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Claremont McKenna College

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More than a Myth: The Benefits of Incorporating Holistic Healing Methods from Native American and Mexican Cultures to Approach Opioid Use Disorder (OUD) Treatment

A Thesis Presented

by

Juliana Michelle Favela

To the Keck Science Department

Of Claremont Mckenna, Scripps, and Pitzer Colleges

In Partial Fulfillment of

The degree of Bachelor of Arts

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Abstract

Opioid Use Disorder (OUD) is a substance use disorder that characterizes a dependence on and an addiction to opioids. Opioids attack the prefrontal cortex, the dopaminergic reward system, and the hypothalamic-pituitary-adrenal (HPA) axis which is responsible for the body's stress response. Opioids constantly shift one's "set point" to the point where normal actions that cause joy and excitement no longer cause those feelings, resulting in craving and dependence. The opioid epidemic is currently ravaging the United States and has disproportionately affected Native American populations specifically in the rural areas (Tipps, et.al, 2018). The current methods for addressing OUD include medicine and is more formally called medical assisted treatment (MAT). Different agonist and antagonist medicines are utilized, including methadone, buprenorphine, and naltrexone, and occasionally Patient Centered Care (PCC) is an aspect of OUD treatment. This treatment style leaves gaps in the patients' personal development, mental health, and confidence and self-esteem building. Therefore, this proposal will attempt to combine culturally holistic methods with MAT in order to fill those gaps and address aspects relating to the patient's internal development post-addiction. Using a range of tests ranging from sobriety retention rate, to familial re-integration using the Family Environmental Scale (FES), to urinary cortisol levels, and finally neuroimaging using fMRI and EEG on two groups of OUD patients with Native American or Mexican heritage (n=45). Culturally holistic methods will be a combination of Native American and Mexican indigenous healing methods. The first group will only receive MAT while the second group will receive both MAT and culturally holistic methods, in order to compare the effects of this additional healing approach. We expect that the second group will consistently outperform group one on all tests due to the increased attention to their personal development and attention to mental health.

Introduction & Background

Widespread Drug/Opioid Abuse in the US

The opioid epidemic stretches across the United States and has devastating impacts on individuals and communities alike. The beginning of the opioid crisis began in the 1990's through prescription pain medications, with deaths increasing since about 1999 (CDC, 1998-2008). In 2018, the death toll from opioid overdose increased to 46,802, which accounts for 69.5% of all drug overdose deaths, according to the CDC. Shortly following that period the problem of heroin addiction has arisen, easily as dangerous and accessible as the pill form, and finally the use of synthetic opioids such as fentanyl, which even in the smallest doses is deadly. Prescription medications are often dosed in pill form and are given to treat moderate to severe pain following surgery, or sometimes for pain associated with cancer. Pills can be easily misused and often are. Commonplace names for popular opiates are OxyContin, Vicodin, and Percocet's. In contrast, a cheaper but as effective drug is heroin, which is similarly produced from morphine found in poppy flowers, which can be snorted or smoked. In 2017-2018 there has been a decrease in heroine deaths by 4% (CDC, 2020), which may be due to the shift from a heroine-based market to a fentanyl-based market. Fentanyl is the number two most dangerous opiate – after elephant tranquilizers – and poses the greatest threat today (Dana Point Rehab, 2019). Fentanyl is often found in other substances; sometimes it is cut with cocaine or other powders to make the sale cheaper for the dealer and the high more potent.

This epidemic has reached communities of all socioeconomic statuses, races, genders, and ethnicities. The level of opioid use is spread out across large metropolitan areas, small metropolitan areas, and nonmetropolitan areas nearly equally (figure 1). Since the drug is available at many different sources and prices, there is not a bar in who can access it. Depending

on the density and urbanicity of the place, the access to different types of opioids may differ. For example, the CDC reported that the death rates related to natural and semisynthetic opioids were the highest in nonmetropolitan areas, while heroin related deaths were the lowest.

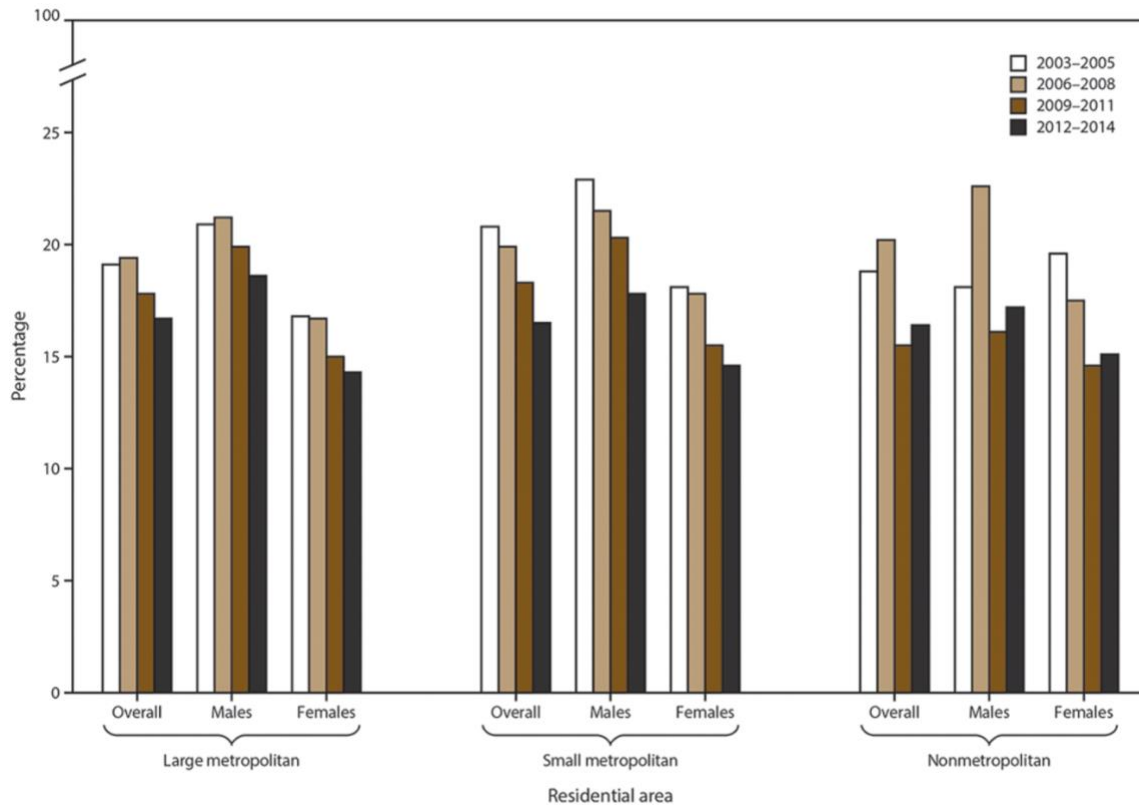


Figure 1. Trends in prevalence of past-year illicit drug use disorder among persons reporting past-year illicit drug use, by sex and residential area[†] — National Survey of Drug Use and Health, United States, 2003–2014

Neuroscience of Opioid Addiction

Opioids are a pain-relieving drug that is derived from opium-containing poppy seeds. Opioids directly impact the brain and the normal function of neurons and neurotransmitters. One of the most famous (or infamous) neurotransmitters is dopamine, in which many addictive substances can influence quite heavily. In order for the neurons to complete their job of wiring messages throughout the brain, or sending neurotransmitters across the synapse, the postsynaptic neuron may be excited, inhibited, or altered in some other biochemical way (Loue, Sana, 2003). This release of rewarding neurotransmitters is the first phase in non-medical opioid users, and

the second phase begins when the dopaminergic or reward system become hyperactive, and the prefrontal cortex is impaired, which is most often shown by heightened impulsivity. Finally, the third phase is what essentially causes the addiction, meaning an impaired neuronal system and change in the reward system that causes an extremely intense need for the drug (Brown, 2020).

More specifically, the prefrontal cortex and its impulses are compromised and therefore so are accompanying functions such as impulse control, and basic cognitive and emotional functioning. Opioids in turn attach to mu receptors which has the effect of releasing more dopamine, and in contrast opioids also activate the kappa receptors, which actually reduces dopamine release and causes feelings of dissatisfaction, prompting users to take more to reverse those feelings. The hypothalamic-pituitary-adrenal axis, which mediates the body's response to stress, is also severely disrupted by opioid use (Brown, 2020). Another circuit that is impacted is the mesolimbic or midbrain reward system. Signals are released from the ventral tegmental area, which releases dopamine to the nucleus accumbens. Our brains in turn remember these feelings, also known as conditioned associations, further leading to cravings.

Some of the most visible symptoms of someone who is addicted to opioids or who is experiencing withdrawal include slurred speech, impaired concentration, and pinpoint pupils, for example. This is a result of opioids attaching to those mu receptors in the locus cerelus, in which neurons produce and distribute noradrenaline which stimulates alertness, wakefulness, blood pressure, and other functions. Opioids prevent the release of noradrenaline and therefore the user is left with sleepiness, low blood pressure, and pressured breathing as well (Kosten, 2002). What then begins to happen is that the "set point" is being constantly changed; noradrenaline will no longer be released when the patient is experiencing things that would normally cause them to

experience joy. Therefore, the patient is now searching for ways to get back to that extremely high level of dopamine and the natural productions are completely offset, resulting in addiction.

In this experiment, the changes in the brain described above will hopefully be captured by different neuroimaging techniques, such as an fMRI or EEG. It is important to include neuroimaging in the healing approach for OUD patients because there is widespread heightened neural activation due to the opioid cues that patients have (Moningka, et.al. 2018). Different brain regions will interact with each other in a dynamic way that represents a range of complex cognitive functions that relate to drug use, and therefore mapping these patterns can make understanding the neural effects of OUD much easier.

Western Treatments and Patient-Centered Care (PCC)

Western traditional treatments that have been developed are universal and come in the forms of medicines including methadone, buprenorphine-naloxone, and naltrexone (Johns Hopkins University, 2020). These medicines can be classified as either agonist or antagonist medicines. Agonists occupy an opioid receptor in the brain thereby minimizing withdrawals, pain, cravings, and substantially decreasing a patient's chance of relapse. Antagonists block the opioid receptors and essentially prevent patients from receiving the mind-altering effects or "highs" that illicit drugs can bring (Indian Health Service, 2020). These medicines are often paired with counseling and behavioral therapies and hospital stays or visits. Some of the methods of counseling for opioid use disorder (OUD) include motivational interviewing and behavioral interventions, which directly attack the effects that OUD can have on personality dissolution and the lack of sense of self (Providers Clinical Support System, 2020).

Patient Centered Care (PCC) is an approach used in different healthcare settings in order to include the patients, healthcare providers, and families in the treatment process, rather than the process just being one-sided. The unique needs of the patient are addressed in the process and three main guidelines are also followed to integrate the patient into the PCC system (figure 2). Additionally, PCC allows there to be shared power and responsibility, and a collaborative care and shared decision making (Marchand, et.al, 2020). A more robust description and guidelines of PCC can be found in tables 3-6).

Traditional Western methods are extremely beneficial to patients who suffer from OUD; the medications are a fast and effective method to attack the biological wounds that have been created by repeated drug abuse. However, there is a lack of attention on the mental health of addicted patients. Because of the harsh and cut-and-dry style that hospitals usually use to approach OUD patients, these patients may be left without a sense of belonging or really an understanding of who they are without opioids in their life.

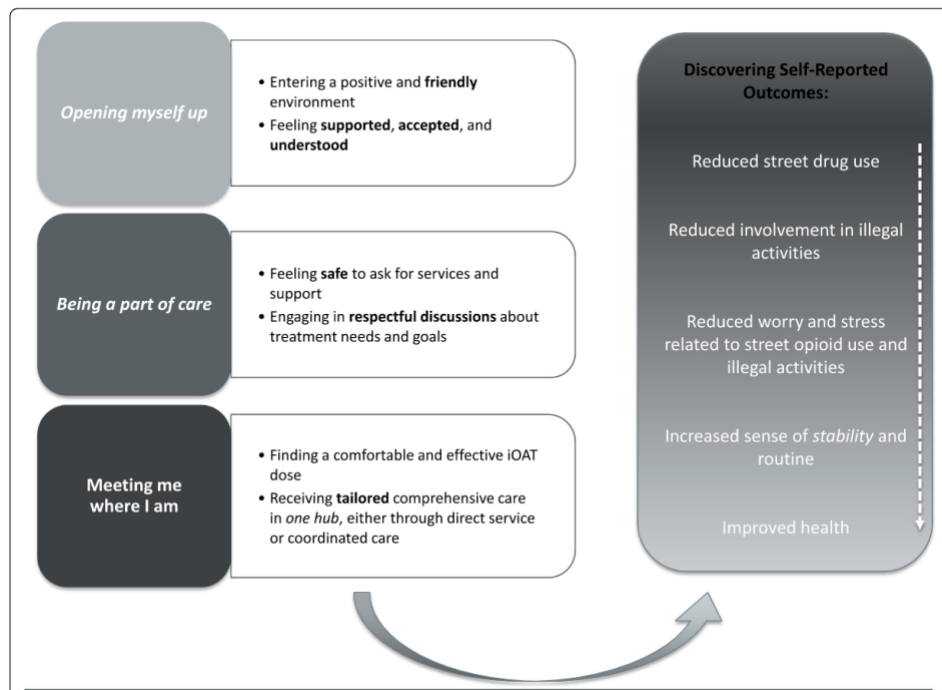


Figure 2. Building healthcare provider relationships for patient-centered care.

The limitations of Western medicine in other areas of substance abuse and especially mental health disorders has the same issue of bluntness, coldness, or a cut-and-dry style that may often cause patients to have a harder time bouncing back to a sustainable and enjoyable life. Any type of addiction is considered a disease and furthermore a mental disorder, as a person's behavior and thinking are distorted and focused primarily on rewarding the brain and the new wiring it has created due to addiction (American Psychiatric Association, 2020). The areas of the brain affected most by substance use disorders relate directly to judgement, decision making, learning, and memory, and thus a case is made that OUD can also be considered a mental disorder. Healthcare in the United States is very transactional and does not necessarily have the breadth to address community problems that may come with the individual. These additional problems may include low socioeconomic status, past history with drug use, lower educational achievements, or family issues, for examples. Medicines and a few motivational interviews may help to get the patient on their feet, but where traditional methods fail is the long term and the personal development. For example, in a study regarding injectable opioid agonist treatment (iOAT), patients were interviewed by their caregivers, as this study was focusing on the benefits of patient centered care and mutual trust throughout the treatment process. Initially, patients reported trust issues and struggling to open up about their addiction problem, partially due to experiencing discrimination in the healthcare industry (Marchand, et. al. 2020). This study focused on the only clinic that had this sort of program going between their patients and caregivers, which further exemplifies the wide gap that there is between OUD patients and them finding the help that is needed to build trust and to build up their character. The gap in the literature is what I hope my experiment will fill in.

Culturally Specific, Holistic, and Patient-Centered Treatments

Where traditional Western methods fail, culturally specific, holistic, and patient-centered treatments might be able to fill the gaps and in fact substantially improve an OUD patient's quality of life. Because these methods encompass the entire person's being and take into consideration cultural identities of the patient, they are more careful and well-rounded to the point of bringing a person to self-sustainability and raising self-esteem on an everlasting timeline. Some groups have taken it upon themselves to include culturally holistic treatment methods that make more sense to them as a community and as people who hold ancient and indigenous ways of knowing and healing. In order to gain a general understanding of how these methods are applied, this section will focus on two main ethnic groups who have particularly struggled with opioid addiction and other substance abuse, and additionally who have very deep, pre-colonial roots and medicinal and healing methods that coincide with their cultural values.

American Indians and Alaska Natives (AI/AN) are the ethnic group with the second highest opioid overdose mortality rate after White populations (Venner, et. al. 2018). Additionally, heroin, opioid, and total drug use has increased in these communities since 1999 (figure 3). In primarily AI/AN communities and especially in rural areas, the opioid mortality rate is much higher compared to White populations (figure 4). Therefore, this paper will focus on Native American populations and their spiritual and cultural methods for addressing addiction, while also bringing in frameworks from other ethnic groups and attempting to apply them to the Native American ethnic group. In addition, across the literature there is a term known as "indigenous ways of knowing," which pull from ancient healing knowledge that indigenous folks have had for eternity, including connections to the body, the mind, and the spirit. While holistic healing methods would be unable to treat an OUD patient on their own, they could add

just what is needed for a patient to really trust in their doctoral team, rebuild their character and life, and find community, especially if a member from their community is involved.

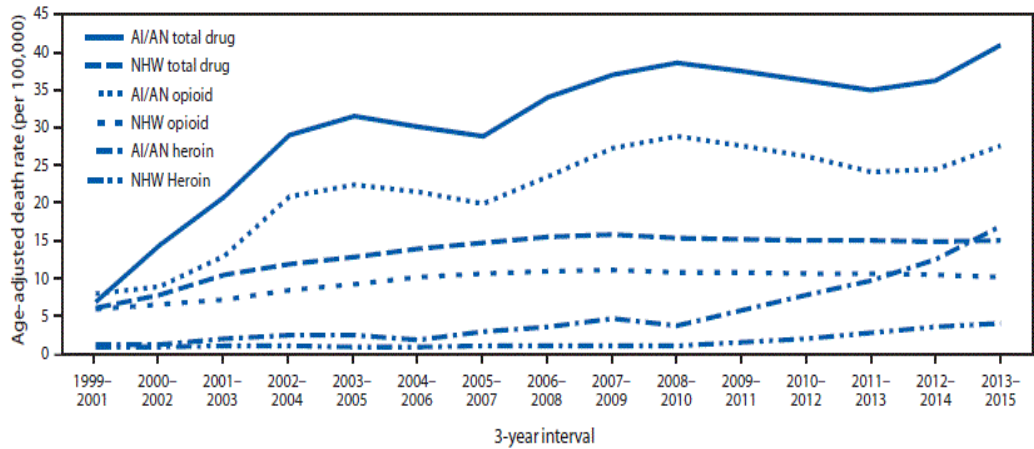


Figure 3. Age-adjusted death rates* for total drug,§ opioid-involved, and heroin-involved overdose deaths among American Indians/Alaska Natives and non-Hispanic whites — Washington, 1999–2015

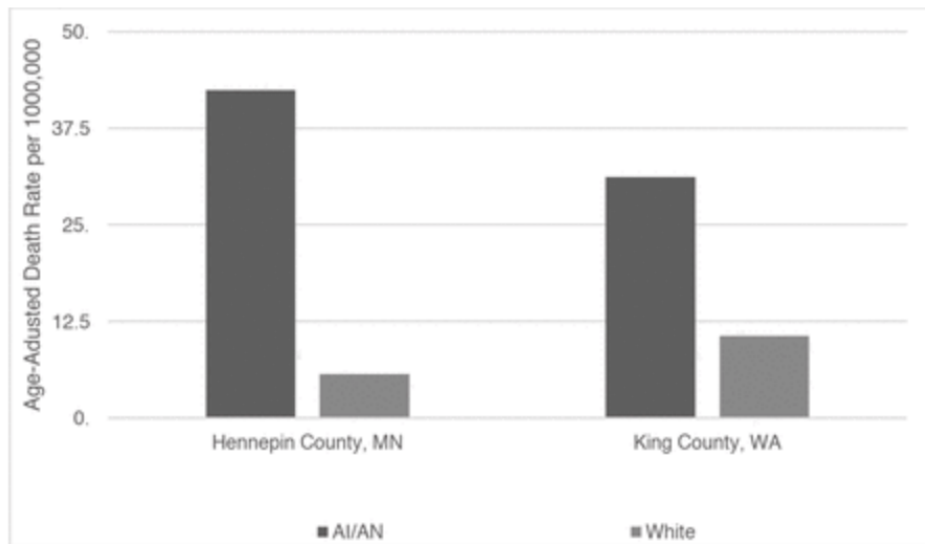


Figure 4. Opioid overdose mortality rates in the rural areas of Hennepin County, MN, and King County, WA.

The foundation of Native American traditional methods include, like was mentioned above, reconnecting the body to the mind and the spirit. In these communities there is what is

known as the Medicine Wheel, which depicts the four cardinal directions, north, east, south and west, further breaking up the person into mental, physical, emotional, and spiritual (figure 5) (McCormick, 2009). A person's health depends on the balance of these four elements (McCabe, 2008). Aside from being a visual depiction of this balance, the Medicine Wheel also refers to healing processes, ceremonies including sweats and sharing circles, and teachings. The most important part of traditional indigenous healing methods is narrative and storytelling, which can be found in other cultures as well. Elders and traditional healers often will provide insight and tell their own stories of healing to those who are suffering, and encourage them to regain trust in their internal dialogue "to become open to the processes of daily living, empathy, acceptance, genuineness, challenges to accept healing forces, role modeling, safety, willingness to explore inner and unknown experiences, ceremonies, teachings and belief in the power of the healing spirit," (McCabe, 2007). The self and the ego are minimized in this dialogue driven process, and therefore blocks are removed, and the inner self is once again unlocked. Additionally, in sharing these narratives with each other, a greater sense of community is built and connections amongst individuals is much stronger and allows for trust and interdependence to build.

The second building block of these traditional healing methods include sweat lodges. The doors of the sweat lodges usually have a symbol of the Medicine Wheel on them. A sweat is a group activity led by an elder according to their specific teachings. Sweats are meant to invoke enlightenment, clearer perceptions, deep emotions, visions, and paths towards growth or ways out of difficult situations (McCabe 2008).

Within a sweat, a person is meant to get more in touch with themselves and build confidence, by shutting out the outside world and other distracting sensory stimuli so that a person can connect with the flow of energy and spirit, pushing out anxieties or negative thoughts.

These methods are widespread throughout many indigenous groups and have maintained a cultural foundation against colonization and oppression.

Another prominent group in the United States that particularly struggles with substance abuse is Mexican folks and Mexican Americans. But in contrast, the cultural heritage and lineage that precedes modern peoples in this ethnic group is so vast and has been using culturally traditional healing methods for upwards of 400 years (Sorrel, 2020). Mexican Traditional Medicine (MTM) are classified as a whole health or medical system, meaning

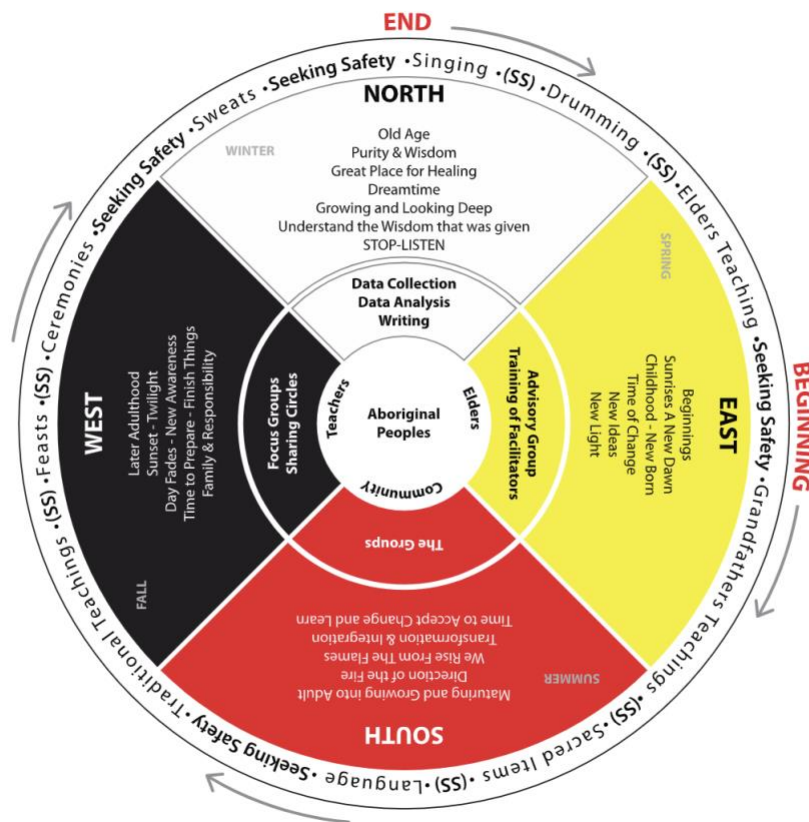


Figure 5. Native American Indigenous Medicine Circle. Denoted by four colors, the four cardinal directions, and symbolism associated with those identifiers. Adapted from an article, “Medicine Wheels: A Mystery in Stone,” written by J. Rod Vickers [86].Marshet al. Harm Reduction Journal (2015) 12:14 Page 7 of 12

includes many different aspects of care including nutrition, herbal products, physical movement activities, and spiritual and mental activities. Treatments are highly rooted in interpersonal

relationships and community building, and the current model for MTM includes a hierarchy of lay healers including *yerberos/as*, *sobador/as*, *parteras*, *abuelas*, and finally the highest ranking *curandero*, who deals with the entire aspect of a patient's illness, including rebuilding bonds with the patient's family and community.

At the lowest level, *abuelas*, which directly translates to grandmothers, usually act as a counselor and the first tier that someone may go to for common illnesses or issues within the household. They are most easily accessible and can act as a medical liaison to assist patients in getting the care they need and help break down the stigma as a trusted member of the community. *Yerberos/as* are members of the community who have an extensive knowledge around sacred herbs, plants, seeds, etc., that can be combined to create ailments for many different problems, ranging from gastrointestinal issues to cancer. *Sobador/as* are particularly known for their knowledge of the body and their ability to rejuvenate patients with their hands, focusing on massaging and pressure points. *Parteras* are specifically trained to help with birthing and any issues that arise with pregnancy. And finally, *curanderos* encompass a wide range of medicinal knowledge and are the highest-ranking members of the MTM system. *Curanderos* are also the link from the patient to the family and community, preserving and restoring balance once a patient seeks their help (Neff, 2002). Similar to Native American methods, *curanderos* will also utilize prayers, narratives and chants, and rituals.

One of the biggest assets that MTM brings to the table is reducing the stigma that surrounds OUD in the Mexican community. Similar to mental health, seeking help for substance abuse is often overlooked or can even be seen as a sign of weakness. MTM is similar to American Indian indigenous methods as it intends to address the imbalance one may find in their spirit, body, and related energies. An important aspect that is taken into consideration in the

MTM system is the Nonlinear Dynamical System (NDS) of Healing. Most importantly, NDS takes into account that healing for everyone is not always beginning in one spot and ending in another and will most likely follow many different paths over a long period of time. The goal with NDS within MTM is for the person to heal more holistically and improve the patient's quality of life in all aspects (Sorrell, 2020). By integrating MTM practices with Western methods, general participation in healthcare could possibly increase for Mexican people and Mexican Americans.

Holistic methods for drug addiction and abuse prove to be less effective than traditional methods such as medicines, inpatient care and therapy, but can provide a more encompassing approach than just these traditional methods alone. The importance of accompanying traditional or Western healing methods with holistic methods and patient centered care can mean all of the difference for someone recovering from a substance abuse disorder. My goal is to demonstrate how the combination of the two make a winning combination for people suffering from substance abuse.

OUD patients who receive a combination of Western traditional methods and culturally holistic methods will have lower stress levels, higher retention rates, and a more improved sense of identity and belonging than those who undergo Western traditional methods alone.

Purpose and Predictions

This study will address how adding holistic, cultural, and patient-centered methods can benefit opioid users by increasing their self-esteem, reintegrating them back into normal life and with their families, and generally addressing their issues with a more well-rounded approach. Since the opioid epidemic harms the lives of all groups of people, the study proposed below will

take into account different personal identifiers. These identifiers will be useful during the experiment when deciding how to culturally address the addiction with specific holistic methods.

What I intend to do in my experiment is incorporate methods from the American Indian practices and include them in MTM practices and vice versa, combining both with Western medicine. By combining two indigenous ways of knowing with two ethnic groups that particularly struggle with OUD, I am hoping to create an intersection that is the most helpful. Alternative hypotheses will address issues associated with the resistance to use practices from other cultures into healing rituals.

Through personalized interviewing, I believe that patients who receive the combination will have answers that address more aspects of their personal life and express reintegration into their families and outside world. Additionally, a chosen elder or member of their community could be assigned to monitor them in social and professional settings to comment on their progress as well, since they will have had to do with the holistic method applied. Questions on the survey will address self-esteem, family questions, and questions that address the meaning or importance of their new life.

The experiment will consist of two groups, one which will only be receiving MAT and the second which will be receiving both MAT and culturally holistic treatment methods. Each group will consist of 45 OUD patients each, for a total of 90 subjects. A total of six methods will be used to measure and compare the results between each group.

The first measure that will be used is a simple sobriety retention measure, in order to map how sober each group is throughout the experiment. This measure is significant because it highlights the success rate of the treatments. I predict that both groups will have a similar curve, yet group 2 might have higher retention rates due to a deeper commitment to the treatments.

The second measure that will be utilized is familial reintegration level, which will be measured using the Family Environmental Scale (FES). This measure will be one of the most important as it measures many aspects of a family lifestyle and how the patient will adapt over time. Additionally, patients in both groups will be given writing prompts to record their development over the experimental period. It is important to stimulate a patient's introspective and reflective abilities in such a transformative process such as getting clean. These two tests will really measure if the person has had a significant change in lifestyle.

Biologically, through a blood sample I also predict that patients who receive all of the treatment methods will show the most decreased levels of cortisol. A stress response in opioid users is very common, especially during withdrawals or at the beginning of their journey towards ending addiction. Those who are only receiving medicinal and Western methods will also see a decrease in cortisol, but not at the same levels. Additionally, a weekly swab will be implemented to test for the drug, and finally neuroimaging methods of fMRI and EEG will be used to test the brain activity in the patients as well. Brain studies are particularly useful because they measure different patterns of activities of patients that may illicit these changed behaviors. Neuroimaging is one of the most important measures in this study.

My ultimate goal is to demonstrate that supplementing western methods with culturally specific holistic methods will fill in the gaps where patients are missing a community aspect and individual, personal development. I predict that the group who receives a combination of traditional medicinal applications of healing, holistic methods, and patient centered care combined will see the most prominent improvement in health and beginning of remission. As of now, there is no experiment that has analyzed the combined effects of medically assisted

treatments and holistic methods, therefore this novel proposal would be extremely useful to the development of treatment for OUD.

Materials, Methods, Proposal

This study will be approved by the Institutional Review Board at Claremont McKenna College in accordance with the currently applicable U.S. Public Health Service guidelines. All participants will provide written informed consent for all research testing.

My intention for this experimental protocol is to fill in the gaps where other studies have not yet ventured. While no study yet has studied combined effects of holistic and western treatment methods, there have been a few literature reviews and meetings about how Native American folks particularly would like to see medical assisted treatment (MAT) integrated with their community holistic methods (Venner, et. al., 2018). Ambitiously, I would also hope to try and integrate Mexican Traditional Methods within the framework of American Native groups and vice versa as well, doing my best to parallel the members of the community.

Survival curves will be utilized in this study as well as a system of checkpoints filled in by the patients' mentors and community members, in addition to cortisol testing and swabs in order to see if opioids are still present in the patient, from beginning to end of the study. The community involvement and activities will be measured by a graded checklist, in addition to 3 interviews with the same questions at the beginning of the study, halfway through treatment, and at the end of treatment.

Subjects and Recruitment

To best demonstrate, this experiment will consist of 90 OUD patients of Mexican heritage or of Native American/Indigenous heritage. 45 patients will receive Western medicines and PCC only (group 1), and 45 will receive western medicines in addition to the combination of cultural and holistic methods (group 2). Measurements for gender, age, race, and ethnicity will obviously be utilized. It will also be important to record if any of the OUD patients have mental health comorbidities.

To recruit these patients, I will travel to areas in the country with the highest density of both populations and approach patients with a new model of treatment that will take their community upbringings into account, and provide a full informational that would show the benefits of medicinal assisted treatment and holistic methods as well. The draw would hopefully come from that communal aspect. Patients might be able to be found in addiction clinics or from lists of current patients that have suffered from OUD. The patients can range from all age groups and gender identities.

In order to protect the identity of the patients, each will be assigned a patient number via code to which the key will be secured in an external location.

Initial Measurements

Initial measurements for each patient will begin with gender, age, race, ethnicity, socio-economic status (income levels), severity and type of opioid use, and age of first use of opioids. Further biological measurements will include a blood test for initial measurements of cortisol, weight, and height, as weight will also be tracked throughout the study. Typical symptoms of

OUD will also be screened for, which includes searching for track marks on the inner arm, pinpoint pupils, drowsiness, and slurred speech. These symptoms indicate opioid intoxication.

Patients will also undergo emotional and psychiatric testing by medically licensed nurses, therapists, and psychologists, for an initial measure on their mental health and emotional and spiritual state. Another label for this method is Patient-Centered Care. This routine will be conducted for subjects under both categories, since therapy and psychology are emblematic of western treatment methods.

Patients who are in the category of receiving western traditional methods and culturally holistic methods will undergo an examination by a trusted leader of their communities; for Native American and Alaska Native patients, a spiritual elder will conduct the test guided by the medicine circle. For Mexican and Mexican American participants, a *curandero* along with their primary *abuela* will conduct the examination.

Table 1. Sample biological checklist for each patient

	Gender	Age	Race	Ethnicity	SES/Income	Initial Cortisol (mcg/dL); time of day	Height (inches)	Weight (lbs)
Patient A	<i>F</i>	<i>18</i>	<i>Black</i>	<i>Native American</i>	<i>40,000</i>	<i>15; 7am</i>	<i>68</i>	<i>140</i>
Patient X	<i>M</i>	<i>25</i>	<i>White</i>	<i>Mexican American</i>	<i>23,000</i>	<i>7; 7am</i>	<i>67</i>	<i>152</i>
Patient Y	<i>F</i>	<i>50</i>	<i>Brown</i>	<i>Mexican</i>	<i>30,000</i>	<i>12; 7am</i>	<i>62</i>	<i>125</i>
Patient Z	<i>Non-Binary (NB)</i>	<i>34</i>	<i>Brown</i>	<i>Mixed (White and Native American)</i>	<i>60,000</i>	<i>3; 4pm</i>	<i>70</i>	<i>170</i>

Table 2. Sample opioid use checklist and severity levels

	Intoxication Upon Arrival Yes/No	Age of First Use	Type of Opioid(s)	Severity (1-10)
Patient A	Y	14	Heroin, Fentanyl	8
Patient X	N	19	Prescription	4
Patient Y	Y	21	Prescription	6
Patient Z	Y	30	Heroin	7

Patient Centered Care Tables

Modeled off of a study done in 2019 by Marchand, et.al. Adjustments were made as this was based on a smoking study.

Table 3. Directed content analysis of the defining characteristics of holistic care (holistic within a Westernized approach in a hospital setting)

Defining Characteristics	Representative example from healthcare worker
<i>Integrated delivery of physical health, mental health or psychosocial supports within addiction treatment setting</i>	“Other interventions designed to improve the potential for a successful outcome included educational sessions about the harmful effects of [opioids] and the benefits of stopping, stress management, the value of developing a support network, improving nutrition and avoiding significant weight gain after stopping [using], the importance of a safe and regular exercise program, and understanding the potential role of spirituality.”
<i>Coordination of health or psychosocial services as part of addiction treatment</i>	“If a woman was involved with many service providers, the ICF [Integrated Care Facilitator], with the woman’s permission, would maintain contact with those providers to ensure that all providers understood her needs in a similar way and that services were coordinated.”
<i>Adapting a gender-responsive approach to the delivery of health, substance use, and psychosocial treatment</i>	“It allows clinicians to treat addiction as the primary problem while also addressing the complexity of issues that women bring to treatment: genetic predispositions, health consequences, shame, isolation, histories of abuse, or a combination of these.”
<i>Integrated delivery of addiction treatment as part of a primary care or hospital setting for other health or psychosocial needs</i>	“[MAT; Medical Assisted Therapy] was available to participants at no cost during hospitalization. A variety of group meetings were held according to a preset time schedule which was announced at the unit. The degree to which patients participated in the meetings differed depending on the length of their hospital stay.

Table 4. Directed content analysis of the defining characteristics of shared decision-making

Defining Characteristics	Representative example from healthcare worker
<i>Client and provider dialogue to reach a mutual decision</i>	“The form of MAT selected is a joint decision made by the client and advisor and is based on the client’s individual [opioid] habits and feelings as well as any contraindications.”
<i>Autonomous decision-making</i>	“Participants appreciated the practitioners’ active listening skills. For example, one client noted that her request to not use tablets or patches for smoking cessation was recognized by the practitioners as the topic was not broached again in consultations.”

Table 5. Directed content analysis of the defining characteristics of therapeutic alliance

Defining Characteristics	Representative example from healthcare worker
<i>Non-judgmental, respectful and accepting</i>	“A major theme discussed by patients was the importance of building supportive relationships. Patients expressed a desire to work with staff who possessed qualities such as empathy, understanding, trust, respect and expertise and described feeling accepted in these relationships. Patients who perceived staff to be nonjudgmental in their approach described that this reduced their feelings of shame.”
<i>Empathy, understanding, warmth, kindness, supportive</i>	“The nurse engages in caring relationships with patients with the purpose of helping them to handle a complex and intricate health problem in a dignified manner, acknowledging the therapeutic effects of feeling being understood as a patient.”

Table 6. Directed content analysis of the defining characteristics of culturally safe care

Defining Characteristics	Representative example from healthcare worker
Adapting care plans to meet culture-specific preferences	“Akeela House developed a model that incorporated traditional Alaska Native cultural lifestyles into the therapeutic community treatment approach. This was termed a “Spirit Camp Model” and consisted off our major elements: (1) spirit groups, (2) cultural awareness activities, (3) urban orientation, and (4) individual counseling. To implement these components, additional Alaska Native counselors were hired.”
Inquiring about health and healing practices of the client	“The nurse engages with Charlie to prioritize his needs. He/she discusses his living situation and how he sees the future. The nurse does an assessment in keeping with the principles of cultural safety and cultural competence—he/she begins by asking Charlie if there is anything that he/she should know about him (e.g. beliefs about health and healing practices) to assist with his treatment plan and before making referrals etc.”
Reflecting on personal beliefs, assumptions and biases	“The concept of cultural safety takes critical inquiry a step further by requiring nurses to reflect on issues of racialization, institutionalized discrimination, culturalism, and health and health-care inequities.”

To further clarify, patients who are receiving the Western methods of treatment will undergo MAT, meaning they would be administered a drug of their choosing between methadone, buprenorphine-naloxone, and naltrexone, and simultaneously receive PCC from their doctors, nurses, therapists, and psychologists, outlined in tables 3-6.

Experiment

Hopefully, after approval from the IRB for all of the neuroimaging, blood and saliva tests, and questionnaires, the experiment will last 6 months, as this is the time period that OUD patients mostly undergo MAT (Biondi, et.al. 2020). This time frame would allow patients to undergo a full transformation whether they are receiving culturally holistic methods or not.

When patients arrive to the testing facilities, they will be routinely swabbed for opioid presence. Patients will receive treatments once a week. After this, they will receive their chosen agonist or antagonist medication, be checked upon by a healthcare professional who follows PCC guidelines; these conversations will have notes taken upon them by the healthcare professionals, like in tables 3-6.

If the patient is in Group 2, they will be accompanied by their chosen sponsor or mentor from their cultural affiliation. This sponsor will have a journal where they take notes, monitor the patients' emotions and mental headspace, and track their spiritual progress. In addition, group 2 patients will have a secondary session per week where they embark on a healing practice with their mentor, community, or family.

In these weekly or twice per week sessions, patients will have their cortisol levels measured via a urinary sample taken in the morning. Once a month, a therapist will check in with them and track their progress as well. Additionally, both groups of patients will have a journal

where they respond to the same prompts, and answers will between groups will be compared at the end.

The records kept by the psychiatrists, therapists, and healthcare providers will be scanned into an electronic system and the paper files will be stored under the patient's numerical code file in the external location. Our team would have access to the scanned files in addition to the healthcare providers, to manage progress and data entry.

Traditional Western Methods; Medical Assisted Treatment (MAT) and PCC

Patient Centered Care

All patients in group 1 will be treated by specialists who understand PCC and adopt the methods of holistic care, shared decision making, therapeutic alliance, and culturally safe care. These practitioners will take note of the conversations they have with patients, focused on trust level, efficacy, and perceived mental and emotional progress based on the patients' answers. Additionally, patients in Group 1 will have a sponsor who will be taking notes on their progress and ranking the patients' headway. This progress form will be identical to the mentors' progress forms in Group 2.

Buprenorphine

Administers of buprenorphine will need to undergo buprenorphine waiver training and obtain a waiver. This drug can be prescribed in tablet, film, buccal film, implants, or injection form. Buprenorphine works as an opioid partial agonist and can cause euphoria or respiratory depression. Overall, buprenorphine diminishes the physical dependency to opioids, such as withdrawal symptoms or cravings (SAMHSA, 2020). In order for a patient to be treated with

buprenorphine, they must abstain from taking opioids 12-24 hours prior to receiving the treatment. Once the patient substantially reduces opioid use, the dosage may be decreased.

Metadone

For this medication, administrators will need to undergo a SAMHSA (Substance Abuse and Mental Health Services Administration) certified treatment program where they will become certified in the Opioid Treatment Program (OTP). Methadone, in contrast to buprenorphine, is a long-lasting opioid agonist, which reduces craving and blocks the effects of opioid usage. This treatment is taken daily and comes in forms of liquid, powder, and diskette form. (SAMHSA, 2020).

Naltrexone

Also known as intramuscular extended release naltrexone, this medication can be prescribed and administered by anyone who is legally able to give medicine. For treating OUD, this medicine is only available in injectable form, which is injected once a month. Naltrexone works to block the euphoric and sedative symptoms that come with ingesting opioids by binding to and blocking opioid receptors in the brain. Patients who elect this option must wait 7 days after using a short-lasting opioid or 10 to 14 days after a long-lasting opioid before accepting the medicine (SAMHSA, 2020).

MAT Plus Culturally Holistic Methods

In addition to receiving their elected medicine, patients in Group 2 will undergo a cultural healing process which has integrated methods from American Indigenous practices and Mexican

Traditional Healing methods. As mentioned above, each patient in Group 2 will have a mentor who is tracking their healing process and additionally guiding them to cultural healing activities that will be a part of the process. Additionally, Group 2 will fill out the progress form which is identical to Group 1's progress form.

The experiment is lasting 6 months which allows for about 2 cultural healing sessions per month, or biweekly, adding up to 12 sessions total. Luckily, there are some intersections between Native American and Mexican cultures, so the crossover should not be too difficult.

Group 2 Holistic Healing Schedule

Activities adapted from a literature review done by Rowan, et.al. in 2014.

Session 1: Goal Setting

Participants will meet with their mentor, which will be the equivalent of an *abuela* or trusted community mentor, and their families to go over and create goals for the patient and their healing process.

Session 2: Foundations of Cultural Healing

Participants will be introduced to the Medicine Wheel by a Native American elder and explained its healing and cultural significance. A *yerbero* will also be present to put forth the importance of being connected to the earth and going through various types of plants that can ease muscle pain and anxiety. These two members together will explain the importance of aligning the body, mind, spirit, and energies.

Session 3: Land Base Activities

Participants will travel to a sacred location where the healing properties of the land have been conferred by community members. Here they will walk in solitude, walk together with

their mentors, and have a Medicine Wheel to reference healing directions while they walk. In addition, participants will have a chance to help build a garden for the community.

Session 4: Storytelling and Narrative

Now that participants understand the general flow of meetings, they will participate in a story telling session with other participants from Group 2, their mentors, and lead community members. Storytelling and narrative are prominent in both cultures and is usually led by the elders who have had stories passed down through their lifetimes.

Session 5: Talking Circle

This talking circle will have been primed by the previous session and will allow participants to share their progress with their peers and have a general discussion about health and energy flow with their mentors.

Session 6 & Midpoint Evaluation: Sweat Lodge and Temazcal

This session is the culmination of the first half of the holistic treatment. In Native American cultures there are sweats which take place in a sweat lodge, and in Mexican culture, with a slight variation of preparation, there is a *temazcal*. These sweats are seen as medicinal and emotional treatments. The sweat will be followed by a midpoint check in with the mentors.

Session 7: Art Creation

Participants will be able to engage in beadmaking, rug weaving, and basket weaving. Beadmaking is popular in both Mexican and Native American cultures, while rug weaving is very prominent in Mexican cultures, and basket weaving in Native American cultures (citations needed). The opportunity to learn from artists and to engage in this form of therapy will be very renewing for the participants

Session 8: Cultural Instruments; Drums and Trumpets

Drums and trumpets are iconic instruments to the Native American community and Mexican community, respectively, and this will be a really immersive and hands-on learning experience for the participants.

Session 9: Land Base Activities: Swimming/Cleansing

Swimming in a spring-fed pond will reenergize the participants and provide a moment to be pensive, introspective, and reevaluate their position within nature and the earth. Water is understood to have healing and cleansing properties, explained to the participants by the *yerberos* and elders.

Session 10: Storytelling and Narrative II

At this point in the trial, it is expected that members of Group 2 will have a lot to share, and hopefully many stories to tell. The stories at this point will be more personal, deep, and metaphorical, led once again by the mentors and community members.

Session 11: Sweat Lodge and Temazcal II

Nearing an end, the participants will engage in their penultimate activity, which will be another sweat session for a final cleansing. In this session, chants and grunting will be led by the sweat organizer which is meant to be a cathartic release.

Session 12 & Final Evaluation: Welcome Home Celebration

Finally, all members of Group 2 will cook a traditional dish with their families to bring to the Welcome Home celebration, which is meant to celebrate how far each of them has come in their healing process. Traditional music and dances will be performed by both cultural groups, and all members engaged in the trial will be invited. Additionally, the final evaluation will be handed in by each participant's mentor.

Writing Prompts for Group 1 and Group 2

In order to compare the personal journeys of the patients in both groups and compare their answers, they will both respond to a total of six writing prompts, one for each month of the treatment that they're in.

1. *What is your biggest motivation right now to get sober and stay sober? List three of your top reasons.*
2. *What are some concerns that you hope healthcare workers and others involved in your care should know about? What do you feel is necessary to address in order to receive the best care?*
3. *Has your whole personhood been addressed during your treatment, or do you feel as if you are another statistic on a page?*
4. *Do you feel connected to your identity, energy, mind, and spirit? Do you feel any misalignments or alignments, or are you having any realizations? Have you regained a sense of self?*
5. *What has helped you most so far in overcoming the obstacles that came with your disorder? What are some challenges you still face now?*
6. *How would you compare your connection with yourself, your family, friends, and with your immediate community before and after your treatment? What are some of the biggest differences between then and now?*

Expected Results

Sobriety Retention

The first variable measured was the survivor rate for participants who are not using opioids anymore. This test was done using swabs every week.

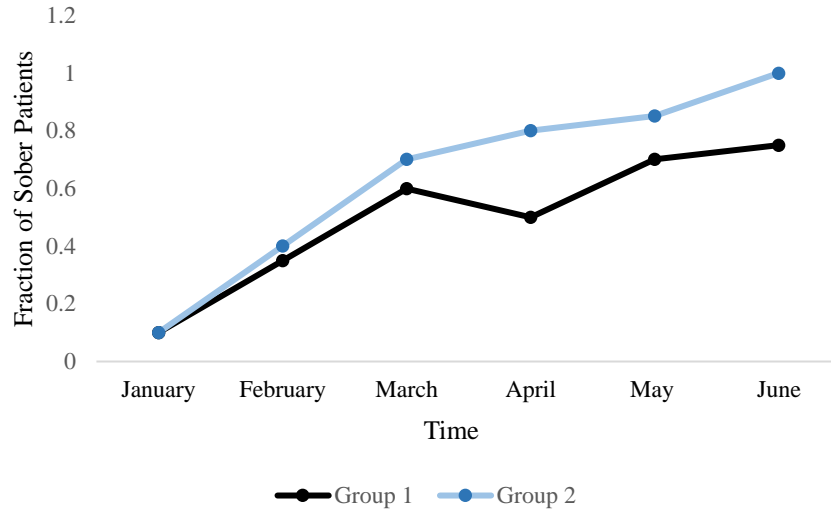


Figure 6. Sobriety retention between treatment groups.

Familial Re-Integration

Using the Family Environment Scale (FES), form R (which measures the current family environment), the 90-item scale presented us with results for Group 1 and Group 2 before and after their treatments. The control group is represented by normative data.

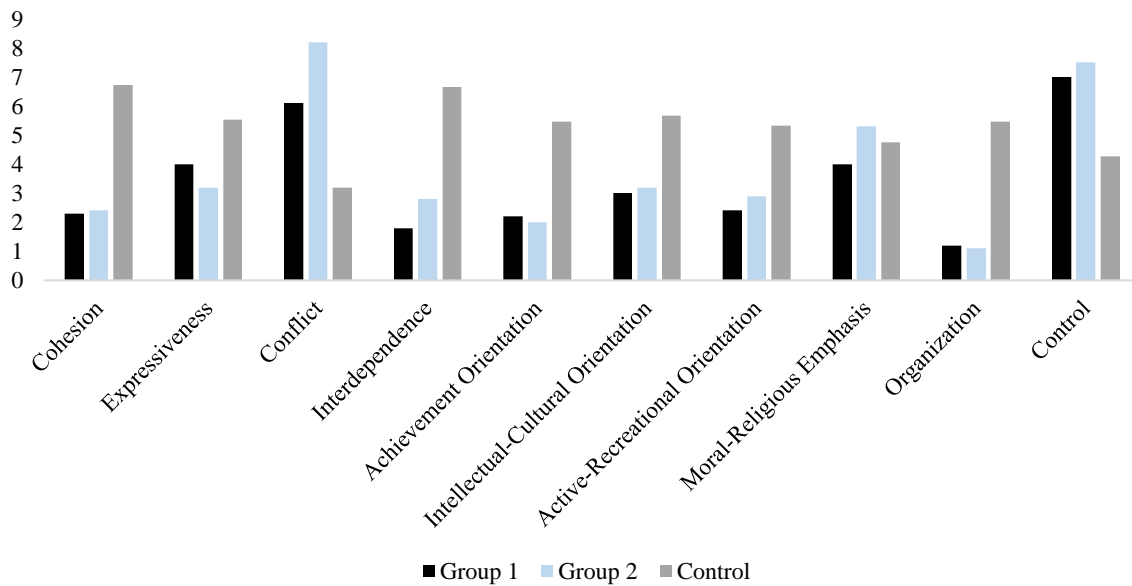


Figure 7. Mean values on Family Environmental Scale's subscales in families with a member with OUD and control prior to treatment.

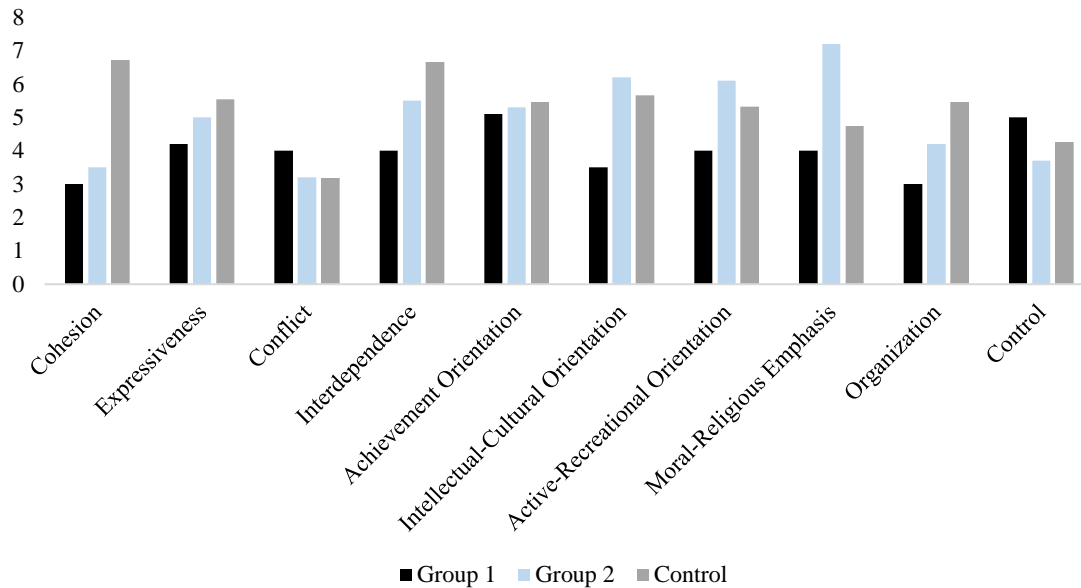


Figure 8. Mean values on Family Environmental Scale's subscales in families with a member with OUD and control following treatment.

Significant Change in Lifestyle

This section will be dictated by the progress reports that will be turned in by Group 1's sponsors and Group 2's mentors. These will be filled out thrice, once at the beginning, halfway point, and end of treatment. The mentors will have to rank their patients' advancements and fallbacks on a scale of 1-10, 1 being the lowest and 10 being the highest.

Table 7. Sample progress report for mentors.

Patient Edward Gonzales, Group 2. Midpoint Evaluation.	
PROMPT	RANKING (1-10)
<i>1. The patient is enthusiastic about participating with their correspondents.</i>	6.5
<i>2. The patient has a good attitude or is cooperative when receiving treatments.</i>	5
<i>3. When engaging in conversation, the patient is introspective about their healing journey.</i>	3
<i>4. The patient has reduced their obsession with opioids; they rarely talk about them.</i>	8

5. The patient shows care for their loved ones, alleviates guilt or shows remorse.	6.5
6. The patient has expressed interest in physical activity, hobbies, or art activities.	7.5
7. The patient is building a strong relationship with you (their sponsor or mentor).	9
8. The patient is interested in their treatment and is curious about medical jargon, how their treatment works, etc.	4
9. The patient shows their appreciation to everyone involved in their treatment.	9
10. The patient has regained their sense of belonging and self.	5

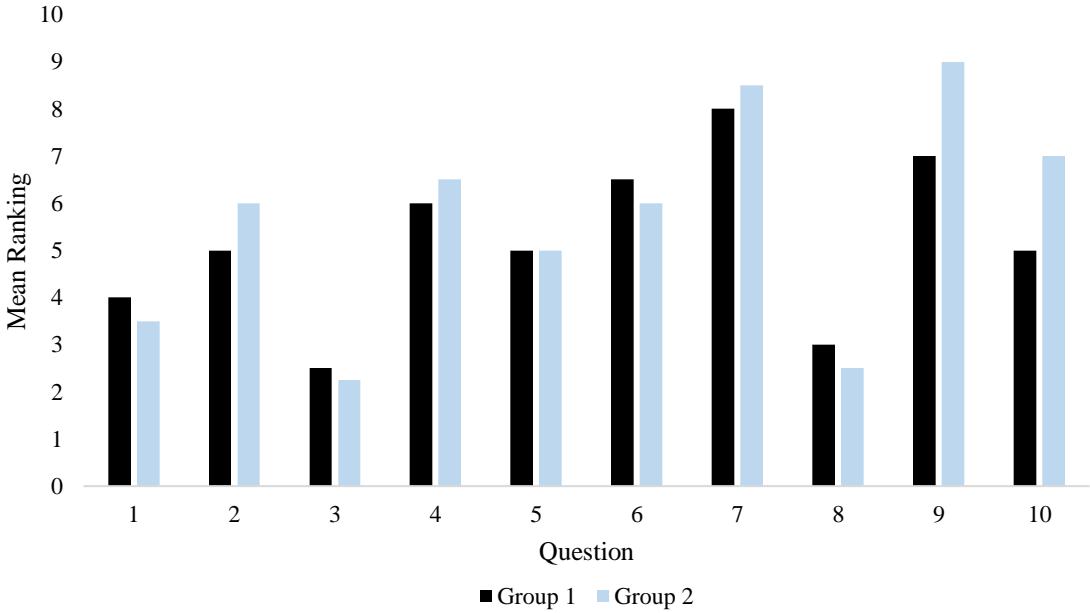


Figure 9. Mean rankings of participants (n=45) for each question in the progress report for Group 1 and Group 2 at the midpoint of treatment.

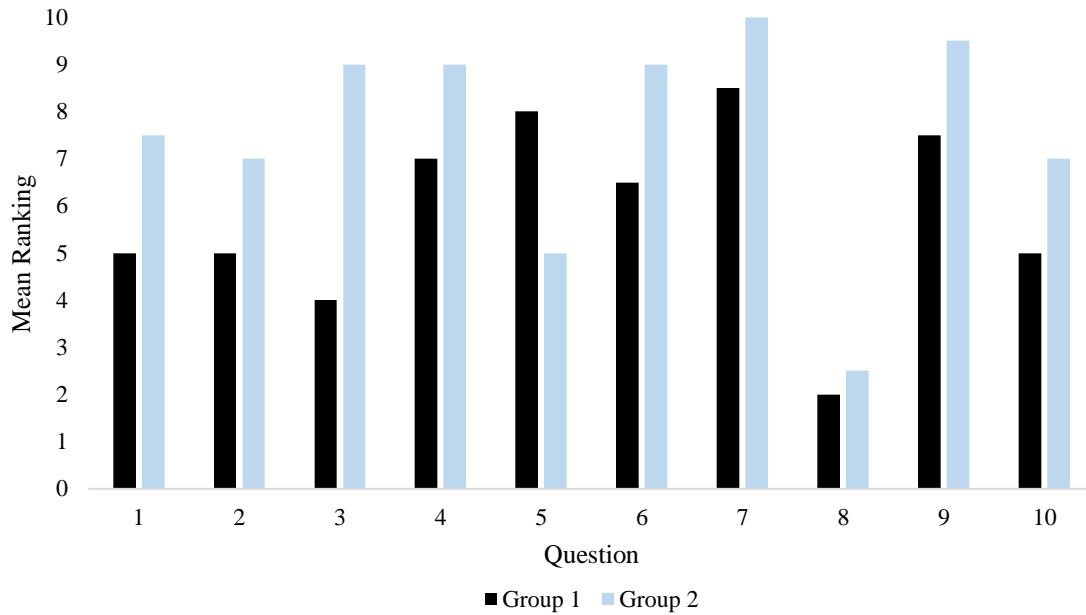


Figure 9. Mean rankings of participants (n=45) for each question in the progress report for Group 1 and Group 2 at the end of treatment.

Writing Prompt Comparisons

The writings were scrutinized by mentors and sponsors alike. Testimonials will be recorded from the participants in each group. Answers will be compared between the groups to determine different levels of self-reflection, realization, and personal development.

Cortisol Levels

Cortisol is an important factor to measure as it has many functions in the body, including regulating our metabolism, controlling blood sugar levels, reducing inflammation, and assisting with memory formulation (Hormone Health Network, 2018). Cortisol is known as the “stress hormone” and is actually a steroid hormone that is made in the adrenal glands. Cortisol receptors are found in a majority of the cells of the body. The HPA axis, which is a combination of the

hypothalamus, pituitary glands, and adrenal glands, controls the secretion of cortisol in the body (Hormone Health Network, 2018).

An adverse effect of using opioids is that it may cause opioid-induced adrenal insufficiency (OIAI), or exert tonic inhibition (Donegan, 2018), which is essentially the suppression of the HPA axis. Approximately 9%-29% of OUD patients encounter OIAI, and most of those in this category are long time opiate users (Tucker, 2019). Therefore, in this section of the results we should be expecting lower levels than the control, which is a healthy patient. Upon cessation of using opioids, though, there is a spike or elevated response (Kakko, et.al. 2019), which is predicted in the second urine sample. The patient will urinate into a container biweekly between 6 and 8am, when cortisol levels are the highest. The normal cortisol range in people 18 and older ranges between 3.5 mcg/24hrs and 45 mcg/24hrs (Mayo Clinic, 2020).

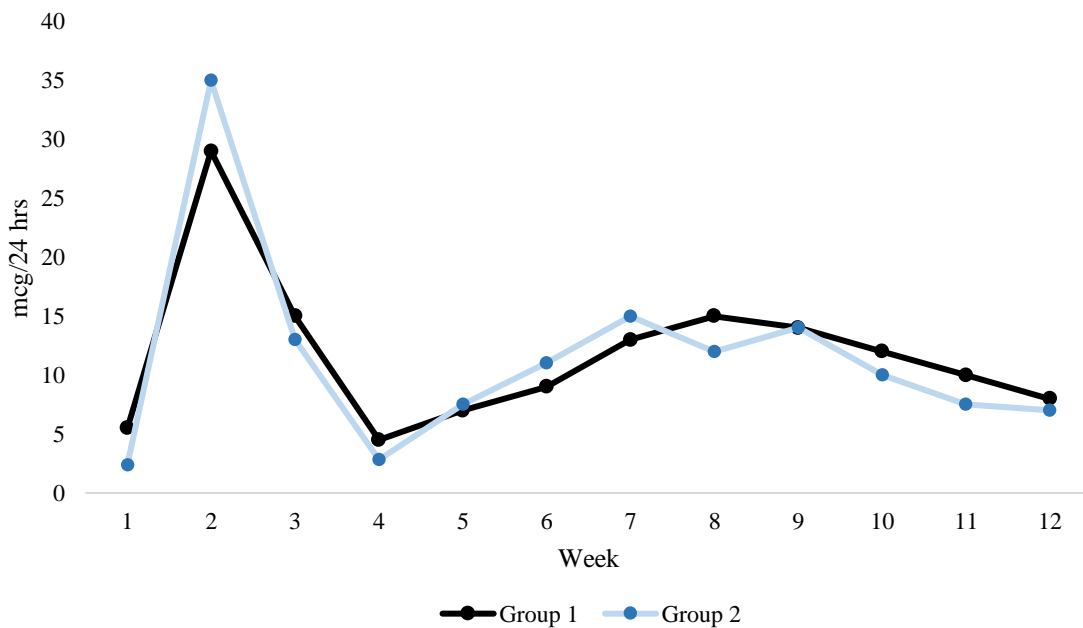


Figure 10. Mean urinary cortisol levels (mcg/24hrs) taken biweekly over the course of treatment.

Neuroimaging: fMRI and EEG

This section will be modeled based on a study done in 2019 by Stewart, et.al. (2019). Their model was conducted within the *Three Stage Model of Addiction* (Koob, 2016), in which the three stages are (1) Binge/Intoxication (2) Negative Reinforcement and (3) Anticipation/Preoccupation. The three stages are linked to abnormal patterns in the brain regions that regard reward processing in the ventral striatum (VS), cognitive control within the frontocingulate regions including inferior frontal gyrus (IFG) and anterior cingulate cortex (ACC), aversive emotional states in the amygdala (AMG) and interoception or the awareness of the internal body state in the insula (INS) (Stewart, et.al. 2019).

Beginning with fMRI testing, a resting state fMRI to be specific, it was found that patients with OUD have a weak frontocingulate functional activity with subcortical regions, but a strong functional connectivity *within* subcortical regions such as in the striatum and the AMG. In line with stage 3, or the Anticipation/Preoccupation stage, data from multiple fMRI studies concluded that patients with OUD also experience weakened INS connectivity to IFG, striatum, and AMG (figure 11). For my study, I would expect to see these lower connectivity levels in the beginning of the treatment, and heightened connectivity throughout and towards the end of the experiment.

An EEG, on the other hand, is a continuous recording of ongoing brain electrical activity. Measurements of voltages in an EEG are usually separated into specific frequency bands that are associated with different mental processes. One band that will be focused on is the beta band, and the most consistent finding is that patients with OUD exhibit greater beta power than healthy individuals (figure 12). These increases could be related to a decreased need for future motor actions, classifying opioid users as having reduced behavioral activation (Stewart, et.al. 2019).

Therefore, this study would predict that patients in Group 2 would have a stronger INS connectivity at the end of the treatment, and less prominent beta band power and increased need for future motor actions. Neuroimaging is extremely significant for understanding OUD patients as it distinctly maps out specifically where in the brain different neuronal patterns can be found and how they differ from normal patterns.

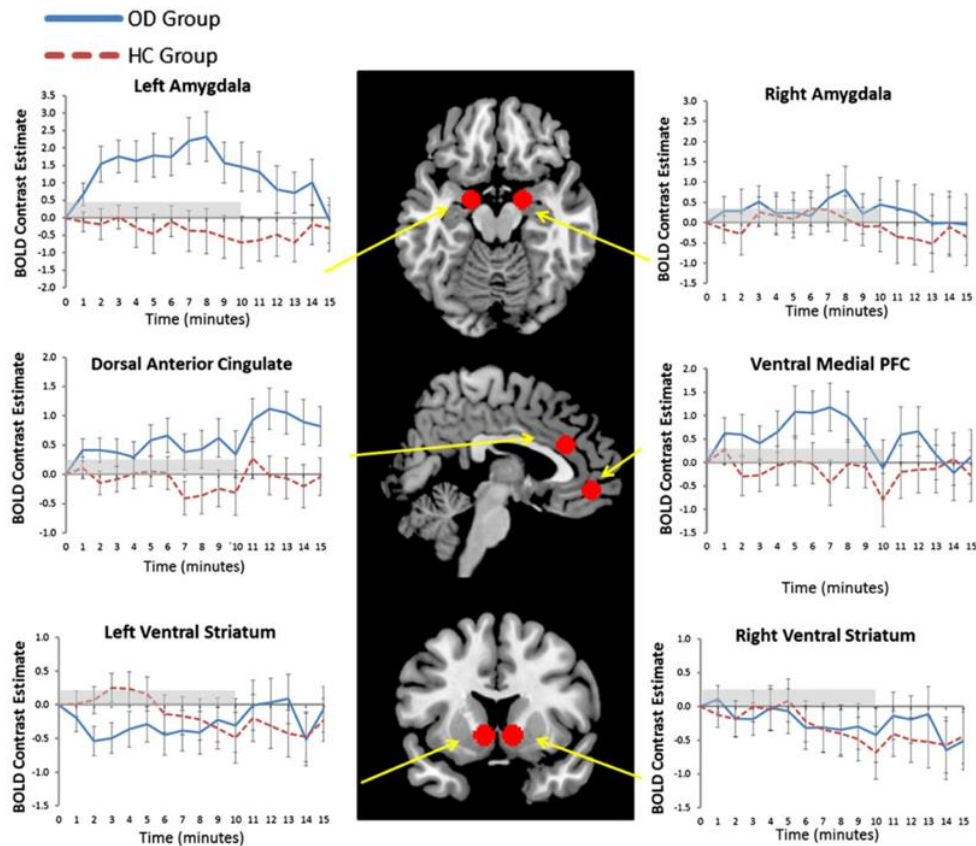


Figure 11. Regions of interest and blood-oxygen-level-dependent (BOLD) results from an fMRI. Based on a task-based fMRI with drug cues shown.

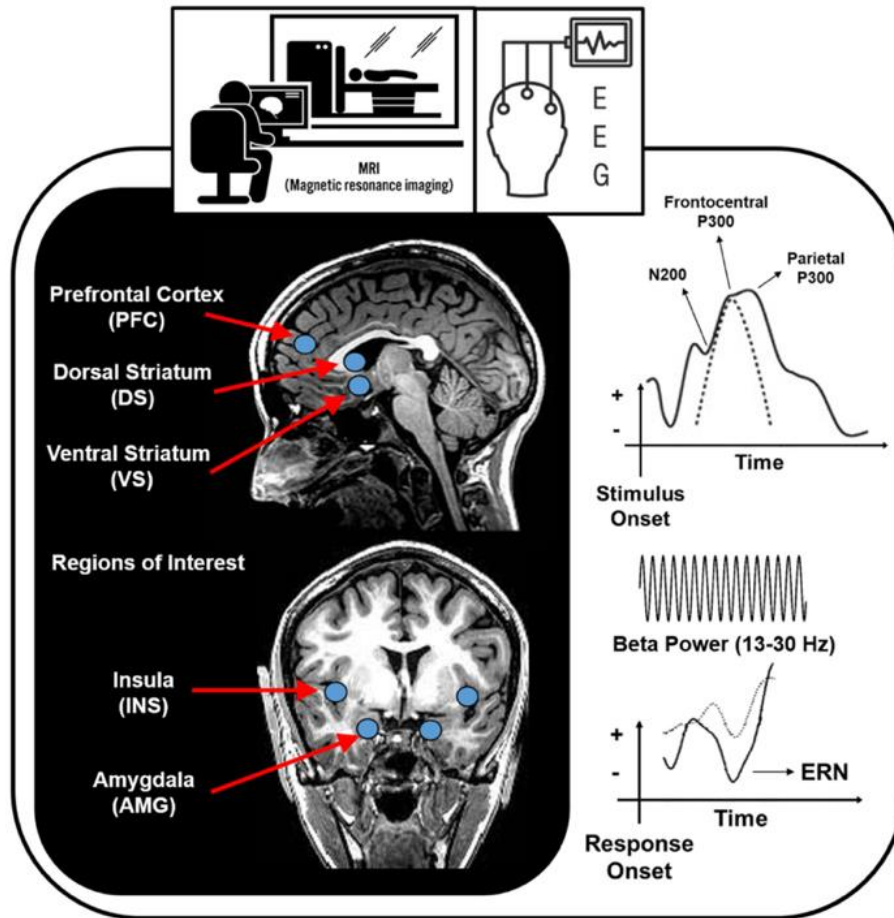


Figure 12. Brain regions and processes that potentially map onto Negative Reinforcement and Anticipation/Preoccupation stages of the Three-Stage Model of Addiction. EEG, electroencephalography; ERN, error related negativity.

Table 8. Key psychological and neurobiological processes reflected in the *Three-Stage Model of Addiction*. *Frontiers in Psychiatry*, 2019.

Binge/Intoxication	Negative Reinforcement	Anticipation/Preoccupation
<ul style="list-style-type: none"> ↑ Ventral striatum dopamine release ↑ Glutamine and dopamine changes in striatal connections between the prefrontal cortex, basal ganglia, and amygdala 	<ul style="list-style-type: none"> ↑ Hypothalamic-pituitary-adrenal axis stress ↑ corticotropin releasing factor in amygdala ↓ Striatal dopamine, serotonin, and opioid responding ↓ Natural rewards <u>fMRI results</u> ↑AMG-VS connectivity 	<ul style="list-style-type: none"> ↑ Basal ganglia driving drug craving and urges ↓ Prefrontal cortex inhibiting distractors ↑ Incentive salience linked to ↑insula and ↑glutamate prefrontal-ventral striatum signals <u>fMRI results</u>

	↑AMG to negative stimuli and drug cues within context of recent drug use and withdrawal ↓ AMG to negative stimuli ↓AMG, DS, and VS to drug cues with naltrexone <u>EEG</u> ↑ beta power and hyper connectivity	↑ VS to drug cues predicts relapse ↓PFC to natural rewards
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Discussion

As the opioid crisis continues to be a huge overarching problem for so many people in the United States, this study is hoping to not only contribute to the current studies of medical assisted treatment and patient-centered care, but to fill the gap in the literature which leaves out the possibilities of incorporating culturally holistic care as well. Opioid addiction gravely impacts peoples’ lives not only biologically, but also socially and personally with regards to losing a sense of self or a sense of belonging. For this reason, turning to ancient healing practices that center around indigenous knowledge and methods relating to the earth’s energy, general spirituality, and connections to nature and the greater cultural community. While MAT has been proven to be a strong method to help OUD patients recover from their addiction, adding these holistic methods will allow the patient to heal in ways that western medicine is unable to reach. Therefore, in combining these two methods, the pairing will create an unbeatable treatment for patients with OUD.

In order to study the gap that lies between MAT and holistic methods, a number of qualitative and quantitative methods will be used pertaining to a patients biological functioning in addition to emotional and personal development. The main models that will be used to study these additional healing factors are sobriety retention using survival curves, familial re-

integration using the Family Environment Scale (FES), a significant change in lifestyle evaluation filled out by the patients' mentors and sponsors, journal entry comparisons, urinary cortisol levels, and finally, neuroimaging. In the case that this study will be approved by the IRB, it would be very encompassing given that there are so many measurements used, which only strengthens the case that conducting a study like this would greatly benefit all communities with cultural roots and heritages.

The most important results in this study will include the progress made by both groups in according to the FES scale and the results found by the fMRI and the EEG. These robust methods of testing how families will integrate following treatment and the rigorous use of neuroimaging will provide promising results that Group 2's treatment presides over the current and only method of MAT. At the end of treatment, the results from the FES will show that Group 2's mean scores improved exponentially from the beginning of the trial, and most specifically much higher than Group 1's progression in the Conflict, Intellectual-Cultural Orientation, and Moral-Religious orientation groups. Mean scores all rose in these groups which is no doubt attributed to the culturally holistic methods that were conducted in order to stimulate interest in personal development with regards to energy and spirituality, tighter affiliation and connection to their home culture, and essentially reducing conflict between themselves and their family and immediate community (figure 8). These results are consistent with the literature that supports an integration of indigenous ways of knowing and MAT. In a study done by Venner, et.al. (2018), as they discuss how members of the Native American community laugh at the thought of only using MAT to treat their community. Additionally, the neuroimaging will show prominent results throughout the different stages of addiction. As discussed in the introduction, when someone is intoxicated their dopamine and glutamine levels spike, this causes for the

reconfiguring of the striatal connections between the prefrontal cortex, basal ganglia, and amygdala. Additionally, in the second phase of Negative Reinforcement, we can see from the fMRI that connectivity between the amygdala and the ventral striatum is increased (table 8), representing the increased activity in reward pathways due to intoxication. The most significant result will be the increased beta band power and hyper connectivity found in the EEG (figure 12).

Other results, while encouraging, are less rigorous but supplementary to the predictions made about the study. The sobriety retention survival curve is measuring the fraction of patients in each group that remained sober throughout the entirety of the experiment. As predicted, Group 2 will have consistently higher ratios of patients who remained sober throughout the 6 months, and by June, or the last month of treatment, 100% of OUD patients were sober (figure 6). As for comparisons of the journal entries, I predict that patients will their personal growth journey in the latter half of their journal entries, as shown by writings being very introspective and reflecting on regrets, but most importantly having sights set on the future. Group 1's entries did not entirely lack references to personal growth, but this was not the main focus whatsoever. In addition, the cortisol levels to be found in both groups were quite similar (figure 10). Finally, the evaluations from the mentors will show much higher mean scores in Group 2 for every question except one. While the rankings are subjective since they were taken by another person, the interpersonal skills and relationships of someone with OUD are harshly impacted and with these results show how effective holistic methods can be.

Limitations

The most important aspect to acknowledge as a limitation is respecting the use of ancient, holy, and precious methods of knowledge from both the Native American and Mexican cultures. It is ambitious and almost out of a scientist's jurisdiction to decide whether members of separate cultures will feel comfortable engaging in activities that are completely foreign to them for the purpose of collecting data. It may also be arrogant to assume that these two cultures would give up their knowledge and practices so readily in order to be used for a scientific study which follows Western practical methods and construction. While these communities undoubtedly want to help their members with OUD, scientists with a novel study like this one may be seen as saviors, colonizing their sacred practices.

Another huge limitation for this study was the lack of literature, or absolute absence of any literature that compares MAT and evidence-based treatments with any holistic, cultural, and/or indigenous methods. This is most likely due to the fact that these holistic methods have never been taken seriously enough to treat a disorder as strong and intense as opioid use. The chemical alterations and effects of opiates might be considered too strong to address without the use of medication or hospitalization.

Because of these limitations, it may be difficult to generalize the data I have projected. Considering the limitations, we would likely have to account for participants dropping the study or disagreeing morally with the combination of two cultural practices.

Conclusions and Future Directions

The projected results are extremely promising of future studies that continue to combine MAT and culturally holistic methods. The results suggest that future studies for patients with OUD should include at least one cultural activity, holistic method related to their culture, and definitely at least patient-centered care. Further research on holistic methods alone with different substance use disorders might be helpful as well and provide a groundwork for studies including holistic methods in the future. It would be necessary to have community elders and mentors present and preferably a part of the research team to make sure methods are accurate and appropriate.

It would be very beneficial to the many groups that are dedicated to studying and trying to resolve the opioid crisis to continue to implement different methods in addition to medical assisted treatment. It is obvious that MAT is one of the best methods to use for patients with OUD, and this study further concludes its strengths. But with this new information on incorporating a patient's identity and culture in order to improve their socialization after seeking out treatment for their addiction issues, it could be the turning point that was needed to address this huge crisis in a more encompassing way.

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