

Mindfulness Based Intervention for 21-Year-Old with Substance Use

Original
Article

Sadia Sohail¹, Anila Sadaf¹

¹ Department of Applied Psychology (National University of Modern Languages, Pakistan).

* Correspondence: Sadia Sohail; E-mail: sadiasohail86@gmail.com

Citation | Sohail. S, Sadaf. A, “Mindfulness Based Intervention for 21-Year-Old with Substance Use”. Int. J. Innov. Sci. Technol., Special Issue pp. 70-81, 2022

Received | July 17, 2022; **Revised** | Aug 22, 2022; **Accepted** | Aug 27, 2022; **Published** | Sep 03, 2022.

[DOI:https://doi.org/10.33411/IJIST/2022040608](https://doi.org/10.33411/IJIST/2022040608)

Substance Use Disorders (SUDs) are a global psychiatric problem associated with a high mortality and morbidity rate. Consequently, contemporary advances in addiction have generated the potential for assessing the efficacy of Mindfulness Based Interventions (MBIs) for treating those with SUDs and their Relapse Prevention. The current case study focuses on a 21-year-old married man referred with the presenting complaints of intake and withdrawal of Heroin. His symptoms fulfilled the criteria of Heroin Withdrawal Disorder and he is currently in a controlled environment. The assessment was carried out through a clinical interview with the client, behavioral observation, Mental Status Examination (MSE) and the subjective rating of symptoms. Formal assessments were also carried out. The management plan was devised to build and maintain an excellent therapeutic alliance. The psychotherapeutic intervention was applied, primarily focusing on the use of MBI that improved symptoms.

Keywords: Substance Use Disorders, Mindfulness Based Intervention, Heroin Withdrawal Relapse Prevention

Acknowledgment.

Conflict of interest:

The authors of this paper declare no conflict of interest.

Author’s Contribution.

Sadia Sohail, as a principal author of this research study, conducted the research, assessed the case, provided

intervention, and analyzed the results and findings. The guidance and support of Dr. Anila Sadaf throughout the process being acknowledged.

Project details. Nil



Introduction

SUDs are characterized by severe negative consequences, including physical and mental health problems and are often characterized by increased relapse rates over time, despite the negative consequences [1]. After the process of detoxification, Mindfulness Based Interventions (MBIs) have been recently incorporated into treatment with SUD patients. Mindfulness-based training and practice have been growing in popularity and emergent research has examined the efficacy of MBIs, especially regarding mental health [2].

Stress may increase the likelihood of alcohol and drug use and may even precipitate relapse after treatment. Moreover, varied mechanisms have been noted to be involved in the emergence, progression as well as maintenance of SUDs so that treatment is difficult, as reflected by high rates of relapse in patients [3].

According to Hogarth [4], experiential avoidance of anxiety or negative mood states can make individuals cope through behavioral patterns or substance use which may become habitual in the course of addiction. In addition, avoidance of states of withdrawal could prompt relapse [4]. According to Kabat-Zinn, the pioneer and prominent worker in preaching MBIs, and the author of MBSR (Mindfulness-Based Stress Reduction), mindfulness refers to paying attention in the present moment; it is done without judgment and on purpose [5], [6].

Moreover, mindfulness has been repeatedly shown to aid in addiction recovery and in improving the quality of life of those with SUDs. Meta-analyses studies have also shown the clinical efficacy of MBIs in the treatment of addictive disorders and SUDs [7]. When talking of Mindfulness Based Interventions and SUDs, a treatment option that may promote long-term change in health behavior are the MBIs that have gained a lot of popularity, especially in recent years. The MBSR, developed by Jon Kabat-Zinn, has also inspired other MBIs specifically designed to help with addictive behaviors such as those for Relapse Prevention.

It comprises 8-weeks of intervention that combines meditation with yoga to help the individuals cope with pain and stress. Skills taught during the MBSR include body scan meditation, focusing more on the breath, sitting meditation as well as yoga postures. It has shown consistency in the reduction of stress and increased psychological well-being for different populations. Mindfulness meditation provides diversity as an alternative to treatment-resistant patients, with activities like yoga and breathing exercises enhancing engagement in daily life [8]. All MBIs, including modified programs [9], [10] employ the use of mindfulness-based meditation practices

Mindfulness meditation practices emphasize the non-judgmental awareness and acceptance of the experience in the present moment. During the MBSR, people learn to listen to their thought patterns and recognize their behaviors, particularly in situations that may be stressful. Focused attention and open monitoring are processes whereby the focused attention sets the foundation to further achieve the latter [11]. Earlier trials of the MBSR identified reductions in assessment measures of pain, negative body image, anxiety, mood disturbance as well as depression. Positive outcomes were found when comparing MBSR to the usual treatments for reducing stress and for increasing subjective well-being [5]–[7] in those with SUDs.

Other effects observed are thought suppressions, reduced negative emotions, reduced psychiatric distress/symptoms, positive mood, reduced cravings, reduction of stress, better working memory, increased optimism, reduced addiction severity, better response inhibition and better decision making as well as reduced withdrawal and relapse symptoms. A recent systematic review also concluded that MBIs were as effective as control interventions while in some cases being more effective than standardized treatment approaches [12].

MBIs have generally been equivalent to other evidence-based conditions and superior to other control conditions. There is evidence of ten exceptional results of Mindfulness including structural brain changes, perceptual shift, reduced arousal of the autonomic system, greater

situational awareness, increase in spirituality, urge surfing, addiction substitution, increase in self-awareness and letting go.

Research suggests that increases in prefrontal activation during a task of executive attention and increased glutamate metabolism in the prefrontal regions of the brain and the white matter, have been significantly associated with mindfulness interventions [13]. Another research using neuroimaging studies showed that there were structural and functional changes associated with mindfulness attention and meditation training which led to a decrease in symptoms of depression and a positive effect on mood [14]. In another research, a significant decrease in state anxiety and negative affect was also noted in participants of an MBI [15], with a reduction in subjectively perceived stress and increased positive affect [16].

Moreover, it has been noted that the type of MBIs employed does not appear to be very important in consideration as an intervention since all of them have produced positive outcomes consistently. In the MBSR program, individuals are taught how to pay more attention to thoughts, feelings and behaviors and cultivation of mindfulness. In addition, the MBSR may help patients with substance used to reduce their stress levels as well as identify their risky behaviors and potential triggers for relapse.

The current study was carried out to investigate the effectiveness of MBSR in a patient with SUD (Heroin Withdrawal).

Novelty of the Study

The study is unique in that it aims to investigate the efficacy of third-wave psychotherapy, namely, the MBSR or mindfulness-based therapy which is not only new to positive psychology but also has been studied less in patients with SUDs. There is a scarcity of research on mindfulness-based therapies with SUD clients, especially in Pakistan. Results of the study may help in the further development of programs that may encompass the use of this third-wave therapy in clients with substance use as well as in the prevention of relapse.

Material And Methods

Investigation Site

A single case of SUD was taken from the Institute of Psychiatry, Benazir Bhutto Hospital Rawalpindi, Pakistan, where there is usually a large turnout of patients with SUDs and mental health problems. Rawalpindi is located in the Punjab Province of Pakistan and along with Islamabad, is known as one of the twin cities. Situated on the Potohar Plateau, it is located at 33.626057 and 73.071442, latitude and longitude coordinates, respectively. Figure 1 shows the study area map depicting the study site.



Figure 1. Study Area Map of Rawalpindi City Showing Study Site

Source: Google Maps (2022). Google Maps. 2022.

<https://www.google.com/maps/@33.6264526,73.0642743,13.75z>

Sample and Research Design

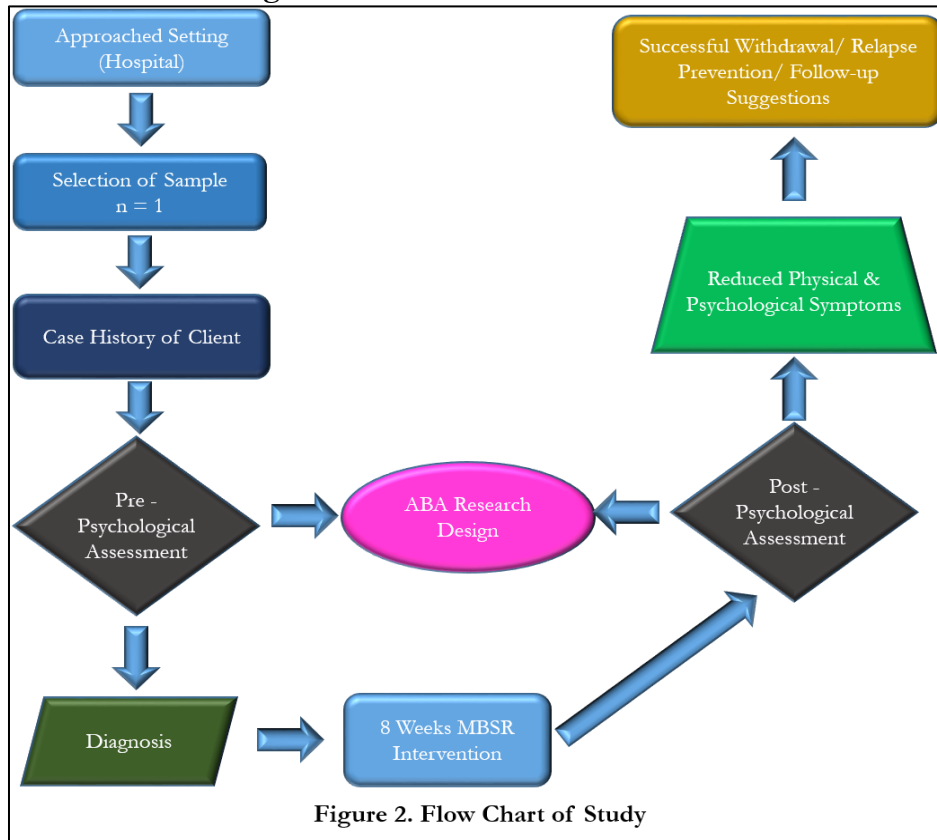


Figure 2. represents the flow chart for the research design used in the study.

The case was of a 21-year-old married man who had left his studies midway through his bachelor's. An ABA research design was applied to assess the effectiveness of Mindfulness-Based Stress Reduction Intervention in a case of a 21-year-old with SUD, particularly Heroin Withdrawal.

There was a history of multiple substance use that began about five years ago, including the use of cannabis (hash), alcohol, tobacco, and opioid use (heroin). At the age of 16, he got under the bad influence of friends in the neighborhood who forced him to use hash, then alcohol; used to have 20 cigarettes of tobacco per day; later started injecting opium (heroin) 2 grams per day (a girl was involved). After previous rehabilitation treatment, he left all substance use, however, again relapsed three times. About a year ago, he again started the use of opioids (Heroin).

In an attempt to forego this substance use on his own, he was brought to the hospital by his brother with complaints of irritability, loss of appetite, nausea, body aches, muscle tension, stress, and insomnia. After two weeks of detoxification and treatment in the hospital setting; he still had symptoms of withdrawal.

The informal assessment was done through behavioral observation, clinical interview, Mental State Examination (MSE) as well as a rating of the client's symptoms.

The formal assessment was done through the Tobacco, Alcohol, Prescription Medication, and other Substances (TAPS) tool, the Drug Abuse Screening Test (DAST), the Clinical Opiate Withdrawal Scale (COWS), the Hospital Anxiety and Depression Scale (HADS), the House Tree Person (HTP) test, and Mindfulness Attention Awareness Scale (MAAS).

A diagnosis was prescribed as 292.0 (F11.23) Heroin Withdrawal, in a Controlled Environment, on Maintenance Therapy (DSM-5, American Psychiatric Association, 2013 [17]).

A management plan was designed to treat the client and help him recover from his present condition, as well as prevent relapse.

The plan comprised goal setting, psycho-education, and the use of techniques from MBSR.

About 12 sessions were taken in total, with the first four sessions of basic case history taking and assessment and rapport building, followed by 8 sessions of MBSR as an intervention with the client.

Ethical considerations were taken into view and approval for the psychological assessment of the client was obtained from the referring psychiatrist and concerned hospital authorities. Moreover, before the start of the interview and assessment, informed consent, both verbal and written, were taken from the client and family, being ensured of confidentiality of information and anonymity of data and that the results of the case study may be used for academic or research-related purposes. Table 1 below gives a summary of the MBSR techniques and exercises that were conducted with the client over 12 sessions.

Table 1. Table depicting the focus of MBSR techniques and exercises conducted with the client

Session	Focus	Therapeutic Exercise
1	Building Therapeutic Alliance-History Taking	Rapport Building through empathy, genuineness, and unconditional positive regard (during a clinical interview)
2	History Taking-Psychological Evaluation	Additional history taking and psychological assessments were carried out
3	Additional Psychological Evaluation and Introduction to MBSR	Psychological Assessments carried out-Introduction to Mindfulness and MBSR given-Case conceptualization done-formal work on the management plan and therapeutic goals laid out
4	Simple Awareness and Focus on Body	Awareness Exercise- Raisin Meditation- Introduction to the Body Scan
5	Focus on Attention	Introduction: Sitting Meditation
6	Dealing with Thoughts	Introduction to Yoga
7	Stress: Responding and Reacting	Introduction to STOP: The One-minute Breathing Space
8	Dealing with Physical Pain or Difficult Emotions	Turning Towards difficult emotions and pain
9	Mindfulness/Communication	Mountain & Lake Meditations
10	Mindfulness/Compassion	Loving-kindness Meditation & Walking Meditation
11	Towards ending Therapy-Re-Assessment of Symptoms and Psychological Evaluation	Developing a Practice of Your Own-Re-assessment of symptoms done
12	Conclusion-Preventing Relapse	Summarizing- Discussing Relapse Prevention and concluding

Results And Discussion

The effectiveness of the intervention was analyzed through a comparison of pre and post-treatment ratings. Significant improvement was seen in the pre and post-intervention

assessment ratings of the client, as shown in the tables and figures that follow. Table 2 and Figure 3 show the pre-treatment and post-treatment subjective ratings of the client's symptoms.

Table 2. Showing Pre-Treatment and Post-Treatment Subjective Ratings of Client's Symptoms

Symptoms	Pre-Treatment Rating (0-10)	Post-Treatment Rating (0-10)
Fatigue	09	03
Body Pain	07	01
Stiffed Muscles	07	02
Insomnia	07	01
Loss of appetite	06	01
Helplessness	07	01
Irritability	08	01
Aggression	08	02
Stress	09	02

Note. Where 0 stands for “symptoms not experienced at all” and 10 for “very much.”

As can be observed there was a significant reduction in levels of fatigue, body pains, stiffness of muscles, disturbance in sleep and appetite, feeling of helplessness, irritability, aggression, and most particularly, stress. This is consistence with findings of research regarding MBIs that significantly aid in reducing the symptoms. As research also suggests that mindfulness helps with symptoms such as worrying about the future and ruminating on the past, which are negative thinking patterns frequently found in individuals with anxiety, depression, eating, and substance abuse disorders [18].

Significant neural effects such as reduced impulsivity symptoms and improved bio-regulation skills were found in similar findings in previous research after 20 weeks of mindfulness intervention programs with subjects with ADHD [19]. Opioid cue-reactivity changes have also been noted in other research on individuals with chronic opioid use [20].

Another research showed that responsiveness to natural rewards increased in those receiving MBI as compared to the control group [21]. Also, it led to reduced subjective cravings as marked by salivation while responding to substance cues in users of opioids [21]. Prior MBI research shows that emotional response inhibition has been associated with the length of the mindfulness practice as well as reduced pain severity among opioid-treated chronic pain patients [22].

In another recent study by Shuai and colleagues [23], stress-induced mood worsening and alcohol-seeking behavior were diminished in participants of a brief MBI, while improvement was observed in subjective mood, compared to baseline. As can be observed in Tables 3 and 4 and Figure 4, the assessment ratings shifted from a substantial level of problem to risky behavior, depicting a reduction in the degree of problem-related to drug abuse. Similar findings were noted in a study on alcoholics. In a study on individuals seeking treatment in outpatient services for drinking it was demonstrated that there was a decrease in drinks per drinking day over time in the sample as a whole while a significant dose effect was noted for the number of groups attended [24].

Similarly, in a study on Mindfulness-Based Relapse Prevention (MBRP) for those with SUDs, data analysis of two Randomized Controlled Trials (RCTs), revealed mindfulness mediating effect of MBRP on a craving which was replicated in a sample of participants who completed the same measurement protocol [25].

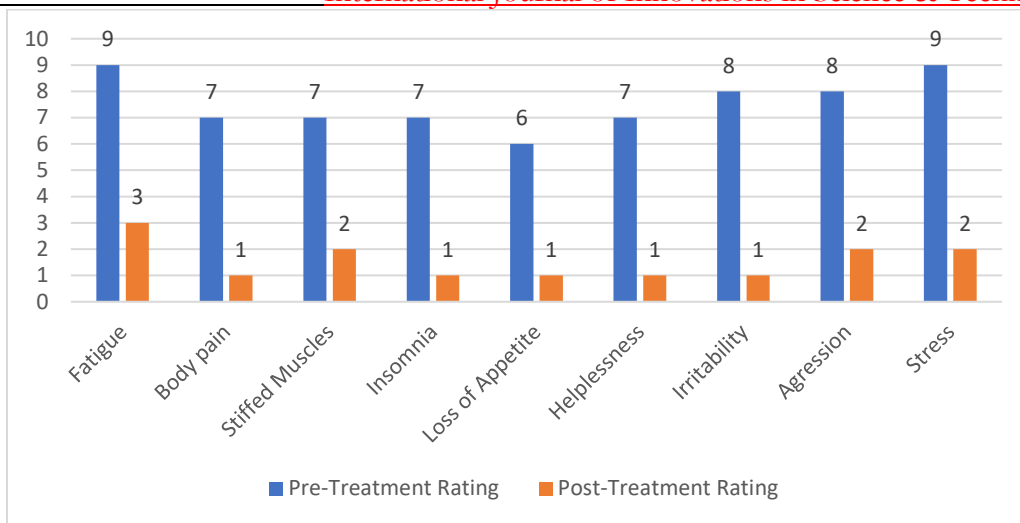


Figure 3. Graph showing Pre-Treatment and Post-Treatment Subjective Ratings of Client's Symptoms

Table 3. Table Illustrating Items and Pre-Intervention and Post Intervention Responses on TAPS I

Items	Screen	Screen
1	Positive	-
2	-	-
3	-	-
4	Positive	-
5	-	-

Note. Item 3 is not scored for males.

Table 1. Table showing the Item Numbers, Obtained Scores, and Degree of Problem Related to Drug Abuse on the DAST-10, Pre-Intervention and Post-Intervention

	Items	Obtained Score	Degree of Problem Related to Drug Abuse
Pre-Intervention	10	08	Substantial Level (6-8)
Post-Intervention	10	02	Risky Behavior (1-2)

Note. Item 3 is reverse scored.

In addition, evidence has also shown decreased self-control to be associated with impairment in the prefrontal neuro-circuitry of the brain, perhaps due to the neurotoxic effects of substances [26]. This may be another reason why MBIs work better in alleviating symptoms and preventing substance use and relapse by helping individuals reach self-control through mindfulness meditation.

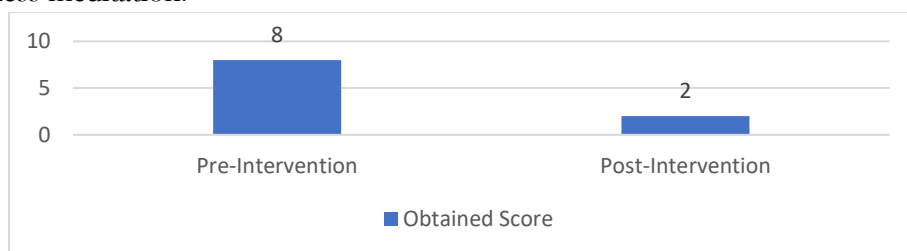


Figure 4. Graph showing the Item Numbers, Obtained Scores, and Degree of Problem Related to Drug Abuse on the DAST-10, Pre-Intervention, and Post-Intervention.

Table 5. The table illustrates the Obtained Scores, Range, and Interpretation of the COWS, Pre-Intervention and Post-Intervention

	Obtained Scores	Range	Interpretation
Pre-Intervention	15	13-24	Moderate
Post-Intervention	1	Not Applicable	Withdrawal Not Applicable

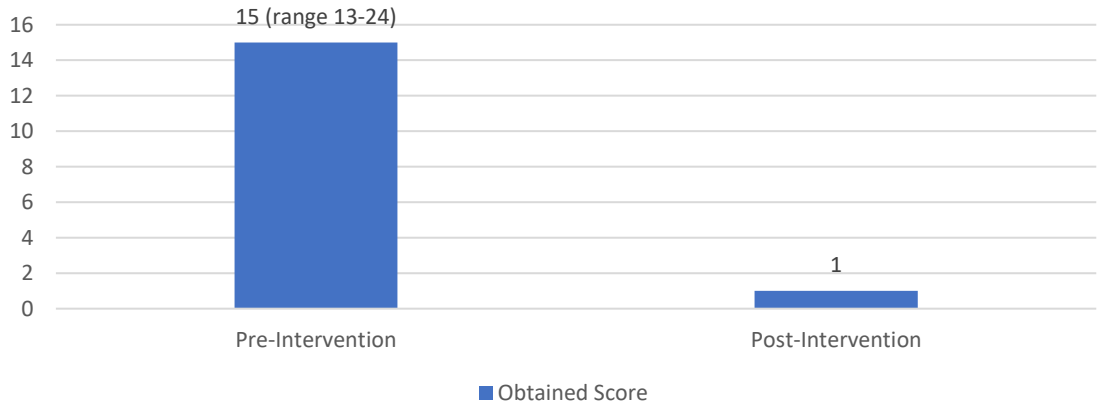


Figure 5. Illustrates the Obtained Scores, Range, and Interpretation of the COWS, Pre-Intervention and Post-Intervention

As Table 5 and Figure 5 show the changes in ratings on the Opioid Withdrawal Scale after MBSR intervention, similar findings were reported in another study on MBI as effective in reducing opioid craving in individuals with chronic pain and opioid use disorder [27]. In another study on smokers, mindfulness-based training showed to be effective in reducing craving-induced smoking behavior [28].

Table 6. The table depicts Anxiety and Depression Scores on the HADS, Pre-Intervention, and Post- Intervention

	Scale	Scores Obtained	Interpretation
Pre-Intervention	Anxiety	10	Borderline
	Depression	08	(borderline case)
Post-Intervention	Anxiety	3	Borderline
	Depression	2	(borderline case) Normal

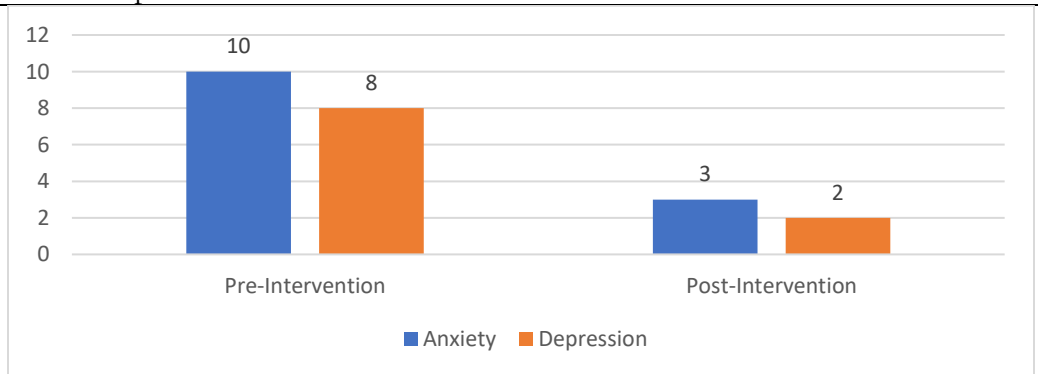


Figure 6. The graph depicts Anxiety and Depression Scores on the HADS, Pre-Intervention, and Post- Intervention

According to Table 6 and as shown in Figure 6, the Anxiety and Depression scores of the client were significantly reduced from 10 to 3 and 8 to 2, respectively. According to Dixon [29], the acceptance stance helps to improve greater accuracy in the perception of mental contents rather than suppressing the content of the mental experience. This helps in the reduction of anxiety and depression-related symptoms as well. Findings are also consistent with the results earlier produced by MBSR intervention [6]. Previous research has also shown that MBI helps significantly reduce anxiety symptoms, as studied in a controlled trial [30].

Prior research using neuroimaging studies has also confirmed structural and functional changes associated with mindfulness training, linked to reduced depression scores, indicating that mindfulness had a positive effect on mood [14].

In another research, participants of an MBI showed a significant decrease in state of anxiety and negative affect [15], a reduction in subjectively perceived stress linked to a decrease in cortisol levels and increased positive affect [16].

Table 7. The table shows the Number of Items, Obtained Scores, and Average of Scores Obtained on the MAAS, Pre-Intervention, and Post- Intervention

	No. of Items	Scores Obtained	Average Score
Pre-Intervention	5	8	1.6
Post-Intervention	5	21	4.2

Note. Higher scores indicate higher dispositional mindfulness.

Table 7 and Figure 7 show the number of items, obtained scores, and an average of scores obtained on the MAAS, pre-intervention and post-intervention.

Mindfulness attention significantly improved in the client who is likely to help with his substance-related problems and relapse prevention. Strengthened awareness of present emotions and thoughts helps to regulate the emotions which is also a critical factor in the recovery process [31].

According to a study [32], SUDs are often marked by a gradual shift from goal-directed behaviors to an increased loss of control over the same behavior and drug intake which is mediated by positive reinforcement effects of the behavior or substance, thereby developing into habitual engagements. This is one of the reasons mindfulness significantly improves substance use-related symptoms and withdrawal as well as relapse prevention, through increased focus, attention and present awareness.

Previous research on mindfulness mediation has also shown positive effects on behavioral inhibition, associated with improved conflict as well as response monitoring [33], [34]. Moreover, research also shows that mindfulness training enhances cognitive control, particularly in socio-emotional contexts as indicated by neural and behavioral evidence [34].

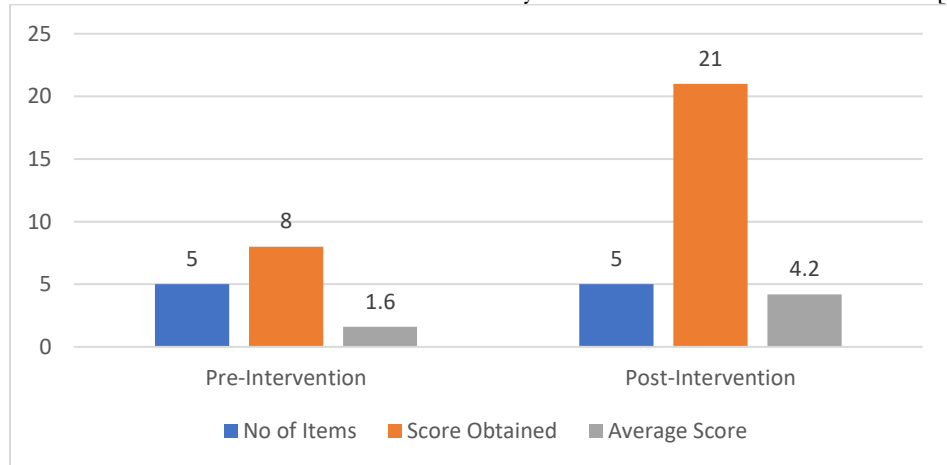


Figure 7. Graph representing the Obtained Scores and Average Obtained on the MAAS, Pre-Intervention, and Post- Intervention

The overall findings of the study are consistent with previous research where consistent positive effects have been found with the MBIs on substance abuse in adults and other treatment outcomes, where meta-analyses research studies have shown clinical efficacy of MBIs for treatment of SUDs and addictive disorders [6]. Similarly, in an RCT on opioid misuse risk, there was a significant effect in the intervention group on changes in positive affect, savoring, meaning in life as well as self-transcendence, thereby indicating that the MBI increased these attributes. Moreover, for the clinical variables also, there was a significant effect on pain post-treatment as well as changes in opioid misuse risk after a three-month follow-up, showing that the MBI resulted in increasing improvement in the variables [35].

The MBIs were more effective than the ‘treatment as usual in reducing the frequency of substance use. A limitation of the study was that no control group was used. Future studies may make use of subjects as controls for a better comparison of the mindfulness intervention with the subjects exposed to psychotherapeutic treatment. Moreover, some aspects of the therapy were tailored according to the client, such as filling up of client’s worksheets by the therapist etc., to make therapy more feasible for him. In addition, in some sessions, the client felt drowsy or physically uneasy, due to which the therapeutic interventions got affected.

In addition, in contrast to the original therapy, due to time limitations, the time per session was tailored to accommodate the client according to his clinical setting. Moreover, future research may also look into assessing which aspects of the treatment intervention are most helpful with particular behaviors. Additional research is required to determine the particular components of the MBIs or the dose of the mindfulness practice best targeting psychiatric distress. The efficacy of other MBIs modified for SUD patients may also be compared in future research. The client’s family members also need to be counseled and psycho-educated and the role regarding his relapse explained. Reevaluation of the client on psychological assessment measures is also recommended in follow-up.

Conclusion

From the results of the study, it may be concluded that the mindfulness-based intervention for clients with SUDs, is effective and may be adapted incorporated with such clients in the future as well. Being an effective intervention, it could be employed with other patients with substance misuse and assessed for effectiveness in Relapse Prevention as well.

References

- [1] A. Beck, A. Rosenthal, M. Auriacombe, and N. Romanczuk-Seiferth, “(Neuro)therapeutic Approaches in the Field of Alcohol Use Disorders,” *Curr. Addict. Reports*, vol. 7, no. 3, pp. 252–259, 2020, doi: 10.1007/s40429-020-00324-w.
- [2] M. L. Dossett, G. L. Fricchione, and H. Benson, “A New Era for Mind–Body Medicine,” *N. Engl. J. Med.*, vol. 382, no. 15, pp. 1390–1391, Apr. 2020, doi: 10.1056/NEJMP1917461/SUPPL_FILE/NEJMP1917461_DISCLOSURES.PDF.
- [3] S. Liu, R. J. Dolan, and A. Heinz, “Translation of Computational Psychiatry in the Context of Addiction,” *JAMA Psychiatry*, vol. 77, no. 11, pp. 1099–1100, Nov. 2020, doi: 10.1001/JAMAPSYCHIATRY.2020.1637.
- [4] L. Hogarth, “Addiction is driven by excessive goal-directed drug choice under negative affect: translational critique of habit and compulsion theory,” *Neuropsychopharmacol.* 2020 455, vol. 45, no. 5, pp. 720–735, Jan. 2020, doi: 10.1038/s41386-020-0600-8.
- [5] R. Adinda and D. R. Bintari, “Mindfulness-Based Stress Reduction (MBSR) Group Intervention to Reduce Burnout among Caregivers in Nursing Home,” *J. Educ. Heal. Community Psychol.*, vol. 9, no. 2, 2020, doi: 10.12928/jehcp.v9i2.15874.
- [6] A. Rosenthal, M. E. Levin, E. L. Garland, and N. Romanczuk-Seiferth, “Mindfulness in Treatment Approaches for Addiction — Underlying Mechanisms and Future Directions,” *Curr. Addict. Reports*, vol. 8, no. 2, pp. 282–297, 2021, doi: 10.1007/s40429-021-00372-w.
- [7] H. Chen *et al.*, “Effects of Loving-Kindness Meditation on Doctors’ Mindfulness, Empathy, and Communication Skills,” *Int. J. Environ. Res. Public Heal.* 2021, Vol. 18, Page 4033, vol. 18, no. 8, p. 4033, Apr. 2021, doi: 10.3390/IJERPH18084033.

- [8] Kabat-Zinn Jon, "Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life by Jon Kabat-Zinn | Goodreads," p. 304, 2005, Accessed: Aug. 22, 2022. [Online]. Available: https://www.goodreads.com/book/show/14096.Wherever_You_Go_There_You_Are
- [9] S. Bowen, N. Chawla, J. Grow, and G. A. Marlatt, "Mindfulness-based relapse prevention for addictive behaviors: A clinician's guide, 2nd ed," 2021, Accessed: Aug. 22, 2022. [Online]. Available: <https://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2021-07868-000&site=ehost-live>
- [10] E. L. Garland, B. Froeliger, and M. O. Howard, "Mindfulness training targets neurocognitive mechanisms of addiction at the attention-appraisal-emotion interface," *Front. Psychiatry*, vol. 4, no. JAN, 2014, doi: 10.3389/FPSYT.2013.00173/FULL.
- [11] I. Zollars, T. I. Poirier, and J. Pailden, "Effects of mindfulness meditation on mindfulness, mental well-being, and perceived stress," *Curr. Pharm. Teach. Learn.*, vol. 11, no. 10, pp. 1022–1028, Oct. 2019, doi: 10.1016/J.CPTL.2019.06.005.
- [12] J. R. Korecki, F. J. Schwebel, V. R. Votaw, and K. Witkiewitz, "Mindfulness-based programs for substance use disorders: a systematic review of manualized treatments," *Subst. Abuse. Treat. Prev. Policy*, vol. 15, no. 1, pp. 1–37, Jul. 2020, doi: 10.1186/S13011-020-00293-3/TABLES/2.
- [13] Y. Y. Tang, P. Askari, and C. Choi, "Brief mindfulness training increased glutamate metabolism in the anterior cingulate cortex," *Neuroreport*, pp. 1142–1145, Nov. 2020, doi: 10.1097/WNR.0000000000001527.
- [14] C. C. Yang *et al.*, "Alterations in Brain Structure and Amplitude of Low-frequency after 8 weeks of Mindfulness Meditation Training in Meditation-Naïve Subjects," *Sci. Reports 2019 91*, vol. 9, no. 1, pp. 1–10, Jul. 2019, doi: 10.1038/s41598-019-47470-4.
- [15] G. M. de Sousa, G. L. de Lima-Araújo, D. B. de Araújo, and M. B. C. de Sousa, "Brief mindfulness-based training and mindfulness trait attenuate psychological stress in university students: a randomized controlled trial," *BMC Psychol.*, vol. 9, no. 1, pp. 1–14, Dec. 2021, doi: 10.1186/S40359-021-00520-X/TABLES/3.
- [16] M. Bellosta-Batalla, M. del Carmen Blanco-Gandía, M. Rodríguez-Arias, A. Cebolla, J. Pérez-Blasco, and L. Moya-Albiol, "Brief mindfulness session improves mood and increases salivary oxytocin in psychology students," *Stress Heal.*, vol. 36, no. 4, pp. 469–477, Oct. 2020, doi: 10.1002/SMI.2942.
- [17] American Psychiatric Association, "Diagnostic and Statistical Manual of Mental Disorders," Mar. 2022, doi: 10.1176/APPI.BOOKS.9780890425787.
- [18] E. Colvin, B. Gardner, P. R. Labelle, and D. Santor, "The Automaticity of Positive and Negative Thinking: A Scoping Review of Mental Habits," *Cognit. Ther. Res.*, vol. 45, no. 6, pp. 1037–1063, Dec. 2021, doi: 10.1007/S10608-021-10218-4.
- [19] A. Sibalis, K. Milligan, C. Pun, T. McKeough, L. A. Schmidt, and S. J. Segalowitz, "An EEG Investigation of the Attention-Related Impact of Mindfulness Training in Youth With ADHD: Outcomes and Methodological Considerations," *J. Atten. Disord.*, vol. 23, no. 7, pp. 733–743, 2019, doi: 10.1177/1087054717719535.
- [20] E. L. Garland, R. M. Atchley, A. W. Hanley, J. K. Zubieta, and B. Froeliger, "Mindfulness-Oriented Recovery Enhancement remediates hedonic dysregulation in opioid users: Neural and affective evidence of target engagement," *Sci. Adv.*, vol. 5, no. 10, pp. 1–13, 2019, doi: 10.1126/sciadv.aax1569.
- [21] A. W. Hanley and E. L. Garland, "Salivary measurement and mindfulness-based modulation of prescription opioid cue-reactivity," *Drug Alcohol Depend.*, vol. 217, p. 108351, Dec. 2020, doi: 10.1016/J.DRUGALCDEP.2020.108351.
- [22] E. L. Garland, M. A. Bryan, S. E. Priddy, M. R. Riquino, B. Froeliger, and M. O. Howard, "Effects of Mindfulness-Oriented Recovery Enhancement Versus Social Support on Negative Affective Interference During Inhibitory Control Among Opioid-Treated Chronic Pain Patients: A Pilot Mechanistic Study," *Ann. Behav. Med.*, vol. 53, no. 10, pp. 865–876, Aug. 2019, doi: 10.1093/ABM/KAY096.
- [23] R. Shuai, A. E. Bakou, L. Hardy, and L. Hogarth, "Ultra-brief breath counting (mindfulness) training promotes recovery from stress-induced alcohol-seeking in student drinkers," *Addict.*

- Behav.*, vol. 102, p. 106141, Mar. 2020, doi: 10.1016/J.ADDBEH.2019.106141.
- [24] D. R. Brown *et al.*, “Decreases in the Late Positive Potential to Alcohol Images Among Alcohol Treatment Seekers Following Mindfulness-Based Relapse Prevention,” *Alcohol Alcohol.*, vol. 55, no. 1, pp. 78–85, Feb. 2020, doi: 10.1093/ALCALC/AGZ096.
- [25] Y. Y. Hsiao, D. Tofghi, E. S. Kruger, M. Lee Van Horn, D. P. MacKinnon, and K. Witkiewitz, “The (Lack of) Replication of Self-Reported Mindfulness as a Mechanism of Change in Mindfulness-Based Relapse Prevention for Substance Use Disorders,” *Mindfulness (N. Y.)*, vol. 10, no. 4, pp. 724–736, Apr. 2019, doi: 10.1007/S12671-018-1023-Z.
- [26] A. Rosenthal *et al.*, “Volumetric Prefrontal Cortex Alterations in Patients With Alcohol Dependence and the Involvement of Self-Control,” *Alcohol. Clin. Exp. Res.*, vol. 43, no. 12, pp. 2514–2524, Dec. 2019, doi: 10.1111/ACER.14211.
- [27] E. L. Garland, A. W. Hanley, A. Kline, and N. A. Cooperman, “Mindfulness-Oriented Recovery Enhancement reduces opioid craving among individuals with opioid use disorder and chronic pain in medication assisted treatment: Ecological momentary assessments from a stage 1 randomized controlled trial,” *Drug Alcohol Depend.*, vol. 203, pp. 61–65, Oct. 2019, doi: 10.1016/J.DRUGALCDEP.2019.07.007.
- [28] K. A. Garrison *et al.*, “Craving to Quit: A Randomized Controlled Trial of Smartphone App-Based Mindfulness Training for Smoking Cessation,” *Nicotine Tob. Res.*, vol. 22, no. 3, pp. 324–331, Mar. 2020, doi: 10.1093/NTR/NTY126.
- [29] M. L. Dixon, M. Girn, and K. Christoff, “Brain Network Organization During Mindful Acceptance of Emotions,” *bioRxiv*, no. March, p. 2020.03.31.018697, 2020, doi: 10.1101/2020.03.31.018697.
- [30] X. R. Zhao *et al.*, “Mindfulness-based cognitive therapy is associated with distinct resting-state neural patterns in patients with generalized anxiety disorder,” *Asia-Pacific Psychiatry*, vol. 11, no. 4, p. e12368, Dec. 2019, doi: 10.1111/APPY.12368.
- [31] K. S. Young, C. F. Sandman, and M. G. Craske, “Positive and negative emotion regulation in adolescence: links to anxiety and depression,” *Brain Sci.*, vol. 9, no. 4, 2019, doi: 10.3390/brainsci9040076.
- [32] A. Heinz *et al.*, “Addiction Research Consortium: Losing and regaining control over drug intake (ReCoDe)—From trajectories to mechanisms and interventions,” *Addict. Biol.*, vol. 25, no. 2, p. e12866, Mar. 2020, doi: 10.1111/ADB.12866.
- [33] J. P. Pozuelos, B. R. Mead, M. R. Rueda, and P. Malinowski, “Short-term mindful breath awareness training improves inhibitory control and response monitoring,” *Prog. Brain Res.*, vol. 244, pp. 137–163, Jan. 2019, doi: 10.1016/BS.PBR.2018.10.019.
- [34] J. T. Quaglia *et al.*, “Brief mindfulness training enhances cognitive control in socioemotional contexts: Behavioral and neural evidence,” *PLoS One*, vol. 14, no. 7, p. e0219862, Jun. 2019, doi: 10.1371/JOURNAL.PONE.0219862.
- [35] E. L. Garland *et al.*, “Mindfulness-oriented recovery enhancement reduces opioid misuse risk via analgesic and positive psychological mechanisms: A randomized controlled trial,” *J. Consult. Clin. Psychol.*, vol. 87, no. 10, pp. 927–940, Oct. 2019, doi: 10.1037/CCP0000390.



Copyright © by authors and 50Sea. This work is licensed under Creative Commons Attribution 4.0 International License.