Mindfulness Intervention Reduces Substance Cravings and Increases Psychological Flexibility

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Abstract

Objective: Substance use disorder (SUD) is an epidemic in the United States. Current standard of care for SUD continues to produce a 40-60% relapse rate. Treatment for SUD is costly and is not obtainable for many individuals. The purpose of this project is to implement mindfulness as an adjunct treatment for SUD to reduce relapse.

Methods: Voluntary program offered at a residential treatment center designed as a team-based project. The combined project includes exercise, wellness, and mindfulness. Adults over the age of 18, male or female with a diagnosis of SUD were eligible. Program consisted of three hourly sessions a week, for a total of three weeks. Sessions included one session of exercise and wellness, one session of mindfulness training, and a combined session. Mindfulness sessions included learning the seven pillars of mindfulness followed by guided meditation. Participants were given a mindfulness journal for daily exercises. Five Facet Mindfulness Questionnaire (FFMQ) was completed before program and on completion. **Results:** 11 of 22 participants completed the program. FFMQ total scores were analyzed with paired t-test with Wilcoxon signed rank to account for small sample size. Statistical significance was based on an alpha of 0.05, V=10.50, z=2.00 and p=0.45.

Conclusion: This project has the potential to decrease relapse rates by increasing mindfulness in individuals with SUD. Mindfulness training reduces cravings and negative thought processes. Implementing mindfulness training with current standard of care can be cost effective and recommended for all individuals with SUD.

Keywords: Mindfulness, Relapse, Substance Use Disorder, Addiction treatment

Mindfulness Intervention Reduces Substance Cravings and Increases Psychological Flexibility

Substance use disorder (SUD) is the recurrent use of drugs or alcohol resulting in clinically significant impairment in function (U.S. Department of Health and Human Services [HHS], 2016). SUD is characterized by physical brain and behavioral changes even after detoxification, resulting in repeated relapses and drug cravings when exposed to substance related stimulus (American Psychiatric Association [APA], 2013). These changes can affect the pleasure/reward center, executive function and inhibition. A person may be more vulnerable to the long-term effects of drug abuse if risk factors are in place such as a previous mental health condition, substance use at early age and genetic components. SUD affects each individual differently requiring individualized lifelong care and treatment.

A variety of SUD treatments are available such as medication-assisted treatments, twelve-step programs (TSP), intensive inpatient rehabilitation and psychotherapies. A promising new adjunct treatment has been found to decrease a client's substance cravings and increase their psychological flexibility: the use of mindfulness-based interventions (MBI). In the initial trial of MBI participants showed statistically significant differences when compared to treatment as usual (TAU) counterparts in substance cravings, acceptance and decreased substance use after interventions (Bowen et al., 2009). MBI can reduce substance cravings and stress induced substance use behaviors (Li et al., 2016).

Problem Statement

In Arizona alone 52,821 people enrolled in state funded behavioral health care with the need for SUD treatment (*Annual Report on Substance Abuse Treatment Program*, 2015). The need to find adequate and effective recovery treatments is of utmost importance for long-term

maintenance. MBIs have shown promise in decreasing cravings, dependence and improving symptoms of depression, anxiety, stress and emotional regulation (Sancho et al., 2018). For some people with SUD recovery treatment is never available. Proper medical and mental health care is often cost-prohibitive. The need for access to cost-effective treatment programs and after care is necessary for the long-term recovery for those affected by SUD. The cost of addiction treatment alone covered by the Arizona Department of Health Services was over 1.6 million dollars in the year 2015 (*Annual Report*, 2015). Those that are able to seek treatment are few with only 12.2% of adults with SUD obtaining any treatment (HHS, 2016).

Even with treatment, 40-60% of clients will relapse, this is an expected part of the recovery process (HHS, 2018). As many as 80% of SUD experience an ongoing cycle of treatment, relapse and continued use (Scott et al, 2005 as cited in Enkema & Bowen, 2017). Reduction of relapse rates through treatment program completion reduces overall mortality and suicide rates (Decker et al., 2017). Relapse frequency can strain an individual's relationships, work/school functioning and decrease emotional stability. Relapses occur for multiple reasons: drug cravings, environment, poor social support, emotional instability and poor coping mechanisms.

Purpose and Rationale

Current standard of care practices for SUD continue to fall short in reducing relapse. For the past 20 years relapse rates have stayed 40-60% (HHS, 2018). The need to decrease the symptoms leading to relapse is critical for recovery. Decreasing cravings, increasing positive coping mechanisms and reducing substance use behaviors are vital to properly care for this specific population. Mindfulness connects the body and mind, allowing cravings and thoughts to be present and also allowing them to pass. A thorough review of current literature was

performed to evaluate if the use of mindfulness with TAU for SUD can reduces cravings and increase psychological flexibility.

Background and Significance

SUD is a chronic relapsing condition affecting 19.3 Million Americans (McCance-Katz, 2018). An estimated 585,000 people died worldwide from drug use in 2019, with one third of those deaths resulting from SUD (United Nations Office on Druge and Crime [UNODC], 2019). The use of opioids was declared a national crisis in 2017 by the U.S. That year 141 people died daily from drug overdoses and 91 of those being from opioids (HHS, 2017).

Only in the past 30 years has addiction been viewed as a disease. Prior to this declaration, the public and healthcare professionals believed addiction was something the client chose to do or a moral failing. Now in the medical community it is known that addiction is not a choice. Many clients will continue to use despite circumstances that would cause a reasonable person to stop such as loss of job, illness related to substance use, and legal implications.

Those experiencing SUD are a vulnerable population. Relapse can mean the return to potentially dangerous situations including substance use, criminal activity, domestic violence and sexual violence (HHS, 2016). Substance use is often associated with mental health disorders such as depression, anxiety, mood dysregulation and post-traumatic stress disorder (PTSD) (Broadus et al, 2010 as cited in Nakamura et al, 2015). Long term management and maintenance of SUD is essential for maintaining quality of life, decreasing relapse and increasing overall mental health.

Mindfulness Based Interventions

"Mindfulness has been defined as paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (Kabat Zinn,1994, as cited in Shorey et al., 2017, pg. 2.)

Meditation/mindfulness has been effectively used for centuries to calm, center, and allow acceptance and self-reflection. Only recently has the adaptation of mindfulness been applied to reduction of psychiatric symptoms and prevention of relapse in substance use.

Bowen et. al. (2009) began the pilot study for the use of mindfulness-based relapse prevention (MBRP) in patients with substance use disorders. Initial results showed a significant improvement in MBRP versus TAU in the decreased use of substances, reduced cravings and increased awareness and acceptance post intervention (Bowen et al., 2009). A qualitative analysis of mindfulness-based addiction therapy showed positive results: interviewees reported the ability to reduce stress, experience an overall improvement in outlook, and avoidance of conflict reactions (Perry, 2019). MBI can reduce substance cravings and stress induced substance use behaviors (Li et al., 2016). MBI has also been found effective in the setting of medication management treatment of opiate use by decreasing substance use and increasing mindfulness (Imani et al, 2015).

Many of those with SUD have a co-occurring mental health condition. At one month follow up, anxiety and depression symptoms were reduced after MBI (Glasner et al., 2017). One meta-analysis found a large pooled effect size to support MBI to reduce anxiety and PTSD symptoms (Cavicchioli et al., 2017). No side effects of MBI have been reported when used alone or as an adjunct therapy. With its great potential, MBI could be a useful tool to effectively reduce cravings, substance use, and increase emotional regulation.

Current Practice

The American Psychiatric Association (APA) established clinical guidelines for the treatment of SUD most recently updated in 2006. The guidelines include an initial client assessment, psychiatric management, pharmacologic treatments, psychosocial treatments,

formulation and implementation of treatment plans and treatment settings (APA, 2006). The well-known twelve-step program was developed by Bill Wilson and Bob Smith in 1939 when they wrote the original Alcoholics Anonymous book (Alcoholics Anonymous World Services, Inc., 2017). Twelve-step programs (TSP) are common, free, and create social support networks for those in recovery. The TSP is based on a spiritual belief in a higher power to help guide people into resisting substance use and changing behaviors leading to use. The underlying belief is that one is powerless against their addiction and must rely on a higher power for strength. One longitudinal study showed at one-year and five-year follow up, those that participated in a TSP program had fewer relapses when compared to individuals that did not attend a TSP (Gamble & O' Lawrence, 2016). Sobriety is obtained by continually working the twelve steps daily and for the rest of the recovering user's life.

Behavior Change to Reduce Relapse

The focus of addiction treatment and recovery is to educate, change behaviors, enhance quality of life and reduce relapse. A key to reducing relapse is to control substance use cravings. A substance craving is the desire to use a substance or addictive behaviors (Kober, 2014, as cited in Sancho et al., 2018). The expected treatment outcome for TAU is to maintain sobriety through the help of the TSP utilizing social support from fellow recovering substance users. The addition of MBI assists with reducing cravings, symptoms of depression and anxiety while mitigating the perception of stress and emotional dysregulation (Sancho et al., 2018). Those that participate in MBI with TAU report fewer cravings and decreased substance use (Davis et al., 2018). The Arizona Department of Health initiatives include the use of incorporating evidence-based practices into prevention and treatment strategies (*Annual Report on Substance Abuse Treatment Program*, 2015). The incorporation of evidence-based practices such as MBI can be cost

effective, provide therapies to reduce cravings, and can be used alongside TAU with efficiency in increasing sobriety.

SUD affects millions of individuals; the use of opioids has been declared a crisis in the United States. The need to understand long term maintenance and relapse prevention is critical to reduce substance use. Throughout research for SUD a common theme is the need to address behaviors by increasing coping mechanisms, social support, and providing therapies to reduce drug cravings and increase emotional flexibility. MBI in combination with TAU is a promising cost-effective relapse reduction tool.

Internal Evidence

A residential treatment center in Arizona has identified a need to continue providing support after residential treatment. Despite this center being highly individualized for each client's addiction recovery needs, there is no established aftercare available. Without established aftercare provided by the treatment center, data has been difficult to obtain regarding relapse rates after program completion. Without the ability to provide aftercare treatment, it has been difficult to remain in touch with clients and measure long term recovery. Current TAU includes establishing clients with a sponsor through locally affiliated anonymous programs. The residential treatment center is not meeting the needs of creating communities, social networking, and relapse prevention programs that increase recovery and sobriety at this time (HHS, 2016). Due to the cost of their program, the majority of SUD clients are unable to cover the cost of aftercare programs such as intensive outpatient and sober living housing and many have lost support from family and friends.

PICOT Question

With millions of individuals needing lifetime management of their SUD, TAU has been the primary treatment to reduce relapse and abstain from substances. As research progresses and the understanding of SUD expands, new modalities of treatment are introduced as potentially effective management tools to continue sobriety, decrease relapses and reduce behaviors associated with substance use. Mindfulness based interventions were introduced 20 years ago as an adjunct therapy to TAU. The effects of mindfulness have shown to decrease relapse rates and reduce craving symptoms. Mindfulness has also been an effective adjunct for depression and anxiety. This knowledge has prompted a literature review driven by the PICOT question: In adults recovering from SUD (P), how does utilizing mindfulness-based practices and a 12-step program (I), compared to 12-step program only (C), affect cravings and mood dysregulation (O) over an eight-week period? (T)

Database Search Process

Databases searched for this literature review included Cumulative Index of Nursing and Allied Health Literature (CINAHL), PsychInfo and PubMed.

Initial search terms for CINAHL included *SUD treatment, mindfulness-based interventions, mindfulness-based relapse prevention, sobriety, recovery, abstinence* and *relapse.* Initial search of SUD treatment and/or mindfulness-based intervention retrieved eight articles. Inclusion of the terms sobriety, recovery or abstinence yielded 3,807 articles. Narrowing inclusion criteria to adults, articles published after 2015, English language, randomized control trial and human resulted in 74 articles. Exclusion criteria included articles older than 2015, adolescent and child addiction treatment, and addictions related to technology or gambling.

Initial search terms for PsychInfo were *SUD and mindfulness-based intervention* AND/OR *relapse, sobriety or abstinence* yielded 56 articles. Limitations were placed for a time frame of 2015-2020, adults age 18 and older, human trials, randomized control trial, systematic reviews which reduced results to 18 articles. Article exclusion included child and adolescent substance use treatment, treatments for gambling and technology addiction, and articles older than 2015.

Initial search terms for PubMed were *SUD, mindfulness-based intervention, relapse, sobriety, abstinence* resulting in an initial 70 studies. Limitations were placed for a time frame of 2015-2020, and age 18 years and older which resulted in 36 articles. Article exclusion criteria was set for children and adolescent substance treatment, articles older than 2015 and mindfulness for addictions other than substance use.

The initial article search yielded 128 articles, reviews of titles and abstracts further reduced the initial articles. Reference list for articles was also searched to reveal two other relevant articles not identified in initial database searches. Through critical appraisal, applying study limitations for inclusion and exclusion criteria, ten high level evidence articles were chosen for this literature review. High level evidence for these articles includes one meta-analysis, one systematic review and eight randomized controlled trials. The systematic reviews and meta-analysis were compared to prevent duplication of research findings. Grey literature was searched to define national initiatives, statistics for SUD, and define needs for change.

Inclusion criteria for the final studies included high level evidence on substance use treatment in adults with mindfulness-based intervention. Qualitative studies, retrospective studies and trials without randomization were excluded from the final ten articles

Critical Appraisal and Synthesis

The ten articles were critically appraised using Melnyk & Fineout-Overholt (2019) rapid critical appraisal checklist to determine quality of evidence (see Appendix A, Table A1). Eight of the studies were high level randomized controlled trials (RCT), and two were meta-analysis reviews (see Appendix A, Table A2). Studies were excluded from final evaluation if they were not high-level evidence such as RCT and Meta-analysis. Qualitative, observational studies, non – randomized controlled trials and case studies were excluded for final appraisal. Research funding was disclosed in three of the ten articles. Sample size for eight of the studies was less than 100, with two studies having a larger sample size (see Appendix A, Table A1). All studies were in the English language, from varying countries including United States, Italy, and Iran. Setting for research was primarily outpatient, except for three studies conducted in residential treatment centers and one inpatient center.

The ten studies were heterogeneous in study design, interventions and measurement tools. Variables in studies were cravings, mindfulness, psychological flexibility and substance use (Appendix). Several studies directly addressed anxiety, depression, days of abstinence and sleep quality. Despite the overall heterogeneity of studies, all of the studies included a form of mindfulness-based intervention on a substance use population in adults. Interventions ranged in a variety of forms of MBI, compared to TAU. Measurement tools were used to assess cravings, substance use, anxiety, mindfulness, and depression. Substance use was found to decrease in eight of the studies, cravings were statistically decreased in eight studies and psychological flexibility increased in two studies (Appendix).

Heterogeneity exists in the type of mindfulness intervention as well. All control groups were TAU, while five experimental were mindfulness-based relapse prevention (MBRP), one

mindfulness awareness in body therapy (MABT), one mind body bridge (MBB), and MBI. MBI varied, making a final conclusion difficult to determine. All studies concluded that MBI with TAU had greater improvement in cravings and substance use. Due to high-level evidence studies, validated measurement tools and correlating statistical evidence, these selected studies are of sufficient quality to implement evidence-based practice.

Conclusion

SUD is a chronic relapsing condition requiring lifelong management. Millions suffer from SUD; opioid use has been declared a national crisis. The need to find helpful and effective treatment is imperative for the nation. TAU has been the primary treatment method with relapse rates remaining unchanged for decades. Change needs to occur to better manage addiction as a chronic disease. This literature review has researched multiple mindfulness interventions positively correlated with decreasing cravings, substance use behaviors and increasing psychological flexibility (Appendix).

Conceptual Framework and Evidence-based Model

The Liverpool mindfulness model is used to direct the implementation of mindfulness-based practice (Malinowski, 2013). The framework uses an individual's motivational factor, mindfulness training, core process, mental stance and outcomes (Appendix B, Figure B1) The Liverpool mindfulness model process engages five tiers of driving motivational factors (Malinowski, 2013). *Tier 1* determines how an individual will engage in mind training. *Tier 2* regular commitment to a mindfulness practice strengthens the mental core processes *Tier 3* the refinement of regulatory processes of emotions and cognitions functions *Tier 4* the improvement of core processes results in a changed or balance mental attitude *Tier 5* is the result of all prior tiers and demonstrates positive outcomes in physical or mental well-being (Malinowski, 2013).

This theory proposes that as a person improves in the core process, this results in a more balanced attitude and positive outcome (Malinowski, 2013). The use of the Liverpool mindfulness model framework will coincide with the implementation of mindfulness-based relapse prevention.

Conceptual frameworks are essential to map the process of important connections to implement in a quality improvement project (Moran et al., 2020). The marriage of the conceptual framework with an evidence-based model allows for a symbiotic relationship of theory and guided implementations. In 1999 Mary Ann Rosswurm and June H. Larrabee created their model to change evidence into practice (Rosswurm & Larrabee, 1999). Their model was tested and verified with implementing evidence-based practice with bedside nurses. The model is designed to assess for change, determine intervention, synthesize evidence, design change, implement and evaluate then integrate the change (see Appendix B, Figure B2)

The need for a conceptual framework when implementing change assists the developer in roles, education, timeline and solidifies tangible ideas. The integration of Rosswurm & Larrabee model with the Liverpool mindfulness model will guide the implementation of a mindfulness-based intervention as an adjunct treatment for SUD.

Applying Evidence to Practice

SUD has been an increasing concern not only in the United States, it is a global crisis needing intervention. Relapse places the individual into compromising positions, returning them to risk taking behavior, and loss of employment, housing or support systems. The consequences to relapse can ripple through a person life and in some instances, it may lead to death. These consequences burden the individual, the health care team and the families of individuals. Stakeholders to relapse prevention include the addiction population, families, insurance

companies, state funded health management, mental health providers and medical providers. Stakeholders have a pivotal role in implementing evidence-based practice (EBP) and successful longevity of EBP program.

After initial critical appraisal of evidence practice, implementation of mindfulness-based practice may be two or three times weekly, with hour long mindfulness-based therapies and education. The program would initially have a length of three weeks, each week will include exercise, mindfulness and combined exercise and mindfulness interventions lasting an hour in length. Education will be ranging from mindfulness, craving reduction, breathing and acceptance. Prior to beginning of program participants will complete pre assessment questionnaires and demographic questions. With initial implementation the goal for a sustainable program would be to also appoint a champion to learn MBRP and continue therapies after initial trial. The need to find a continuation for treatment and the program is essential for implementing EBP.

Prior to implementation of MBI, information will need to be obtained regarding current demographic age, gender, current TAU and length of treatment plan. Stakeholders will assist in determining data and work with project lead to continually monitor treatment success or areas needed for improvement.

The literature review was heterogeneous in the interventions provided to multiple adult SUD individuals. Despite this MBRP was used in seven of the ten studies (Appendix) with effectiveness in decreasing relapse rates, cravings and increasing psychological flexibility. MBRP is the best evidence to implement due to multiple studies validating its reliability. Teaching MBRP to individuals in a treatment program and educational opportunities to staff to continue therapy will provide the foundation for continual use after initiation.

Implementation of MBRP will need to have monitoring completed, pre and posttest assessing cravings, mindfulness and psychological flexibility should be administered to determine effectiveness. Five-Facet Mindfulness Questionnaire (FFMQ) tool was used to assess mindfulness (See Appendix C, Figure C1). (Nakamura et al, 2015). The use of validated tools is vital to ensure appropriate data collection.

Implications of Proposed Project

Increasing rates of SUD continue to burden the health care system. Relapses increase the chance of death or harm to individuals. The nation is in a crisis, the need to find effective cost containing treatment for the long-term management of SUD is imperative. SUD is a chronic relapsing condition that needs lifelong management. Despite heterogeneity in the literature the conclusion can be drawn that TAU with mindfulness teaching can decrease cravings, increase psychological flexibility and decrease substance use. Implementing mindfulness increases individuals' resilience and self-efficacy in the treatment of their disease.

Methods

The purpose of this project is to assist in reduction of relapse rates from SUD through MBI. This project is a dual project with partner Hayley Avino. She provided exercise and wellness intervention in conjunction with mindfulness. Current practice does not incorporate the benefits of exercise and mindfulness together as a relapse prevention strategy. Current standard of care for relapse prevention is 12-step programs that uses social unity to reduce relapse, but do not include physical or mental exercise components. Due to the COVID-19 pandemic in person classes were suspended for safety. All interventions were conducted via Zoom. Classes included individual mindfulness, exercise, and combined sessions. Three weekly sessions approximately an hour in length were part of a three week-long program. Each mindfulness session included

education on mindfulness and was lead through power point presentations and guided meditation. Mindfulness classes taught The Seven Pillars of Mindfulness: Non-Judging, Non-Striving, Trust, Beginners Mind, Acceptance, Letting go and Patience. The program ran for nine weeks with open enrollment in order to capture participants and obtain data for collection. The intervention was continued until the 11th week to capture participants that joined on the 8th week of enrollment. Those enrolled in the program were given a mindfulness journal created by Courtney Routson. There were daily mindfulness exercises included ranging from mindful coloring, practicing states of mindfulness such as eating, walking or conversation. The journal was designed for 50 days, giving individuals 21 days while they were in treatment and 30 days after discharge from the facility. It is anticipated with the use of exercise and mindfulness, those recovering from SUD will have another cost-free tool to use to combat relapse after treatment.

Ethical Considerations

This project was approved by the Arizona State University's Institutional Review Board for expedited review on August 26th, 2020.

Population & Setting

Population is adults, male and female age 18 and older. All participants were currently enrolled in residential treatment at one of two treatment facilities in southwest Arizona. Length of stays for individuals was 14-30 days with an average of 21 day lengths of stay for SUD treatment. The residential treatment facility has two locations with each facility having 10 co-ed bed capacity.

Project Description

Recruitment was acquired through the facility admission process and flyer (see Appendix F, Figure F1) distribution at a residential treatment center in southern Arizona. On admission, participants were given a description of the project by the admission coordinator and had the option to begin participation or join at a later date. Flyers were also distributed through the residential treatment center encourage clients to participate. Participants were encouraged to attend at least eight of nine sessions in order to earn a reward bag with items to assist in exercise and mindfulness after discharge. Reward bags were funded through GoFundMe, student and business donations. Reward bags included yoga mats, jump ropes, water bottles, mindful coloring books and color pencils. Consent was obtained through participation in program. Participants were cleared for exercise participation by residential treatment facility practioner on admission to facility. Prior to beginning the first session demographic information and Five Facet Mindfulness Questionnaire (FFMQ) were completed. At the conclusion of the program, a second FFMQ and satisfaction survey were administered.

Instrumentation, Data Collection and Analysis Plan

Data collected through pre- and post-intervention questionnaires. Demographics were collected through demographic information questionnaires created by student (Appendix E) and a FFMQ. Demographics consisted of gender, age, marital status, education, ethnicity, employment status, income, prior addiction treatment and mindfulness practices (Appendix E). Pre and post FFMQ were collected and compared for changes in mindfulness practice. Each individual had an identifying number consisting of their last two digits of their birth year and last two digits of telephone number. These ID numbers were used to identify individuals' data. No birthdates or patient identification were used for data collection. Once data was collected it was organized in an Excel spreadsheet to be used by Intellectus™ Statistics software.

The FFMQ tool has been validated for reliability and is widely used to assess mindfulness. FFMQ is a 39 question Likert questionnaire with scores ranging from 1- never or rarely true to 5- very often or always true. Questions are answered based on the participants own opinion of what is true for them. FFMQ is used to determine overall mindfulness and 5 facets of mindfulness: Observing, Awareness, Non-Reacting, Non-Judging and Describing.

Studies have shown that the FFMQ has been found to have minimal differential item functioning (Baer et al., 2011). Differential item functioning is important to determine if a particular group of people would be inclined to answer questions in a certain way creating bias within the questionnaire. A study was conducted to determine FFMQ as a self-assessment of mindfulness and its relationship to determining potential for substance use. It was found that the observing and nonreactivity areas of the FFMQ were able to predict a lower tobacco use, alcohol use and heavy alcohol use (Eisenlohr-Moul et al. 2012). The FFMQ found that nonjudgment is an important factor in reducing relapse and decreasing a negative mood (Temme & Wang, 2018). In one of the original FFMQ studies for validity it was found that the relationship between the act of observing and psychological adjustment were higher in the meditation group (Baer et al., 2008). The use of the FFMQ will give valuable information on the participants' mindfulness prior to beginning training and after completion of mindfulness session with daily participation.

Budget and Funding

The total budget for this project was $13,529.80, student donations of $4,409.80 and $9,120.00 was in kind from project site. Budget cost included time spent by stakeholders and student to plan, design and implement project. Due to COVID-19 equipment had to be purchased and installed to provide intervention via zoom.

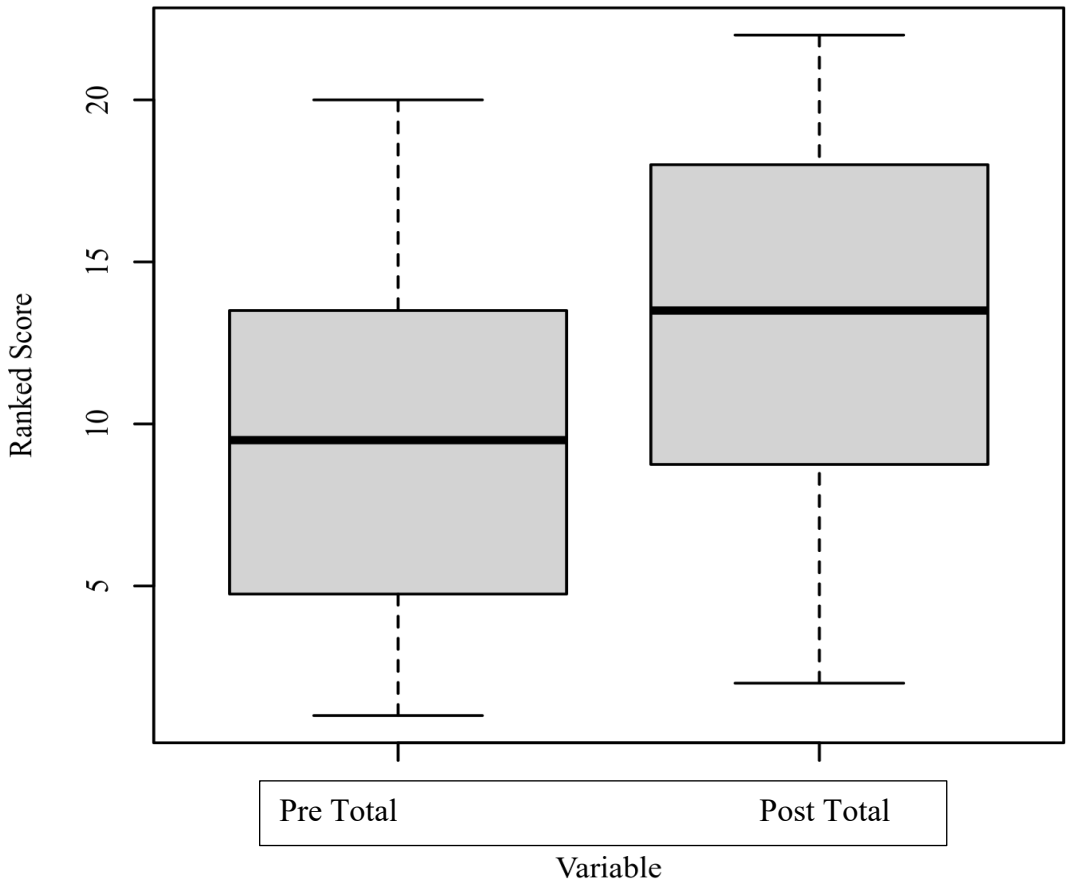
Results

Outcomes

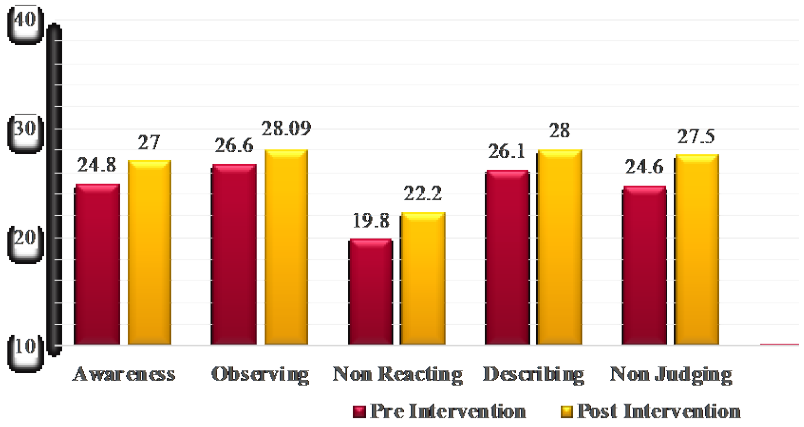
Twenty-two total participants partook in the project over the 11week pilot program. Eleven of these 22 completed the program and provided FFMQ data pre- and post-intervention. Average age of participants was 36 years. Sixty percent participants were male and 40% female, with the majority identifying as Caucasian with a high school education or above. Prior to participating in mindfulness exercises 60% already practiced mindfulness.

Data collected from FFMQ was analyzed with Intellectus™ software. A two-tailed Wilcoxon signed rank test was conducted to examine whether there was a significant difference between FFMQ total score pre- and post-intervention. The two-tailed Wilcoxon signed rank test is a non-parametric alternative to the paired samples *t*-test and does not share its distributional assumptions (Conover & Iman, 1981 as sited in Intellectus 2021).

The results of the two-tailed Wilcoxon signed rank test were significant based on an alpha value of 0.05, $V = 10.50$, $z = -2.00$, $p = .045$. This indicates that the differences between Pre total score and Post total score are not likely due to random variation. The median of pre-total ($Mdn = 119.00$) was significantly lower than the median of Post total ($Mdn = 124.00$).



Sample size was not large enough to determine statistical significance on individual domains of Awareness, Observing, Non-Reacting, Describing and Non-Judging. It is noted that average scores in each domain did increase post intervention.



Average Score for participants in each domain for FFMQ

Post intervention satisfaction questionnaires (Appendix Figure 3E) were created by project creators. Nine of the 11 participants completed post questionnaires. 80% of individuals felt the program helped increase their quality of life, social support and prepared them for long term sobriety. Open ended suggestion box was included to gather ideas for future practice. Suggestions were made for mindfulness portion were "Overall the program is excellent, and I really enjoyed the testimonials…The meditation sessions could be a little longer" and "more mindfulness". All participants stated they would continue mindfulness-based actives.

Impact of Project

This project directly affected the individuals that participated in the program. Their increase in mindfulness and quality of life have given them resources to continue their sobriety after treatment. While we know relapse is a part of recovery, giving the proper support and tools to reduce relapse can impact a person's substance use behavior. Reducing relapse can decrease a person's chance of returning to high-risk behaviors such as substance use, criminal activity and decline in mental health leading to suicide. If one person has decreased their relapse and continued to seek exercise and mindfulness after treatment, they can influence another person

struggling with their sobriety. They can use the knowledge they have gained from their disease process and give back to others in need.

The impact on the residential treatment center is to be able to offer a new and innovative way to provide treatment for SUD. Individuals are different, one person may respond well to the 12-step program and another individual my need something different in order to be pulled towards sobriety. The residential treatment center can now offer another method to persons seeking SUD treatment that is not available at any other residential treatment facility. The continuation of the project for five years will continue to strengthen and prosper the treatment center through student led evidence-based research.

Being a legacy project with ASU, this project will impact the future of DNP students at ASU seeking evidence-based treatment for SUD. This project will continue to pave the way for individuals directly or indirectly affected by SUD. It has made an avenue available to use evidence-based research to help SUD disorder treatment improve and potentially decrease the relapse rate.

The overall impact for this project is beneficial for many people. It has addressed a gap in care and used innovation to find a unique method to bridge that gap. It has allowed a residential treatment center to gain continued involvement with a state university and its student resources. The largest impact of all is on the individuals in treatment, their family and friends that will be affected by their loved ones' decrease in relapse and increase in sobriety.

Sustainability

The D.R.E.A.M.E.R. project has received a commitment through the residential treatment center to work with ASU students to continue work for five years. Doctorate of Nurse Practice students will continue to evaluate and make appropriate evidence-based changes to improve the project. Between project implementation of the pilot program and the successor student, recorded mindfulness sessions are available. The mindfulness journal has been given to be printed when individuals choose to participate in D.R.E.A.M.E.R. project.

Technology was purchased with the first pilot program to perform video conferences with clients at both facilities. Future fundraising will be performed by successor through events to encourage public participation in exercise classes for donations to program. The residential treatment center staff are committed to continuing and improving the program to help met the needs of SUD clients at their facility.

Discussion

Summary

MBI has been a treatment adjunct to SUD for the past twenty years. Through research it has gained acknowledgement as a helpful tool to reduce cravings, relapse and substance use. The D.R.E.A.M.E.R. project was able to combine mindfulness and exercise during a residential treatment program for SUD. This was a pilot program to increase methods to reduce relapse. The nine-week program was had a total of 11 participants complete the entire program. All participants increased in their overall mindfulness and stated they would continue mindful activities after discharge.

When looking at current evidence-based research a recent systematic review in 2020 showed positive a positive outcome of MBIs is their ability to decrease the sustained and motivated focus on substance related behavioral cues (Korecki et al., 2020). The use of MBI is to teach a person that non-judgment, acceptance and observing is important to reduce cravings and substance use.

Individuals with SUD are in a cycle of addiction; preoccupation/anticipation, binge/intoxication and withdrawl/negative affect (Priddy et al., 2018). Due to this cycle people are set up to repeat abuse. Mindfulness is used to reinstate control at the first stage of addiction. Teaching an individual mindfulness gives them the control to notice their craving and not react to it with substance use. Through practicing mindfulness an individual learns to appreciate daily life, contentment, relaxation and joy (Priddy et al., 2018).

Though MBI needs to have more large studies to understand its effectiveness and significance, research has shown that MBIs when combined with TAU are more beneficial in reducing relapse and substance use. Studies have shown that MBI with Cognitive Behavioral Therapy (CBT) is a superior relapse prevention strategy (Priddy et. al., 2018). This continued evidence-based research aligns with the D.R.E.A.M.E.R. projects prediction that introducing mindfulness and exercise will reduce the risk of relapse. Daily mindfulness for individuals in recovery can continue to decrease substance use behaviors, increase psychological flexibility and reduce relapse.

Limitations & Barriers

This project largest barrier was the unexpected COVID-19 pandemic of 2020. COVID-19 required social distancing and quarantining to reduce communal spread. This directly affected the project that was initially going to be an in-person exercise and mindfulness class outside of the residential treatment facility. ASU IRB suspended all in person interventions, requiring the movement of the project to a virtual platform. This limited group participant to residential treatment center clients currently in treatment, previously it was going to be an open program for individuals to participate in if maintaining their sobriety.

Limitations of the project were the group size. A total of 22 participants joined the project during some phases, while only 11 completed the entire program. This was an attrition rate of 50% which reduced the group size for statistical analysis. Due to small group size the only statistically significant item was the total mindfulness scores from the FFMQ. The domains of the FFMQ were too small of a data set to obtain statistical significance.

Recommendations

Due to the increase in mindfulness and quality of life of individuals in the D.R.E.A.M.E.R. project continued research and implementation of SUD adjunct treatment with mindfulness and exercise is recommended. Programs combining the need for social interaction and introspection have potential to provide a valuable tool to maintain sobriety and decrease relapse.

Further continuation of the D.R.E.A.M.E.R. project should focus on refining educational materials and class format to provide a more comprehensive treatment. Incorporation of different mindfulness techniques and education would be beneficial for further program changes.

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Appendix A

Mindfulness Based Intervention Research Summary Evaluations

Table A1

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Cavicchioli, M. et al. (2018). The clinical efficacy of Mindfulness-based treatments for alcohol and drug use disorders: A meta-analytic review of randomized and nonrandomized controlled trials **Country:** Italy **Funding:** none reported **Bias**: none detected	**Inferred:** Relapse Prevention	**Method:** Meta-Analysis **Type:** Quantitative **Purpose:** Evaluation of mindfulness-based interventions to promote effectiveness compared to TAU for Alcohol and Drug use disorders.	**n =3,531** **N= 37** **Setting:** Department of Psychology University Milan **IC:** Scientific peer reviewed journals. MBI assessment vs TAU in SUD. Valid and reliable instrument to assess for SUD. RCT **EC:** Studies without valid or reliable criteria for SUD diagnosis or instruments	**IV:** MBI **DV1:** Abstinence **DV2**: cravings	Moderators, bias of publication and Orwin's fail safe	Cohens *d*	CI 95% **DV1:** p <0.001 **DV2:** p<0.001	**LOE:** I **Grade:** no Recommendations **Strengths:** Large study evaluating 37 studies **Weakness:** some studies had small sample sizes MBI are effective with TAU to increase abstinence from substances use and decrease cravings.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Nakamura et al., (2015) Investigating impacts of incorporating an adjuvant mind-body intervention method into treatment as usual at a community-based substance abuse treatment facility: A pilot randomized controlled study **Country:** United States **Funding:** Mind-body research program at University of Utah **Bias:** none noted	**Inferred:** Relapse prevention	**Method:** prospective two-parallel group RCT **Type:** quantitative **Purpose:** evaluation of MBI as an adjuvant treatment for cravings and drug use, and reduction of psychological symptoms.	**n=** 38 **Sample Setting:** women's only Substance use treatment program in Salt Lake City **IC:** currently attending SUD treatment, with ability to complete 10 weeks of sessions. **EC:** active psychosis, suicidal ideations	**IV:** MBB **DV1:** cravings and drug use **DV2:** reducing symptoms of coexisting conditions.	PACS Center for epidemiological studies depression scale Five-facet mindfulness questionnaire	*t*-test	95% Confidence interval **DV1:** baseline covariate value 9.81, post MBI group 3.78, p< 0.001 **DV2:** baseline covariate 126.12, post intervention 25.97, p <0.001	**LOE:** I **Grade:** no recommendations **Strength:** Validated reliable questioners, use of experienced practitioners. **Weakness:** small sample size, vague inclusion criteria. MBB intervention can easily be incorporated into TAU to reduce cravings and psychological symptoms.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Shorey et al. (2017) A randomized controlled trial of a mindfulness and acceptance group therapy for residential substance use patients **Country:** United States **Funding:** National Institute on Alcohol Abuse and Alcoholism grants **Bias:** none noted	**Inferred:** Relapse prevention	**Method:** RCT **Type:** quantitative **Purpose:** Evaluate effectiveness of MBI on cravings, Psychological flexibility and mindfulness.	**n=** 117 **Sample setting:** Private residential treatment center **IC:** Age 18 and older, in a 28-30-day residential substance use program. Cleared from substance withdrawal. **EC:** psychotic symptoms, cognitively impaired.	**IV:** 8 Week MBI **DV1:** cravings **DV2:** psychological flexibility	PACS 18-item acceptant and action questionnaire, substance abuse version.	Multivariant analysis of variance Cohen *d*	**DV1:** *d=0.20* **DV2:** *r*=.34 p<.05	**LOE:** I **Grade:** no recommendation **Strength:** Evaluating MBI in residential treatment **Weakness:** small sample size, small effect size in MBI MBI can be implemented in a variety of treatment centers

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Price, C. et al, (2019) Longitudinal effects of interoceptive awareness training through mindfulness awareness in body-oriented therapy as an adjunct to women's substance use disorder treatment: A randomized controlled trial **Country:** Unites States **Funding:** National Institute on Drug Abuse, National Institute of Health **Bias:** none noted	**Inferred:** Relapse prevention	**Method:** three group, repeated measures, randomized controlled trial. **Type:** Quantitative **Purpose:** efficacy of MBI as an adjunct to intensive outpatient treatment to reduce substance use.	**N**= 395 **n**= 217 **Sample setting**: three community non-profit outpatient clinic in Pacific north west. **IC**: age 18+, female, fluent in English, enrolled in IPO, agreed to not engage in another modality or MBI **EC**: currently pregnant, untreated psychotic diagnosis or symptoms, cognitive impairment	**IV**: MBI **DV**: days abstinent **DV2**: cravings	Timeline Followback PACS	Generalized estimating equations	25% attrition rate 95% CI **DV1**: mean=18.9 Effect size .32 **DV2**: Mean difference -3.2	**LOE**: I **Grade**: no recommendations **Weakness**: 25% drop out rate, only females studied **Strength**: large study, RCT implementation of MBI can reduce cravings and increase abstinence days over a 12-month period.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Imani, et al. (2015) Effectiveness of mindfulness-based group therapy compared to the usual opioid dependence treatment **Country:** Iran **Funding:** nondisclosed. **Bias:** none noted	**Inferred:** Relapse Prevention	**Method:** RCT **Type:** quantitative **Purpose:** assess Effectiveness of MBI group therapy compared to TAU.	**N=** 50 **n=** 30 **Sample Setting:** Iranian National Center for Addiction **IC:** Diagnosis of opioid dependence, age 18-40, 8 years of completed education, two-week completion of medical treatment with opioid agonist. Informed **EC:** psychosis, dementia, imminent suicide risk, organic brain disorder or other drug addiction except nicotine.	**IV:** MBI **DV1:** opioid consumption	Addiction Severity Index	*t*-test,	**Mean =** Control- 0.77 Experimental- 1.1	**LOE: I** **Grade:** no recommendation **Strength:** Statistical significance and feasibility of MBI interventions. **Weakness:** small sample size, only male MBI can reduce substance use and relapse behaviors

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Davis, J. et al. (2018) Substance use outcomes for mindfulness-based relapse prevention are partially mediated by reductions in stress: Results from a randomized trial **Country:** United States **Funding:** National Institute on Drug Abuse **Bias**: none noted	**Inferred:** Relapse Prevention	**Method:** RCT **Type:** Quantitative **Purpose:** effect of experimental conditions compared to TAU for stress, cravings and substance use	**N**=84 **n**= 79 **Sample Setting:** residential public not-for profit substance uses residential treatment center **IC:** age 18-29, proficiency in English, clear cognitive abilities **EC:** adolescents, adults age 30+, cognitive disfunction	**IV:** MBI **DV1:** cravings **DV2:** substance use	Global Appraisal of Individual Needs. Substance frequency scale	Bi-linear spline models, Cohen *d*	**DV1:** *d* = --0.58 **DV2**: *d* = -0.58	**LOE:** I **Grade:** no recommendations **Strength:** moderate sample size, validated assessment tools **Weakness:** rolling admission process, potential for contamination by participants within treatment program MBI can be implemented in any setting, to reduce cravings and substance use.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Li, W. (2016) Mindfulness treatment for substance misuse: A systematic review and meta-analysis **Country:** United States **Funding:** National Institute of Health grant **Bias:** none noted	**Inferred:** Relapse Prevention	**Method:** Meta-analysis **Type:** Quantitative **Purpose:** Evaluate method characteristics and estimate effectiveness of MBI in substance misuse.	**n=** 473 **N**= 42 **Sample Setting:** outpatient treatment centers, adults and adolescent substance use, criminal justice system & laboratory **IC:** MBI, quasi-experimental with repeated measures, substance use population**,** peer reviewed **EC:** book reviews, abstracts, dissertations, systematic reviews, treatment guidelines, pre-experimental design, did not utilize MBI.	**IV:** MBI **DV1:** substance misuse **DV2:** cravings	Methodological Quality Rating Scale	Cohen *d*	95% Confidence interval **DV1:** *d*=-0.28 Small effect size **DV2:** *d*=-0.68 Medium effect size	**LOE:** I **Grade:** no recommendation **Strength:** use of tool to evaluate each study, two independent reviewers for each study, statistics performed appropriately. **Weakness:** only included English language studies. Small sample size due to exclusion criteria MBI can be useful to decrease substance use and cravings.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurement	Data	Finding	Application to practice
Enkema, M., et al. (2017). Mindfulness practice moderates the relationship between craving and substance use in a clinical sample. **Country:** United States **Funding:** Institutional Nation Research Service Aware and Pre-doctoral Individual National Research Award. **Bias:** No bias noted	**Inferred:** Relapse Prevention,	**Method:** Randomized control **Type:** Quantitative **Purpose:** determine mindfulness application in correlation with relationship between cravings and substance use.	n = 57 Data collected from outpatient setting for SUD. Age 21-60. **IC:** Completed treatment in previous two weeks, English speaking, medically cleared. **EC:** presented with psychosis, dementia, imminent danger to self or others or previously participated in MBRP trial.	**IV** = 8-week treatment **DV1**= days of use **DV2**= craving	Timeline Followback Penn Alcohol Craving Scale MBRP Follow-up Practice Questionnaire	Linear multiple regression	**DV1** **Mean-**27.63 **SD-** 8.12 **DV2** P <0.001 **SD-**1.16 **Mean**-1.22	**LOE**: 1 **Grade**: no recommendation at this time **Strengths:** data analysis organized **Weakness:** small sample size, multiple variables Formal mindfulness practice can reduce cravings and reduce relapse

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to Practice
Glasner, S., et al. (2017). Mindfulness-based relapse prevention for stimulant dependent adults: A pilot randomized clinical trial. **Country:** United States **Funding:** Grants from National Institute on Drug Abuse **Bias:** None noted	**Inferred:** Relapse Prevention	**Method:** RCT **Type:** Quantitative **Purpose:** Comparison of MBRP to Health Education in stimulant dependent adults alongside contingency management.	**n**= 63 Conducted at University Based research clinic. **IC:** >/= 18 old, current DSM IV diagnosis of stimulant dependence, fluent in English, & physically able to sit for 30 min. **EC:** medical impairment that compromised safety, required medical detoxification from substance, psychiatric impairment, &/or homeless.	**IV:** MBI **DV1:** depression severity **DV2:** anxiety severity	Urine Toxicology screen Addiction Severity Index Beck Depression Inventory II Beck Anxiety Inventory Difficulty in Emotion Regulation Scale White Bear Suppression Inventory Five-Factor Mindfulness Questionnaire	Multivariate logistic regression analysis	**DV1** p=0.03 Effect size= 0.58 **DV2** p=0.01 Effect size 0.61	**LOE**: I **Grade:** no recommendation at this time **Strength:** easily replicable **Weakness:** limited to stimulant abuse MBRP can reduce depression and anxiety amongst stimulant dependent adults, reducing stimulant use.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Citation	Theory	Design	Sample	Variables	Measurements	Data	Findings	Application to practice
Abed, M., et al. (2019). Mindfulness-based relapse prevention to reduce lapse and craving **Country:** Iran **Funding:** none disclosed **Bias:** none identified	**Stated:** Negative-reinforcement withdrawal model.	**Method:** RCT **Type:** quantitative **Purpose:** to determine if MBRP may reduce relapse and craving in MMT patients.	**n**=55 conducted at multiple MMT sites. **IC:** consent to participate, undergoing MMT, at least 2 relapses with MMT. **EC:** unwillingness to participate, more than 2 absence session from experimental group.	**IV:** MBRP for 8 weeks **DV1:** Desire to use **DV2:** intention to use **DV3:** relapse	Heroin Craving Questionnaire Drug urine screen	Multivariate analyses of variance	**DV1-** Experimental Mean-18.93 SD-1.75 P = 0.00 **DV1** Control Mean-31.66 SD-3.12 **DV2**- Control Mean-18.42 SD-3.19 **DV2**- Experimental Mean-30.46 SD-3.49 **DV3**- Control + drug screens 22-23% in 1-3 months Experimental 9-14% in 1-3 months	**LOE:** I **Grade:** no recommendation **Strength:** Randomized, both groups received methadone treatment during interventions **Weakness:** Small sample size and male only patients were used. **Harm:** no associated harm. MBRP is simple to implement and repeatable. Applicable to use as an attempt to reduce relapse and cravings.

Key: **DV**: Dependent Variable, **EC**: Exclusion Criteria, **IC:** Inclusion Criteria, **IV:** Independent Variable, **LOE:** Level of Evidence, **MBRP:** Mindfulness Based Relapse Prevention, **MMT:** Methadone Maintenance Therapy, **n:** Sample Size ,**N:** population size **PACS:** Penn Alcohol Craving Scale, **RCT:** Randomized Control Trial, **SD:** Standard Deviation **SUD:** Substance use Disorder, **TAU:** Treatment as Usual

Mindfulness Based Intervention Synthesis of Evidence Summary

Table A2

Synthesis Table

					Study					
Citation	Imani	Nakamura	Wen	Glasner	Enkema	Shorey	Cavicchioli	Davis	Abed	Price
Year	2015	2015	2017	2017	2017	2018	2018	2018	2019	2019
Design/Method	RCT	RCT	Systematic review	RCT	RCT	RCT	Meta-Analysis	RCT	RCT	RCT
Level of Evidence	I	I	I	I	I	I	I	I	I	I
					Study Characteristics					
Demographics										
Male/Female	30/0	0/38		45/18		87/30		51/28	55/0	0/187
Age	18-40	18-55		22-67	21-60	18+		18-29	27-50	22-61
Setting:										
Outpatient	X			X	X				X	X

Key: **ACT**: acceptance and commitment therapy, **ASI**: Addiction Severity Index, **AAQ_SA**: Acceptance & Action Questionnaire Substance Abuse, **BAI**: Beck Anxiety Inventory, **BDI-II:** Beck Depression Inventory, **FFMQ:** Five Factor Mindfulness Questionnaire, **GAIN:** Global Appraisal of Individual Needs, **HCQ:** Heroin Craving Questionnaire. **HE:** Health Education, **MABT:** Mindfulness Awareness in Body Therapy, **MBB:** Mind Body Bridge, **MBGT**: Mindfulness Based Group Therapy, **MBI**: Mindfulness Based Intervention **MMT:** Methadone Maintenance Therapy, **MBRP:** Mindfulness Based Relapse Prevention, **PACS**: Penn Alcohol Craving Scale**, RCT:** Randomized Controlled Trial, **SFS:** Substance Frequency Scale, **TAU:** Treatment as Usual, **TLFB:** Timeline Follow Back, *Clinically Significant, ↓ Decreased, ↑ Increased, ≠ Not Significant

Inpatient		X								
Residential treatment						X		X		
Sample Size/Studies included	30	38	42 studies	63		117	37 Studies	84	55	187
Measurement Tools										
FFMQ	X	X		X		X				
ASI	X			X						
PACS		X	X		X	X				X
TLFB					X					X
MBRP follow up					X					
BDI-II				X						
BAI										
SFS								X		
GAIN								X		
HCQ										
AAQ-SA						X				
					Interventions					
MBGT	X									

Key: **ACT**: acceptance and commitment therapy, **ASI**: Addiction Severity Index, **AAQ_SA**: Acceptance & Action Questionnaire Substance Abuse, **BAI**: Beck Anxiety Inventory, **BDI-II:** Beck Depression Inventory, **FFMQ:** Five Factor Mindfulness Questionnaire, **GAIN:** Global Appraisal of Individual Needs, **HCQ:** Heroin Craving Questionnaire. **HE:** Health Education, **MABT:** Mindfulness Awareness in Body Therapy, **MBB:** Mind Body Bridge, **MBGT**: Mindfulness Based Group Therapy, **MBI**: Mindfulness Based Intervention **MMT:** Methadone Maintenance Therapy, **MBRP:** Mindfulness Based Relapse Prevention, **PACS**: Penn Alcohol Craving Scale**, RCT:** Randomized Controlled Trial, **SFS:** Substance Frequency Scale, **TAU:** Treatment as Usual, **TLFB:** Timeline Follow Back, *Clinically Significant, ↓ Decreased, ↑ Increased, ≠ Not Significant

TAU	X	X	X		X	X	X	X		X
MBB		X								
MBI			X				X			
ACT							X			
MBRP				X	X		X	X	X	
HE				X						
MABT										X
MMT									X	
Duration/weeks	8	10		8	8	4	1.5-48	4	8	8
					Variables					
Cravings		↓*	↓		↓	↑	↓*	↓*	↓*	↓*
Substance use	↓*		↓	↓*	↓		↓	↓*	↓	↓
mindfulness		↑*								
Psychological flexibility				↑*		↑*	≠	↓*		≠

Key: **ACT**: acceptance and commitment therapy, **ASI**: Addiction Severity Index, **AAQ_SA**: Acceptance & Action Questionnaire Substance Abuse, **BAI**: Beck Anxiety Inventory, **BDI-II:** Beck Depression Inventory, **FFMQ:** Five Factor Mindfulness Questionnaire, **GAIN:** Global Appraisal of Individual Needs, **HCQ:** Heroin Craving Questionnaire. **HE:** Health Education, **MABT:** Mindfulness Awareness in Body Therapy, **MBB:** Mind Body Bridge, **MBGT**: Mindfulness Based Group Therapy, **MBI**: Mindfulness Based Intervention **MMT:** Methadone Maintenance Therapy, **MBRP:** Mindfulness Based Relapse Prevention, **PACS**: Penn Alcohol Craving Scale**, RCT:** Randomized Controlled Trial, **SFS:** Substance Frequency Scale, **TAU:** Treatment as Usual, **TLFB:** Timeline Follow Back, *Clinically Significant, ↓ Decreased, ↑ Increased, ≠ Not Significant

Appendix B

Conceptual and Theoretical Models

Figure B2
Rosswurm & Larabee Model

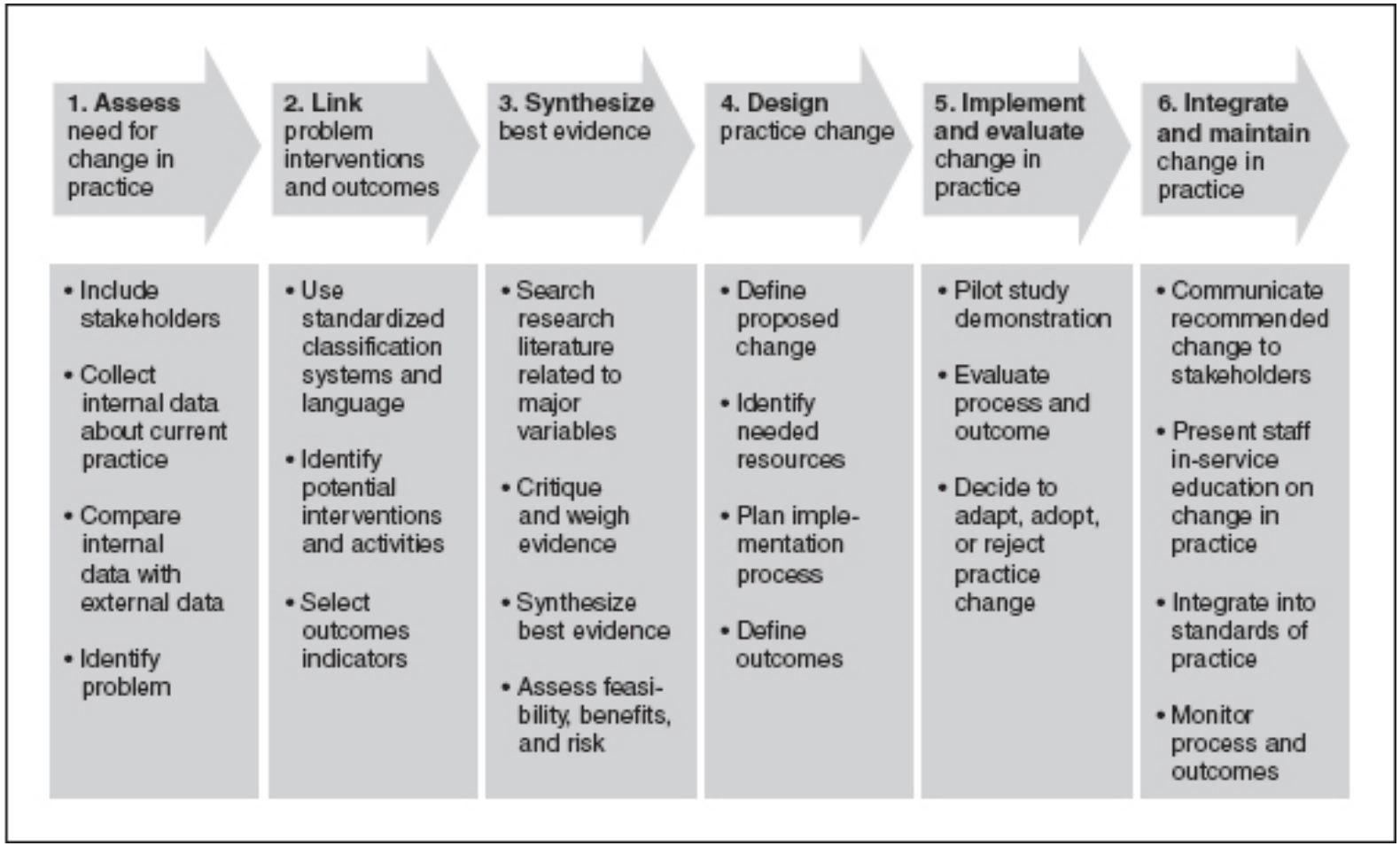
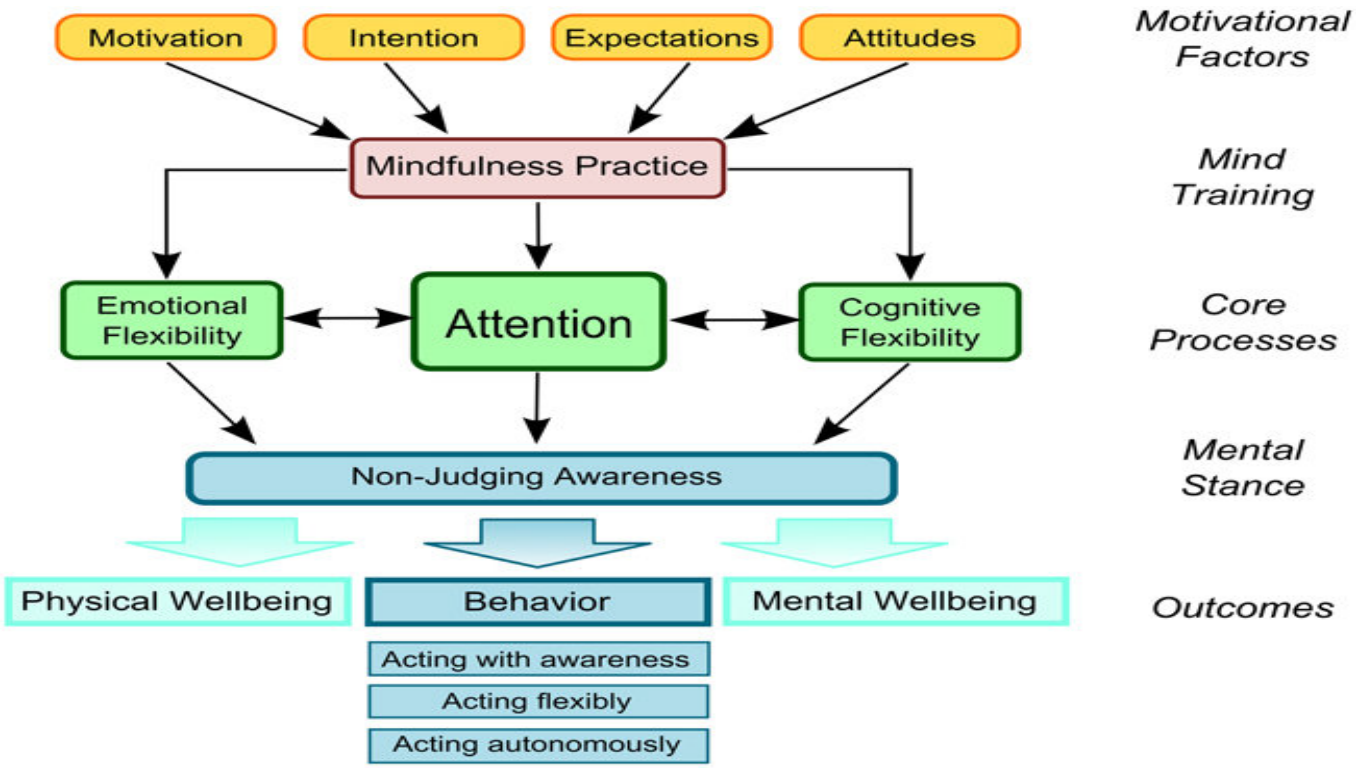


Figure 2C

Liverpool Mindfulness Model



Appendix E

Tools for Assessment

Figure 1E

Five Facet Mindfulness Questionnaire

Five Facet Mindfulness Questionnaire (FFMQ)

Please rate each of the following statements with the number that best describes *your own opinion* of what is *generally true for you*.		**Never or very rarely true**	**Rarely true**	**Sometimes true**	**Often true**	**Very often or always true**
FFQM 1	When I'm walking, I deliberately notice the sensations of my body moving. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 2	I'm good at finding words to describe my feelings. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 3	I criticize myself for having irrational or inappropriate emotions. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 4	I perceive my feelings and emotions without having to react to them. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 5	When I do things, my mind wanders off and I'm easily distracted. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 6	When I take a shower or bath, I stay alert to the sensations of water on my body. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 7	I can easily put my beliefs, opinions, and expectations into words. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 8	I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 9	I watch my feelings without getting lost in them. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 10	I tell myself I shouldn't be feeling the way I'm feeling. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 11	I notice how foods and drinks affect my thoughts, bodily sensations, and emotions. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 12	It's hard for me to find the words to describe what I'm thinking. (D-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 13	I am easily distracted. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 14	I believe some of my thoughts are abnormal or bad and I shouldn't think that way. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 15	I pay attention to sensations, such as the wind in my hair or sun on my face. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 16	I have trouble thinking of the right words to express how I feel about things. (D-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 17	I make judgments about whether my thoughts are good or bad. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 18	I find it difficult to stay focused on what's happening in the present. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 19	When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 20	I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 21	In difficult situations, I can pause without immediately reacting. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 22	When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words. (D-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 23	It seems I am "running on automatic" without much awareness of what I'm doing. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 24	When I have distressing thoughts or images, I feel calm soon after. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 25	I tell myself that I shouldn't be thinking the way I'm thinking. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 26	I notice the smells and aromas of things. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 27	Even when I'm feeling terribly upset, I can find a way to put it into words. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 28	I rush through activities without being really attentive to them. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 29	When I have distressing thoughts or images, I am able just to notice them without reacting. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 30	I think some of my emotions are bad or inappropriate and I shouldn't feel them. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 31	I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 32	My natural tendency is to put my experiences into words. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 33	When I have distressing thoughts or images, I just notice them and let them go. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 34	I do jobs or tasks automatically without being aware of what I'm doing. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 35	When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 36	I pay attention to how my emotions affect my thoughts and behavior. OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 37	I can usually describe how I feel at the moment in considerable detail. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 38	I find myself doing things without paying attention. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 39	I disapprove of myself when I have irrational ideas. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

Scoring:
(Note: R = reverse-scored item)

Subscale Directions	Your Score TOTAL	Your score item Avg.
Observing: Sum items 1 + 6 + 11 + 15 + 20 + 26 + 31 + 36		
Describing: Sum items 2 + 7 + 12R + 16R + 22R + 27 + 32 + 37.		
Acting with Awareness: Sum items 5R + 8R + 13R + 18R + 23R + 28R + 34R + 38R		
Nonjudging of inner experience: Sum items 3R + 10R + 14R + 17R + 25R + 30R + 35R + 39R		
Nonreactivity to inner experience: Sum items 4 + 9 + 19 + 21 + 24 + 29 + 33.		
TOTAL FFMQ (add subscale scores)		

NOTE: Some researchers divide the total in each category by the number of items in that category to get an average category score. The Total FFMQ can be divided by 39 to get an average item score.

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Figure 2E

Pre-intervention Demographic Questionnaire

Instructions

Please answer all the questions. If you are unsure about which response to give to a question, **please choose the one** that appears most appropriate. This can often be your first response.

1. What is your age in years (Please fill in the blank)_____
2. What gender do you identify with?
   1. Male
   2. Female
   3. I prefer not to answer
3. Which race/ethnicity best describes you? (Please choose only one.)
   1. American Indian or Alaskan Native
   2. Asian / Pacific Islander
   3. Black or African American Hispanic
   4. White / Caucasian
   5. Multiple ethnicity / Other (please specify) _____
4. What is your marital status?
   1. Single, never married
   2. Married or domestic partnership
   3. Widowed
   4. Divorced
   5. Separated
5. What is your highest level of education?
   1. Less than a high school diploma
   2. High school graduate, diploma or the equivalent (for example: GED)
   3. Trade/technical/vocational training
   4. Some college credit, no degree
   5. Associate degree
   6. Bachelor's degree
   7. Master's degree
   8. Professional degree
   9. Doctorate degree
6. What is your employment status?
   1. Employed full-time (40 hours or more/week)
   2. Employed part-time
   3. Unemployed and currently looking for work

4. Unemployed and not looking for work
5. Student
6. Retired
7. Self-employed
8. Unable to work

7. What is your household income?
   1. Below 10k
   2. 10k-50k
   3. 50k-100k
   4. 100k-150k
   5. Over 150k
8. Do you currently have a gym membership?
   1. Yes
   2. No

Figure 3E

Post-Intervention Satisfaction Survey

Please use unique ID #: Last two digits of your birth year and last two digits of your telephone number

ID#: ___ ___ ___ ___

Instructions: Please answer all the questions.

1) Do you feel this program enhanced your quality of life?
   a. Yes
   b. No

2) Do you feel this program enhanced your sense of social support?
   a. Yes
   b. No

3) Which health-related activities do you plan on continuing? (circle all that apply)
   a. Mindfulness
   b. Physical Activity
   c. Lifestyle Change
   d. I do not plan on continuing these activities

4) Do you feel more prepared to achieve long term sobriety after participating in this program?
   a. Yes
   b. No

5) Do you feel it would be beneficial to continue a program like this after discharge from treatment?
   a. Yes
   b. No

6) How do you feel about this program?
   a. Very Satisfied
   b. Satisfied
   c. Neither satisfied or dissatisfied
   d. Dissatisfied
   e. Very dissatisfied

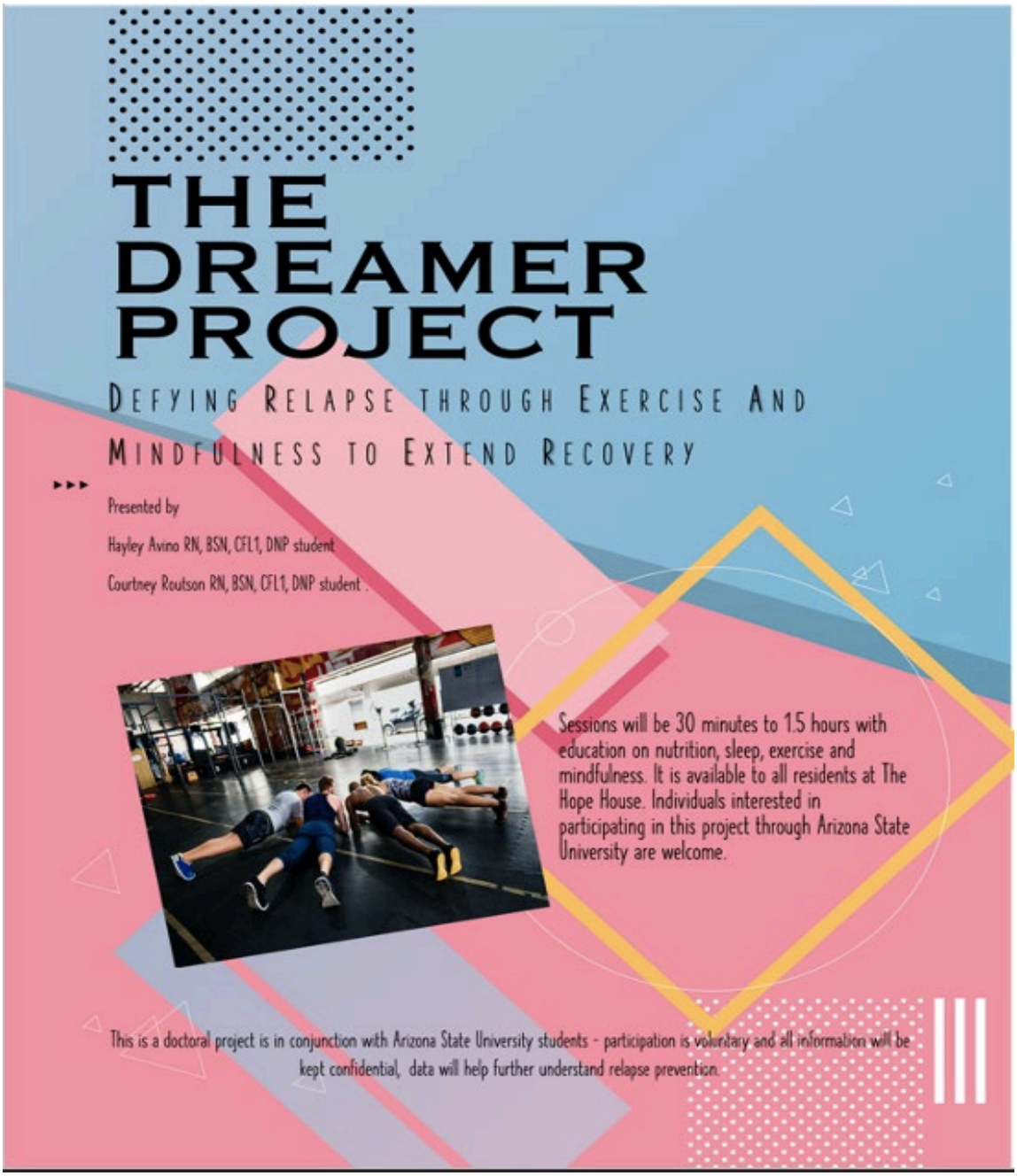
7) Do you have any suggestions to make this program better?

*** THANK YOU FOR YOUR PARTICIPATION ***

Appendix F

Recruitment Flyer

Figure 1F



Appendix G

Budget

Figure 1G

	Expenses	In-Kind Support
Personal		
Russell Ferrara COO 2hrs a week x 12 (100/hr)		2,400.00 – The Hope House
Quinn McCullough clinical operations coordinator 2hrs a week x 12 weeks (100/hr)		2,400.00 – The Hope House
Breanna Gonzalez Lead clinical therapist 2hrs a week x 12 weeks (100/hr)		2,400.00- The Hope House
Student time for creation of program, journal and teaching twice weekly. Time creating program for implementation. 50hr x 42.00 for creation, 36 hr for implementation at site x 42.00	2,100 + 1,512 3,612.00 – student volunteer	
Cost of Mindfulness based leadership certification	150.00 – Students funding	250.00 scholarship from ASU mindfulness program
Nursing staff to supervise groups 2hr for 9 weeks $50/hr x 18hr		900.00 -
Meeting Room & Equipment		
Room at the Hope house		300.00 – The Hope House room already in place, no furniture needed.
Electricity to power room and equipment 5,000 watts x .10 per KWH for one hour twice weekly for 9 weeks		10.00 – The Hope House
Internet cost 30.00month x 3months		90.00 – Use of the The Hope House internet
Web cam with microphone to alternate in person and via zoom between both houses.		150.00
Cost of printing mindfulness/health journal 0.20x 60 pages	480.0- Student funding	
Printing of assessment screens 0.20x 40	8.0 – Student funding	
Cost of 3 ring binder 3.00 x 20	59.8- Student funding	
Page dividers 2.00 x 20	40.0- Student funding	

Utilizing television for zoom and apple TV products, wear and tear of products already in place		200.00- Use of the Hope House television and projector already in place.
Writing implements for journal	25.00- Student funding	
Zoom membership		20.00- New membership needed The Hope House
Equipment for Recording		
Microphone	35.00- student funding	
Total Expenses	Expenses	In-Kind
$13,529.80	4,409.80	9,120.00

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