and 10-month follow-up

Penn Alcohol Craving Scale

- **Outcome type**: continuous outcome
- **Reporting**: partially reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment, 1- and 4-, and 10-month follow-up

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** NIDA, NIAAA, Recovery Centers of King County **Country:** USA **Setting:** residential **Comments:** **Authors name:** Sarah Bowen **Institution:** University of Washington **Email:** swbowen @uw.edu **Address:** Center for the Study of Health and Risk Behaviors, University of Washington, 1100 NE 45th St, Ste 300, Seattle, WA 98105 **COI:** Drs Bowen, Grow, and Chawla conduct MBRP training for which they receive monetary incentives, although the findings presented in this article have not yet been presented as part of these trainings. No other disclosures were reported. **Diagnosis tool:** received inpatient alcohol use disorder treatment **Diagnosis type:** informat **Funding:** NIDA, NIAAA, Recovery Centers of King County **Journal:** JAMA Psychiatry **Publication type:** published report **Secondary Publications:** Carroll et al. (2017); Roos et al. (2019); Roos et al. (2017); Greenfield et al. (2018); Hsiao et al. (2018)
Notes	

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Bowen 2014 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: missing outcome data roughly balanced with similar reasons for attrition, used maximum likelihood estimation
Selective reporting (reporting bias)	Low risk	Judgement comment: protocol available and reported primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: differences on some measures at baseline but controlled in analyses

Brewer 2009

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** alcohol and/or cocaine use disorder **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 21 Control 1 • *Number randomized*: 15 Control 2 • *Number randomized*:

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Brewer 2009 *(Continued)*

Overall

- *Number randomized*: 36

Included criteria: English speaking, DSM-IV criteria for alcohol or cocaine dependence

Excluded criteria: younger than 18 years old, suicidal, homicidal, current psychotic disorder, cognitive disorder precluding completion of treatment study, on beta-blocker

Number missing: 22

Reason missing: not reported

Baseline differences: fewer married in mindfulness group, no other baseline differences

Age: 38.2

Percent female: 28%

Race/Ethnicity: 64% White, 24% Black, 12% Hispanic

Interventions

Intervention characteristics

Mindfulness-based intervention

- *Group name*: Mindfulness training
- *Theory*: MBRP (Witkiewitz et al., 2005)
- *Duration*: 9 weeks
- *Timing*: 1x week for 1 hour
- *Delivery*: group
- *Providers*: PhD-level therapist with 12 years of mindfulness practice and several years teaching
- *Co-intervention*: none
- *Integrity*: not reported
- *Compliance*: not reported

Control 1

- *Group name*: Cognitive Behavior Therapy
- *Theory*: NIDA CBT manual (Carroll, 1998)
- *Duration*: 12 weeks
- *Timing*: 1x week for 1 hour
- *Delivery*: group
- *Providers*: PhD-level therapists
- *Co-intervention*: none
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Percentage days alcohol use

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Percentage days cocaine use

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better

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Brewer 2009 *(Continued)*

- **Data value**: endpoint
- **Time point**: post-treatment

Craving during stress provocation

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** NIDA, US VA New England MIRECC, Varela Grant from Mind and Life Institute **Country:** USA **Authors name:** Judson Brewer **Institution:** Yale University **Email:** judson.brewer@yale.edu **Address:** Judson A. Brewer, MD, PhD, VA Connecticut Healthcare System, 950 Campbell Avenue, Building 36, Room 142, West Haven, CT, 06516, USA **COI:** none **Diagnosis tool:** DSM-IV criteria for alcohol and/or cocaine abuse or dependence in the past year **Diagnosis type:** formal **Funding:** NIDA, US VA New England MIRECC, Varela Grant from Mind and Life Institute **Journal:** Substance Abuse **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: random numbers used
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias)	High risk	Judgement comment: no blinding

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Brewer 2009 *(Continued)*
All outcomes

Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: attrition higher in mindfulness; completer analysis used
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no significant differences except marital status

Brown 2017

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 15 Control 1 • *Number randomized*: 13 Overall • *Number randomized*: 28 **Included criteria:** recent report to or open case with child protective services, case low-to-moderate risk and involved parental substance use as presenting problem, children remained in the home or parents had weekly visitation, parent English speaking **Excluded criteria:** case involved sexual abuse, family in extreme crisis **Number missing:** 7 **Reason missing:** "too much on plate", moved, personal life changes, unreachable **Baseline differences:** none **Age:** 31

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Brown 2017 *(Continued)*

	Percent female: 81% **Race/Ethnicity:** 71.4% White, 14.3% Latinx, 9.5% Black, 4.5% other
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-oriented recovery enhancement Child Welfare • *Theory*: Garland (2013) • *Duration*: 6 weeks • *Timing*: 1x week for 1 hour • *Delivery*: individual • *Providers*: principal investigator trained in mindfulness • *Co-intervention*: none • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control • *Co-intervention*: case management as usual
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** USA **Setting:** not residential **Authors name:** Samantha Marie Brown **Institution:** University of Denver **Email:** not available **Address:** not available **COI:** not reported **Diagnosis tool:** Mini International Neuropsychiatry Interview; Simple Screening Instrument for Substance Abuse **Diagnosis type:** formal **Funding:** none reported **Journal:** dissertation **Publication type:** dissertation **Secondary Publications:** none
Notes	

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Brown 2017 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: drop out rates and reasons similar across groups (p. 41)
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Davis 2013

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** alcohol **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 30 Control 1 • *Number randomized*: 25 Overall • *Number randomized*: 55 **Included criteria:** 18 to 29, smoke 10+ cigarettes per day, 5+ alcohol binges per month **Excluded criteria:** alcohol dependence; diagnosis of schizophrenia, bipolar or delusional disorder; CO breath testing showed CO level of 10 ppm or less

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Davis 2013 *(Continued)*

	Number missing: 30 **Reason missing:** technical college exams and vacations **Baseline differences:** none **Age:** 21.9 **Percent female:** 29.1% **Race/Ethnicity:** 90.9% White, 5.5% Latino/Hispanic, 1.8% African American, 1.8% American Indian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness training for smokers • *Theory*: Mindfulness-based stress reduction (Kabat-Zinn, 1994) • *Duration*: 6 weeks • *Timing*: 1x week for 2 hours, 1 7-hour Quit Day retreat • *Delivery*: group • *Providers*: Instructors for both MTS and ILS held Master's degrees in psychology and had equivalent experience with smoking cessation interventions • *Co-intervention*: none • *Integrity*: not reported • *Compliance*: yes (meditation minutes per day) Control 1 • *Group name*: Interactive Learning for Smokers • *Theory*: Freedom from Smoking (American Lung Association) • *Duration*: 6 weeks • *Timing*: 1x week for 2 hours, 1 7-hour Quit Day retreat • *Delivery*: group • *Providers*: Instructors for both MTS and ILS held Master's degrees in psychology and had equivalent experience with smoking cessation interventions. • *Co-intervention*: none • *Integrity*: not reported • *Compliance*: yes (walking minutes per day)
Outcomes	*Drinks per week* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**:lower is better • **Data value**: endpoint • **Time point**: post-treatment *Treatment acceptability (attrition)* • **Outcome type**:dDichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** NIDA **Country:** USA

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Davis 2013 *(Continued)*

Setting: not residential

Comments:

Authors name: James M. Davis

Institution: University of Wisconsin - Madison

Email: jjamesdavis@hotmail.com

Address: Center for Tobacco Research and Intervention, University of Wisconsin School of Medicine and Public Health, 1930 Monroe Street, Suite 200, 53711 Madison, WI, USA

COI: none

Diagnosis tool: 5+ alcohol binges per month (5+ drinks per day for males, 4+ for females)

Diagnosis type: informal

Funding: NIDA

Journal: BMC Complementary and Alternative Medicine

Publicationptype: published report

Secondary Publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: used quote: "random draws" (p. 3)
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: descriptions provided to decrease control group awareness they were assigned to control condition, but no personnel blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: drop out rates similar but no reasons given
Selective reporting (reporting bias)	Low risk	Judgement comment: protocol available and all outcomes included

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Davis 2013 *(Continued)*

Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences (p. 6)

Davis 2018

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 44 Control 1 • *Number randomized*: 35 Overall • *Number randomized*: 79 **Included criteria:** 18 to 29, English proficiency, clear cognitive ability to understand and provide consent **Excluded criteria:** none **Number missing:** 14 **Reason missing:** removed from facility, left facility on own volition, incarcerated, unable to contact **Baseline differences:** none **Age:** 25.3 **Percent female:** 35% **Race/Ethnicity:** 91.3% White, 7.5% African American, 1.25% Native American
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-based relapse prevention • *Theory*: MBRP (Witkiewitz, Marlatt, & Walker, 2005) • *Duration*: 4 weeks • *Timing*: 2x week for 1.5 hours • *Delivery*: group • *Providers*: masters-level clinicians with 200 hours of mindfulness-based intervention training, supervision prior to leading MBRP groups • *Co-intervention*: residential treatment-as-usual • *Integrity*: clinical supervision, rated on adherence and competence scale, self-rated adherence • *Compliance*: Reported practicing mindfulness more than TAU only group

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Davis 2018 *(Continued)*

	Control 1 • *Group name*: Extra social support groups (NA or AA) • *Theory*: 12-step approach • *Duration*: 4 weeks • *Timing*: 2x weekly additional NA or AA • *Delivery*: group • *Providers*: not reported • *Co-intervention*: residential treatment-as-usual • *Integrity*: not reported • *Compliance*: not reported
Outcomes	*Substance Frequency Scale* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment, 6-month follow-up *Craving Scale* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment, 6-month follow-up
Identification	**Sponsorship source:** National Institute on Drug Abuse (Grant num.: 1R36DA041538; PI: Davis), Fahs-Beck Fund for Research and Experimentation (PI: Davis) (082876), Campus Research Board (Grant num.: RB15434; PI: Roberts) **Country:** USA **Setting:** residential **Authors name:** Jordan Davis **Institution:** University of Southern California **Email:** jordanpd@usc.edu **Address:** 669 W 34th Street, Los Angeles, CA 90089, United States. **COI:** **Diagnosis tool:** resident at treatment center **Diagnosis type:** informal **Funding:** National Institute on Drug Abuse, Fahs-Beck Fund for Research and Experimentation, Campus Research Board **Journal:** Journal of Substance Abuse Treatment **Publication type:** published report **Secondary publications:** Davis et al. (2019)
Notes	

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Davis 2018 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: quote: "allocation was performed randomly by an online clinical trial randomizer" p. 39
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: participants not blinded
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: drop out rates and reasons similar across groups (p. 41)
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available; no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences (p. 39)

de Dios 2012

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** marijuana **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 22 Control 1 • *Number randomized*: 12 Overall • *Number randomized*: 34 **Included criteria:** 18 to 29 years old; live within 20 miles of Providence, RI; plan to stay in area for next 3 months; speak English; endorse desire to quit or reduce marijuana use; use marijuana to relax, relieve anxiety, calm down

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de Dios 2012 *(Continued)*

Excluded criteria: severe psychiatric disorders; high use of alcohol or other drugs; past month use of cocaine, heroin, methamphetamines, or other drugs

Number missing: 7

Reason missing: not reported

Baseline differences: none

Age: 23.03

Percent female: 100%

Race/Ethnicity: 50% White, 32.4% African American, 5.9% Hispanic, 11.8% other

Interventions

Intervention characteristics

Mindfulness-based intervention

- *Group name*: Motivational Interviewing Mindfulness Meditation
- *Theory*: Motivational interviewing (Stein et al., in press), Mindfulness meditation (Kabat-Zinn, 1990; Segal et al., 2002)
- *Duration*: 2 weeks
- *Timing*: Once every two weeks
- *Delivery*: Individual
- *Providers*: Master's level interventionist trained in mindfulness meditation by certified MBSR instructor
- *Co-intervention*: none
- *Integrity*: audio recorded sessions reviewed in supervision
- *Compliance*: daily diary

Control 1: No treatment control

- *Co-intervention*: none

Outcomes

Marijuana use days

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment, 3-month follow-up

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: NIDA

Country: USA

Setting: not residential

Authors name: Marcel A. de Dios

Institution: Brown University

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de Dios 2012 *(Continued)*

Email: mdedios@butler.org

Address: Butler Hospital, Providence, RI 02906, USA

COI: not reported

Diagnosis tool: Used marijuana three or more times in the past month

Diagnosis type: informal

Funding: NIDA

Journal: Journal of Substance Abuse Treatment

Publication type: published report

SecondarypPublications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: used ITT analysis with all who attended first session (how they defined "enrollled" in the study, p. 58)
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Esmaeili 2017

Study characteristics

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Esmaeili 2017 *(Continued)*

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 30 Control 1 • *Number randomized*: 30 Overall • *Number randomized*: 60 **Included criteria:** 18 to 50 years old, male, 2 to 12 months of methadone maintenance therapy, not participating in other therapy groups **Excluded criteria:** Use of antipsychotic drugs, inability to answer questions due to physical and psychological problems, lapse, positive results from random urine test (for opium, amphetamines, cannabis, buprenorphin), absence from 2+ training sessions **Number missing:** unclear **Reason missing:** not reported **Baseline differences:** none **Age:** 32.5 **Percent female:** 0% **Race/Ethnicity:** Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness and schema therapy • *Theory*: mindfulness and schema therapy (A Practical Guide) (van Vreeswijk et al., 2014) • *Duration*: 8 weeks • *Timing*: 1x week for 1.5h • *Delivery*: group • *Providers*: graduate student in clinical psychology • *Co-intervention*: methadone maintenance treatment • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control • *Co-intervention*: methadone maintenance treatment
Outcomes	No eligible outcomes reported
Identification	**Sponsorship source:** none reported **Country:** Iran **Setting:** not residential

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Esmaeili 2017 *(Continued)*

Authors name: Mohammad Reza Miri

Institution: Birjand University of Medical Sciences

Email: miri_moh2516@yahoo.com

Address: Social Determinants of Health Research Center, Birjand University of Medical Sciences, Birjand, Iran.

COI: none

Diagnosis tool: patients referred to outpatient drug addiction treatment and receiving methadone maintenance therapy

Diagnosis type: informal

Funding: none reported

Journal: Journal of Substance Use

Publication type: published report

Secondary publications: none

Substance: opioids

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment:nNo blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: dropout not clearly reported
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Foroushani 2019

Study characteristics

Methods	**Study design:** randomized controlled trial

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Foroushani 2019 *(Continued)*

	Study grouping: parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • Number randomized: 30 Control 1 • Number randomized: 30 Overall • Number randomized: 60 **Included criteria:** male, receiving methadone maintenance therapy, three lapses during MMT **Excluded criteria:** absence from 2+ sessions for experimental group **Number missing:** 5 **Reason missing:** not reported **Baseline differences:** unclear **age:** 35.5 **Race/Ethnicity:** Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBRP • *Theory*: Bowen et al. (2011) • *Duration*: 8 weeks • *Timing*: 1x week for 2 hours. • *Delivery*: group • *Providers*: not reported • *Co-intervention*: methadone maintenance treatment • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control • *Co-intervention*: methadone maintenance treatment
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** internal funds **Country:** Iran

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Foroushani 2019 *(Continued)*

Setting: not residential

Authors name: Nahid Sarami Foroushani

Institution: Islamic Azad University

Email: nahid.sarami97@gmail.com

Address: Department of Psychology, Khomeinishar Branch, Islamic Azad University, 581796781, Isfahan, Iran

COI: none

Diagnosis tool: receiving methadone maintenance therapy at addiction treatment center

Diagnosis type: informal

Funding: internal funds

Journal: Heroin Addiction & Related Clinical Problems

Publication type: published report

Secondary publications:

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: dropout only in the treatment group, did not use ITT
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Unclear risk	Judgement comment: not reported

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Garland 2010

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 27 Control 1 • *Number randomized*: 26 Overall • *Number randomized*: 53 **Included criteria:** 18+, alcohol dependence, resided in therapeutic community for 18 months or more **Excluded criteria:** participants were excluded if they scored less than 16 on the AUDIT, or if they endorsed screening questions indicating active psychosis (Degenhardt et al. 2005) or suicidality **Number missing:** 16 **Reason missing:** not reported **Baseline differences:** none **Age:** 40.3 **Percent female:** 20.8% **Race/Ethnicity:** 60.4% African American, 34.0% White, 5.6% other
Interventions	**Substance:** alcohol **Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-oriented recovery enhancement • *Theory*: adapted from mindfulness-based cognitive therapy (Segal et al., 2002) • *Duration*: 10 weeks • *Timing*: 1x week • *Delivery*: group • *Providers*: master's level social worker with training in CBT for substance dependence and mindfulness meditation • *Co-intervention*: therapeutic community TAU • *Integrity*: not reported • *Compliance*: not reported Control 1 • *Group name*: Addiction Support Group • *Theory*: Matrix Model (Rawson & McCann, 2006) • *Duration*: 10 weeks • *Timing*: 1x week • *Delivery*: group • *Providers*: masters-level social worker

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Garland 2010 *(Continued)*

- *Co-intervention*: therapeutic community TAU
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Penn Alcohol Craving Scale

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: NCCAM, Mind and Life Institute, UNC Chapel Hill School of Social Work

Country: USA

Setting: residential

Authors name: Eric L. Garland

Institution: Florida State University

Email: elgarlan@gmail.com

Address: College of Social Work, Florida State University, University Center, Building C, Tallahassee, FL 32306-2570

COI: not reported

Diagnosis tool: DSM-IV alcohol dependence

Diagnosis type: formal

Funding: NCCAM, Mind and Life Institute, UNC Chapel Hill School of Social Work

Journal: Journal of Psychoactive Drugs

Publication type: published report

Secondary publications: Garland (2010)

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported

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Garland 2010 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: dropout rates similar but no reasons given
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Garland 2016

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 64 Control 1 • *Number randomized*: 64 Control 2 • *Number randomized*: 52 Overall • *Number randomized*: 180 **Included criteria:** 18 years or older, current substance use disorder diagnosis, current psychiatric disorder diagnosis, homelessness prior to entering the therapeutic community **Excluded criteria:** active psychosis, substance withdrawal **Number missing:** 52

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Garland 2016 *(Continued)*

Reason missing: dropped out of therapeutic community, relapsed while in treatment

Baseline differences: no differences on average number of substance use disorder diagnoses or trauma exposure

Age: 37.6

Percent female: 0%

Race/Ethnicity: 40 to 44% White, 44 to 45% Black, 12 to 14% Other

Interventions

Intervention characteristics

Mindfulness-based intervention

- *Group name*: Mindfulness-oriented recovery enhancement
- *Theory*: MORE (Garland, 2013)
- *Duration*: 10 weeks
- *Timing*: 1x week for 2 hours
- *Delivery*: group
- *Providers*: clinical social worker with mindfulness practice experience and clinical experience offering mindfulness training to persons with psychiatric disorders
- *Co-intervention*: unclear
- *Integrity*: supervised by first author / developer of MORE, structured manuals with treatment implementation protocols, weekly supervision, fidelity checklist
- *Compliance*: not reported

Control 1

- *Group name*: Cognitive Behavior Therapy
- *Theory*: Seeking Safety (Najavits, 2002)
- *Duration*: 10 weeks
- *Timing*: 1x week for 2 hours
- *Delivery*: group
- *Providers*: masters-level clinicians with experience treating people with addiction, trauma, and psychiatric disorders
- *Co-intervention*: unclear
- *Integrity*: weekly supervision, review of sessions, competence and adherence scales
- *Compliance*: not reported

Control 2

- *Group name*: TAU
- *Theory*: Coping skills groups (Monti & Rohsenow, 1999)
- *Duration*: 10 weeks
- *Timing*: unclear
- *Delivery*: group
- *Providers*: not reported
- *Co-intervention*: unclear
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Penn Alcohol Craving Scale

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint

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Garland 2016 *(Continued)*

- **Time point**: post-treatment

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: SAMHSA, NIDA

Country: USA

Setting: residential

Authors name: Eric L. Garland

Institution: University of Utah

Email: eric.garland@socwk.utah.edu

Address: 395 South, 1500 East, University of Utah, Salt Lake City, UT, 84112, USA.

COI: The first author (ELG) developed the Mindfulness-Oriented Recovery Enhancement (MORE) intervention, and has received income from the MORE treatment manual (Garland, 2013) and therapist training.

Diagnosis tool: MINI

Diagnosis type: formal

Funding: SAMHSA, NIDA

Journal: Behaviour Therapy and Research

Publication type: published report

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: used quote: "randomizer software"
Allocation concealment (selection bias)	Low risk	Judgement comment: randomization table created by first author and given to study coordinator
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding of participants, but research assistants blinded
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure

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Garland 2016 *(Continued)*

Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: dropout rate and reasons similar, used ITT
Selective reporting (reporting bias)	Low risk	Judgement comment: no protocol but clear statement of plausible primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Unclear risk	Judgement comment: no differences on some measures, but not reported for all outcomes

Garland 2019

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 15 Control 1 • *Number randomized*: 15 Overall • *Number randomized*: 30 **Included criteria:** 18 years or older, admitted to MMT in the past year, chronic non-cancer pain, English speaking **Excluded criteria:** none **Number missing:** 0 **Reason missing:** n/a **Baseline differences:** not reported **Age:** 50.4 **Percent female:** 50% **Race/Ethnicity:** 53% African American, 36.7% White, 20% Hispanic
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-oriented recovery enhancement

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Garland 2019 *(Continued)*

- *Theory*: MORE (Garland, 2013)
- *Duration*: 8 weeks
- *Timing*: 1x week 2hours
- *Delivery*: group
- *Providers*: masters-level clinician
- *Co-intervention*: Methadone maintenance therapy
- *Integrity*: supervised by first author / developer of MORE, recordings reviewed during weekly supervision
- *Compliance*: not reported

Control 1

- *Group name*: TAU
- *Theory*: process-oriented, present-centered therapy and cognitive behavioral coping skills training
- *Duration*: 8 weeks
- *Timing*: not reported
- *Delivery*: not reported
- *Providers*: not reported
- *Co-intervention*: methadone maintenance therapy
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: NCCAM, NIDA

Country: USA

Setting: not residential

Authors name: Eric L. Garland

Institution: University of Utah

Email: eric.garland@socwk.utah.edu

Address: College of Social Work and Center on Mindfulness and Integrative Health Intervention Development, University of Utah, 395 South, 1500 East, Salt Lake City, UT 84112 USA

COI: Eric Garland, PhD, LCSW is the Director of the Center on Mindfulness and Integrative Health Intervention Development. The Center provides Mindfulness-Oriented Recovery Enhancement (MORE), mindfulness-based therapy, and cognitive behavioral therapy in the context of research trials for no cost to research participants; however, Dr. Garland has received honoraria and payment for delivering seminars, lectures, and teaching engagements (related to training clinicians in MORE and mindfulness) sponsored by institutions of higher education, government agencies, academic teaching hospitals, and medical centers. Dr. Garland also receives royalties from the sale of books related to MORE.

Diagnosis tool: receiving methadone maintenance therapy

Diagnosis type: informal

Funding: NCCAM, NIDA

Journal: Drug and Alcohol Dependence

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Garland 2019 *(Continued)*

	Publication type: published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: similar attrition across groups and not lost to follow-up
Selective reporting (reporting bias)	High risk	Judgement comment: protocol available and not all outcomes reported
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Glasner 2017

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** stimulants **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 31 Control 1 • *Number randomized*: 32 Overall

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Glasner 2017 *(Continued)*

- *Number randomized*: 63

Included criteria: 18+, DSM-IV diagnosis of stimulant dependence, able to read English, physically able to sit for 30+ minutes

Excluded criteria: medical impairment that compromised safety, required medical detoxification, exhibited psychiatric symptoms that warranted hospitalization, were homeless

Number missing: 37

Reason missing: absence from protocol participation, not enough compensation, no longer interested, tampering with urine sample

Baseline differences: no differences in prevalence of psychiatric disorders, similar in demographics

Age: 45.3

Percent female: 28.6%

Race/Ethnicity: 44.4% African American, 30.2% White, 20.6% Hispanic, 4.7% other

Interventions

Intervention characteristics

Mindfulness-based intervention

- *Group name*: Mindfulness-based relapse prevention
- *Theory*: MBRP (Bowen et al., 2011)
- *Duration*: 8 weeks
- *Timing*: 1x week for 75 minutes
- *Delivery*: group
- *Providers*: masters-level clinician with training in MBSR and MBRP
- *Co-intervention*: Contingency management (Petry, 2006)
- *Integrity*: supervised by MBRP trainer, MBRP Adherence Scale completed by PI on random 50% of sessions
- *Compliance*: minutes practiced per day

Control 1

- *Group name*: Health education
- *Theory*: wellness manual (Kinnunen et al., 2008)
- *Duration*: 8 weeks
- *Timing*: 1x week for 75 minutes
- *Delivery*: group
- *Providers*: certified health instructor with master's degree in public health
- *Co-intervention*: Contingency management (Petry, 2006)
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: NIDA

Country: USA

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Glasner 2017 *(Continued)*

Setting: not residential

Authors name: Suzette Glasner

Institution: UCLA

Email: sglasner@ucla.edu

Address: Integrated Substance Abuse Programs, David Geffen School of Medicine at UCLA, Semel Institute for Neuroscience and Human Behavior, 1640 S. Sepulveda Blvd, Suite 120, LosAngeles, CA 90024, USA

COI: none

Diagnosis tool: MINI

Diagnosis type: formal

Funding: NIDA

Journal: Mindfulness

Publication type: published report

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: quote: "random number table"
Allocation concealment (selection bias)	Low risk	Judgement comment: quote: "table was locked in the desk of the study director and after completion of baseline data collection"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: similar attrition but reasons not given
Selective reporting (reporting bias)	Low risk	Judgement comment: no protocol but clear statement of plausible primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Unclear risk	Judgement comment: not reported

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Himelstein 2015

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 22 Control 1 • *Number randomized*: 22 Overall • *Number randomized*: 44 **Included criteria:** not reported **Excluded criteria:** not reported **Number missing:** 17 **Reason missing:** released from detention facility, incomplete self-report assessment **Baseline differences:** none **Age:** 16.4 **Percent female:** 0% **Race/Ethnicity:** 70% Latino, 14% African American, 6% Caucasian, 5% Pacific Islander, 5% mixed-ethnic descent
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-based substance abuse treatment • *Theory*: Himelstein and Saul (2015) • *Duration*: 8-12 weeks • *Timing*: 1x week for 45 to 60 minutes • *Delivery*: individual • *Providers*: master's and PhD-level trained clinicians with experience working with incarcerated youth and teaching mindfulness • *Co-intervention*: 12-session mindfulness-based substance abuse treatment without meditation, included motivational interviewing, goal planning, and successful reentry back into the community • *Integrity*: not reported • *Compliance*: not reported Control 1 • *Group name*: individual counseling • *Theory*: not reported • *Duration*: 8 to 12 weeks • *Timing*: 1x week for 45 to 60 minutes • *Delivery*: individual

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Himelstein 2015 *(Continued)*

- *Providers*: master's and PhD-level trained clinicians with experience working with incarcerated youth and teaching mindfulness
- *Co-intervention*: 12-session mindfulness-based substance abuse treatment without meditation, included motivational interviewing, goal planning, and successful reentry back into the community
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes	No eligible outcomes reported
Identification	**Sponsorship source:** NIDA **Country:** USA **Setting:** residential **Authors name:** Sam Himelstein **Institution:** Center for Adolescent Studies **Email:** info@samhimelstein.com **Address:** Center for Adolescent Studies, Oakland, CA, USA **COI:** not reported **Diagnosis tool:** unclear **Diagnosis type:** formal **Funding:** NIDA **Journal:** Mindfulness **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: no description
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: high attrition although unclear in what groups; used intention-to-treat
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome

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Himelstein 2015 *(Continued)*

Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Imani 2015

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • Number randomized: 15 Control 1 • Number randomized: 15 Overall • Number randomized: 30 **Included criteria:** 18 to 40 years old, 8+ years education, two weeks of medical treatment with opioid agonist medication **Excluded criteria:** psychosis, dementia, suicide risk organic brain disorder, other drug dependence diagnosis (except nicotine) **Number missing:** 2 **Reason missing:** not reported **Baseline differences:** no significant differences **Age:** 37.4 **percent female:** 3.4% **Rcae/Ethnicity:** Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBRP • *Theory*: Bowen et al. (2009) • *Duration*: 8 weeks • *Timing*: 1x a week for 2 hours. • *Delivery*: group • *Providers*: not reported • *Co-intervention*: TAU (medical management including opioid agonist, weekly individual counseling sessions) • *Integrity*: not reported • *Compliance*: not reported

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Imani 2015 *(Continued)*

	Control 1: No treatment control • *Co-intervention*: TAU (medical management including opioid agonist, weekly individual counseling sessions)
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** Iran **Setting:** not residential **Authors name:** Saeed Imani **Institution:** Shahid Beheshti University **Email:** s_imani@sbu.ac.ir **Address:** Clinical psychology, Department of Clinical Psychology, Shahid Beheshti University, Tehran, IR Iran **COI:** none **Diagnosis tool:** DSM-IV-TR **Diagnosis type:** formal **Funding:** none reported **Journal:** Iranian J Psychiatry **Publication type:** published report **Secondary publications:**
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias)	Low risk	Objective measure

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Imani 2015 *(Continued)*

Treatment acceptability (attrition)		
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: dropout only in the treatment group, did not use intention-to-treat
Selective reporting (reporting bias)	Low risk	Judgement comment: protocol available and reported primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Unclear risk	Judgement comment: no differences on some measures, but not reported for all outcomes

Jenaabadi 2017

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 19 Control 1 • *Number randomized*: 19 Control 2 • *Number randomized*: 19 Overall • *Number randomized*: 57 **Included criteria:** 20 to 45 years old, elementary school education+, abusing opioids but not dependent on stimulant drugs **Excluded criteria:** mental retardation, psychotic disorders, structural brain abnormalities, suicidal thoughts **Number missing:** 18 **Reason missing:** not reported **Baseline differences:** differences in quote: "duration of recent treatment" and "number of unsuccessful quits" **Age:** 32.2 **Percent female:** 0% **Race/Ethnicity:** Iranian

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Jenaabadi 2017 *(Continued)*

Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-based relapse prevention • *Theory*: Bowen et al. (2011) • *Duration*: 8 weeks • *Timing*: 1x week for 1.5 hours • *Delivery*: group • *Providers*: not reported • *Co-intervention*: not reported • *Integrity*: not reported • *Compliance*: not reported Control 1 • *Group name*: methadone maintenance therapy group • *Theory*: not reported • *Duration*: not reported • *Timing*: not reported • *Delivery*: not reported • *Providers*: not reported • *Co-intervention*: not reported • *Integrity*: not reported • *Compliance*: not reported Control 2: No treatment control • *Co-intervention*: none
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** Iran **Setting:** not residential **Comments:** **Authors name:** Amir Hossein Jahangir **Institution:** Shahid Beheshti University of Medical Sciences **Email:** jahangir@yahoo.com **Address:** Department of Clinical Psychology, Taleghani Educational Hospital, School of Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran **COI:** not reported **Diagnosis tool:** DSM-5 **Diagnosis type:** formal

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Jenaabadi 2017 *(Continued)*

Funding: none reported

Journal: Shiraz E-Med J

Publication type: published report

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: similar dropout across groups, but no reasons given
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	High risk	Judgement comment: groups differed at baseline on recent treatment and unsuccessful quit attempts

Lee 2011

Study characteristics

Methods

Study design: randomized controlled trial

Study grouping: parallel group

Participants

Substance: various substances

Baseline characteristics

Mindfulness-based intervention

- *Number randomized*: 10

Control 1

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Lee 2011 *(Continued)*

- *Number randomized*: 14

Overall

- *Number randomized*: 24

Included criteria: receiving treatment at drug abuse treatment center, had used illicit drugs in the past, abstinent from illicit drugs for 6 months or more

Excluded criteria: psychotic features, delirium, illiteracy

Number missing: unclear

Reason missing: not reported

Baseline differences: differences on DUDIT-E

Age: 40.6

Percent female: 0%

Race/Ethnicity: Taiwanese

Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-based relapse prevention • *Theory*: Bowen et al. (2011) • *Duration*: 10 weeks • *Timing*: 1x week for 1.5 hour • *Delivery*: group • *Providers*: certified clinical psychologist trained in relapse prevention and meditation • *Co-intervention*: unclear • *Integrity*: not reported • *Compliance*: not reported Control 1 • *Group name*: Treatment-as-usual • *Theory*: substance use education • *Duration*: not available • *Timing*: not available • *Delivery*: not available • *Providers*: not available • *Co-intervention*: not applicable • *Integrity*: not reported • *Compliance*: not reported
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** Taiwan

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Lee 2011 *(Continued)*

Setting: Residential

Authors name: Kun-Hua Lee

Institution: Kaohsiung Medical University

Email: kunhualee627@gmail.com

Address: Kun-Hua Lee, Department of Psychology, Kaohsiung Medical University (100, Shih-Chuan 1st Road, Kaohsiung, 80708, Taiwan. Tel: +886-7-3215422txt14. E-mail: kunhualee627@gmail.com

COI: none

Diagnosis tool: In drug abuse treatment

Diagnosis type: Informal

Funding: none reported

Journal: Journal of Substance Use

Publication type: published reported

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: not clearly reported but likely no dropout (incarcerated)
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: controlled for baseline differences in analyses

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Machado 2020

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 22 Control 1 • *Number randomized*: 20 Overall • *Number randomized*: 42 **Included criteria:** diagnosis of substance use disorder, having been in substance use disorder treatment for at least a month, literacy, being over 18 **Excluded criteria:** psychotic disorders, severe cognitive impairment, suicidal ideation **Number missing:** 13 **Reason missing:** changed residence, could not be found, relapsed, did not fill out questionnaires **Baseline differences:** no differences **Age:** 44 **Percent female:** 50% **Race/Ethnicity:** Brazilian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBRP • *Theory*: Bowen et al. (2014) • *Duration*: 8 weeks • *Timing*: 1x week for 2 hours • *Delivery*: unclear • *Providers*: trained instructor with MBRP and SUD expertise • *Co-intervention*: outpatient treatment-as-usual (occupational therapy; psychological, psychiatric, clinical, and nutritional treatment; guidance from social worker) • *Integrity*: not reported • *Compliance*: not reported Control 1: No treatment control • *Co-intervention*: outpatient treatment-as-usual (occupational therapy; psychological, psychiatric, clinical, and nutritional treatment; guidance from social worker)
Outcomes	Percentage days with heavy alcohol use • **Outcome type**: continuous outcome

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Machado 2020 *(Continued)*

- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment, 3-month follow-up

Alcohol consumption in standard doses

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment, 3-month follow-up

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** n/a **Country:** Brazil **Setting:** not residential **Comments:** **Authors name:** Machado **Institution:** Universidade Federal de São Paulo **Email:** mayra.pamachado@gmail.com **Address:** Mayra Pires Alves Machado, Rua Botucatu, 862, 1o andar, Vila Clementino, CEP 04023-062, São Paulo, SP, Brazil **COI:** none **Diagnosis tool:** not reported **Diagnosis type:** formal **Funding:** Fundac¸a˜o de Amparo a` Pesquisa do Estado de São Paulo (FAPESP; grant 2015/19472-5), the Conselho Nacional de Desenvolvimento Cient´ıfico e Tecnolo´gico (CNPq; process 142267/2015-5), and the Associac¸a˜o de Fundo e Incentivo a` Pesquisa (AFIP) **Journal:** Brazilian Journal of Psychiatry **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

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Machado 2020 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	No description
Allocation concealment (selection bias)	Unclear risk	No description
Blinding of participants and personnel (performance bias) All outcomes	High risk	Noo blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	similar attrition, used intention-to-treat analyses
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	No baseline differences in outcomes

Marfurt 2007

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 7 Control 1 • *Number randomized*: 7 Overall • *Number randomized*: 14 **Included criteria:** women between the ages 22 to 60 with at least 90 days of sobriety, resident at the facility, history of alcohol or drug abuse, speak and understand English **Excluded criteria:** none

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Marfurt 2007 *(Continued)*

	Number missing: 4 **Reason missing:** withdrew at the baseline measurement for new work assignments, missed 4+ meditation sessions **Baseline differences:** younger age in waitlist **Age:** 42.4 **Percent female:** 100% **Race/Ethnicity:** 100% White
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Stress reduction and mindfulness training • *Theory*: unclear • *Duration*: 6 weeks • *Timing*: Once per week for 90 minutes • *Delivery*: group • *Providers*: licensed social worker with 10 years of experience in substance abuse counseling, trained in meditation and yoga • *Co-intervention*: residential treatment-as-usual • *Integrity*: not reported • *Compliance*: not reported Control 1: no treatment control • *Co-intervention*: residential treatment-as-usual
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** none reported **Country:** USA **Setting:** residential **Authors name:** Stephanie Marfurt **Institution:** Texas Woman's University **Email:** not available **Address:** not available **COI:** not reported **Diagnosis tool:** Receiving residential treatment and history of substance abuse **Diagnosis type:** Informal **Funding: n**ot reported **Journal:** Dissertation

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Marfurt 2007 *(Continued)*

	Publication type: dissertation **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: similar attrition but reasons not given
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	High risk	Baseline differences on age

Margolin 2006

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** heroin **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 38 Control 1 • *Number randomized*: 34 Overall

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Margolin 2006 *(Continued)*

- *Number randomized*: 72

Included criteria: methadone-maintained clients with opioid use disorder

Excluded criteria: none

Number missing: 11

Reason missing: not reported

Baseline differences: none between MBI and control

Age: 41.5

Percent female: 65%

Race/Ethnicity: 44% to 47% White, 26% to 44% African American, 12% to 26% Hispanic

Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Spiritual Self-Schema (3-S) therapy • *Theory*: Avants and Margolin (2004), Majjhima Nikaya (2001) • *Duration*: 8 weeks • *Timing*: 1x per week • *Delivery*: combination of individual only and individual plus group • *Providers*: authors with unreported credentials • *Co-intervention*: standard care + daily MMT and case management with addiction counseling + MMT (Methadone Maintenance Treatment) • *Integrity*: sessions videotaped and rated by trained observers • *Compliance*: yes (attendance, home practice) Control 1: no treatment control • *Co-intervention*: standard care + daily MMT and case management with addiction counseling + MMT (Methadone Maintenance Treatment)
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**:lLower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** NIDA **Country:** USA **Setting:** not residential **Authors name:** Arthur Margolin **Institution:** Yale University **Email:** arthur.margolin@yale.edu **Address:** Yale University School of Medicine, Welch Center, 495 Congress Ave., New Haven, CT 06519 **COI:** not reported **Diagnosis tool:** DSM-IV

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Margolin 2006 *(Continued)*

Diagnosis type: formal

Funding: NIDA

Journal: AIDS Education and Prevention

Publication type: published report

Secondary publications: none

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: similar attrition but reasons not given
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences when collapsed across two active groups

Mermelstein 2015

Study characteristics

Methods

Study design: randomized controlled trial

Study grouping: parallel group

Participants

Substance: alcohol

Baseline characteristics

Mindfulness-based intervention

- *Number randomized*: 38

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Mermelstein 2015 *(Continued)*

	No treatment • *Number randomized*: 38 Overall • *Number randomized*: 76 **Included criteria:** 18 to 24, at least one binge drinking episode in past 2 weeks, full-time non-commuter student, not currently under the influence of alcohol or illicit substances **Excluded criteria:** self-reported diagnosis of schizophrenia or other psychotic disorder **Pretreatment:** no differences on consequences of alcohol use at baseline, no other baseline between-group tests reported **Number missing:** 3 **Reason missing:** lost to follow-up, reasons unknown **Baseline differences:** no differences on consequences of alcohol use at baseline, no other baseline between-group tests reported **Age:** 19.1 **Percent female:** 50% **Race/Ethnicity:** 91% white, 4% black, 4% multiracial, 1% Latino
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Brief mindfulness intervention • *Theory*: Breath meditation (UCLA Mindful Awareness Research Center) and urge surfing (Bowen et al., 2011) • *Duration*: one session with homework assigned for 4 weeks • *Timing*: one time per week for 1 hour • *Delivery*: individual • *Providers*: 3 doctoral clinical psychology students • *Co-intervention*: Cue exposure • *Integrity*: not reported • *Compliance*: assessed practices per week Control 1: no treatment control • *Co-intervention*: cue exposure
Outcomes	D*rinking episodes* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment *Total drinks per week* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint

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Mermelstein 2015 *(Continued)*

- **Time point**: post-treatment

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** none reported **Country:** USA **Setting:** not residential **Authors name:** Liza C. Mermelstein **Institution:** Brown University **Email:** lizamermelstein@gmail.com **Address:** Liza C. Mermelstein, Alpert Medical School of Brown University–Psychiatry and Human Behavior, 222 Richmond Street, Providence, RI 02903 **COI:** not reported **Diagnosis tool:** at least one binge drinking episode in past 2 weeks **Diagnosis type:** Informal **Funding:** none reported **Journal:** Psychology of Addictive Behaviors **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: no description
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure

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Mermelstein 2015 *(Continued)*

Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: similar attrition rates but reasons not given
Selective reporting (reporting bias)	Low risk	Judgement comment: no protocol but clear statement of plausible primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Ramezani 2019

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 16 Control 1 • *Number randomized*: 13 Overall • *Number randomized*: 29 **Included criteria:** receiving treatment at substance dependence clinic, not attending other treatment **Excluded criteria:** absence from 2+ therapy sessions, unwillingness to continue treatment, lack of methadone consumption, being illiterate **Number missing:** not reported **Reason missing:** not reported **Baseline differences:** not reported **Age:** 33.3 **Percent female:** 0% **Race/Ethnicity:** 100% Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBCT

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Ramezani 2019 *(Continued)*

- *Theory*: Segal et al. (2002)
- *Duration*: 5 weeks
- *Timing*: 2x week for 2 hours
- *Delivery*: unclear
- *Providers*: not reported
- *Co-intervention*: methadone
- *Integrity*: not reported
- *Compliance*: not reported

Control 1: no treatment control

- *Co-intervention*: methadone

Outcomes	No eligible outcomes reported
Identification	**Sponsorship source:** n/a **Country:** Iran **Setting:** unclear **Authors name:** Ramezani **Institution:** University of Mohaghegh Ardabili **Email:** lavinramezani@yahoo.com **Address:** Department of Psychology, Faculty of Education and Psychology, University of Mohaghegh Ardabili, Ardabil, Iran **COI:** none **Diagnosis tool:** receiving treatment at substance dependence clinic **Diagnosis type:** informal **Funding:** The Deputy of Research and Technology of Kurdistan University of Medical Sciences **Journal:** Journal of Practice in Clinical Psychology **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No description
Allocation concealment (selection bias)	Unclear risk	No description
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding

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Ramezani 2019 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Dropout not reported
Selective reporting (reporting bias)	Unclear risk	No protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Unclear risk	Not reported

Shorey 2017

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substance **Baseline characteristics** Mindfulness-based intervention • Number randomized: 64 Control 1 • Number randomized: 53 Overall • Number randomized: 117 **Included criteria:** 18+ years old, cleared from withdrawal by medical staff **Excluded criteria:** psychotic symptoms, cognitive impairment **Baseline differences:** more women in mindfulness group **Number missing:** 8 **Reason missing:** disobeyed unit rules, left unit voluntarily **Age:** 41.3 **Percent female:** 26% **Race/Ethnicity:** 92.2% white, 3.4% African American, 1.7% Hispanic, 1.7% Asian American, 0.9% Indian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness and acceptance group • *Theory*: MBRP (Bowen et al., 2014), MBSR (Kabat-Zinn, 1990), ACT (Hayes et al., 2012) • *Duration*: 4 weeks • *Timing*: 2x week for 1.5 hours. • *Delivery*: group

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Shorey 2017 *(Continued)*

- *Providers*: master's level graduate student in clinical psychology with training in mindfulness, ACT, and SUD treatment, personal daily practice
- *Co-intervention*: residential TAU - 12-step based model individual and group
- *Integrity*: treatment components checklist, sessions recorded and coded for adherence, supervision from licensed psychologist
- *Compliance*: not reported

Control 1: no treatment control

- *Co-intervention*: residential TAU - 12-step based model individual and group

Outcomes

Penn Alcohol Craving Scale - alcohol

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Penn Alcohol Craving Scale - drug

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification

Sponsorship source: NIAAA

Country: USA

Setting: residential

Authors name: Ryan C. Shorey

Institution: Ohio University

Email: shorey@ohio.edu

Address: Department of Psychology, Ohio University, 239 Porter Hall, Athens, OH, 45701, USA.

COI: Ryan C. Shorey and Gregory L. Stuart received consulting compensation from the Cornerstone of Recovery.

Diagnosis tool: receiving treatment at residential substance use program

Diagnosis type: informal

Funding: NIAAA

Journal: Substance Use & Misuse

Publication type: published report

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Shorey 2017 *(Continued)*

	Secondary publications:
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: random number generator used
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: similar attrition rates with similar reasons
Selective reporting (reporting bias)	Low risk	Judgement comment: no protocol but clear statement of plausible primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Vowles 2020

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 17 Control 1 • *Number randomized*: 18

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Vowles 2020 *(Continued)*

	Overall • *Number randomized*: 35 **Included criteria:** receiving treatment for chronic pain through VA, prescribed at least one opioid medication for chronic pain, show evidence of opioid misuse, speak and read English **Excluded criteria:** history of suicide attempt in past 12 months, current buprenorphine prescription, uncontrolled psychosis **Number missing:** 7 **Reason missing:** taken off opioids, suicide attempt, no response, lost to follow-up **Baseline differences:** lower prescribed opioid dose in usual care group **Age:** 50.5 **Percent female:** 14% **Race/Ethnicity:** 51.4% White, 28.6% Latinx, 17.1% Native American, 2.9% other
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Acceptance and Commitment Therapy and MBRP • *Theory*: ACT for chronic pain (Vowles et al., 2007) and MBRP (Bowen et al., 2010) • *Duration*: 12 weeks • *Timing*: 1x week for 1.5 hours • *Delivery*: group • *Providers*: doctoral trainees in clinical psychology program trained by developers • *Co-intervention*: usual care VA standard care • *Integrity*: session audiotaped and reviewed by senior author who provided weekly supervision • *Compliance*: not available Control 1: no treatment control • *Co-intervention*: usual care versus standard care
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** NCCIH **Country:** USA **Setting:** not residential **Authors name:** Kevin E. Vowles **Institution:** Queen's University Belfast **Email:** kvowles@unm.edu **Address:** School of Psychology, Queen's University Belfast, David Keir Building, 18-30 Malone Rd, Belfast BT9 5BN, Northern Ireland, United Kingdom

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Vowles 2020 *(Continued)*

	COI: not reported **Diagnosis tool:** Current Opioid Misuse Measure (COMM) established cut point of 9+ and/or meeting criteria for opioid use disorder by DSM 5 **Diagnosis type:** informal/formal **Funding:** NCCIH **Journal:** Journal of Pain **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: numerically higher attrition in usual-care arm
Selective reporting (reporting bias)	Low risk	Judgement comment: protocol available and reported primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	No baseline differences

Witkiewitz 2014

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances

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Witkiewitz 2014 *(Continued)*

	Baseline characteristics Mindfulness-based intervention • *Number randomized*: 55 Relapse prevention • *Number randomized*: 50 Overall • *Number randomized*: 105 **Included criteria:** residency at the treatment center, proficiency in the English language, willingness to be randomized to treatment condition, and sufficient self-reported cognitive ability to understand and provide consent **Excluded criteria:** none **Number missing:** 34 **Reason missing:** switched groups before starting treatment, opted out of study, left center, failed to respond **Baseline differences:** none **Age:** 34.0 **Percent female:** 100 % **Race/Ethnicity:** 34.5% to 51.0% white, 10.2% to 12.7% African American, 7.3% to 10.2% Native American, 2% to 3.6% Asian, 0% to 1.8% Hispanic/Latinx
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-based relapse prevention • *Theory*: Mindfulness-based relapse prevention (Bowen et al., 2010) • *Duration*: 8 weeks • *Timing*: Twice per week for 50 minutes • *Delivery*: group • *Providers*: master's level clinician employed by treatment program and trained in MBRP and MBSR • *Co-intervention*: residential treatment-as-usual • *Integrity*: not reported • *Compliance*: not reported Control 1 • *Group name*: Relapse prevention • *Theory*: Daley and Marlatt (2006), Coping Skills Training Guide (Monti et al., 2002) • *Duration*: 8 weeks • *Timing*: twice per week for 50 minutes • *Delivery*: group • *Providers*: master's level clinician employed by treatment center trained in RP • *Co-intervention*: residential treatment-as-usual • *Integrity*: not reported • *Compliance*: not reported
Outcomes	*Drug use days*

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Witkiewitz 2014 *(Continued)*

- **Outcome type**: continuous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** Washington State University Vancouver grant **Country:** USA **Setting:** residential **Authors name:** Katie Witkiewitz **Institution:** University of New Mexico **Email:** katiew@unm.edu **Address:** Dr Katie Witkiewitz, PhD, Department of Psychology, Center on Alcoholism, Substance Abuse, and Addictions, University of New Mexico, 2650 Yale Blvd SE, Albuquerque, NM, USA **COI:** none **Diagnosis tool:** receiving residential treatment **Diagnosis type:** informal **Funding:** Washington State University Vancouver grant **Journal:** Substance Use & Misuse **Publication type:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: quote: "random number generator"
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding

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Witkiewitz 2014 *(Continued)*

Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: reasons for dropout and amount of dropout similar across groups
Selective reporting (reporting bias)	Low risk	Judgement comment: no protocol but clear statement of plausible primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Wongtongkam 2018

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** alcohol **Baseline characteristics** Mindfulness-based intervention • Number randomized: 23 Control 1 • Number randomized: 22 Overall • Number randomized: 45 **Included criteria:** age 18 years and older, with a diagnosis of alcohol dependence and proficiency in spoken Thai language **Excluded criteria:** psychotic symptoms, disrupting other participants, unable to control behaviors while meditating **Number missing:** not reported **Reason missing:** n/a **Baseline differences:** mindfulness group higher on personal distress **Age:** 40.2 **Percent female:** %

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Wongtongkam 2018 *(Continued)*

	Race/Ethnicity: Thai
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Vipassana • *Theory*: Buddhist Vipassana • *Duration*: 5 days • *Timing*: 1x day for 2 hours. • *Delivery*: group • *Providers*: Thai Buddhist monk with 30 years of practice and teaching experience • *Co-intervention*: residential TAU • *Integrity*: not reported • *Compliance*: not reported Control 1 • *Group name*: physical exercise • *Theory*: • *Duration*: 5 days • *Timing*: 1x a day for 2 hours. • *Delivery*: unclear • *Providers*: • *Co-intervention*: residential TAU • *Integrity*: not reported • *Compliance*: not reported
Outcomes	No eligible outcomes reported
Identification	**Sponsorship source:** not reported **Country:** Australia, Thailand **Setting:** residential **Comments:** **Authors name:** Nualnong Wongtongkam **Institution:** Charles Sturt University **Email:** nwongtongkam@csu.edu.au **Address:** School of Biomedical Sciences, Charles Sturt University, Bathurst, New South Wales 2795, Australia. **COI:** the authors report no conflicts of interest. **Diagnosis tool:** diagnosis of alcohol dependence **Diagnosis type: f**ormal **Funding:** not reported **Journal:** Alcoholism Treatment Quarterly **Publication type: p**ublished report **Secondary publications:** none

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Wongtongkam 2018 *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: not reported
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: not reported, although likely no dropout (residential setting)
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	High risk	Judgement comment: differences at baseline

Wongtongkam 2019

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** various substances **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 24 Control 1 • *Number randomized*: 22 Overall • *Number randomized*: 46 **Included criteria:** 18+, receiving treatment at rehabilitation center, had illegal substance use problems, proficient in spoken and written Thai **Excluded criteria:** showing severe psychotic symptoms, disrupting others while meditating **Number missing:** 20

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Wongtongkam 2019 *(Continued)*

	Reason missing: not reported **Baseline differences:** no differences **Age:** 29.5 **Percent female:** 100% **Race/Ethnicity:** 100% Thai
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Vipassana • *Theory*: Goenka & Hart (2000) • *Duration*: 5 days • *Timing*: 1x day for 2.5 hours • *Delivery*: group • *Providers*: Buddhist monk with 20+ years of experience teaching meditation • *Co-intervention*: residential treatment-as-usual • *Integrity*: not reported • *Compliance*: not reported Control 1: no treatment control • *Co-intervention*: residential treatment-as-usual
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** n/a **Country:** Thailand **Setting:** residential **Comments:** **Authors name:** Wongtongkam **Institution:** Charles Sturt University **Email:** nualnongw@gmail.com **Address:** School of Biomedical Sciences, Charles Sturt University, Albury, Australia **COI:** none **Diagnosis tool:** receiving treatment at rehabilitation center **Diagnosis type:** informal **Funding:** none reported **Journal:** Therapeutic Communities **Publication type:** published report

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Wongtongkam 2019 *(Continued)*

Secondary publications: none

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "simple random allocation by a nurse," but not further specified
Allocation concealment (selection bias)	Unclear risk	not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	similar attrition but reasons not given
Selective reporting (reporting bias)	Unclear risk	no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	no baseline differences

Yaghubi 2017

Study characteristics

Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** opioids **Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 35 Control 1 • *Number randomized*: 35 Overall • *Number randomized*: 70

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Yaghubi 2017 *(Continued)*

	Included criteria: age between 20 to 45 years, psychiatric or medical references regarding the original diagnosis and diagnostic criteria for substance dependence according to the Diagnostic and Statistical Manual of Mental Disorders-5th edition (DSM-5), not having severe psychiatric disorders (schizophrenia, depression and bipolar disorder), and having the least degree of junior high school **Excluded criteria:** not wanting to continue the meetings, the absence at more than two sessions, participating in other health programs simultaneously, and having a long-term dependence on simultaneous multi-drug **Number missing:** 10 **Reason missing:** irregular presence and non-completion of questionnaires **Baseline differences:** none **Age:** 30. **Percent female:** 0% **Race/Ethnicity:** Iranian
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: Mindfulness-based relapse prevention • *Theory*: not reported • *Duration*: 8 weeks • *Timing*: 1x per week for 2 hours • *Delivery*: group • *Providers*: clinical psychologist • *Co-intervention*: methadone therapy • *Integrity*: not reported • *Compliance*: not reported Control 1: no treatment control • *Co-intervention*: methadone therapy
Outcomes	*Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** Isfahan University of Medical Sciences and Health Services **Country:** Iran **Setting:** not residential **Authors name:** Fatemeh Zargar **Institution:** Isfahan University of Medical Sciences **Email:** fatemehzargar@gmail.com **Address:** Behavioral Sciences Research Center and Department of Psychiatry, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

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Yaghubi 2017 *(Continued)*

	COI: none
	Diagnosis tool: DSM-IV
	Diagnosis type: formal
	Funding: Isfahan University of Medical Sciences and Health Services
	Journal: Addiction & Health
	Publication type: published report
	Secondary publications: Yaghubi et al. (2018)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: quote: "table of random numbers"
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: imbalance in number of dropouts
Selective reporting (reporting bias)	High risk	Judgement comment: pProtocol available but not all outcomes reported (distress tolerance not reported)
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences on demographics, also appears no differences on outcomes either

Zemestani 2016

Study characteristics

Methods	**Study design:** randomized controlled trial
	Study grouping: parallel group
Participants	**Substance:** various substances
	Baseline characteristics

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Zemestani 2016 *(Continued)*

Mindfulness-based intervention

- *Number randomized*: 37

Treatment as usual

- *Number randomized*: 37

Overall

- *Number randomized*: 74

Included criteria: DSM-IV-TR substance dependence, 2+ weeks in inpatient or outpatient treatment and completion of detoxification, BDI-II score in moderate range, speak and read Persian

Excluded criteria: psychotic disorder, suicide risk, withdrawal risk, need for more intensive treatment, did not complete inpatient or outpatient treatment

Number missing: 8

Reason missing: dropped out, missed 4+ sessions, lost to 3-month follow-up

Baseline differences: none

Age: 30.1

Percent female: 20.3%

Race/Ethnicity: Iranian

Interventions

Intervention characteristics

Mindfulness-based intervention

- *Group name*: MBRP
- *Theory*: Bowen et al. (2009, 2011)
- *Duration*: 8 weeks
- *Timing*: 1x week for 2 hours
- *Delivery*: group
- *Providers*: clinical psychologist with training mindfulness and CBT
- *Co-intervention*: none
- *Integrity*: audiotaped sessions, rated for adherence/competence
- *Compliance*: not reported

Control 1

- *Group name*: TAU
- *Theory*: 12-step, process oriented format, rational thinking skills (Ellis & MacLaren, 2005), relapse prevention skills (Gorski, 2007)
- *Duration*: 8 weeks
- *Timing*: 1x week for 2 hours
- *Delivery*: group
- *Providers*: clinical psychologist with varying levels of clinical training and experience in the delivery of therapy and outpatient aftercare
- *Co-intervention*: none
- *Integrity*: not reported
- *Compliance*: not reported

Outcomes

Penn Alcohol Craving Scale

- **Outcome type**: continuous outcome

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Zemestani 2016 *(Continued)*

- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment and 3-month follow-up

Treatment acceptability (attrition)

- **Outcome type**: dichotomous outcome
- **Reporting**: fully reported
- **Direction**: lower is better
- **Data value**: endpoint
- **Time point**: post-treatment

Identification	**Sponsorship source:** Italian Ministry of Health **Country:** Iran, Italy **Setting:** residential **Authors name:** Mehdi Zemestani **Institution:** University of Kurdistan **Email:** m.zemestan@gmail.com **Address:** Social Sciences, University of Kurdistan, Sanandaj, Iran **COI:** none **Diagnosis tool:** DSM-IV SCID-IV **Diagnosis type:** formal **Funding:** Italian Ministry of Health **Journal:** Mindfulness **Publication Ttpe:** published report **Secondary publications:** none
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: quote: "pre-prepared blocked randomization lists"
Allocation concealment (selection bias)	Low risk	Judgement comment: allocated by first author who was not involved in recruitment
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: blinding of research staff but not participants
Blinding of outcome assessment (detection bias)	Low risk	Objective measure

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Zemestani 2016 *(Continued)*

Treatment acceptability (attrition)		
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: similar attrition rates, reasons not given but intention-to-treat analyses used
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no protocol available, no statement of primary outcome
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

Zgierska 2017

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Substance:** alcohol **Baseline characteristics** Mindfulness-based intervention • Number randomized: 64 Control 1 • Number randomized: 59 Overall • Number randomized: 123 **Included criteria:** 18+, English fluency, alcohol dependence diagnosis, early recovery (quit date within the prior 2-14 weeks), completion of ≥2 weeks outpatient treatment for alcohol dependence, elevated Perceived Stress Scale-10 (score ≥14) **Excluded criteria:** inability to reliably participate, current meditation practice, current pregnancy, schizophrenia, delusional, or bipolar disorders; acute drug use disorder based on SCID **Number missing:** 11 **Reason missing:** lack of time or changed life circumstances, withdrawn by PI due to disruptiveness **Baseline differences:** control more likely to be employed **Age:** 41 **Percent female:** 44% **Race/Ethnicity:** 91.0% White, 4.5% African-American, 4.5% other, 2.7% Hispanic/Latinx

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Zgierska 2017 *(Continued)*

Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBRP-A • *Theory*: Bowen et al. (2010) • *Duration*: 8 weeks • *Timing*: 1x week for 2 hours. • *Delivery*: group • *Providers*: therapist with degree in clinical psychology, social work, or substance abuse counseling, ≥2 years of experience in mental health and/or substance abuse counseling and group therapy facilitation, ≥2 years personal mindfulness meditation experience, experience teaching mindfulness meditation in group setting • *Co-intervention*: outpatient care for alcohol dependence - included motivational enhancement, relapse prevention, and 12-step facilitation strategies • *Integrity*: PI observed delivery of first intervention, MBRP Adherence and Competence measure completed by RA who observed sessions, PI audited randomly selected recorded sessions • *Compliance*: formal practice minutes Control 1: no treatment control • *Co-intervention*: outpatient care for alcohol dependence - included motivational enhancement, relapse prevention, and 12-step facilitation strategies
Outcomes	*Percentage heavy drinking days* • **Outcome type**: continuous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • post-treatment and 4-month follow-up *Number of drinks per day* • **Outcome type**: continuous outcome • **Reporting**:fully reported • **Direction**: lower is better • **Data value**: endpoint • post-treatment and 4-month follow-up *Any heavy drinking* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • post-treatment and 4-month follow-up *Treatment acceptability (attrition)* • **Outcome type**: dichotomous outcome • **Reporting**: fully reported • **Direction**: lower is better • **Data value**: endpoint • **Time point**: post-treatment
Identification	**Sponsorship source:** NIAAA, NCATS

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Zgierska 2017 *(Continued)*

Country: USA

Setting: not residential

Authors name: Aleksandra E. Zgierska

Institution: University of Wisconsin - Madison

Email: aleksandra.zgierska@fammed.wisc.edu

Address: School of Medicine and Public Health, Department of Family Medicine and Community Health, University of Wisconsin-Madison, 1100 Delaplaine Ct., Madison, WI 53715, USA

COI: none

Diagnosis tool: SCID for DSM-IV-TR alcohol dependence

Diagnosis type: formal

Funding: NIAAA, NCATS

Publication type: published report

Secondary publications: Zgierska et al. (2019)

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: study statistician prepared randomization envelopes
Allocation concealment (selection bias)	Low risk	Judgement comment: randomization envelopes
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: no blinding
Blinding of outcome assessment (detection bias) Treatment acceptability (attrition)	Low risk	Objective measure
Blinding of outcome assessment (detection bias) All non-attrition outcomes	High risk	Self-report
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: numerically higher attrition in mindfulness condition, not all participants included in analysis
Selective reporting (reporting bias)	Low risk	Judgement comment: no protocol but clear statement of plausible primary outcomes
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Judgement comment: no baseline differences

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Zhang 2019

Study characteristics	
Methods	**Study design:** randomized controlled trial **Study grouping:** parallel group
Participants	**Baseline characteristics** Mindfulness-based intervention • *Number randomized*: 20 Control 1 • *Number randomized*: 20 Overall • *Number randomized*: 40 **Included criteria:** DSM-5 stimulant use disorder, receiving treatment at mandated drug rehabilitation center **Excluded criteria:** cognitive disability, serious physical health condition, previous mindfulness-related practice experience (e.g., qigong), had participated in previous study, participating in concurrent study **Number missing:** not reported **Reason missing:** not reported **Baseline differences:** intervention group younger age, no differences in drug use history or other demongraphics **Age:** 34.4 **Percent female:** 0% **Race/Ethnicity:** 100% Chinese
Interventions	**Intervention characteristics** Mindfulness-based intervention • *Group name*: MBRP • *Theory*: Bowen et al. (2009) • *Duration*: 10 days • *Timing*: 1x day for 2 hours • *Delivery*: group • *Providers*: not reported • *Co-intervention*: residential treatment-as-usual • *Integrity*: not reported • *Compliance*: not reported Control 1: no treatment control • *Co-intervention*: residential treatment-as-usual
Outcomes	No eligible outcomes reported
Identification	**Sponsorship source:** n/a

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Zhang 2019 *(Continued)*

Country: China

Setting: residential

Authors name: Zhang

Institution: Shanghai Jiao Tong University

Email: dujiangdou@163.com

Address: Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, Shanghai 20030, China

COI: not reported

Diagnosis tool: DSM-5

Diagnosis type: formal

Funding: none reported

Journal: National Natural Science Foundation of China, Project of Science and Technology Commission of Shanghai Municipality

Publication type: published report

Secondary publications: none

Substance: stimulants

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomized number table
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Dropout not reported
Selective reporting (reporting bias)	High risk	Protocol available and not all outcomes reported
Other bias: equivalence of baseline characteristics (selection bias)	Low risk	Treatment-as-usual control

CBT: cognitive behavioral therapy;**COI:** conflict of interest**DSM-5:** Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; **ITT:** intention-to-treat; MBI: mindfulness-based interventions; **MBRP:** mindfulness-based relapse prevention; **MBSR; m**indfulness-based

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stress reduction; **PTSD:** post-traumatic stress disorder; **SCID:** structured interview guide;**SD:** standard deviation; **SUD:** substance use disorder**TAU:** treatment as usual.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Alexander 2019	Not randomized or quasi-randomized
Amaro 2017	Not patients with SUD
Bandawar 2016	Not face-to-face delivery
Bowen 2006	Not randomized or quasi-randomized
Bowen 2012	Not randomized or quasi-randomized
Bowen 2017	Not randomized or quasi-randomized
Carpentier 2015	Does not include no treatment or other treatment comparison
Caselli 2016	Not mindfulness-based intervention
Chen 2019	Not mindfulness-based intervention
Chouhan 2011	Not patients with SUD
Collins 2009	Does not include no treatment or other treatment comparison
Crescentini 2015	Not individually randomized trial
Crowfoot 2014	Not mindfulness-based intervention
DRKS00015678	Not patients with SUD
Enkema 2017	Does not include no treatment or other treatment comparison
Fonagy 2010	Not patients with SUD
Garland 2014	Not patients with SUD
Garland 2014a	Not patients with SUD
Garland 2014b	Not patients with SUD
Garland 2017	Not patients with SUD
Garland 2017a	Not patients with SUD
Garland 2017b	Not patients with SUD
Garland 2018	Not patients with SUD
Garland 2019a	Not patients with SUD
Garland 2019b	Not patients with SUD

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Study	Reason for exclusion
Garland 2019c	Not patients with SUD
Garland 2020	Not patients with SUD
Gayner 2012	Not patients with SUD
Gibson 2019	Does not include no treatment or other treatment comparison
Grow 2015	Not randomized or quasi-randomized
Hai 2021	Not mindfulness-based intervention
Hargreaves 1974	Not patients with SUD
Hruschak 2021	Not mindfulness-based intervention
Iranshahri 2015	Not randomized or quasi-randomized
IRCT20150413021727N2	Not randomized or quasi-randomized
IRCT2015042420961N	Not mindfulness-based intervention
Kamboj 2017	Not face-to-face delivery
Lee 2017	Not mindfulness-based intervention
Lyons 2019	Not patients with SUD
Magidson 2011	Not mindfulness-based intervention
Malouf 2017	Not patients with SUD
Marcus 2001	Not randomized or quasi-randomized
Marcus 2009	Not randomized or quasi-randomized
Murphy 2014	Not mindfulness-based intervention
Nakamura 2015	Not mindfulness-based intervention
NCT01505101	Not patients with SUD
NCT04082637	Not mindfulness-based intervention
NCT04160754	Not patients with SUD
NCT04567043	Not patients with SUD
NCT04769986	Not mindfulness-based intervention
Nice 2008	Not patients with SUD
Ojehagen 1992	Not mindfulness-based intervention
Parker 1978	Not mindfulness-based intervention

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Study	Reason for exclusion
Parker 1978a	Not mindfulness-based intervention
Price 2012	Not mindfulness-based intervention
Price 2012a	Not mindfulness-based intervention
Price 2016	Not mindfulness-based intervention
Price 2017	Not mindfulness-based intervention
Price 2018	Not mindfulness-based intervention
Price 2019	Not mindfulness-based intervention
Price 2019a	Not mindfulness-based intervention
Rentala 2020	Not mindfulness-based intervention
Russell 2019	does not include no treatment or other treatment comparison
Simpson 2015	Not mindfulness-based intervention
Tang 2016	Not patients with SUD
Temme 2012	Not randomized or quasi-randomized
Vinci 2014	Not face-to-face delivery
Wupperman 2015	Not randomized or quasi-randomized

SUD: Substance use disorder.

Characteristics of studies awaiting classification *[ordered by study ID]*

ACTRN12613000193774

Methods	
Participants	adults with alcohol dependence
Interventions	mindfulness-based cognitive therapy vs. alcohol support group
Outcomes	Brief Symptom Inventory, Penn Alcohol Craving Scale, Impaired Alcohol Response Inhibition Scale, Perceived Stress Scale, White Bear Suppression Inventory, psychophysiological cue reactivity, Kentucky Inventory of Mindfulness Skills, Attitudes Towards Treatment Questionnaire
Notes	Contact email: chris.lee@murdoch.edu.au, anticipated enrollment date of February 20, 2013

Baldus 2018

Methods	

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Baldus 2018 *(Continued)*

Participants	340 13 to 19 year olds receiving inpatient or day treatment targeting substance use
Interventions	mindfulness-based psychotherapy with standard substance use treatment vs. standard substance use treatment
Outcomes	substance use, substance use symptoms, comorbid symptoms
Notes	

Becker 2017

Methods	
Participants	60 adults with comorbid alcohol dependence and depression
Interventions	mindfulness-based training vs. behavioral activation
Outcomes	default mode network activity, craving, depression, relapse rates
Notes	

c9njc, R. B. R.

Methods	
Participants	not available
Interventions	not available
Outcomes	not available
Notes	

CasasGaviln 2018

Methods	
Participants	162 patients diagnosed with alcohol use disorder
Interventions	mindfulness-based relapse prevention vs. control
Outcomes	unclear
Notes	

Chen 2018

Methods	

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Chen 2018 *(Continued)*

Participants	180 participants with methamphetamine use disorder
Interventions	mindfulness-based relapse prevention with virtual reality cue exposure vs. treatment-as-usual
Outcomes	craving, virtual cue reactivity, anxiety, depression, emotion regulation, mindfulness, drug-related attention bias
Notes	

Connors 2011

Methods	
Participants	92 participants
Interventions	mindfulness-based stress reduction vs. healthy lifestyle lectures
Outcomes	stress, hassles, anxiety, psychiatric symptoms
Notes	

CTRI/2018/07/014994

Methods	
Participants	not available
Interventions	not available
Outcomes	not available
Notes	

Garland 2016a

Methods	
Participants	not available
Interventions	not available
Outcomes	not available
Notes	

IRCT2013031612826N1

Methods	

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IRCT2013031612826N1 *(Continued)*

Participants	30 patients who are dependent on opioids receiving treatment with methadone in the Iranian National Center for Addiction Study
Interventions	mindfulness-based group therapy vs. control
Outcomes	craving, alcohol and drug use consequences, mindfulness, acceptance, Difficulties in Emotion Regulation Scale; Addiction Severity Index; Depression, Anxiety, and Stress Scale
Notes	Contact email: psychology2008@gmail.com, expected recruitment end date July 21, 2013

IRCT2015041321727N1

Methods	
Participants	24 male participants with substance dependence recruited from the Yavaran Omid Addiction Treatment Clinic
Interventions	6 one-hour group therapy sessions based on detached mindfulness techniques vs. "common group therapy program of the clinic"
Outcomes	Relapse Prediction Scale, Meta-Cognitive Questionnaire-30, Beck Depression and Anxiety Inventory, Clinica Global Improvement, Client Satisfaction Questionnaire
Notes	Contact email: zahragholami014@gmail.com, expected recruitment end date December 22, 2013

IRCT2015061522749N1

Methods	
Participants	36 patients with heroin use being treated with methadone and without acute mental disorder
Interventions	mindfulness-based cognitive therapy vs. control
Outcomes	Obsessive Compulsive Drug Use Scale (OCDUS) and Ruminative Response Scale (RRS)
Notes	Contact email: ali91haghnazari@gmail.com, expected completion date: March 21, 2014

IRCT2015121925603N1

Methods	
Participants	90 males with methamphetamine addiction
Interventions	12 mindfulness sessions vs. control
Outcomes	affective control, self-regulation, perceived stress
Notes	Contact email: psyk13t@yahoo.com, expected recruitment end date August 21, 2016

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Irct20170702034844N	
Methods	
Participants	not available
Interventions	not available
Outcomes	not available
Notes	

IRCT2017081325160N7	
Methods	
Participants	40 males with stimulant abuse/dependence
Interventions	mindfulness-based cognitive therapy vs. control
Outcomes	psychological symptoms, craving beliefs, self-efficacy
Notes	Contact email: ahmadij@sums.ac.ir, expected recruitment end date August 22, 2018

NCT01211418	
Methods	
Participants	66 adults meeting DSM-IV criteria for cocaine dependence or abuse and seeking treatment
Interventions	integrative meditation vs. supportive counseling
Outcomes	cocaine urine toxicology, use of drugs and alcohol, heart rate variability, Addiction Severity Index, length of time in drug treatment program, cocaine cravings, Beck Depression Inventory II, Spielberger State-Trait Anxiety Inventory, Self-Efficacy and Self-Esteem
Notes	Contact information: Mary Bahr-Robertson, Research Supervisor, University of Maryland, College Park Last updated October, 15, 2018

NCT02147483	
Methods	
Participants	4 participants with DSM-IV-TR diagnosis of alcohol dependence
Interventions	mindfulness-based relapse prevention vs. treatment-as-usual
Outcomes	mindfulness, craving, depression, anxiety, perceived stress, obsessive thoughts of alcohol/compulsive drinking, drinking behavior

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NCT02147483 *(Continued)*

Notes	Contact information: Jennifer Kim Penberthy, Associate Professor, University of Virginia Last updated: April 17, 2019

NCT03366909

Methods	
Participants	40 participants with cannabis use
Interventions	mindfulness-based relapse prevention vs. classic therapy
Outcomes	cannabis use, treatment retention, withdrawal symptoms, electroretinogram, retinal thickness
Notes	Contact information: Vincent LaprevoteCentre Psychothérapique de Nancy, last updated April 19, 2018

NCT03748875

Methods	
Participants	200 adults with DSM 5 amphetamine use disorder
Interventions	mindfulness-based relapse prevention
Outcomes	treatment-as-usual
Notes	

NCT03894501

Methods	
Participants	30 participants in methadone treatment for at least 3 months with non-malignant pain for 2 months or longer
Interventions	mindfulness-oriented recovery enhancement vs. methadone program treatment-as-usual
Outcomes	expressing interest in the study, refusing study participation, number screened, number consented, number refusing participation after/during consent, number of sessions completed by study participants, percentage of sessions completed by study participants, number of participants who drop out, number of completed assessments
Notes	Contact information: Nina A. Cooperman, Psy. D., Associate Professor, Rutgers, The State University of New Jersey Last updated: September 4, 2019

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Negrei 2015

Methods	
Participants	60 Romanian patients
Interventions	mindfulness-based cognitive therapy vs. medication treatment
Outcomes	depression, anxiety
Notes	

Park 2005

Methods	
Participants	not available
Interventions	not available
Outcomes	not available
Notes	

RBR-4br6q5

Methods	
Participants	40 crack users following the 12 steps program in a therapeutic community
Interventions	8 weeks of meditation for stress reduction vs. control
Outcomes	perceived stress
Notes	Contact email: mseleghim@yahoo.com, anticipated first enrollment date October 5, 2016

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; **DSM-5:** Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition.

Characteristics of ongoing studies *[ordered by study ID]*

DRKS00014041

Study name	Treatment of mindfulness-based psychotherapy in adolescent inpatients with substance use disorders
Methods	
Participants	246 adolescents (13 to 19 years) with substance use disorders
Interventions	12 group therapy sessions of a mindfulness-based therapy vs. standard substance use disorder treatment

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DRKS00014041 *(Continued)*

Outcomes	days with substance use, craving, well-being / quality of life, abstinence motivation, severity of dependence, mindfulness skill, impulsivity, perceived stress, disability days, comorbid diagnoses, general psychosocial functioning, changes in meditation, treatment adherence
Starting date	August 16, 2018
Contact information	Tanja.Legenbauer at rub.de
Notes	

Ellingson 2018

Study name	
Methods	
Participants	36 adults seeking treatment for alcohol use disorder
Interventions	mindfulness-based relapse prevention vs. relapse prevention
Outcomes	alcohol dependence, depression, anxiety, mindfulness
Starting date	
Contact information	
Notes	

NCT02755103

Study name	Mindfulness meditation for the treatment of women with comorbid PTSD and SUD
Methods	
Participants	102 females with DSM 5 alcohol or substance use disorder and PTSD
Interventions	mindfulness-based relapse prevention vs. treatment-as-usual
Outcomes	PTSD symptoms, days of substance use, amount of substance use, emotion regulation, mindfulness
Starting date	June 1, 2016
Contact information	Therese K. Killeen, Research Professor, Medical University of South Carolina
Notes	

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NCT03734666

Study name	Development of a mindfulness-based treatment for the reduction of alcohol use and smoking cessation
Methods	
Participants	80 participants who smoke and with elevated alcohol use
Interventions	mindfulness-based relapse prevention vs. cognitive behavioral therapy
Outcomes	participant satisfaction, rate of recruitment, participant retention, questionnaire completion, smoking abstinence, alcohol use
Starting date	November 1, 2018
Contact information	Mikaela.Hemenway@moffitt.org
Notes	

NCT03883646

Study name	Mindfulness for alcohol abusing offenders (MIT)
Methods	
Participants	480 females with alcohol use disorder released from incarceration > 3 months
Interventions	mindfulness-based relapse prevention vs. relapse prevention
Outcomes	alcohol craving, alcohol consumption, temptation to drink alcohol, criminal behavior
Starting date	July 1, 2018
Contact information	Jenna Shold, PhD 505-400-5241 jshold@mrn.org
Notes	

NCT04112186

Study name	Mindfulness-Oriented Recovery Enhancement (MORE) in heroin addiction
Methods	
Participants	300 adults with opioid use disorder with heroin as primary drug of choice, stabilized on methadone or other form of MAT
Interventions	8-weeks of group therapy using psychological principles including mindfulness training vs. 8-weeks of group therapy using psychological principles not including mindfulness training
Outcomes	fMRI BOLD signal during tasks of reward, control reactivity, cue reactivity, during resting-state functional connectivity, voxel-based morphometry, urine drug test
Starting date	October 21, 2020

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NCT04112186 *(Continued)*

Contact information	Rita Goldstein, PhD Icahn School of Medicine at Mount Sinai, rita.goldstein@mssm.edu
Notes	

NCT04278352

Study name	Mindfulness-based relapse prevention for opioid and alcohol use disorders (MBRP)
Methods	
Participants	240 adults who completed behavioral health treatment for opioid use disorder (OUD) or alcohol use disorder (AUD) within previous 8 weeks, meeting DSM-5 criteria for OUD or AUD
Interventions	mindfulness-based relapse prevention vs. waitlist control
Outcomes	opioid / alcohol use, opioid alcohol craving, withdrawal symptoms, quality of life, perceived stress, posttraumatic stress symptoms, pain severity, medication adherence, mindfulness skills, emotion regulation skills, executive functioning, savoring, affect
Starting date	July 1, 2020
Contact information	Heidi Zinzow, Ph.D. 864-656-4376 hzinzow@clemson.edu
Notes	

NCT04278586

Study name	Effect of mindfulness on opioid use and anxiety during primary care buprenorphine treatment (R33 phase) (Mindful-OBOT)
Methods	
Participants	236 adults with opioid use disorder diagnosis, prescribed buprenorphine, less than 90 days of abstinence
Interventions	Live-online Mindful Recovery OUD Care continuum vs. Live-Online Control
Outcomes	opioid abstinence, cocaine toxicology, benzodiazepine toxicology, anxiety, pain interference, pain catastrophizing, substance craving, mental health, treatment retention, emotion regulation, self-compassion, internalized stigma, decentering, rumination, experiential avoidance, perceived stress, interoceptive awareness, mindfulness
Starting date	January 6, 2021
Contact information	Kayley Okst, BA 857-270-0372 kokst@challiance.org
Notes	

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NCT04491968

Study name	Mindfulness oriented recovery enhancement for chronic pain and opioid relapse
Methods	
Participants	154 adults currently on methadone, experiencing non-malignant pain for ≥3 months
Interventions	Mindfulness-oriented recovery enhancement vs. methadone treatment-as-usual
Outcomes	opioid relapse, opioid abstinence vs. any opioid use, drug abstinence vs. other drug use, number of days of opioid use, number of days of other drug use, craving, pain, emotional distress
Starting date	August 13, 2020
Contact information	Nina Cooperman, PsyD732-235-8569 cooperna@rwjms.rutgers.edu
Notes	

NCT04584502

Study name	Mindful Moms in Recovery (MMORE)
Methods	
Participants	120 adults receiving comprehensive medication treatment for opioid use disorder at maternity care practice
Interventions	Mindful Moms yoga mindfulness intervention vs. treatment-as-usual
Outcomes	retention in medication treatment for opioid use disorder, opioid abstinence, opioid and other substance use, depression, anxiety, stress, post-traumatic stress, mindfulness, pain, quality of life
Starting date	June 2021
Contact information	Ashley E Maher, BA606-646-7039 ashley.e.maher@dartmouth.edu
Notes	

NCT04648228

Study name	Pain and opioids: integrated treatment In veterans
Methods	
Participants	160 adults, 21 years or older, stabilized on buprenorphine dose for 1 to 6 months, enrolled in VA Co-Occurring Disorders clinic, chronic pain for < 6 months
Interventions	Acceptance and commitment therapy and Mindfulness-Based Relapse Prevention vs. education control
Outcomes	pain interference, opioid misuse, pain intensity, depression, pain-related fear, alcohol and other drug use

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NCT04648228 *(Continued)*

Starting date	June 11, 2021
Contact information	Zachary Schmidt, PhD 505-265-1711 ext 6079 Zachary.Schmidt2@va.gov
Notes	

BOLD:blood-oxygen-level-dependent; **DSM-5:** Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; **fMRI:** functional magnetic resonance imaging; **MRI:** magnetic resonance imaging; **PTSD:** post-traumatic stress disorder.

DATA AND ANALYSES

Comparison 1. Mindfulness versus no treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Continuous abstinence at post-treatment	1	112	Risk Ratio (M-H, Random, 95% CI)	0.96 [0.44, 2.14]
1.2 Continuous abstinence at follow-up	1	112	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.54, 2.01]
1.3 Percentage days with substance use at post-treatment	4	248	Std. Mean Difference (IV, Random, 95% CI)	0.05 [-0.37, 0.47]
1.4 Percentage days with substance use at follow-up	3	167	Std. Mean Difference (IV, Random, 95% CI)	0.21 [-0.12, 0.54]
1.5 Consumed amount at post-treatment	3	221	Std. Mean Difference (IV, Random, 95% CI)	0.10 [-0.31, 0.52]
1.6 Consumed amount at follow-up	2	142	Std. Mean Difference (IV, Random, 95% CI)	0.33 [0.00, 0.66]
1.7 Craving intensity at post-treatment	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.8 Treatment acceptability (attrition)	21	1087	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.77, 1.40]
1.9 Treatment acceptability (attrition): sensitivity analysis (fixed-effects model)	21	1087	Risk Ratio (M-H, Fixed, 95% CI)	1.13 [0.84, 1.50]

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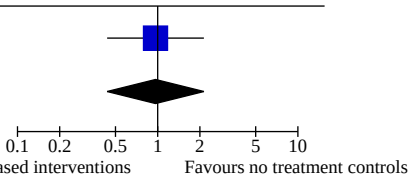
Analysis 1.1. Comparison 1: Mindfulness versus no treatment, Outcome 1: Continuous abstinence at post-treatment

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Zgierska 2017	10	57	10	55	100.0%	0.96 [0.44 , 2.14]
Total (95% CI)		**57**		**55**	**100.0%**	**0.96 [0.44 , 2.14]**
Total events:	10		10			

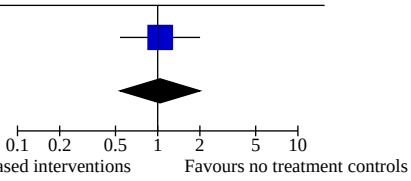
Heterogeneity: Not applicable
Test for overall effect: Z = 0.09 (P = 0.93)
Test for subgroup differences: Not applicable



Analysis 1.2. Comparison 1: Mindfulness versus no treatment, Outcome 2: Continuous abstinence at follow-up

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Zgierska 2017	14	57	13	55	100.0%	1.04 [0.54 , 2.01]
Total (95% CI)		**57**		**55**	**100.0%**	**1.04 [0.54 , 2.01]**
Total events:	14		13			

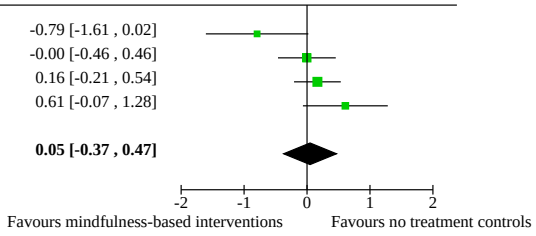
Heterogeneity: Not applicable
Test for overall effect: Z = 0.11 (P = 0.91)
Test for subgroup differences: Not applicable



Analysis 1.3. Comparison 1: Mindfulness versus no treatment, Outcome 3: Percentage days with substance use at post-treatment

Study or Subgroup	Mindfulness Mean	Mindfulness SD	Mindfulness Total	No Treatment Mean	No Treatment SD	No Treatment Total	Weight	Std. Mean Difference IV, Random, 95% CI
de Dios 2012	2.18	2.58	17	4.2	2.26	10	16.7%	-0.79 [-1.61 , 0.02]
Mermelstein 2015	2.08	98	37	2.25	1.32	36	29.2%	-0.00 [-0.46 , 0.46]
Zgierska 2017	2.4	6.5	57	1.5	4	55	33.3%	0.16 [-0.21 , 0.54]
Machado 2020	12.4	23.8	20	1.2	4	16	20.8%	0.61 [-0.07 , 1.28]
Total (95% CI)			**131**			**117**	**100.0%**	**0.05 [-0.37 , 0.47]**

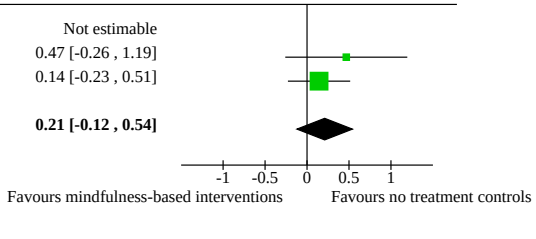
Heterogeneity: Tau² = 0.10; Chi² = 7.11, df = 3 (P = 0.07); I² = 58%
Test for overall effect: Z = 0.23 (P = 0.82)
Test for subgroup differences: Not applicable



Analysis 1.4. Comparison 1: Mindfulness versus no treatment, Outcome 4: Percentage days with substance use at follow-up

Study or Subgroup	Mindfulness Mean	Mindfulness SD	Mindfulness Total	No Treatment Mean	No Treatment SD	No Treatment Total	Weight	Std. Mean Difference IV, Random, 95% CI
de Dios 2012	0.42	1.7	16	0	0	9		Not estimable
Machado 2020	11.7	25.7	15	2.8	5	15	20.7%	0.47 [-0.26 , 1.19]
Zgierska 2017	4.5	9.3	57	3.2	8.7	55	79.3%	0.14 [-0.23 , 0.51]
Total (95% CI)			**88**			**79**	**100.0%**	**0.21 [-0.12 , 0.54]**

Heterogeneity: Tau² = 0.00; Chi² = 0.61, df = 1 (P = 0.44); I² = 0%
Test for overall effect: Z = 1.25 (P = 0.21)
Test for subgroup differences: Not applicable



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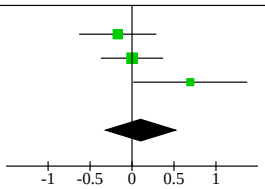
Analysis 1.5. Comparison 1: Mindfulness versus no treatment, Outcome 5: Consumed amount at post-treatment

Study or Subgroup	Mindfulness Mean	Mindfulness SD	Mindfulness Total	No Treatment Mean	No Treatment SD	No Treatment Total	Weight	Std. Mean Difference IV, Random, 95% CI
Mermelstein 2015	16.54	11.85	37	19	16.47	36	35.2%	-0.17 [-0.63 , 0.29]
Zgierska 2017	0.2	0.5	57	0.2	0.5	55	41.4%	0.00 [-0.37 , 0.37]
Machado 2020	1.6	2.6	20	0.2	0.5	16	23.4%	0.69 [0.02 , 1.37]
Total (95% CI)			**114**			**107**	**100.0%**	**0.10 [-0.31 , 0.52]**

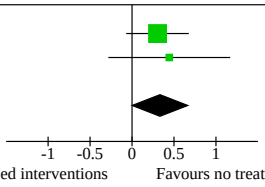
Heterogeneity: Tau² = 0.07; Chi² = 4.41, df = 2 (P = 0.11); I² = 55%
Test for overall effect: Z = 0.48 (P = 0.63)
Test for subgroup differences: Not applicable



Analysis 1.6. Comparison 1: Mindfulness versus no treatment, Outcome 6: Consumed amount at follow-up

Study or Subgroup	Mindfulness Mean	Mindfulness SD	Mindfulness Total	No Treatment Mean	No Treatment SD	No Treatment Total	Weight	Std. Mean Difference IV, Random, 95% CI
Zgierska 2017	0.7	1.7	57	0.3	0.7	55	79.1%	0.30 [-0.07 , 0.68]
Machado 2020	1.3	2.7	15	0.4	0.7	15	20.9%	0.44 [-0.28 , 1.17]
Total (95% CI)			**72**			**70**	**100.0%**	**0.33 [0.00 , 0.66]**

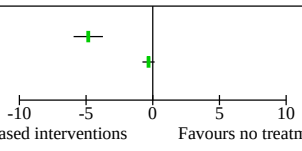
Heterogeneity: Tau² = 0.00; Chi² = 0.11, df = 1 (P = 0.74); I² = 0%
Test for overall effect: Z = 1.97 (P = 0.05)
Test for subgroup differences: Not applicable



Analysis 1.7. Comparison 1: Mindfulness versus no treatment, Outcome 7: Craving intensity at post-treatment

Study or Subgroup	Mindfulness Mean	Mindfulness SD	Mindfulness Total	No Treatment Mean	No Treatment SD	No Treatment Total	Std. Mean Difference IV, Random, 95% CI
Abed 2019	18.93	1.75	24	31.66	3.12	29	-4.84 [-5.94 , -3.74]
Bevan 2012	39.4	18.94	35	46.34	23.71	40	-0.32 [-0.77 , 0.14]

Test for subgroup differences: Not applicable



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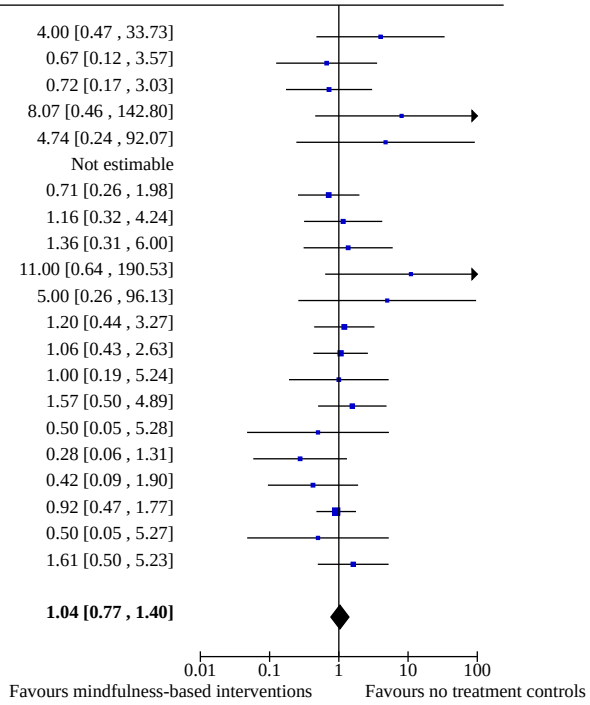
Analysis 1.8. Comparison 1: Mindfulness versus no treatment, Outcome 8: Treatment acceptability (attrition)

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Abed 2019	4	30	1	30	2.0%	4.00 [0.47 , 33.73]
Alizadehgoradel 2019	2	20	3	20	3.2%	0.67 [0.12 , 3.57]
Alterman 2004	3	18	3	13	4.4%	0.72 [0.17 , 3.03]
Asl 2014a	4	28	0	25	1.1%	8.07 [0.46 , 142.80]
Asl 2014b	2	18	0	17	1.0%	4.74 [0.24 , 92.07]
Bein 2015	0	4	0	4		Not estimable
Bevan 2012	5	35	8	40	8.6%	0.71 [0.26 , 1.98]
Brown 2017	4	15	3	13	5.3%	1.16 [0.32 , 4.24]
de Dios 2012	5	22	2	12	4.1%	1.36 [0.31 , 6.00]
Foroushani 2019	5	30	0	30	1.1%	11.00 [0.64 , 190.53]
Imani 2015	2	15	0	15	1.0%	5.00 [0.26 , 96.13]
Jenaabadi 2017	6	19	5	19	8.9%	1.20 [0.44 , 3.27]
Machado 2020	7	22	6	20	10.9%	1.06 [0.43 , 2.63]
Marfurt 2007	2	7	2	7	3.3%	1.00 [0.19 , 5.24]
Margolin 2006	7	38	4	34	6.9%	1.57 [0.50 , 4.89]
Mermelstein 2015	1	38	2	38	1.6%	0.50 [0.05 , 5.28]
Shorey 2017	2	64	6	53	3.7%	0.28 [0.06 , 1.31]
Vowles 2020	2	17	5	18	4.0%	0.42 [0.09 , 1.90]
Wongtongkam 2019	10	24	10	22	20.7%	0.92 [0.47 , 1.77]
Yaghubi 2017	1	35	2	35	1.6%	0.50 [0.05 , 5.27]
Zgierska 2017	7	64	4	59	6.5%	1.61 [0.50 , 5.23]
Total (95% CI)		**563**		**524**	**100.0%**	**1.04 [0.77 , 1.40]**
Total events:	81		66			

Heterogeneity: Tau² = 0.00; Chi² = 15.85, df = 19 (P = 0.67); I² = 0%
Test for overall effect: Z = 0.23 (P = 0.82)
Test for subgroup differences: Not applicable



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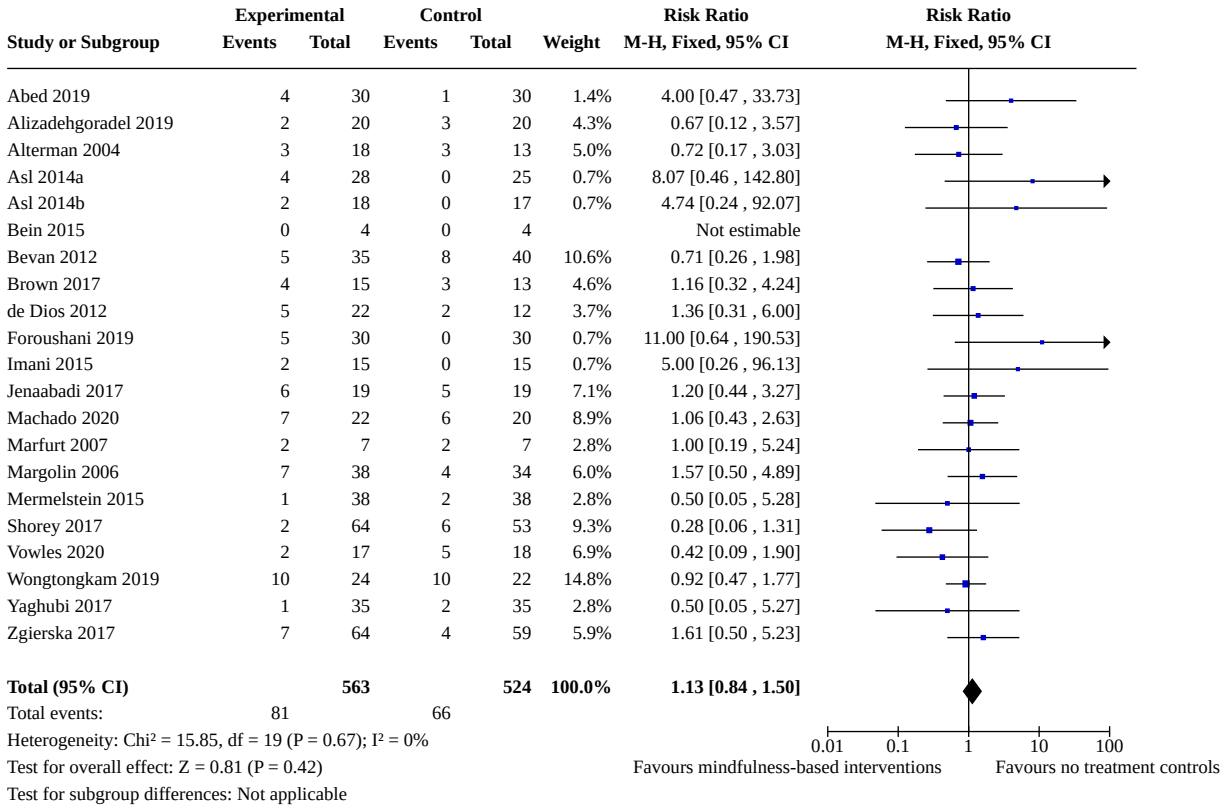
Analysis 1.9. Comparison 1: Mindfulness versus no treatment, Outcome 9: Treatment acceptability (attrition): sensitivity analysis (fixed-effects model)



Comparison 2. Mindfulness versus other treatments

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Continuous abstinence at post-treatment	1	286	Risk Ratio (M-H, Random, 95% CI)	0.80 [0.45, 1.44]
2.2 Continuous abstinence at follow-up	1	286	Risk Ratio (M-H, Random, 95% CI)	0.57 [0.28, 1.16]
2.3 Percentage days with substance use at post-treatment	5	523	Std. Mean Difference (IV, Random, 95% CI)	-0.21 [-0.45, 0.03]
2.4 Percentage days with substance use at follow-up	3	409	Std. Mean Difference (IV, Random, 95% CI)	-0.39 [-0.96, 0.17]
2.5 Consumed amount at post-treatment	1	25	Std. Mean Difference (IV, Random, 95% CI)	-0.42 [-1.23, 0.39]
2.6 Craving intensity at post-treatment	9		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.7 Craving intensity at follow-up	4		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only

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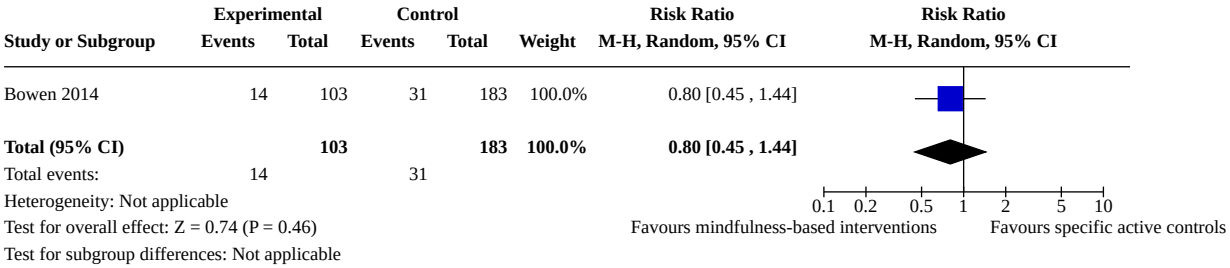
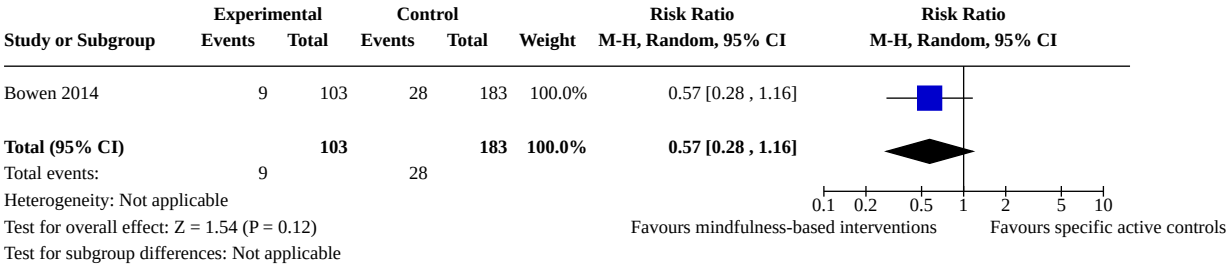
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.8 Treatment acceptability (attrition)	14	1531	Risk Ratio (M-H, Random, 95% CI)	1.06 [0.89, 1.26]
2.9 Treatment acceptability (attrition): sensitivity analysis (fixed effects model)	14	1531	Risk Ratio (M-H, Fixed, 95% CI)	1.07 [0.91, 1.25]

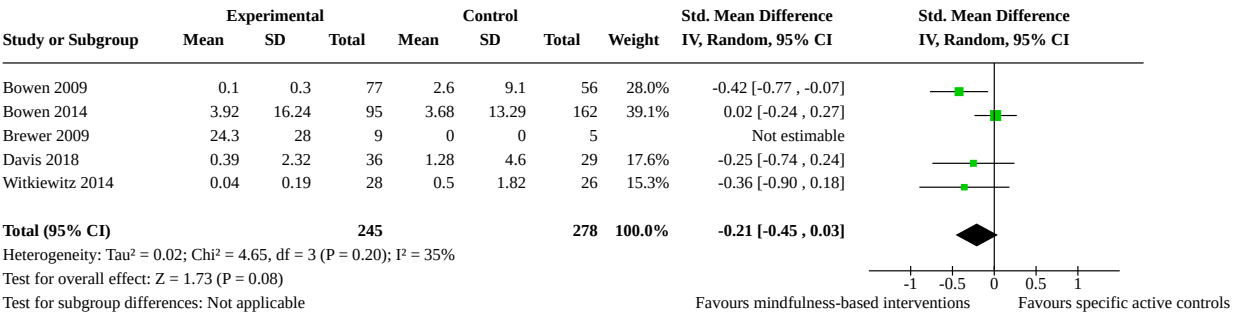
Analysis 2.1. Comparison 2: Mindfulness versus other treatments, Outcome 1: Continuous abstinence at post-treatment



Analysis 2.2. Comparison 2: Mindfulness versus other treatments, Outcome 2: Continuous abstinence at follow-up



Analysis 2.3. Comparison 2: Mindfulness versus other treatments, Outcome 3: Percentage days with substance use at post-treatment



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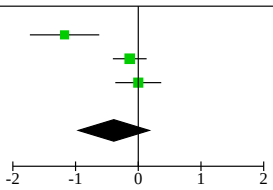
Analysis 2.4. Comparison 2: Mindfulness versus other treatments, Outcome 4: Percentage days with substance use at follow-up

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Davis 2018	5.94	12.9	33	22.7	15.4	27	29.0%	-1.18 [-1.73 , -0.62]
Bowen 2014	3.06	15.08	83	5.34	17.56	148	36.7%	-0.14 [-0.41 , 0.13]
Bowen 2009	5.1	14.9	69	5.1	15.3	49	34.3%	0.00 [-0.37 , 0.37]
Total (95% CI)			**185**			**224**	**100.0%**	**-0.39 [-0.96 , 0.17]**

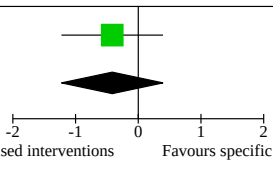
Heterogeneity: Tau² = 0.21; Chi² = 13.20, df = 2 (P = 0.001); I² = 85%
Test for overall effect: Z = 1.35 (P = 0.18)
Test for subgroup differences: Not applicable



Analysis 2.5. Comparison 2: Mindfulness versus other treatments, Outcome 5: Consumed amount at post-treatment

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Davis 2013	10.7	11.94	15	15.25	8.08	10	100.0%	-0.42 [-1.23 , 0.39]
Total (95% CI)			**15**			**10**	**100.0%**	**-0.42 [-1.23 , 0.39]**

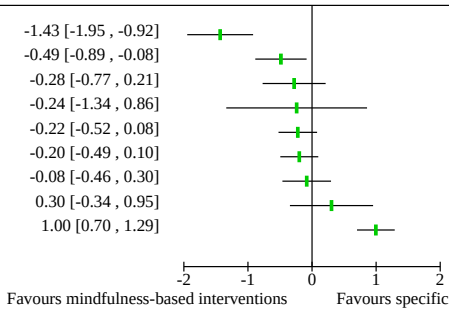
Heterogeneity: Not applicable
Test for overall effect: Z = 1.00 (P = 0.32)
Test for subgroup differences: Not applicable



Analysis 2.6. Comparison 2: Mindfulness versus other treatments, Outcome 6: Craving intensity at post-treatment

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Std. Mean Difference IV, Random, 95% CI	Risk of Bias A	B	C	D	E	F
Zemestani 2016	12	6.7	37	20.1	4.2	37	-1.43 [-1.95 , -0.92]	+	+	-	+	?	+
Bowen 2009	1.1	1.1	62	1.7	1.4	41	-0.49 [-0.89 , -0.08]	+	?	-	?	+	+
Davis 2018	1.75	1.95	36	2.36	2.39	29	-0.28 [-0.77 , 0.21]	+	?	-	+	?	+
Brewer 2009	1.1	3.7	9	2	3.1	5	-0.24 [-1.34 , 0.86]	+	?	-	?	?	+
Garland 2016	19.66	14.24	64	22.98	15.2	128	-0.22 [-0.52 , 0.08]	+	+	-	+	+	?
Bowen 2014	1.1	1.05	95	1.33	1.26	82	-0.20 [-0.49 , 0.10]	?	?	-	+	+	+
Shorey 2017	3.29	4.51	62	3.66	4.33	47	-0.08 [-0.46 , 0.30]	+	?	-	+	+	+
Garland 2010	4.6	5.3	18	3.2	3.6	19	0.30 [-0.34 , 0.95]	?	?	-	?	?	+
Black 2019	1.6	0.2	100	1.4	0.2	100	1.00 [0.70 , 1.29]	+	+	-	+	-	+

Test for subgroup differences: Not applicable



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Incomplete outcome data (attrition bias)
(E) Selective reporting (reporting bias)
(F) Other bias: equivalence of baseline characteristics (selection bias)

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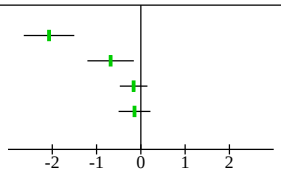
Analysis 2.7. Comparison 2: Mindfulness versus other treatments, Outcome 7: Craving intensity at follow-up

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Std. Mean Difference IV, Random, 95% CI
Zemestani 2016	11.8	6.9	37	23.4	3.7	37	-2.07 [-2.64 , -1.50]
Davis 2018	1.71	2.62	33	4.06	4.16	27	-0.68 [-1.21 , -0.16]
Bowen 2014	0.87	0.85	83	1.02	0.98	76	-0.16 [-0.47 , 0.15]
Bowen 2009	1.1	1.3	70	1.3	1.5	52	-0.14 [-0.50 , 0.22]

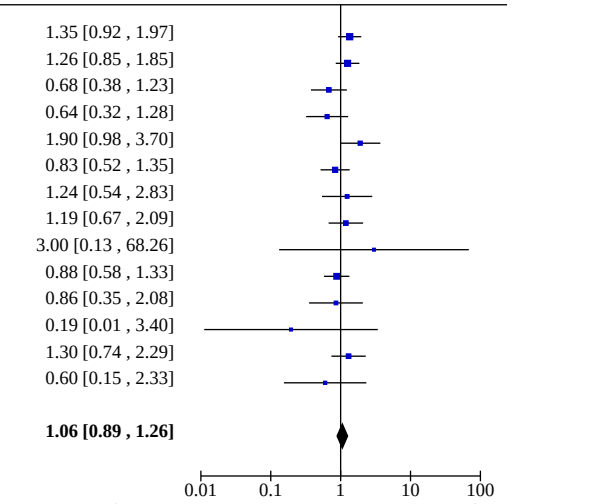
Test for subgroup differences: Not applicable



Analysis 2.8. Comparison 2: Mindfulness versus other treatments, Outcome 8: Treatment acceptability (attrition)

Study or Subgroup	Experimental Events	Total	Control Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Alegria 2019	48	172	35	169	15.5%	1.35 [0.92 , 1.97]
Black 2019	40	114	31	111	15.0%	1.26 [0.85 , 1.85]
Bowen 2009	16	93	19	75	7.5%	0.68 [0.38 , 1.23]
Bowen 2014	12	103	16	88	5.6%	0.64 [0.32 , 1.28]
Brewer 2009	16	21	6	15	6.1%	1.90 [0.98 , 3.70]
Davis 2013	15	30	15	25	10.7%	0.83 [0.52 , 1.35]
Garland 2010	9	27	7	26	4.1%	1.24 [0.54 , 2.83]
Garland 2016	19	64	16	64	8.1%	1.19 [0.67 , 2.09]
Garland 2019	1	15	0	15	0.3%	3.00 [0.13 , 68.26]
Glasner 2017	17	31	20	32	13.5%	0.88 [0.58 , 1.33]
Jenaabadi 2017	6	19	7	19	3.6%	0.86 [0.35 , 2.08]
Lee 2011	0	10	3	14	0.4%	0.19 [0.01 , 3.40]
Witkiewitz 2014	20	55	14	50	8.1%	1.30 [0.74 , 2.29]
Zemestani 2016	3	37	5	37	1.6%	0.60 [0.15 , 2.33]
Total (95% CI)		**791**		**740**	**100.0%**	**1.06 [0.89 , 1.26]**
Total events:	222		194			

Heterogeneity: Tau² = 0.01; Chi² = 14.66, df = 13 (P = 0.33); I² = 11%
Test for overall effect: Z = 0.64 (P = 0.52)
Test for subgroup differences: Not applicable



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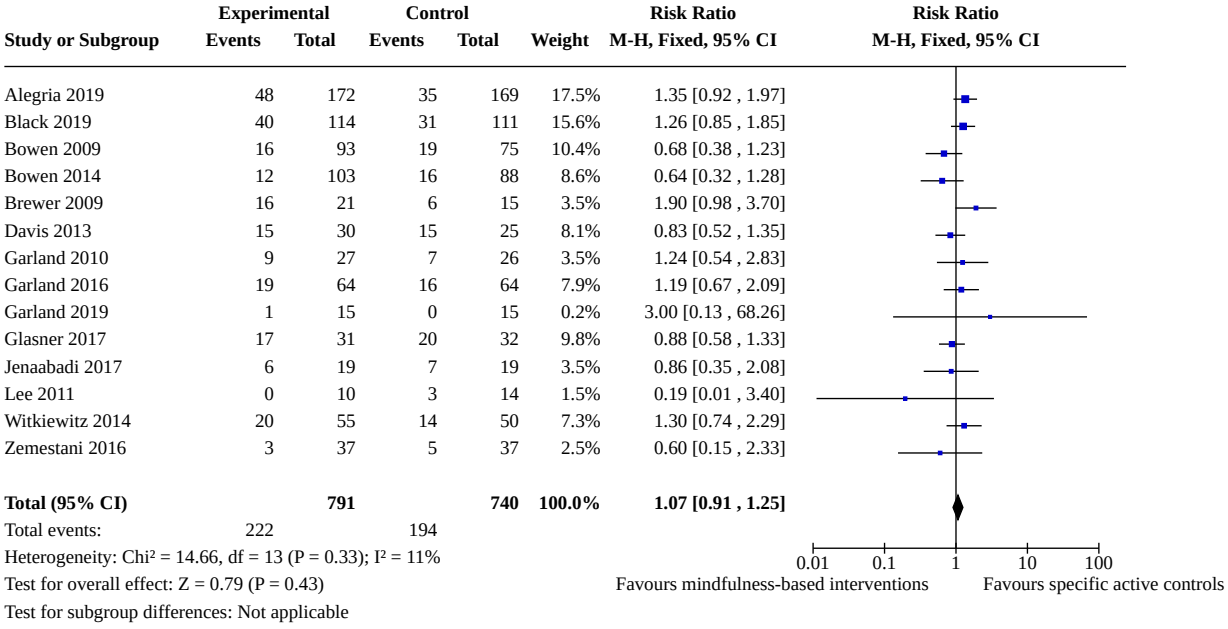
Analysis 2.9. Comparison 2: Mindfulness versus other treatments, Outcome 9: Treatment acceptability (attrition): sensitivity analysis (fixed effects model)



ADDITIONAL TABLES

Table 1. Acronyms used

Acronym	Term
SUD	substance use disorder
MBI	mindfulness-based intervention
RCT	randomized controlled trial
SMD	standardized mean difference
CI	confidence interval
USA	United States of America
MBSR	Mindfulness-Based Stres Reduction
MBCT	Mindfulness-Based Cognitive Therapy
MORE	Mindfulness-Oriented Recovery Enhancement
DBT	Dialectical Behavior Therapy
ACT	Acceptance and Commitment Therapy
MBRP	Mindfulness-Based Relapse Prevention
SD	standard deviation

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Table 1. Acronyms used *(Continued)*

SE	standard error
AE	adverse effects
SAE	serious adverse effects

APPENDICES

Appendix 1. CDAG Specialised Register search

April 26, 2021 (215hits)

(acceptance or meditation or mindful* or Vipassana or zen or yoga or yogic or relaxation):ti,ab,kw,xin

Appendix 2. CENTRAL search strategy

CENTRAL (via onlinelibrary.wiley.com)

Issue 3, 2021 (877 hits)

#1 MeSH descriptor: [Substance-Related Disorders] explode all trees

#2 MeSH descriptor: [Alcohol Drinking] explode all trees

#3 MeSH descriptor: [Amphetamines] explode all trees

#4 MeSH descriptor: [Cannabis] explode all trees

#5 MeSH descriptor: [Cocaine] explode all trees

#6 MeSH descriptor: [Designer Drugs] explode all trees

#7 MeSH descriptor: [Heroin] explode all trees

#8 MeSH descriptor: [Methamphetamine] explode all trees

#9 MeSH descriptor: [Narcotics] explode all trees

#10 MeSH descriptor: [Street Drugs] explode all trees

#11 (alcohol or amphetamine* or drug* or polydrug or substance or cannabis or cocaine or "hash oil*" or hashish or heroin or lsd or marihuana or marijuana or methadone or mdma or morphine or ecstasy or methamphetamine* or narcotics or opioid* or opiate* or opium):ti,ab

#12 (abstin*OR abstain* or abuse* or addict* or dependen* or misuse or overdose or withdrawal* or disorder*):ti,ab,kw

#13 #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11

#14 #12 and #13

#15 #1 or #2 or #14

#16 MeSH descriptor: [Mindfulness] explode all trees

#17 MeSH descriptor: [Meditation] explode all trees

#18 (acceptance or meditation or mindful* or Vipassana or zen or yoga or yogic or relaxation):ti,ab,kw

#19 (breathing near/3 technique):ti,ab,kw

#20 (breathing near/3 exercise):ti,ab,kw

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#21 dialectical next behavior next therapy

#22 DBT:ti,ab

#23 (acceptance near/3 therapy):ti,ab

#24 #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23

#25 #14 and #24

Appendix 3. PubMed search strategy

PubMed

April 26, 2021 (1178 hits)

1. Substance-Related Disorders[MeSH]
2. Alcohol Drinking[MeSH]
3. Amphetamines[MeSH]
4. Cannabis[MeSH]
5. Cocaine[MeSH]
6. Designer Drugs[MeSH]
7. Heroin[MeSH]
8. Methamphetamine[MeSH]
9. Narcotics[MeSH]
10. Street Drugs[MeSH]
11. (alcohol[tiab] OR amphetamine*[tiab] OR drug*[tiab] OR polydrug[tiab] OR substance[tiab] OR cannabis[tiab] OR cocaine[tiab] OR "hash oil*"[tiab] OR hashish[tiab] OR heroin[tiab] OR lsd[tiab] OR marihuana[tiab] OR marijuana[tiab] OR methadone[tiab] OR mdma[tiab] OR morphine[tiab] OR ecstasy[tiab] OR methamphetamine*[tiab] OR narcotics[tiab] OR opioid*[tiab] OR opiate*[tiab] OR opium[tiab])
12. abstin*[tiab] OR abstain*[tiab] OR abuse*[tiab] OR addict*[tiab] OR dependen*[tiab] OR misuse[tiab] OR overdose[tiab] OR withdrawal*[tiab] OR disorder*[tiab]
13. #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11
14. #12 AND #13
15. #1 OR #2 OR #14
16. Mindfulness[MeSH]
17. Meditation[MeSH]
18. acceptance[tiab] OR meditation[tiab] OR mindfulmindful*[tiab] OR Vipassana[tiab] OR zen[tiab] OR yoga[tiab] OR yogic[tiab] OR relaxation[tiab] OR "breathing technique"[tiab] OR "breathing exercise"[tiab]
19. "dialectical behavior therapy" OR DBT[tiab]
20. "acceptance and commitment therapy" OR ACT[tiab]
21. #16 OR #17 OR #18 OR #19 OR #20
22. randomized controlled trial [pt]
23. controlled clinical trial [pt]
24. randomized [tiab]
25. placebo [tiab]
26. drug therapy [sh]
27. randomly [tiab]
28. trial [tiab]
29. groups [tiab]
30. groups [tiab]
31. #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30
32. (animals [mh] NOT humans [mh])
33. #31 NOT #32
34. #15 AND #21 AND #33

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Appendix 4. EMBASE search strategy

Embase (OVID)

April 26, 2021 (1204 hits)

1 exp addiction/

2 exp drug abuse/

3 exp alcohol abuse/

4 ((alcohol or amphetamine* or drug* or polydrug or substance or cannabis or cocaine or hashish or heroin or lsd or marihuana or marijuana or methadone or mdma or morphine or ecstasy or methamphetamine* or narcotics or opioid* or opiate* or opium) adj5 (abstin* or abstain* or abuse* or addict* or dependen* or misuse or overdose or withdrawal* or disorder*)).ti,ab.

5 1 or 2 or 3 or 4

6 exp mindfulness/

7 exp meditation/

8 acceptance.ab,ti.

9 meditation.ab,ti.

10 "mindful*".ab,ti.

11 vipassana.ab,ti.

12 zen.ab,ti.

13 (yoga or yogic).ab,ti.

14 relaxation.ab,ti.

15 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14

16 5 and 15

17 exp clinical trial/

18 (clin$ adj3 trial$).tw.

19 exp double blind procedure/

20 exp controlled clinical trial/

21 (placebo or assign* or allocat* or volunteer* or random* or factorial* or crossover).ti,ab.

22 ((singl$ or doubl$ or trebl$ or tripl$) adj3 (blind$ or mask$)).tw.

23 17 or 18 or 19 or 20 or 21 or 22

24 16 and 23

Appendix 5. WOS search strategy

Web of Science (via Web of Knowledge)

April 26, 2021 (699 hits)

Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years

1. TS=((alcohol OR amphetamine* OR drug* OR polydrug OR substance OR cannabis OR cocaine OR "hash oil*" OR hashish OR heroin OR lsd OR marihuana OR marijuana OR methadone OR mdma OR morphine OR ecstasy OR methamphetamine* OR narcotics OR opioid* OR opiate* OR opium) NEAR/6 (abstin* OR abstain* OR abuse* OR addict* OR dependen* OR misuse OR overdose OR withdrawal* OR disorder*))

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2. TS=(acceptance OR meditation OR mindful* OR Vipassana OR zen OR yoga OR yogic OR relaxation OR "breathing technique" OR "breathing exercise")
3. TS=((randomi* OR randomly OR trial*))
4. #1 AND #2 AND #3

Appendix 6. CINAHL search strategy

CINAHL (via EBSCO)

April 26, 2021(637 hits)

S38 S30 AND S36 AND S37

S37 S8 OR S18

S36 S31 OR S32 OR S33 OR S34 OR S35

S35 TX "acceptance and commitment therapy"

S34 TX "dialectical behavior therapy"

S33 TI (acceptance or meditation or mindfulmindful* or Vipassana or zen or yoga or yogic or relaxation or "breathing technique" or "breathing exercise") or AB(acceptance or meditation or mindfulmindful* or Vipassana or zen or yoga or yogic or relaxation or "breathing technique" or "breathing exercise")

S32 (MH "Meditation")

S31 (MH "Mindfulness")

S30 S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29

S29 MH "Quantitative Studies"

S28 TI placebo* or AB placebo*

S27 MH "Placebos"

S26 TI random* allocat* or AB random* allocat*

S25 MH "Random Assignment"

S24 TI randomi?ed control* trial* or AB randomi?ed control* trial*

S23 AB (singl* or doubl* or trebl* or tripl*) and AB (blind* or mask*)

S22 TI (singl* or doubl* or trebl* or tripl*) and TI (blind* or mask*)

S21 TI clinic* N1 trial* or AB clinic* N1 trial*

S20 PT Clinical trial

S19 MH "Clinical Trials+"

S18 S9 AND S17

S17 S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16

S16 (MH "Ketamine")

S15 (MH "Amphetamines+")

S14 (MH "Methadone")

S13 (MH "Hallucinogens+")

S12 MH "Designer Drugs"

S11 MH "Narcotics"

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S10 TX(polydrug or alcohol or opioid or opiate or opium or hallucinogen or cocaine or benzodiazepine* or amphetamine*or “anti-anxiety-agents” or barbiturate* or “lysergic acid” or ketamine or cannabis or marihuana or marijuana or hashish or inhalant* or solvent or steroid* or methadone or morphine)

S9 S5 or S6 or S7

S8 S1 or S2 or S3 or S4

S7 TX(use* N2 drug) or TX(use* N2 disorder) or TX(use* N2 illicit)

S6 TX(use* N2 drug) or TX(use* N2 disorder) or TX(use* N2 illicit)

S5 TX(addict* OR overdos* OR intoxicat* OR abstin* OR abstain OR withdraw* OR abus* OR misus* OR disorder* OR dependen*)

S4 TX(substance N3 addict*) or TX(substance N3 dependen*) or TX(substance N3 abuse*) or TX(substance N3 misus*)

S3 TX(drug N3 addict*) or TX(drug N3 dependen*) or TX(drug N3 abuse*) or TX(drug N3 misus*)

S2 (MH "Psychoses, Substance-Induced+")

S1 (MH "Substance Use Disorders+")

Appendix 7. Critieria for risk of bias assessment

Item	Judgment	Description
1. Random sequence generation (selection bias)	Low risk	The investigators describe a random component in the sequence generation process such as: random number table; computer random number generator; coin tossing; shuffling cards or envelopes; throwing dice; drawing of lots; minimization
	High risk	The investigators describe a non-random component in the sequence generation process such as: odd or even date of birth; date (or day) of admission; hospital or clinic record number; alternation; judgement of the clinician; results of a laboratory test or a series of tests; availability of the intervention
	Unclear risk	Insufficient information about the sequence generation process to permit judgement of low or high risk
2. Allocation concealment (selection bias)	Low risk	Investigators enrolling participants could not foresee assignment because one of the following, or an equivalent method, was used to conceal allocation: central allocation (including telephone, web-based, and pharmacy-controlled, randomisation); sequentially numbered drug containers of identical appearance; sequentially numbered, opaque, sealed envelopes.
	High risk	Investigators enrolling participants could possibly foresee assignments because one of the following method was used: open random allocation schedule (e.g. a list of random numbers); assignment envelopes without appropriate safeguards (e.g. if envelopes were unsealed or nonopaque or not sequentially numbered); alternation or rotation; date of birth; case record number; any other explicitly unconcealed procedure.
	Unclear risk	Insufficient information to permit judgement of low or high risk This is usually the case if the method of concealment is not described or not described in sufficient detail to allow a definite judgement
3. Blinding of participants and providers (performance bias)	Low risk	No blinding or incomplete blinding, but the review authors judge that the outcome is not likely to be influenced by lack of blinding;

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(Continued)

Objective outcomes		Blinding of participants and key study personnel ensured, and unlikely that the blinding could have been broken.
	High risk	No blinding or incomplete blinding, and the outcome is likely to be influenced by lack of blinding; Blinding of key study participants and personnel attempted, but likely that the blinding could have been broken, and the outcome is likely to be influenced by lack of blinding.
	Unclear risk	Insufficient information to permit judgement of low or high risk;
4. Blinding of participants and providers (performance bias) Subjective outcomes	Low risk	Blinding of participants and providers ensured and unlikely that the blinding could have been broken;
	High risk	No blinding or incomplete blinding, and the outcome is likely to be influenced by lack of blinding; Blinding of key study participants and personnel attempted, but likely that the blinding could have been broken, and the outcome is likely to be influenced by lack of blinding.
	Unclear risk	Insufficient information to permit judgement of low or high risk;
5. Blinding of outcome assessor (detection bias) Objective outcomes	Low risk	No blinding of outcome assessment, but the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding; Blinding of outcome assessment ensured, and unlikely that the blinding could have been broken
	High risk	No blinding of outcome assessment, and the outcome measurement is likely to be influenced by lack of blinding; Blinding of outcome assessment, but likely that the blinding could have been broken, and the outcome measurement is likely to be influenced by lack of blinding
	Unclear risk	Insufficient information to permit judgement of low or high risk;
6.blinding of outcome assessor (detection bias) Subjective outcomes	Low risk	Blinding of outcome assessment ensured, and unlikely that the blinding could have been broken
	High risk	No blinding of outcome assessment, and the outcome measurement is likely to be influenced by lack of blinding; Blinding of outcome assessment, but likely that the blinding could have been broken, and the outcome measurement is likely to be influenced by lack of blinding
	Unclear risk	Insufficient information to permit judgement of low or high risk;
7. Incomplete outcome data (attrition bias)	Low risk	No missing outcome data; Reasons for missing outcome data unlikely to be related to true outcome (for survival data, censoring unlikely to be introducing bias);

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(Continued)

For all outcomes except retention in treatment or drop out		Missing outcome data balanced in numbers across intervention groups, with similar reasons for missing data across groups; For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk not enough to have a clinically relevant impact on the intervention effect estimate; For continuous outcome data, plausible effect size (difference in means or standardized difference in means) among missing outcomes not enough to have a clinically relevant impact on observed effect size; Missing data have been imputed using appropriate methods; All randomised patients are reported/analysed in the group they were allocated to by randomisation irrespective of non-compliance and co-interventions (intention to treat)
	High risk	Reason for missing outcome data likely to be related to true outcome, with either imbalance in numbers or reasons for missing data across intervention groups; For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk enough to induce clinically relevant bias in intervention effect estimate; For continuous outcome data, plausible effect size (difference in means or standardized difference in means) among missing outcomes enough to induce clinically relevant bias in observed effect size; 'As-treated' analysis done with substantial departure of the intervention received from that assigned at randomisation;
	Unclear risk	Insufficient information to permit judgement of low or high risk (e.g. number randomised not stated, no reasons for missing data provided; number of drop out not reported for each group);
8 Selective reporting (reporting bias)	Low risk	The study protocol is available and all of the study's pre-specified (primary and secondary) outcomes that are of interest in the review have been reported in the pre-specified way; The study protocol is not available but it is clear that the published reports include all expected outcomes, including those that were pre-specified (convincing text of this nature may be uncommon).
	High risk	Not all of the study's pre-specified primary outcomes have been reported; One or more primary outcomes is reported using measurements, analysis methods or subsets of the data (e.g. subscales) that were not pre-specified; One or more reported primary outcomes were not pre-specified (unless clear justification for their reporting is provided, such as an unexpected adverse effect); One or more outcomes of interest in the review are reported incompletely so that they cannot be entered in a meta-analysis; The study report fails to include results for a key outcome that would be expected to have been reported for such a study.
	Unclear risk	Insufficient information to permit judgement of low or high risk

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(Continued)

9. Other bias (1): equivalence of baseline characteristics	Low risk	The testing of baseline age, gender and baseline drinking (drinking amount, frequency, years of problematic drinking) fulfils at least one of the following conditions: - baseline equivalence between groups was shown for age, gender AND at least one indicator of baseline drinking (e.g. sleep induction, sleep maintenance, insomnia duration) - baseline differences between groups were demonstrated, but adequately controlled in the statistical analyses
	High risk	Differences between groups in one or more relevant baseline characteristics became evident, but were not controlled in the statistical analyses
	Unclear risk	Insufficient reporting of baseline equivalence or its testing to permit judgement of 'Yes' or 'No'
9. Other bias (2): equivalence of treatment utilization	Low risk	The equivalence of treatment utilization in the intervention and control group was tested and confirmed
	High risk	Differences in treatment utilization between the intervention and control group became evident and were not controlled in the statistical analyses
	Unclear risk	Insufficient reporting of treatment attendance to permit judgement of 'Yes' or 'No'

Appendix 8. PsycINFO search strategy

April 26, 2021 (745)

1 exp exp "substance use disorder"/

2 exp Drug Addiction/

3 exp alcoholism/

4 ((alcohol or amphetamine* or drug* or polydrug or substance or cannabis or cocaine or hashish or heroin or lsd or marihuana or marijuana or methadone or mdma or morphine or ecstasy or methamphetamine* or narcotics or opioid* or opiate* or opium) adj5 (abstin* or abstain* or abuse* or addict* or dependen* or misuse or overdose or withdrawal* or disorder*)).ti,ab.

5 1 or 2 or 3 or 4

6 exp MINDFULNESS/

7 exp MEDITATION/

8 acceptance.ab,ti.

9 meditation.ab,ti.

10 mindful*.ab,ti.

11 vipassana.ab,ti.

12 zen.ab,ti.

13 (yoga or yogic).ab,ti.

14 relaxation.ab,ti.

15 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14

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16 5 and 15

17 ("double-blind" or random* or control).tw.

18 16 and 17

HISTORY

Protocol first published: Issue 6, 2015

CONTRIBUTIONS OF AUTHORS

SIMON B. GOLDBERG

- study selection
- data extraction
- data management
- analysis of data
- interpretation and discussion of results
- writing of the review
- securing funding

BRIAN T. PACE

- study selection
- data extraction
- data management
- interpretation and discussion of results
- writing of the review
- securing funding

MATAS GRISKAITIS

- study selection
- data extraction
- data management
- interpretation and discussion of results
- writing of the review
- securing funding

REINHARD WILLUTZKI

- protocol elaboration
- study selection
- participation in consent discussions
- interpretation and discussion of results

NICOLE SKOETZ

- interpretation and discussion of results
- writing of the review

SVEN THOENES

- protocol elaboration
- study selection
- participation in consent discussions

ALEKSANDRA ZGIERSKA

- protocol elaboration

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- study selection
- participation in consent discussions
- interpretation and discussion of results

SUSANNE RÖSNER

- protocol elaboration
- study selection
- data extraction
- data management
- participation in consent discussions
- analysis of data
- interpretation and discussion of results
- writing of the review
- securing funding

Sven Thoenes died in October 2020 before the publication of this review. The contributions as stated above were provided before the author died.

DECLARATIONS OF INTEREST

SIMON B. GOLDBERG: No conflict of interest known

BRIAN T. PACE: No conflict of interest known

MATAS GRISKAITIS: No conflict of interest known

REINHARD WILLUTZKI: No conflict of interest known

NICOLE SKOETZ: No conflict of interest known

SVEN THOENES: (deceased, October 2020). No conflict of interest known. This declaration of interest was provided before the author died.

ALEKSANDRA ZGIERSKA: Dr. Zgierska is a member of the Board of Directors for the American Society of Addiction Medicine.

SUSANNE RÖSNER: No conflict of interest known

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Internal sources

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  Provision of infrastructure, related services and salery

External sources

- National Institutes of Health, USA

  National Center for Complementary & Integrative Health Award Number K23AT010879

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Study selection

Jonathan Livingstone is producing a Cochrane Review with the topic mindfulness and tobacco, therefore we decided to exclude tobacco from our review. In order to isolate the effects of training in mindfulness meditation (Crane 2017), we excluded interventions that did not involve instruction in mindfulness meditation (e.g. Acceptance and Commitment Therapy and Dialectical Behavior Therapy were not eligible). We did not include quasi-randomized studies.

Analysis

Sensitivity analyses were not conducted as there were insufficient studies (≤ 10) for all outcomes with the exception of treatment acceptability (differential attrition). Therefore, we did not conduct subgroup analyses separated by substance. Analyses were separated by control condition type based on evidence that the strength of the control condition impacts the magnitude of between-group effects for

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MBIs (Goldberg 2018; Goldberg 2021). We omitted assessment of risk of bias related to equivalence of treatment utilization as this was not relevant when a no treatment comparison condition or when an other treatment comparison condition with a different intended duration or intensity was used. Blinding of pf participants, personnel, and outcome assessor (performance and detection bias) was not assessed separately for objective and subjective outcomes. This was because, with the exception of treatment acceptability in the form of study attrition, all outcomes were assessed subjectively via self-report.

INDEX TERMS

Medical Subject Headings (MeSH)

Cognitive Behavioral Therapy; Craving; *Mindfulness; Randomized Controlled Trials as Topic; Recurrence; *Substance-Related Disorders [therapy]

MeSH check words

Humans

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