Mindfulness-based interventions in inpatient treatment for Substance Use Disorders: A systematic review

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ABSTRACT

Inpatient treatment for Substance Use Disorder (SUD), such as Therapeutic Communities and Residential Treatment has been used to test the effect of Mindfulness-Based Interventions (MBI) over different outcomes. Although there is evidence of the effectiveness of MBIs, little is known about the particularities that the place may have in the outcomes.

The main objective of this Systematic Review was to evaluate the effectiveness of MBIs for SUDs performed in the inpatient context.

PubMed, Web of Science and PsycInfo were used for the search. Quantitative and qualitative studies with no control, usual treatment or other active comparator intervention for SUDs inpatient treatment from 1980 to 2020 were included. From 21 selected studies, 18 were quantitative and 3 qualitative; 12 studies were RCT. Most samples were comprised with women.

Based on characteristics of outcomes, we were able to divide them into: Substance Use and Associated Outcomes, Stress, Impulsivity & Evaluation of the MBI protocol. Results suggest that stress assessment is a determining factor for treatment success in these settings. Regarding substance use, although several outcomes have been assessed, the most remarkable results were craving reduction and improvement in treatment adherence.

There is evidence that MBIs in inpatient settings benefited those who participated in the experimental groups on some outcomes, such as stress and substance use. Little is mentioned about the impact of the environment over the outcomes and short follow-ups were a relevant limitation of most of the studies. Future assessments must increase follow-up time and evaluate the relationship between the context and the MBI.

1. Introduction

Mindfulness is considered an ability, defined by Kabat-Zinn (2003) as “awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally about the experiences revealed moment by moment”. Mindfulness can be developed by means of practices in structured programs known as Mindfulness-Based Interventions (MBI). The first MBI was Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 2003), created in the late 70’s to treat chronic pain in patients at the University of Massachusetts Medical Center. From the results obtained with that clinical population, new studies were carried out and the original protocol was adapted for use with other health conditions, generating new MBIs.

Crane and colleagues assert that MBIs contain five foundational elements: derivation of a combination between contemplative practice and science; focus on the search for the origin and relief of suffering; orientation to the present aiming at distancing; flexibility of the immediate experience (defined as decentering) (Kessel et al., 2016); development of attentional, emotional, and behavioral self-regulation and, finally, intensive training (usually in groups for 8 weeks) (Crane, Brewer, Feldman, Santorelli, & Williams, 2017).

The benefits of MBIs are observed in a greater improvement of some aspects of mental health, such as anxiety (Marchand, 2013) and depression (Hofmann, Sawyer, Witt, & Oh, 2010; Segal, Williams, & Teasdale, 2018), or even for mental health promotion in adults in nonclinical settings, when compared to non-active control groups.
Due to the nature of these targeted disorders, the benefit might be accounted for by the action of mindfulness on emotional regulation, which can also contribute to the treatment of substance use disorders (SUDs) (Tang, Tang, & Posner, 2016). Mindfulness-Based Relapse Prevention (MBRP) was developed to act as adjunctive to the treatment of SUD (Bowen, Chawla, & Witkiewitz, 2015), and comprises some studies of efficacy evaluation published in the last years. A review and meta-analysis of nine studies on MBRP with 901 individuals in outpatient settings (7 studies), closed environment (1 study) and prison (1 study), found no significant effects of MBRP regarding abstinence rates, frequency or amount of alcohol and drug use. However, it found small effect sizes for an important predictor of relapse (craving) and also for negative consequences of alcohol or drug use, even in comparison with other interventions (treatment as usual, relapse prevention, or cognitive-behavioral therapy) (Grant et al., 2017). However, the clinical trial with the largest sample so far demonstrated superiority of MBRP over Treatment as Usual and Relapse Prevention in consumption outcomes only after one year of follow-up (Bowen et al., 2014). Therefore, a shortened follow-up time is a major limitation of many clinical trials that evaluate the program.

Interventions for SUD other than MBRP have recently started to emerge, aimed at even more specific populations such as MBRP for women (MBRP-W) (Amaro, Spear, Vallejo, Conron, & Black, 2014) or for adolescents, as Mindfulness-Based Substance Abuse Treatment for Adolescents (MBSAT) (Himelstein, Saul, & Garcia-romeu, 2015). There is also a protocol tested in smokers, the Mindfulness-Based Addiction Treatment (MBAT) (Vidrine, Spears, Heppner, Reitzel, Marcus, Cinciripini, Waters, Tindle, Fine, & Safrane, 2016), or Mindfulness-Oriented Recovery Enhancement (MORE), which combines positive psychology and cognitive therapy for treatment of opioid use disorder (Garland, Baker, Riquino, & Priddy, 2019). In addition, other MBIs not adapted for SUDs are applied in treatment contexts, such as MBSR (Marcus et al., 2003) or combined, such as Goal Management Training + Mindfulness Meditation (Valls-Serrano, Caracuel, & Verdejo-garcia, 2016).

Even with numerous treatment models and scientific advances in SUD interventions, difficulties in the treatment and maintenance of healthy behaviors still remain (Manuel, Hagedorn, & Finney, 2011). With the continuous development of treatments, researchers and professionals working in the intervention have observed the difficulty in treatment adherence and in the effectiveness of programs that promote the integral quality of life (Parsons, Crane, Parsons, Fjorback, & Kuyken, 2017), which makes it necessary to evaluate the effectiveness of treatment environments (Smith, Gates, & Foxcroft, 2006), including therapeutic communities and residential treatment.

De Leon (2010) describes a therapeutic community (TC) as a model of hospitalization for complementary assistance to the main medical and mental health treatments for SUDs, involving mutual help. People with SUDs who are treated in TCs tend to have greater psychosocial problems than those who are treated in outpatient programs, and TCs are shown to be effective in treating SUDs in such complex cases (Staiger, Likmitzsky, Lake, & Gruenert, 2020). In contrast, residential treatment (RT) can be described as a place of rehabilitation, understood as a first phase of treatment for SUDs, characteristically followed by a less intensive treatment and post-treatment services within a continuum of care (Reif, Ph, George, Ph, Braude, Ph, Dougherty, Ph, Daniels, & Ed, 2014). Some characteristics of RTs and TCs are similar: the voluntary character of entry and exit; the aim at abstinence with the support of colleagues; self-help models; and often the use of 12 step models. It is worth mentioning that the entire process offered at TCs requires that the patient stays 24-hour inside the treatment environment as it is understood by the community as a whole as fundamental to the recovery process. However, the presence of qualified mental health professionals can be limited (De Leon, 2015).

With the growing body of literature supporting efficacy of MBIs for SUD treatment (Cavicchioli, Movalli, & Maffei, 2018; Li, Howard, Garland, Mckevon, & Lazar, 2017), it is fundamental to systematically analyze effects of MBIs provided in RTs and TCs, since these approaches have a distinct and specific philosophy and more control of the treatment environment. This systematic review evaluated the effectiveness of MBIs for SUDs performed in the context of TCs and RTs.

2. Material and methods

This systematic review was pre-registered in PROSPERO (CRD42021211118) and the data are presented in accordance with the guidelines of PRISMA (Page et al., 2021).

2.1. Search strategy

We ran a search in the databases PubMed, Web of Science and PsycINFO using the following strategy: Mindfulness AND (Residential Treatment OR Therapeutic Community OR Inpatient Treatment for Substance Use Disorders) (for full detail search strategy, see Supplementary Material). In addition, we performed a manual search in the reference lists of relevant studies and retrieved review articles. The articles related to the topic of MBI for SUDs indoors treatment were selected for in-depth examination.

2.2. Study selection

In order to obtain the largest number of studies to analyze, in addition to English we searched for terms in French and Spanish. Both quantitative and qualitative studies were selected, as long as the participants were undergoing treatment for SUDs. The period considered for the search for articles was between 1980, aligned with the beginning of MBI studies, and April 2021.

The exclusion of articles involved a few steps. First, we analyzed whether the treatment model was outpatient or inpatient, excluding those that were outpatient or studies in which the intervention occurred after hospitalization. Subsequently, studies that were performed in RT with a maximum stay of 24 h were excluded. Cross-sectional studies and protocol reports were also excluded.

Furthermore, conceptualizing what qualifies as RT or TC is essential to better define these contexts, but in the absence of consensus for these definitions, we included all studies that mentioned having applied an MBI for SUD at either both RTs or and TCs (Fig. 1).

2.3. Data collection and analysis

The search was performed in the three databases of interest and the titles of all articles were reviewed. If they indicated that they were studies of MBIs in TCs or RTs, they were selected and the abstract was reviewed and inserted into a data extraction form. Next, articles reporting studies conducted in those settings were selected for full reading and analysis of the exclusion and inclusion criteria. No more analysis was performed. The article selection step was performed by two authors (UJJ and AGPD), and a third reviewer was consulted in case of disagreement.

2.4. Risk of bias assessment

We used the appropriate Cochrane’s risk of bias tool to assess all quantitative-based studies included in this review according to the study type; the RoB 2 (Higgins, Altman, Gotzsche, Juni, Moher, & Oxman, 2011) for randomized controlled trials (Table 1), and the ROBINS I (Sterne, Hernán, Reeves, Savović, Berkman, Viswanathan, Henry, Altman, Ansari, Boutron, Carpenter, Chan, Churchill, Deeks, Hrobjartsson, Kirkham, Juni, Loke, Pigott, & Higgins, 2015) for non-randomized studies (Table 2). Both of them assessed the risk of bias in the following domains: selection of participants; bias due to confounding; classification of interventions, deviations from intended interventions, missing data, measurement of outcomes and analysis, and selection of
3. Results

3.1. Study characteristics

Table 3 presents characteristics of the included studies and Table 4 lists all mentioned MBIs in studies. The initial search identified 5,773 studies, out of which 137 were pre-selected after the exclusion for duplication and the inclusion/exclusion criteria. The pre-selected articles were fully read and 21 were included in this review (Fig. 2). There were 2,246 participants in 18 articles, of which 1,309 had undergone some type of MBI, and 932 were female (71.89%). However, (Garland, Roberts-lewis, Tronnier, Graves, & Kelley, 2016) do not report the gender proportions in their study, while (Witkiewitz, Greenfield, & Bowen, 2013) do not mention the proportions for each group after the inclusion criteria for the analysis. The total dropout number was 595 participants considering thirteen studies. Still, (Marcus et al., 2009) and (Amaro et al., 2014) did not provide this information. One should bear...
Table 3
Characteristics of the studies.

| Study Design, Country and Setting | Participants Dropout | Substances | MBI Protocol with number of sessions | Provider (person who delivered the protocol) | Comparator | Longest follow up | Time of treatment | Home exercises |
|----------------------------------|----------------------|------------|--------------------------------------|---------------------------------------------|------------|-----------------|-----------------|----------------|
| Amaro & Black, 2021, USA RT      | N = 200 MMWR (n = 100) NA (n = 100) Only women Mean age = 32.5 Dropout = 16 (MMWR = 10; NA = 6) After 6.5 months = 20 (MMWR = 13; NA = 7). | Cannabis Alcohol Cocaine and/or Crack Sedatives/ hypnotics Hallucinogens Heroin Opiates/analgesics Methadone | MMWR 12 sessions delivered twice weekly for 80 minutes per session | Lead teachers for each intervention had at least 2 years of experience in their respective topics. MMWR lead teachers were experienced mindfulness facilitators; one was in the process of acquiring MBSR instructor certification at project start. | Neurobiology of addiction (NA) | 8.5 months | The average number of days the sample was in RT was (SD = 15.0) (75% of sample started the study intervention within 50 days of residential entry). | Informal Practice: Awareness. Formal Practice: Audio Recording of Guided Meditation. |
| Davis et al., 2019, USA RT | N = 79 MBRP (n = 44) TAU (n = 35) 35% female Mean age = 25.3 Dropout = 17; ITT analysis with 24 participants (MBRP = 15; TAU = 11) | Poly-substance users | MBRP 8 sessions, rolling group delivered twice weekly. | Two master’s degree-level clinicians who underwent 200h of training in MBIs and received supervision prior to leading MBRP groups. | TAU | 6 months | Total Mean of days 41.6 (SD = 26.3) MBRP 43.3 (SD = 35.1) TAU 39.3 (SD = 30.7) | Guided Meditation: 20–30 min per day. |
| Roos et al., 2019, N-RCT USA RT | 109 adults 46% female Mean age = 36.4 Dropout = 21 | Alcohol, Cocaine/crack, Methamphetamine, Marijuana, Heroin, Opioid pills and Anti-anxiety pills | Rolling MBRP Eight modules delivered over 8 weeks Rolling MBRP program developed and evaluated in the current study included eight modules, with each module offered in a single 1h session, and two sessions offered per week (8h total) | One therapist, with occasional groups co-facilitated by two therapists. There were a total of five therapists who led the Rolling MBRP groups. All therapists were graduate students in a Ph.D. clinical psychology program who were formally trained in MBRP | N-A | N-R | Short-term Residential Treatment (approximately 21–28 days) | Homework Review. |
| Black & Amaro, 2019, RCT USA RT | 200 women; 100 in MMWR and 100 in Neurobiology of addiction Mean age = 32.5 Dropout = Same in Amaro and Black (2021) | Polyusers; amphetamine/methamphetamine users was majority (76%) | MMWR delivered twice weekly for 80 min each for a total of 12 group sessions (6 weeks) | An experienced teacher trained in both MBSR and MMWR facilitated all sessions along with an on-site masters-level clinician with experience in SUDs who co-facilitated the intervention. | Neurobiology of addiction (NA) psychodrual education attention control | Pre-post | Mean 94.4 days (SD = 59.3, range = 190) | Formal Practice: Audio Recording of Guided Meditation: sitting meditation, sitting meditation without audio, loving kindness meditation, walking meditation, body scan, and mindful stretching. Informal Practice: stop light technique, triangle of awareness, mindfulness of breath, mindfulness of emotions, mindfulness of thoughts, mindfulness of body sensations, and (continued on next page) |
| Study Design, Country and Setting | Participants | Substances | MBI Protocol with number of sessions | Provider (person who delivered the protocol) | Comparator | Longest follow up | Time of treatment | Home exercises |
|----------------------------------|--------------|------------|-------------------------------------|-------------------------------------------|------------|------------------|------------------|----------------|
| Davis et al., 2018, RCT USA RT   | N = 79. MBRP (n = 44) vs TAU (n = 35) 35% female Dropout — same in Davis et al. (2019) | Poly-substance users | MBRP (8 sessions, rolling group and delivered twice weekly) | Two master’s degree-level clinicians who underwent 200h of training in MBIs and received supervision prior to leading MBRP groups. | TAU | 6 months | Total days = 41.6 (SD = 26.3) MBRP 43.3 (SD = 35.1) TAU 39.3 (SD = 30.7) | Audio Recording of Cognitive Behavioral Therapy Workbook with course information. |
| Shorey et al., 2017, RCT USA RT | N = 117 64 in MDF and acceptance and 53 in TAU Male n = 87 Dropout — same in Davis et al. (2019) | Alcohol, Opioid, Cocaine, polysubstance, Cannabis, Amphetamine, Sedative/ Hypnotic/Anxiolytic | Mindfulness and Acceptance (modified protocol based in MBRP, MBSR and ACT with 8 session - 4 weeks) | Facilitated by one Master’s level graduate student therapist in Clinical Psychology. This therapist had extensive training in mindfulness-based, acceptance and commitment, and substance use treatments. The therapist received weekly supervision Treatment was administered by a clinical psychologist trained in neuropsychology and MM. The GMT sessions were held in the morning, and were of 120 min length. Meditation sessions lasted 40 min each. Cognitive Behavioral Therapy and TAU | TAU | N-R | The facilities in the study has 28-30 day residential treatment program | Audio Recording of Guided Meditation. |
| Valls-serrano, Caracuel, & Verdejo-garcia, 2016 RCT Spain TC | N = 52 16 in GMT + MF and 16 in TAU Male n = 21 Dropout — same in Davis et al. (2019) | Alcohol (n = 14); Cocaine (n = 12); Heroin/cocaine (n = 6) | Goal Management Training + Mindfulness Meditation (GMT + MM received 8 sessions of GMT and 8 sessions of Mindfulness Meditation across 8 weeks) | Facilitated by a clinical psychologist trained in neuropsychology and MM. The GMT sessions were held in the morning, and were of 120 min length. Meditation sessions lasted 40 min each. Cognitive Behavioral Therapy and TAU | TAU | Pre-post | The mean of days GMT + MM Group = 184.62, (SD = 39.99) and TAU Group = 179.5 (SD = 40.44) | Authors mention that GMT + MM is aimed at facilitating transfer to daily life activities but the paper does not describe recommended home practices. |
| Garland, Roberts-lewis, Tronnier, Graven, & Kelley, 2016, RCT USA RT | N = 180 MORE (n = 64), CBT (n = 64), or TAU (n = 52). | Alcohol, cocaine, marijuana, opioids, | MORE (10 sessions that lasted two hours) | MORE were administered by a Masters-level clinical social worker who had practiced mindfulness for >5 years and had clinical experience offering mindfulness training to persons with psychiatric disorders. This individual was supervised weekly by the first author (who developed MORE). Authors mention that the MBRP group was facilitated by a clinical psychologist (Ph.D), certified by the Psychology and Counseling Organization of I.R. Iran. A part of the therapist’s PhD training focused on mindfulness techniques, and he had been trained in CBT for depression and SUDs via master courses, Topics included psycho-education, effects of substance use on interpersonal relationships, rational thinking skills | TAU | Pre-post | N-R | Mindfulness Practice of 15 min/ per day. |
| Zemestani & Ottaviani, 2016, Quasi-experimental Iran TC. | N = 74 MBRP(n = 37), TAU (n = 37) | Cocaine (17.8) Heroin (16.4) Marijuana (13.7) Methamphetamine (39.7) Polysubstance (12.3) | MBRP (8 sessions; 2 hours) | The MBRP group was facilitated by a clinical psychologist (Ph.D), certified by the Psychology and Counseling Organization of I.R. Iran. A part of the therapist’s PhD training focused on mindfulness techniques, and he had been trained in CBT for depression and SUDs via master courses, Topics included psycho-education, effects of substance use on interpersonal relationships, rational thinking skills | TAU | Pre-post and follow-up 2 months | All participants should be at least 2 weeks in the TC. | Homework review. |

(continued on next page)
| Study Design, Country and Setting | Participants Dropout | Substances | MBI Protocol with number of sessions | Provider (person who delivered the protocol) | Comparator | Longest follow up | Time of treatment | Home exercises |
|----------------------------------|----------------------|------------|----------------------------------|-------------------------------------------|------------|-----------------|-----------------|----------------|
| Amaro et al., 2014, Pilot-study RT USA | N = 318 Mean age = 33.9 Dropout = N-R. | Measured by ASI Alcohol (n = 311 Mean = 0.18 SD = 0.2) Drug (N = 316, Mean = 0.16 SD = 0.1) | MBRP-W (Moment-by-Moment in Women’s Recovery. An adapted model of MBSR for women with 9 Sessions which lasted 1.5–2 hours per session) | clinical training workshops, and the co-leadership of an MBCT for unipolar depression. MBRP-W was co-facilitated by a SUD treatment counselor and one of two masters’ level facilitators. All were trained and certified in MBSR and participated in the development of MBRP-W. MBRP-W groups were offered four to six times per year from 2003 to 2006. MBRP-W was offered in English and Spanish. The Lead Facilitator had a daily meditation practice for over 5 years and had attended numerous multiday mindfulness retreats. The two Co-Facilitators of the MBRP groups were trained by the Lead Facilitator and at the time of the study they had a daily meditation practice for 2 or 3 years, as well as mindfulness retreat experience. | N-A | 12 months | Mean days= 157.3 SD = 121.8 | N-R |
| Witkiewitz et al., 2014, Pilot RCT USA | N = 105 MBRP = 55 and RP = 50 Mean age = 34 Dropout = 34 during treatment (MBRP = 20; RP = 14), Follow-up: 51 (MBRP = 27; RP = 24) | Methamphetamine (35.5%), heroin and other opiates (22.6%), cocaine (19.4%), alcohol (9.7%), marijuana (6.5%), nicotine (3.2%), and other drugs (3.2%). | MBRP Delivered twice weekly for 50-min sessions over 8 weeks | The Lead Facilitator had a daily meditation practice for over 5 years and had attended numerous multiday mindfulness retreats. The two Co-Facilitators of the MBRP groups were trained by the Lead Facilitator and at the time of the study they had a daily meditation practice for 2 or 3 years, as well as mindfulness retreat experience. | Relapse Prevention | 15 weeks | N-R | Homework review. Guided Meditation: 30-min meditation sitting groups on four days per week. |
| Witkiewitz, Greenfield, & Bowen, 2013, Second analysis RCT USA | N = 70 Women Mean age = 34 Dropout = 51 as the same | Methamphetamines (15%), alcohol (12%), heroin (11%), marijuana (10%), crack cocaine (9%), and hallucinogens (2%). | MBRP Delivered twice weekly for 50-min sessions over 8 weeks | Authors mention that MBRP and RP interventions were based on prior manuals but the paper does not describe recommended home practices. | N-R | Relapse Prevention | 15 weeks | N-R | Authors mention that MBRP and RP interventions were based on prior manuals but the paper does not describe recommended home practices. |
| Garland, Franken, & Howard, 2012, Second analysis from a RCT pilot RT USA | Same of Garland, Gaylord, Boettiger, & Howard, 2010 Dropout = 15 (6 during 10 sessions and 9 in 6 month follow-up). They did not differ the groups. | Same of Garland, Gaylord et al. (2010) | Same of Garland, Gaylord et al. (2010) | A licensed Master’s level social worker (MSW) with experience in mindfulness who was trained in cognitive behavioral treatments for substance dependence delivered the MORE intervention. | Same Garland, Gaylord et al. (2010) | Six months after the MORE | Same of Garland, Gaylord et al. (2010) | N-R |
| Garland, Gaylord, Boettiger, & Howard, 2010 Pilot RCT USA | N = 53 MORE = 27 and ASG = 26 Men Mean age = 40.3 Dropout = 16 (MORE = 9; ASG = 7) | Alcohol | MORE 10 Sessions | A Master’s level social worker (MSW) with experience in mindfulness meditation who was trained in cognitive-behavioral treatments for substance dependence delivered the intervention | Alcohol dependence support group (ASG) | Pre-post | Mean of 22.3 months (SD = 3.7) | MORE: Mindfulness practice for 15 min/ per day. ASG: journal for 15 min/per day on support group topics. |

(continued on next page)
| Study Design, Country and Setting | Participants | Substances | MBI Protocol with number of sessions | Provider (person who delivered the protocol) | Comparator | Longest follow up | Time of treatment | Home exercises |
|----------------------------------|--------------|------------|-------------------------------------|---------------------------------------------|------------|----------------|------------------|-----------------|
| Liehr et al., 2010, USA TC       | N = 393      |            | MBSR MBTC                           | Instructor-guided mindfulness intervention  | Retention rates were 58%, 29%, 16% and 12% for the TC control group, and 60%, 36%, 27% and 16% for the MBTC intervention group at 1, 3, 6 and 9 months, respectively. | TAU        | 9 months       | 18 months residential program | Audio Recording of Guided Meditation. |
| Linguistic Analysis              |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
| Marcus et al., 2009, USA TC      | N = 459      | Cocaine: TAU =33.3 MBTC =33.7; Marijuana: TAU = 21.0 MBTC =25.8 Alcohol: TAU =21.0 MBTC =17.2 | MBI Protocol with number of sessions | Comparator | Longest follow up | Time of treatment | Home exercises |
| Stage 1b Trial                   |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
| Marcus et al., 2003, USA TC      | N = 21       |            | MBSR 8 Sessions Mindfulness-trained psychotherapist who conducted the intervention | N-R | Only pre-post Subjects who had been in residence more than 30 days were recruited for the study to avoid the first-month period of highest attrition | TAU        | 9 months       | 18 months residential program | Mindfulness Practice from 45-60 min., at least 6 days/week. Workbooks and Audio Recording of Guided Meditation. |
| Pilot Study                      |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
| Marcus, Fine, & Kouzekanani, 2001, USA TC | 36 (only two female) | Alcohol, cocaine, heroin, marijuana and inhalants users | MBSR 8 Sessions A psychotherapist with a long-term meditation practice and advanced training in MBSR. | Control group Pre-post Control Group (M) = 8.5 months, DP = 1.26 months MBSR (M) = 3.4 months, DP = 0.18 months | TAU        | 9 months       | 18 months residential program | Mindfulness Practice from 40 – 60 min., at least 6 days per week. Awareness written exercises. |
| Quasi-experimental study         |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
|                                  |              |            |                                     |                                             |            |                |                  |                 |
| Note: TC = Therapeutic Community; RT = Residential Treatment; N-R = Not Reported; N-A = Not Applicable; MBI = Mindfulness-based Intervention; MMWR = Moment-by-Moment in Women’s recovery; MBSR = Mindfulness-Based Stress Reduction; MBRP = Mindfulness-Based Relapse Prevention; MBRP-W = Moment-by-Moment in Women’s Recovery: A Mindfulness-Based Approach to Relapse Prevention; MORE = Mindfulness-Oriented Recovery Enhancement; GMT = goal management training; MM = mindfulness meditation; M = Mean; ASG = Alcohol dependence support group; NA = neurobiology of addiction; SD = Standard Deviation; USA = United States |
in mind that some of the articles included in this review are secondary analyses, and/or analyzed data of the same study in separate articles, in which cases the number of participants was accounted for only once. In regard the countries where the studies were conducted, 17 were in the United States, (Valls-Serrano et al., 2016) was in Spain, (Harris, 2015) was in Ireland, and (Zemestani & Ottaviani, 2016) was in Iran. All the articles found were published in English.

Concerning control groups among the studies which used qualitative design, only the (Harris, 2015) study had a control group, as it compared different types of treatment involving MBRP in TC (male residential service, female residential service and drug free day program). Among the quantitative studies, some RCT’s included treatment as usual (TAU) as a comparison (Davis et al., 2018, 2019; Shorey et al., 2017; Valls-Serrano et al., 2016). Additionally, there were other types of control groups, such as Alcohol Dependence Support (Garland, Gaylord, Boettiger, & Howard, 2010; Garland et al., 2010), relapse prevention (Witkiewitz, Greenfield, & Bowen, 2013), neurobiology of addiction (Amaro & Black, 2021; Black & Amaro, 2019), and a study that comprised two control groups: Cognitive Behavioral Therapy and TAU (Garland et al., 2016).

The quantitative studies presented several distinct methodologies.
Earlier in MBI research, Marcus and colleagues conducted a quasi-experimental study in TC (Marcus, Fine, & Kouzekanani, 2001), and the same author later published a stage 1 trial design (Marcus et al., 2009). A more recent study carried out a linguistic analysis (Liehr et al., 2010). Zemestani and Ottaviani (2016) also published a quasi-experimental study that evaluated MBRP for patients with SUDs and depression. Some studies can be classified as nonrandomized controlled trials, such as those of Witkiewitz and colleagues, carried out with secondary data (Witkiewitz et al., 2013), and a pilot RCT, both in RT for women (Witkiewitz et al., 2014). Garland et al. (2010) used the same study design, but in a TC. Roos and colleagues performed a nonrandomized study, as the mode of intervention (rolling MBRP) would not allow for a standard RCT (Roos et al., 2019). There were also seven RCTs (Amaro & Black, 2021; Black & Amaro, 2019; Davis et al., 2018, 2019; Garland et al., 2016; Shorey et al., 2017; Valls-Serrano et al., 2016), all of them published between 2016 and 2021.

Few studies included follow-up assessment, which is fundamental to identify the long-term effects of interventions. Most of them comprised only pre-and postintervention evaluations (Black & Amaro, 2019; Garland et al., 2010, 2016; Marcus et al., 2001, 2003; Valls-Serrano et al., 2016). However, four of them had a six-month follow-up (Davis et al., 2018; Garland, Franken, & Howard, 2012; Witkiewitz et al., 2013, 2014); the longest ones followed the participants up for nine months (Marcus et al., 2009), and only one evaluated the participants 12 months after the intervention (Amaro et al., 2014). Concerning the training of MBI facilitators, we observed that interventionists in most of the studies had extensive hours of meditation practice and advanced training. Only one study did not report the characteristics of the facilitator (Witkiewitz et al., 2013), and another only reported the professional was a mindfulness instructor (Liehr et al., 2010).

Concerning the duration of stay in TCs, participants had been there for 12.45 months on average, considering all the samples and the experimental groups (many studies did not provide the information separately). As for the RTs, on the other hand, participants had been in treatment for an average of 49 days. Two studies (Roos et al., 2019; Shorey et al., 2017) only reported the maximum treatment time allowed (28–30 days).

We evaluated blindness in the studies. We observed that some studies (n = 10) did not report any information in this regard (Davis et al., 2019; Garland, Schwarz, Kelly, Ahmed, & Howard, 2012; Garland et al., 2012; Harris, 2015; Liehr et al., 2010; Marcus et al., 2003, 2009; Valls-Serrano et al., 2016; Witkiewitz et al., 2013, 2014) and, one study reported not blind participants (Shorey et al., 2017). Moreover, others presented a variability in the level of information details of the blind procedure: part of the studies reported some blind, either in instruments collection or data analysis.

None of the studies indicated or reported causing side effects or harm to participants due to having received MBI.

### 3.2. Outcome characteristics

Table 5 presents objectives, instruments and effects of measured outcomes of included studies. Outcomes were divided in the following categories: substance use and other outcomes related to SUDs; Stress; Impulsivity and Evaluation of the MBI.

#### 3.2.1. Substance use and associated outcomes

The study by (Black and Amaro (2019) evaluated a protocol called Moment-by-Moment in Women’s Recovery (MMWR) and compared it to psychoeducation of addiction neurobiology as an active control group. Regarding retention rates, with or without improvement up to 150 days after initiation, the results of the survival analysis of intention-to-treat showed that the MMWR group had lower risk of finishing the treatment without any improvement. (p < .07). The study by (Amaro et al., 2014) did not collect the entire sample in RT, since 26.1% (n = 83) of the sample was recruited from outpatient treatment. Their results showed that 36% of the sample completed the nine sessions of the intervention and that the participants had a decrease in the severity of alcohol (p < .001) and other drugs (p < .05) dependence.

The study by (Shorey et al., 2017), carried out in a short-term RT, used an intervention adapted from MBRP, MBSR and Acceptance and Commitment Therapy (ACT). The authors found no statistically significant differences between the groups regarding consumption. Their results, on the other hand, suggest that there may be a decrease in craving (d = 0.07) and an increase in psychological flexibility with small effect sizes in the experimental group. The authors add that the treatment performed in a few days may have directly contributed to the absence of differences between the groups, and emphasize the relevance of studying ACT in closed treatment contexts.

A study compared two groups in a TC to evaluate the MORE: Cognitive-Behavioral Therapy (CBT) and TAU (Garland et al., 2016). The MORE group showed, after 10 sessions, fewer post-traumatic stress symptoms compared to the CBT (p = 0.04) and TAU (p = 0.05) groups, in addition to fewer symptoms of anxiety and depression, an effect that was observed in the two comparison groups as well. The study also showed that dispositional mindfulness was the mediator in an indirect effect for craving (Sobel test p = 0.01) and fewer post-traumatic symptoms (Sobel test p = 0.02). The authors argue that as MORE focuses particularly on reappraisal to regulate negative emotions, it may contribute to increasing positive feelings. Zemestani and Ottaviani (2016) evaluated the effectiveness of MBRP in patients with SUDs and depression, detecting satisfactory results for this outcome for time, treatment and in the time/treatment interaction (p < .0001).

In another study that also evaluated MORE, considering physiological data of alcohol-related stress (Garland et al., 2010), the mindfulness group was compared with a control group named Alcohol Dependence Support Group (ASG), which included contents of MORE, such as talking about feelings and thoughts. The main results showed that in the post-treatment, the heart rate variability (HRV) of the participants in MORE had a greater decrease than that in the control group (p = 0.045) after the presentation of alcohol-related visual stressors (images of alcoholic beverages). Moreover, the MORE participants presented lower attentional bias when the stimuli were presented at 200 ms. Garland and colleagues carried out a follow-up with that sample six months after the MORE to evaluate relapse (Garland et al., 2012). Out of the 47 participants who followed through to the post-treatment (ASG and MORE), nine (19.1%) relapsed within that interval. The participants who did so had presented higher reactivity to the high frequency of heart rate variability when facing alcohol stimuli. Finally, it should be noted that the treatment environment in these studies with the same sample was reported differently; in Garland et al. (2010) it is reported as TC, whereas in Garland et al. (2012) it is reported as RT.

The study of Witkiewitz et al. (2014), on the other hand, evaluated MBRP in women referred to RT by the criminal justice system. The intervention was also conducted in a rolling group, versus closed cohort, format. The results of the 15-week follow-up showed that the MBRP group had fewer days of drug use (96 %) and well as fewer legal and psychiatric problems than the Relapse Prevention (RP) group. Authors did not have data on what other treatments were offered in the treatment facility. Another study by the same authors, also with women referred by the criminal justice system, found a significant interaction between race/ethnicity, as the patients who underwent MBRP had a lower score on the Addiction Severity Index (ASI) than those who did RP (d = 0.09). In addition to a significant difference in the improvement of the interaction race/ethnicity in the number of days of drug use in those who did MBRP compared to RP (p = 0.002), in spite of a small effect size (Witkiewitz et al., 2013). Both authors stress the fact that as some women remained in RT, it was not possible to carry out some controls for a better analysis, which is a limitation of the study.

#### 3.2.2. Stress

The study by Liehr et al. (2010) brings an innovative methodology of
| Study                        | Objective                                                                 | Instruments and outcomes                                                                 | Effects of measured outcomes                                                                 |
|-----------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Amaro & Black, 2021         | Efficacy of MMWR for women with complex social and clinical stories for SUDs and relapse outcomes | Timeline Followback (TLFB), Breathalyzer and Urinalyzer, Stressor Checklist Revised, PTSD Symptom Scale Self Report and FFMQ  
Blinded: substance use | Post MMWR:  
- Increase time to use marijuana (p = .049).  
- Increase days using marijuana after 3.5 months (p = .030).  
- Increase days using marijuana compared to GC (marijuana users) (p = .020).  
Class attendance:  
- Increase time up to 1st use (r = .49, p < .001), intoxication (r = .48, p < .001).  
- Increase days in substance use (r = -.30, p < .009) and total days intoxicated by alcohol (r = .25, p < .021). |
| Davis et al., 2019          | To verify whether MBRP decreases impulsivity for SUDs during and after treatment; and how this change affects the consumption of substance post-treatment. | UPPS-P (SUPPS-P) Impulsive behavior scale, Substance Frequency Scale (SFS)  
Blinded: N-R | MBRP: During treatment  
- Decrease impulsivity dimensions: negative urgency (b = -.41, p < .000); positive urgency (b = -.20, p = .022); lack of premeditation (b = -.26, p < .000); lack of perseverance (b = -.12, p = .01); sensation seeking (b = -.13, p = .03).  
Groups: During treatment  
- Decrease impulsivity dimensions: negative urgency (Wald χ² = 4.43(1), p = .03) lack of premeditation (Wald χ² = 6.29(1), p < .001); lack of perseverance (Wald χ² = 4.07(1), p = .04).  
TAU: Post-treatment:  
- Increase impulsivity dimensions: negative urgency (simple slope: b-linear = .12, p < .000; b-quad = -.01, p < .04); positive urgency simple slopes: b-linear = .14, p < .000; b-quad = -.01, p < .000).  
Mediation between positive urgency (indirect effect = -.205, 95% CI [-.420, -.183] and negative (indirect effect = -.208, 95% CI [-.359, -.531]), and the consumption.  
Feasibility and acceptability of the intervention.  
Dose-Response: ≥ 2 sessions MBRP  
- Increase mental health (b = 1.214; SE = 0.479  p = 0.277; p < .05).  
- Increase mindfulness trait (b = 4.39; SE = 1.461; p = 0.351; p < .01).  
Mechanism of change - type of practice, frequency + total sessions:  
- More informal: decrease craving (p < .01), increase mental health (p < .01), increase self-compassion (p < .05), and increase mindfulness (p < .01).  
- More formal: increase mental health (p < .05), and increase mindfulness (p < .01). |
| Roos et al., 2019           | To assess feasibility, acceptability, dose-response relationships, and mechanisms of change of Rolling groups-MBRP in RT for treatment of SUD | MBRP Adherence and Competence (MBRP-AC) Scale; Cognitive and Affective Mindfulness Scale-Revised; Short Form Health Survey; Days Abstinent Prior to Treatment; Penn Alcohol Craving Scale.  
Blinded: for MBRP-AC, for protocol and at follow-up |  |
| Black & Amaro, 2019         | To evaluate MMWR efficacy;  
To determine underlying psychological and neural mechanisms in women diagnosed with SUDS compared to psychoeducation. | TLFB, relapse days, days in residential treatment, Applied Mindfulness Process Scale, Five Facet Mindfulness Questionnaire (FFMQ), Perceived Stress Scale (PSS), Depression, Anxiety and Stress Scale (DASS-21), Distress Tolerance Scale (DTS), Difficulties in Emotional Regulation Scale (DERS), Penn Alcohol Craving Scale (PACS), Positive and Negative Affect Scale (PANAS).  
Blinded: staff members were blinded to group assignment and study hypotheses. | Risk of finishing without improvement  
MMWR < Control HR = 0.42, 95% CI: 0.16-1.08, p = .07.  
Attendance on MMWR:  
- Increase mindfulness (r = 0.61, p < .01).  
- Increase distress tolerance (r = 0.55, p < .01).  
- Increase positive affect (r = 0.52, p < .01).  
- Increase stress perceived (r = 0.21, p = .03). |
| Davis et al., 2018          | To assess whether MBRP + TAU reduces stress, craving and consumption compared to the TAU + 12-step control group | TLFB, The Substance Use Frequency Scale (SFS), items on the Craving Scale (GAIN) e PSS.  
Blinded: To prevent bias, therapists were not involved in follow-up assessments with the experimental group and were blind to participant responses on all outcomes during the treatment and follow-up phase. Finally, supervision of adherence and competence was conducted by one rater. | MBRP during and after treatment:  
- Decrease substance use (p < .001) and maintain their lower.  
- Decrease craving (p < .001) and maintain their lower.  
- Decrease stress (p < .01) and maintain their lower. |
| Shorey et al., 2017         | To assess whether M&ACT reduces craving, increases psychological flexibility related to | PAGS, FFMQ, Acceptance and Action Questionnaire, substance abuse (AAQ-SA).  
No blinded | M&ACT:  
- The greater drug craving at discharge, the lower perceived group importance.  
(continued on next page) |
Table 5 (continued)

| Study                                      | Objective                                                                 | Instruments                                                                 | Effects of measured outcomes                                                                 |
|--------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Valls-serrano et al., 2016                 | To evaluate the effects of Goal Management Training + Mindfulness Meditation (GMT + MM) on executive functions of poly substance users compared to TAU | Letter-number sequencing from WAIS-III, Color-word interference test strop test from Delis-Kaplan executive functions systems battery, Information sampling test (IST), Stocking of Cambridge (CANTAB), Zoo-map test from Behavioral assessment of the dysexecutive syn-drome (BADS), Revised strategy application test, Multiple Errands Test – contextualized version (MET-CV), Blinded: N-R | The greater psychological flexibility, the greater perceived group importance. |
| Zemestani & Ottaviani, 2016                | To assess the effectiveness of MBRP compared to TAU in patients with depression. | Beck Depression Inventory (BDI-II), Beck Anxiety Inventory (BAI), Penn Alcohol Craving Scale (PACS). Blinded: Follow-up data were gathered by volunteers who held a master’s degree in psychology or social work, had no involvement in the intervention phase of the study, and were blind to the intervention arm. | MBRP + Time: Decrease depression F(2,144) = 30.73, p < .0001, n² = .31. Decrease anxiety F(2,144) = 43.96, p < .0001, n² = .39. Decrease craving F(2,144) = 35.90, p < .0001, n² = .34. |
| Harris, 2015                               | To assess the impact of MBRP on TC; To explore clients’ perception and attitude towards the protocol; To examine how it can be helpful for individuals with substance abuse problems who were undergoing three institutional treatment models. | Semi-structured interviews for participants and Focus group. Blinded: N-R | Participants of both genders reported positive experience and real benefits. Discrepant perception of MBRP’s “urge surfing”. Perception that the program is valuable. |
| Amaro et al., 2014                         | To assess the feasibility, acceptability, and potential benefits of integrating the MBRP-W for SUDs in women; | Feasibility and Acceptability of MBRP-W were measured by participation (number of sessions attended) and participant satisfaction, Addiction Severity Index (ASI), Perceived Stress Scale (PSS). Blinded: To assess feasibility and acceptability, a self-administered satisfaction questionnaire was collected by an independent research interviewer at the last MBRP-W session of each group. Independent interviewers conducted structured baseline interviews and follow-up in English or Spanish. | Feasibility and Acceptability: 1–4 sessions: 19.8%; 5–9 sessions: 35.8%; Not attended: 44.3%. Quality: ranged 3.4 (max. 4). Importance: ranged 3.5 (max. 4). Clinical outcomes: Decrease alcohol severity (X2 = 19.0, DF = 4, p < .001). Decrease drug severity (X2 = 10.0, DF = 4, p < .05). Decrease stress perceived (SE = 0.74, p < .05). |
| Witkiewitz et al., 2014                    | To assess whether MBRP is a feasible and effective intervention to reduce drug use and drug-related consequences for women referred by the criminal-justice system. | TLFB, Short Inventory of Problems (SIP-M), Addiction Severity Index (ASI). Blinded: N-R | MBRP: Decrease drug use days (IRR = 0.94; 95% IC: 0.00–0.12; p = 0.001) Decrease legal status (B (SE) = –0.31 (0.13), p = .02) Decrease medical status (B (SE) = –0.25 (0.09), p = .007) |
| Witkiewitz et al., 2013                    | A secondary analysis of Witkiewitz et al., 2014 to evaluate outcomes of MBRP and relapse prevention (RP) | TLFB, Addiction Severity Index (ASI). Blinded: N-R | MBRP: Decrease drug use days at follow-up (B (SE) = –7.99 (2.53), p = .002). Decrease addiction score (B (SE) = –0.12 (0.04), p = .005). Racial and ethnic minorities in MBRP had: Decrease drug use days (B (SE) = 3.59, p = .03). |
Reported; DT

Note: The instruments were all placed with the acronyms in order not to increase this note. TC

Blinded: N-R

Alcohol dependence severity (AUDIT), Alcohol attentional bias, HFHRV cue-reactivity.

Blinded: N-R

To examine whether with MORE participants would show less reactivity of HFHRV to alcohol cues;

To predict whether alcohol attention bias increases relapse after 6 months.

Garland, Franken, & Howard, 2012

Alcohol dependence severity (AUDIT), Alcohol attentional bias, HFHRV cue-reactivity.

Blinded: N-R

To increase understanding of these mindfulness-related treatment effects;

To explore the acceptability and feasibility of MORE.

Garland, Schwarz, Kelly, Ahmed, Howard, Howard, 2012

Semi-structured interview with open-ended questions.

Blinded: N-R

To compare MORE with ASG in cognitive, affective and physiological effects involved in the stress that precipitates relapse to alcohol consumption.

Garland et al., 2010

Atitudes Towards Treatment, FFMQ, Brief Symptom Inventory (BSI), Impaired Alcohol Response Inhibition Scale (IRISA, PSS-10, White Bear Suppression Inventory (WBISI), Psychophysiological cue-reactivity, Attentional Bias.

Blinded: Psychosocial instruments were verbally administered in interviews conducted by a research assistant who was blind to group assignment.

Liehr et al., 2010

Participants were asked to write a story about the stress they were experiencing.

Blinded: N-R

To explore through linguistic analysis the effects of MBTC over a 9-month study period.

Marcus et al., 2009

Symptoms of Stress Inventory (SOSI), Salivary cortisol, Retention data, MBTC dose response.

Blinded: N-R

To assess the effectiveness of the MBTC;

To analyze whether there was a reduction in stress and an increase in treatment retention compared to TAU at admission and follow-up (1, 3, 6 and 9 months).

Marcus et al., 2009

Standardized guidance for expressive writing.

Blinded: Selective reduction of the texts was achieved by the researchers who independently read the stories of stress to highlight key words and phrases related to the MBTC intervention.

Carroll et al., 2008

Salivary Cortisol, PSS.

Blinded: N-R

To determine salivary cortisol levels before and after an 8-week MBSR protocol, in addition to collecting subjective reports of stress.

Marcus et al., 2003

Ways of Coping Checklist (WOCL), Symptom Checklist-90-R (SCL-90-R).

Blinded: To control experimenter bias, different researchers supervised data collection at the experimental and comparison sites, and different research assistants entered the pre-test and post-test data into the computer.

Marcus et al., 2001

Decrease treatment and race or ethnicity predicted drug use days (B (SE) = 5.70 (2.50), p = .02).

Decrease relapse after 6 months.

Participants who relapsed compared those who did not relapsed:

As a population with characteristics of poverty, homelessness, violence and trauma without the benefits of advanced education, participation in MORE has had a substantial and positive impact on the lives of some recovering individuals. Themes of awareness, acceptance and non-reactivity permeated the participants’ narratives, many of whom seemed to believe that mindfulness was a useful means of dealing with addiction and stress. The more mindfulness practice, the more decentralization and removal from daily stressors and annoyances.

Blinded: N-R

Increase HFHRV reactivity to alcohol by the 6-month follow-up (F (1,36) = 5.85, p = .02, d = .85).

Increase HFHRV to stress cues by the 6-month follow-up (F (1,36) = 7.70, p = .009, d = 1.05)

MORE participants were correlated to highest pre-intervention levels of perceived stress (r = .52, p = .03), changes in Attentional Bias in 200ms (r = .49, p = .042) and changes in post-intervention HRV recovery (r = .49, p = .045).

Decrease stress perceived 10 weeks after treatment (p = .03).

Decrease HRV during the recovery period (p = .03).

Decrease distress from alcohol cue-exposure (p = .03).

MORE participants were correlated to highest pre-intervention levels of perceived stress (r = .52, p = .03), changes in Attentional Bias in 200ms (r = .49, p = .042) and changes in post-intervention HRV recovery (r = .49, p = .045).

Decrease negative emotion and anxiety (p < .01).

Decrease use of negative emotion words in stories (p < .01).

The MBTC intervention did not significantly change feeling and thinking in word use over time; however, the MBTC used fewer negative emotion words when writing about stress compared to the TC control group.

Decrease stress symptoms in both groups over 9 months (p < .01).

Blinded: Selective reduction of the texts was achieved by the researchers who independently read the stories of stress to highlight key words and phrases related to the MBTC intervention.

Carroll et al., 2008

Participants were asked to write a story about the stress they were experiencing.

Blinded: N-R

To explore through linguistic analysis the effects of MBTC over a 9-month study period.

Liehr et al., 2010

Participants were asked to write a story about the stress they were experiencing.

Blinded: N-R

Decrease total stress (p < .0001).

Decrease tension and emotional irritability at 3 months (p = .02 and p = .03).

Decrease cortisol over 9 months (p < .03).

Participants level was associated with dropout (hazard ratio = 976, p < .01).

The results showed that there are three qualities identified in the stress stories by MBSR participants: usefulness, portability and sustainability, which were identified as essential qualities important to integrate MBSR into the treatment of BD.

Participants who relapsed compared those who did not relapsed:

Decrease cortisol (p < .0001).

Decrease stress, but not statistically significant.

Increase self-controlling (ES = 0.114).

Increase seeking social support (ES = 0.048).

Decrease hostility (ES = 0.06).

Decrease paranoid ideation (ES = 0.046).

Blinded: Selective reduction of the texts was achieved by the researchers who independently read the stories of stress to highlight key words and phrases related to the MBTC intervention.

Marcus et al., 2003

Decrease use of negative emotion words in stories (p < .01).

The MBTC intervention did not significantly change feeling and thinking in word use over time; however, the MBTC used fewer negative emotion words when writing about stress compared to the TC control group.

Decrease stress symptoms in both groups over 9 months (p < .01).

Marcus et al., 2001

Decrease total stress (p < .0001).

Decrease tension and emotional irritability at 3 months (p = .02 and p = .03).

Decrease cortisol over 9 months (p < .03).

Participants level was associated with dropout (hazard ratio = 976, p < .01).

The results showed that there are three qualities identified in the stress stories by MBSR participants: usefulness, portability and sustainability, which were identified as essential qualities important to integrate MBSR into the treatment of BD.

Participants who relapsed compared those who did not relapsed:

Decrease cortisol (p < .0001).

Decrease stress, but not statistically significant.

Increase self-controlling (ES = 0.114).

Increase seeking social support (ES = 0.048).

Decrease hostility (ES = 0.06).

Decrease paranoid ideation (ES = 0.046).

Blinded: Selective reduction of the texts was achieved by the researchers who independently read the stories of stress to highlight key words and phrases related to the MBTC intervention.

Marcus et al., 2003

Decrease use of negative emotion words in stories (p < .01).

The MBTC intervention did not significantly change feeling and thinking in word use over time; however, the MBTC used fewer negative emotion words when writing about stress compared to the TC control group.

Decrease stress symptoms in both groups over 9 months (p < .01).

Marcus et al., 2001

Decrease total stress (p < .0001).

Decrease tension and emotional irritability at 3 months (p = .02 and p = .03).

Decrease cortisol over 9 months (p < .03).

Participants level was associated with dropout (hazard ratio = 976, p < .01).

The results showed that there are three qualities identified in the stress stories by MBSR participants: usefulness, portability and sustainability, which were identified as essential qualities important to integrate MBSR into the treatment of BD.
linguistic analysis in the context of studies of MBIs in TCs. The research involved 393 patients, divided into a MBTC (Mindfulness-Based Therapeutic Community) group and a TAU group. The linguistic analysis was based on texts the participants wrote about stress stories after a program that merged the MBSR with the TC treatment, the MBTC. The study analyzed the use of positive and negative words and feelings, and the results have shown a decrease in the use of negative and stress-related emotion words (p < 0.05) in the MBTC group. Besides, the authors mention that as any other behavioral therapy, MBIs require engagement of participants in both formal and informal practices. Being offered inside a context where structured activities compete with their work and leisure, this may interfere in their adherence to the practices.

In a quasi-experimental study, Marcus et al. (2009) used the participants’ salivary cortisol to evaluate MBTC for stress. Even though both groups showed changes over time (p = 0.03), there was no difference between them regarding retention in TC treatment (p = 0.45). The study was limited by the TC staff’s perception that the MBTC was separate from the treatment curriculum rather than an additional tool that could be useful both during treatment and later in the participants’ lives. Finally, Marcus et al. (2003) (n = 21) also assessed salivary cortisol in order to evaluate the level of stress after MBSR. The results showed a statistical difference (p = 0.001) in the decrease in cortisol after MBSR. However, as it was carried out with a very small and non-randomized sample, the generalization of the results was compromised.

Black and Amaro (2019) found a greater reduction in stress as well as an increase in positive affect, both during treatment and later in the participants’ lives. The study evaluated the feasibility, acceptability, dose–response relations, and mechanisms of the Rolling MBRP (Roos et al., 2019). The results were considered satisfactory regarding feasibility, with an average number of participants attending 3.69 of the eight sessions delivered twice a week, and also in terms of dose response, as those who participated in two or more sessions had higher rates of mindfulness and mental health. The analyses showed significant results of mediation of a number of sessions in informal and formal practices, especially for those who attended two or more rolling MBRP sessions for mental health outcomes. Finally, it is noteworthy that, as it is an RT with a short-term treatment, this type of intervention may be more appropriate, especially considering that the dose response observed was short (Roos et al., 2019).

Amaro and colleagues evaluated the acceptability and feasibility of MBRP-W, but did not include a control group. The results showed that depending on the treatment’s dosage it would have an impact on the permanence of the treatment. More specifically, women who received no MBRP-W or lower doses of the intervention could stay less in residential treatment compared to the group who had received high dosage of the treatment. Particularly, regarding the treatment retention, the higher dosage group had received SUD treatment at six and 12 months of follow-up (Amaro et al., 2014). The study by Harris (2015), carried out in Ireland, qualitatively evaluated the impact of the MBRP in a TC. The patients’ statements revealed initial estrangement, until they understood what mindfulness was, as well as the urge surfing (to manage craving) and relaxation practices. She also highlights that protocol reception was higher among those who were treated in the institution’s closed treatment model than among those who were on a drug-free day program. The author highlighted the compatibility between MBTP and the purposes of TC treatment, which aims to offer a comprehensive treatment for individuals with SUDs.

In addition to this study, two other qualitative works evaluated the implementation of an MBI. Garland and colleagues evaluated MORE as an adaptation for TCs in which participants’ statements were collected after the intervention. Participants reported greater awareness, presence and insight, highlighting the addiction-action schema and coping. They also reported acceptance of and coping with various triggers during treatment, such as craving, nonreactivity, difficult emotions, interpersonal stress and reappraisal. Their reports also covered the effects of practices, group process, therapist modeling and the usefulness of MORE in the context of treatment, especially for socioeconomically disadvantaged individuals (Garland et al., 2012).

Finally, in the study by (Carroll, Liehr, Raines, & Marcus, 2008) based on the MBSR, patients’ reports of stress stories after the intervention demonstrated an effect in three domains: (1) usefulness to calm down, (2) portability to take to other places in life, and sustainability to continue treatment goals outside of TC, and (3) how lessons of stress can improve the TC environment.

4. Discussion

The present study evaluated, through a systematic review, the effects of MBIs for substance use related outcomes in inpatient treatments such as TCs and RTs, the two most common types of inpatient treatment (National Institute on Drug Abuse, 2015). The results deepen the understanding of the effects of MBIs in those contexts, since they are considered safer places to prevent relapse, as participants have no access to drugs. The results were divided into sub-themes corresponding to the outcomes most commonly measured by studies on the treatment process for SUDs: use of substances and other outcomes related to SUDs, stress, and impulsivity. On the other hand, studies assessing effectiveness and feasibility of MBI protocols in RTs may highlight factors that contribute to implementation of MBIs in inpatient settings. Moreover, studies have suggested that stress assessment is a determining factor for treatment success. In this regard, nine of the included studies had some measure of
stress as primary or secondary outcome. The same applies to the assessment of positive emotions, whose increase can be important in long term inpatient treatment, as seen in (Garland et al., 2016).

There are a range of MBIs in studies carried out in inpatient settings evaluated by different research groups. For example, Marcus and colleagues of MBSR or MBTC (Marcus et al., 2009, 2001, 2003), Witkiewitz and colleagues, and Davis and colleagues, who included both standard MBRP and an adapted Rolling MBRP in RTs (Davis et al., 2018, 2019; Witkiewitz et al., 2014; Witkiewitz et al., 2013). Another research group that assessed an MBI in inpatient treatment was Garland and colleagues, with MORE (Garland et al., 2016, 2010, 2012; Garland et al., 2012). This review also showed several examples of integrated treatments, such as GMT + MM (Valls-Serrano et al., 2016) and Mindfulness with ACT (Shorey et al., 2017), which may offer added benefit considering the complexity of SUDs.

All RCTs reported significant improvements in main outcomes, with their subjective benefits confirmed by the qualitative studies that were included in this review (Harris, 2015; Garland et al., 2012; Carroll et al., 2008), and underscored the importance of these methodologies to understand the process of implementing MBIs in RTs and TCs. Based on the results of the RCTs, the expansion of MBIs as part of treatments combined with other therapeutic practices, such as the 12 steps, conventional therapy, and relapse prevention, is still being discussed. Nonrandomized Controlled Trials were mostly characterized by verifying feasibility and acceptability, and their results showed satisfactory effects. The studies that had longer follow-ups are NRCTs, which are important for the observation of long-term efficacy and contain studies that evaluated participants nine or twelve months after the intervention (Amaro et al., 2014; Marcus et al., 2009). On the other hand, risk of bias analysis showed that RCTs were of superior methodological quality, with almost all studies demonstrating low risk of bias (eight out of ten), while in non-randomized studies only one of six studies demonstrated low risk.

This review shows the relevance of these treatment facilities, and additionally it can be a research environment to verify the effectiveness of MBIs. Another strength of this review was to substantiate MBIs as part of the initial treatment rather than only aftercare, as it was initially developed (Witkiewitz et al., 2014). Although the efficacy for this inpatient treatment model is not yet considered high by (Reif et al., 2014) and (de Andrade et al., 2019) considered that studies conducted in RTs showed a moderate effect for SUDs. Apart from these, other variables were evaluated, such as post-traumatic stress disorder (Garland et al., 2016) or depressive symptoms and psychiatric symptoms (Black & Amaro, 2019; Witkiewitz et al., 2013, 2014). In this sense, in order to evaluate the MBI’s effectiveness in RTs and TCs, it is important to evaluate covariates taken under consideration in these comorbid diagnoses.

One of the advantages of offering MBIs within these treatment settings is that patients can receive the intervention as a part of the program and consequently without competing activities. Aligned with that, they also can receive audio recordings or homework that improves their meditation practice in between sessions. The use of recording meditations is a good alternative because it is a controllable environment, where researchers can check post-treatment and all issues that may involve being treated without routine access to substances.
caution and there are some possible explanations for that. First, all interventions were delivered by professionals with higher education or specialization apart from their experiences and had received training in Mindfulness or meditation. Second, studies followed criteria to include participants. Third, RT institutions have specific criteria for receiving patients without acute crises. Besides that, the studies did not report the effect of the therapist and site (settings). The absence of these reports means either a positive argument for mindfulness promotion in the inpatient settings or a negligence of researchers about the importance of gathering evidence on this matter. Harms due to mindfulness practices, although at a small frequency, may occur and influence participants’ adherence to treatment (Baer et al., 2020), as well as the effect of the therapist and setting. Clinical professionals and researchers should be aware of this to increase notification.

In this review, we can see that only three studies reported the role of the treatment site in MBI in more detail (Garland et al., 2012; Harris, 2015; Liehr et al., 2010), which is a significant point to be considered by the authors in future publications. Another important issue was the lack of specification of other activities available at treatment sites, as this may have influenced outcomes. Given this gap, it is crucial that studies address the effect of treatment site on outcomes more carefully, both for studies of MBIs and for other interventions for SUDs. We also think there is a need for further review studies comparing MBIs in inpatient and outpatient settings. These suggestions had already been made by (Finney, Hahn, & Moos, 1996) who, when comparing the effectiveness of the two settings for the treatment of alcohol, stated the need for researchers to include the analysis of the mediation or moderation effect of the setting on the outcomes studied.

4.1. Limitations

We were unable to discuss further aspects related to the setting considering that only two studies reported that the treatment environment could have interfered in the results found, namely the qualitative articles (Carroll et al., 2008; Harris, 2015). We highlight the need for future quantitative studies to address this aspect and consider the treatment context in which the intervention is being offered as a factor for change. Also, only two quantitative studies discussed more aspects related to the closed treatment setting (Liehr et al., 2010; Marcus et al., 2009). Of these four studies, three are from the team of Marcus and colleagues. Although there has been an increase in the number of studies in recent years, especially RCTs in RTs, such as (Amaro & Black, 2021) and (Davis et al., 2018), the authors provided no further discussions about this type of treatment.

Most NRCTs were evaluated as studies with moderate risk of bias, which indicates that better controlled studies are called for, especially since some of these studies are recent and aim to verify the feasibility and acceptability of the protocol (Amaro et al., 2014; Roos et al., 2019).

No study indicated harm to participants who underwent MBI, which constitutes an important argument for their promotion in both settings. However, it is worth mentioning that all interventions were delivered by people with ample experience in Mindfulness or meditation, and with higher education or specialization, so the risks of harm to participants were reduced. Another point that may have contributed to this is that even if the participants dropped out of the study, they could remain in the treatment as usual. It is ethical and beneficial for the patient, but can, on the other hand, introduce a bias in the samples, mainly without precise details about what constitutes this treatment as usual. Britton (2019) states that risks can be observed in several mindfulness-related processes when done excessively, a fact that was not observed in the studies of this review.

Another factor that should be considered is publication bias, as studies that present positive results are more likely to be published, while those that have negative results are either not published or are obscured. Consequently, this would be no different in the study of MBIs (Britton, 2019; Dimidjian & Segal, 2015; Howard, 2016).

5. Conclusions

There is evidence that MBIs in inpatient settings such as RTs and TCs benefited those who participated in the experimental groups on some outcomes, such as stress and substance use. With this review, researchers in MBIs or SUDs, as well as professionals working in those types of settings, can have a more solid basis for the implementation and partnerships of MBIs, to the point of being able to choose different programs for different outcomes.

We suggest that further studies be carried out, especially RCTs that use a longer follow-up time. Even when considering the 20-year window of studies, it is important that future research focuses more deeply on the relationship between the environment and the MBI. In addition, among the various outcomes of interest, the assessment of substance use and aspects related to treatment challenges, such as stress, should increase the acceptance of MBIs in these settings, aiming to promote the well-being of patients.

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CRediT authorship contribution statement

Itamar José Felix-Junior: Conceptualization, Methodology, Investigation, Writing – original draft, Formal analysis. Ana Paula G Donate: Investigation, Writing – review & editing, Formal analysis, Resources. Ana Regina Noto: Project administration, Supervision, Funding acquisition. José Carlos F Galdouroz: Writing – review & editing. Natalia Maria Simionato: Validation, Methodology, Data curation, Resources, Writing – review & editing. Emérita Sátiro Opaleyse: Supervision, Writing – original draft, Formal analysis.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2022.100467.

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