

Christian Neurotheology and Opioid Addiction

Christian Neurotheology
And Opioid Addiction

An Introduction on how
Christian spiritual practice
can heal the mind and
help with Opioid addiction

N. W. Fitch

Dedicated to:

Dad,

For teaching me to find strength and
courage in my faith

Nonnie,

For being my biggest support through life
and school

And My Wife,

For being the love of my life and all-around
amazing human being.

And finally,

for Isabella

Preface from Author

This book, in its original format, is written in the format of a doctoral thesis. It contains graphs, charts, anatomical diagrams, and statistical reporting to cover a meta-analytical review on the current research present that covers the topic of pastoral counseling therapy, the opioid epidemic in the United States, the neuroscience of spirituality and faith, pharmacology of opioid medications and how they affect the neurobiology of the brain, and the current standards of treatment for treating addiction. If this text at any point become popular, there will be revisions and an attempt to turn the manuscript into a more user-friendly read. With that said I do not dissuade any from reading this book, especially those interested in the subject, knows anyone who is suffering from opioid use disorder, or is that individual themselves.

If you are suffering, know that you are not alone and that there are a multitude of options available for you to get the help you need and live a healthier life, free of addiction. No one should have to suffer alone, there is always hope.

- [1 Corinthians 13]
N.W. Fitch

SAMHSA Hotline:

1-800-662-4357

Christian Neurotheology and Opioid Addiction

Efficacy of Christian Based Ministerial
Counseling Therapy
and Spiritual Based Twelve-Step
Recovery Programs in Opioid Use Disorder

A Doctoral Dissertation:

By

N.W. Fitch

May 2022

Abstract

It has been established that the opioid epidemic and crisis is a current public health concern that warrants a multi-level approach with an aim to lower the number of those suffering from substance use disorders, as well as opioid overdose-related deaths. The statistical projection on the opioid crisis is growing in both number of reported cases of substance use disorder, as well as opioid overdose-related deaths, and will continue to rise until the year 2035^{1,7,8,10}. The burden of the opioid crisis is felt by these communities, which places further burden on local law enforcement, emergency responders, and the medical community at large. Opioid overdose-related death is an avoidable consequence of the epidemic and should be the initial focal point. Research has shown that medical-assisted therapy for emergency situations, as well as in addiction treatment is best for treating opioid related overdose and substance use disorders¹³.

Further research indicates that the use of combination therapy, consisting of medication assisted therapy and cognitive behavioral therapy) is the most proven to be effective at sustaining retention rates of those suffering from substance use disorders, especially those with opioid use disorders^{12,13}. Christian based ministerial counseling services, pastoral counseling services, as well as the spiritual based twelve-step model of recovery, are all types of cognitive behavioral therapy that have started to become more popular in recent medical and psychological academic literature regarding their efficacy in sustaining long term retention rates in patients with substance use disorder. The focus of this book is to conduct a meta-analytic and systematic review of the current literature regarding Christian based cognitive behavioral modalities in the treatment of substance use disorders and opioid use disorders and report on the efficacy of these treatment models.

After conducting a thorough review of the current literature, it was found that Christian PCT and TSF recovery models were efficacious at aiding those with OUD in achieving long term abstinence. Studies further point out that spiritual based TSF is best overall in treating SUD, that Christian based PCT works better in certain demographics than it does in other, but that both work in both religious populations and non-religious populations (atheist, agnostic) when compared to other CBT.

Methodology

Researcher conducted a search of public health and epidemiological statistical reviews of opioid epidemic in the United States through standard government agency websites. Neuroscience information was gathered through selective search on neuroscience articles published through the National Institute of Health (NIH) Medical Library Database. Neurotheology research was searched through multiple databases. Randomized controlled trials (RCT) that utilized a double blind with t score reporting and confidence intervals were preferred. Studies that used fundamental magnetic resonance imaging (fMRI) were preferable than other imaging modalities, although others were selected based off p value reporting ($p < 0.05$) with appropriate confidence interval banding reporting (95% CI). Combination therapy research was collected through multiple databases through the National Institute of Health medical library database for both the efficacy of medication- assisted therapy and cognitive behavioral therapy research.

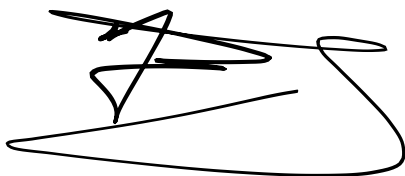
Randomized controlled studies were the preferred data selected, combination therapy data was collected and confirmed through Cochrane Review as the gold standard of therapy. The studies collected on pastoral counseling therapy and twelve step recovery models were through various databases. Studies were selected that reported statistics utilizing a double blind random controlled trial and ANOVA t scoring reporting when available, but due to limitations in specified data search some were selected only reporting standard statistical means with appropriate p reporting ($p < 0.05$) with matching confidence interval (95% CI). Studies with large populations (n values > 100), a review of participant demographics was conducted to ensure the demographics of population observed was close to national demographic reporting to reduce validity of data application in clinical setting. This includes age range medians, race and ethnicity diversification, and reporting on personal views of religion and spirituality.

For long-term studies, the time reported that was sufficient was greater than or equal to 12 months (≥ 12), as this is the standard reported in long term studies found in a wide data base search. The INSPIRIT index for religious and spirituality was the preferred subjective reporting index when searching for studies that surveyed participants who reported on religious and spiritual psychological states. Studies that incorporated the use of INSPIRIT index and verification with neural imaging with either fMRI or PET scanning were more favored in selection due to cross validity of subjective and objective data reporting. Becker Index was preferred when searching for research on subjective reporting of acute changes in mood and depression. With these parameters in set, the author was able to conduct an appropriate review of the current literature using established search criteria applied in scientific meta-analytical reviews of comparable interventions and measured outcomes.

Authors Declaration

All the work here within this dissertation is that of the author, Nathaniel Fitch. No assistance or collaboration from any secondary party was obtained.

Signed,

A handwritten signature in black ink, appearing to be 'N. W. Fitch', written over a horizontal line.

N. W. Fitch, MBS
PhD candidate

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Abbreviations

1. AA: Alcoholics Anonymous
2. ACC: anterior cingulate cortex
3. ACTH: adrenocorticotrophic hormone
4. ADP: adenosine triphosphate
5. ANCOVA: a one-way analysis of covariance
6. ARP: Addiction Recovery Program
7. ATP: Adenosine Triphosphate
8. BCT: Behavioral Couple's Therapy
9. cAMP: cyclic adenosine monophosphate
10. CBT: cognitive behavioral therapy
11. CDC: Center for Disease Control
12. cGMP: cyclic guanosine monophosphate
13. CM: contingency management
14. CRA: community reinforcement approach
15. DEA: Drug Enforcement Administration
16. DMN: default mode network
17. DOA: drugs of abuse
18. DOC: drug of choice
19. DOR: delta opioid receptor
20. fMRI: functionalized magnetic resonance image
21. GPCR: G protein-coupled receptors

- 22. HCV: hepatitis C virus
- 23. HHS: U.S. Department of Health and Human Resources
- 24. HIV: human immunodeficiency virus
- 25. IDU: injection drug use
- 26. INSPIRIT: index of spiritual experience
- 27. IPL: inferior parietal lobule
- 28. ISAM: International Society of Addiction Medicine
- 29. IVDA: intravenous drug associated
- 30. IV: intravenous
- 31. KOR: kappa opioid receptor
- 32. MAT: Medication Assisted Therapy
- 33. MI: motivational interviewing
- 34. MOR: mu opioid receptor
- 35. MTC: Ministerial Counseling Therapy
- 36. NIH: National Institute of Health
- 37. PCC: posterior node network
- 38. PCT: Pastoral Counseling Treatment
- 39. PFC: prefrontal cortex
- 40. PVC: primary visual cortex
- 41. RP: relapse prevention
- 42. SAMHSA: Substance Abuse and Mental Health Service Administration
- 43. SPECT: single photon computed tomography
- 44. SPL: superior parietal lobule

- 45. SUDs: substance abuse disorders
- 46. STD: sexually transmitted disease
- 47. UMC: United Methodist Church

List of Tables and Illustrations

Chapter 1 Illustrations

Image 1.1: Data from CDC¹

Total CDC data from 2018 to 2019 Drug overdose deaths per 100,000 population		
Population	2018	2019
Total	20.7 SE: 0.082	21.6 SE: 0.083

Image 1.2 based off Data from CDC⁴

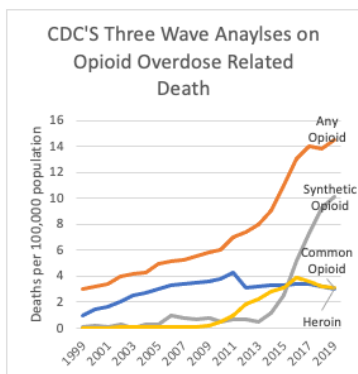


Image 1.3: Based off data from HHS¹⁰

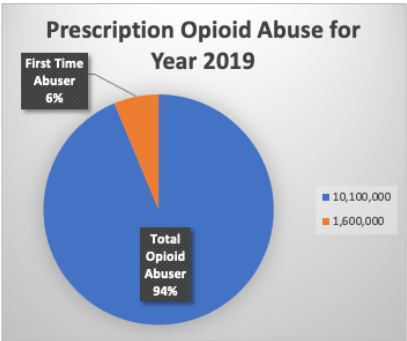


Image 1.4: data reported from CDC¹

Table 1.3: Individual provided reasons for prescription drug misuse, for individuals aged 18 and older, who have incorrectly used a prescription drug in the past year: 2015 (Reported in percentages)				
Main Reason for Misuse	Pain reliever	Tranquilizer	Stimulant	Sedative
Relive physical Pain	63.4	-	-	-
Relax	10.9	46.2	-	12.0
Help with Sleep	4.5	21.2	-	73.2
Help be alert	-	-	28.4	-

Image 1.5 Data reported from CDC¹

States with highest reported IV heroin OD-deaths	Mortality Incident Report
West Virginia	57.8 per 100,000
Ohio	46.3 per 100,000
Pennsylvania	44.3 per 100,000
District of Columbia (D.C.)	44.0 per 100,000
Kentucky	37.2 per 100,000

Chapter 2 Illustrations

Image 2.1: list of commonly abused substances and examples³¹

Common Drug of Abuse	Example
Opioid analgesics (narcotics)	Heroin, oxycodone, fentanyl
General central nervous depressants	Alcohol, barbiturates
Central nervous system stimulants	Amphetamines, nicotine, cocaine
Hallucinogenic	LSD, phencyclidine, mescaline
Marijuana	Cannabis
Sedative-Hypnotics	Alprazolam, diazepam
Inhalants	Toluene, nitrous oxide, amyl nitrate

Image 2.2: anatomy of a neuron (image by N. Fitch)

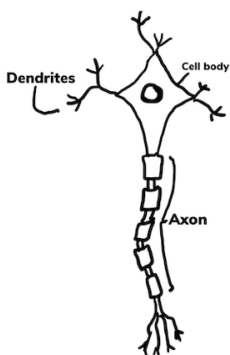


Image 2.3: neuron synapse communication (image by N Fitch). [Note that NT stands for neurotransmitter.]

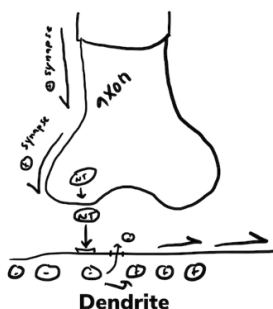


Image 2.4: primary effects and mechanism of action for G subunits

Type of G subunit	Primary Effect on Secondary Messenger	MOA
Gs	increase levels of cAMP	Activates adenylyl cyclase which catalyzes the synthesis of cAMP.
Gi	Decrease levels of cAMP	Inhibits adenylyl cyclase activity

Image 2.5: protein kinase phosphorylating a protein [Image by N. Fitch]

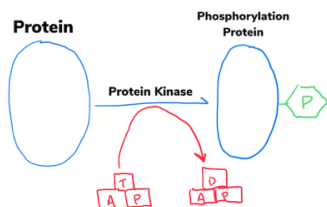
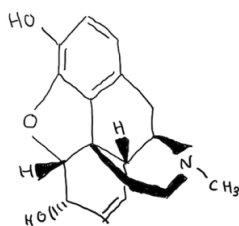


Image 2.6: Chemical Structure of Naturally occurring opiates. [Image by N. Fitch]



Morphine

Image 2.7: Opioid classification system, with examples.

[Note that any drug listed can be used illicitly, examples are listed as their intended purpose]

Opioid Classification	Illicit Examples	Medical Examples
Naturally Occurring Opiates		<ul style="list-style-type: none"> • Morphine • Codeine • Thebaine
Semi-Synthetic Opiates	<ul style="list-style-type: none"> • Heroin 	<ul style="list-style-type: none"> • Hydrocodone • Hydromorphone • Oxycodone
Synthetic Opiates	<ul style="list-style-type: none"> • Illicitly manufactured fentanyl³⁴ 	<ul style="list-style-type: none"> • Fentanyl • Tramadol • Methadone

Image 2.8: summary of opioid receptor subtypes with function explanation³⁴

Opioid Receptor	Receptor Subtypes	Function
Mu Receptor/ MOR	<ul style="list-style-type: none"> • Mu1 • Mu2 • Mu3 	<p>Mu1: pain, responsible for opioid dependency</p> <p>Mu2: causes euphoria, dependence, respiratory depression, pupil dilation, decrease function of GI tract/ constipation</p> <p>Mu3: hypotension, dilates blood vessels</p>
Kappa Receptor/ KOR	<ul style="list-style-type: none"> • Kappa1 • Kappa2 • Kappa3 	<p>All KOR subtypes</p> <p>Cause: analgesic response, diuresis, and dysphoria.</p>
Delta Receptor/ DOR	<ul style="list-style-type: none"> • Delta1 • Delta2 	<p>All DOR subtypes cause: analgesic response and decrease in gastric mobility.</p>

Image 2.9: action of opioids on the ascending spinothalamic tract within the spinal cord.

[Image by N. Fitch]

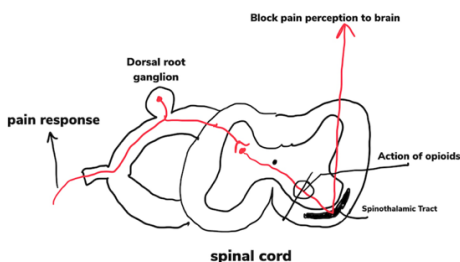


Image: 2.9.1: Regions of the Brain associated with Addiction³⁰ [Image by N. Fitch]

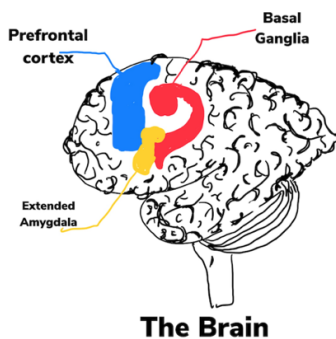


Image 2.9.2: Summary of MAT Drugs of Choice (DOC)

Opioid Agonist/ Antagonist Used in MAT	Pharmacodynamics	When Used	Benefits/ weakness
<u>Methadone</u>	Opioid Receptor Agonist	MAT: DOC for detoxification	Benefit <ul style="list-style-type: none"> • Long duration of action • Allows for tapering of drug which lowers dependency • Cheaper cost Weakness <ul style="list-style-type: none"> • Can still be abused as it acts on the same Mu2 receptors as Heroin • Needs monitoring
<u>Naloxone</u>	Opioid Receptor Antagonist.	DOC for emergency opioid overdose management in ED setting	Benefit <ul style="list-style-type: none"> • Fast acting • Readily available, can be obtained without a prescription Weakness <ul style="list-style-type: none"> • Short Acting • May need multiple doses to successfully reach a precipitate withdrawal in patient
<u>Buprenorphine</u>	Mixed Opioid Agonist/ antagonist	MAT Detox	Benefit <ul style="list-style-type: none"> • Long duration of action (the longest) • Will cause a precipitate withdrawal even with high dose opioid abuse Weakness <ul style="list-style-type: none"> • More expensive • More prescribing restrictions

Chapter 3 Illustrations

Image 3.1: The Four Lobes of the Brain
[Image by N. Fitch]

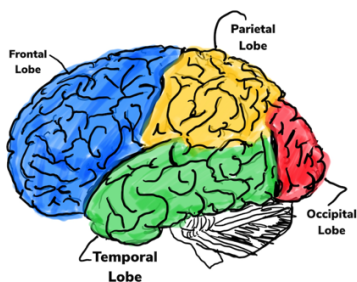


Image 3.2: Relationship of PFC to ACC
[image by N. Fitch]

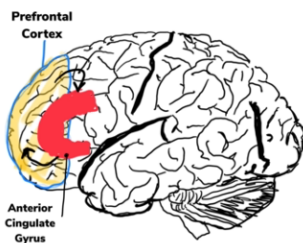


Image 3.3: Internal Midsection View of Brain showing ACC, PCC, and Thalamus
[Image by N. Fitch]

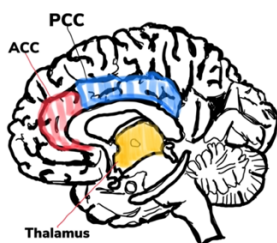


Image 3.4: Midsagittal View of brain showing basal ganglia and amygdala [image by N. Fitch]

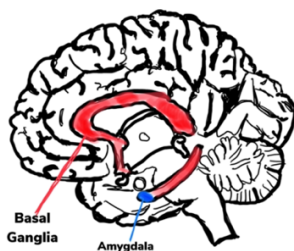
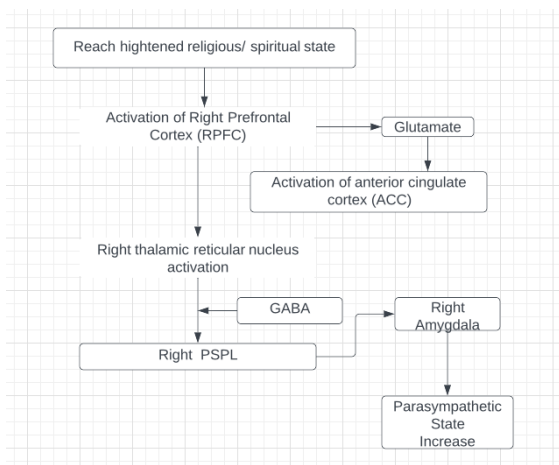


Image 3.5: Proposed neurobiological pathway of prayer effect on brain [Adapted from Newberg and Iversen, 2003⁴⁶]



Chapter 4 Illustrations

Image 4.1: MAT medication classification, as listed by SAMHSA^{11,40}

<u>MAT medication classification use</u>	<u>Name of GST medication</u>
Alcohol Use Disorder (AUD)	Acamprosate, disulfiram, and Naltrexone
Opioid Dependency Disorder (ODD)	Buprenorphine, methadone, and naltrexone
Opioid Agonist Therapy (OAT) for Opioid Overdose	Naloxone

Image 4.2: Different CBT modalities and their settings

<u>CBT modality</u>	<u>Individual Therapy</u>	<u>Group Therapy</u>	<u>Can be either</u>
Motivational Intervention	+	+	+
Contingency Management	+	-	-
Relapse Prevention/ other treatments	+	-	-
Couples/ Family Treatment	-	+	-
Pastoral Counseling Support	+	+	+
Twelve-step programs/ Spirituality program	-	+	-

Chapter 5 Illustrations

Image 5.1: The Serenity Prayer, used by AA and other spiritual based therapy models⁶³

*"God, grant me the serenity to
accept the things
I cannot change,
Courage to change the I can,
And Wisdom to know the
difference."*

- Serenity Prayer,
Reinhold Niebuhr,
1932⁶³

Image 5.3: An annotated Twelve Steps, from the original AA twelve step recovery model⁶⁶

The (annotated) Twelve Steps⁶⁶

1. We admitted we were powerless over alcohol and that our lives had become unmanageable on our own.
2. Came to Believe that a higher power than ourselves could restore us to peace of mind.
3. Decided to turn down our lives over to the care of God *as we understood Him*.
4. Searched inward without fear or hesitation to create a moral inventory of ourselves.
5. Admitted to God, to ourselves, and to another person the exact nature of our wrongings.
6. Were entirely ready to have God remove all these wrongs from our own character.
7. Humbly asked God to remove the shortcomings.
8. Made a list of all persons we had harmed and opened the mind up to amend them all.
9. Made direct amends to any persons, when possible, except in a situation that would cause them injury or harm.
10. Continued to take a personal moral inventory, and when found wrong, admitted the wrong.
11. Through prayer and meditation improved the minds connection with God, *as we understood him*, asking only for his knowledge of his will for us and the power to carry that out.
12. Having had undergone a spiritual awakening as the result of these steps, tried to carry this message to other alcoholics and forever practice these principles.

Image 5.4: Cochran Review on AA/TSF complete findings^{68,69}

AA/ TSF comparative Data	Performed better than non-TSF?	Statistical Evidence
RCT variant of 12 -month abstinence rate of retention	Yes	RR 1.21 95% CI 1.03 to 1.42 N= 1936
% of days abstinent	Yes	MD 12.91 95% CI 7.55 to 18.29 N= 392
Longest period of Abstinence	Yes	MD: 0.60 95% CI -0.30 to 1.50 n- 136

1

An Overview on the Opioid Crisis in America

Introduction

The opioid epidemic is still on the rise within the United States. According to the Center for Disease Control (national center for health statistics, 2020), the national average for drug overdose related deaths has increased by 5% from 2018 to 2019 and has even quadrupled since the year 1999¹. The CDC further reports that over 70% of the 70, 630 premature deaths (premature deaths is defined as an individual expiring prior to the age reported average of the specified population they belong to²) of the year 2019 had involved opioid use in some capacity¹.

Total CDC data from 2018 to 2019 Drug overdose deaths per 100,000 population		
Population	2018	2019
Total	20.7 SE: 0.082	21.6 SE: 0.083

Image 1.1: Data from CDC¹

In the time span of the year 2018 to the year 2019, there had been nominal and significant changes to the reported statistics involved in opioid involved death^{1,2,3}. The opioid crisis is only getting worse across the united states, with a projection to keep increasing until 2035¹.

Identifying the Cause

In a study by Mattson et al. (2021), the researchers were able to narrow down the significant changes to four specific pieces of data. That opioid-involved death rates had increased by over 6% in the past several years, that synthetic opioid-involved death rates (excluding methadone use) had increased by over 15% in the past several years, but that prescription opioid-involved death rates had decreased by nearly 7% along with heroin-involved death rates had also decreased by over 6% within the same time span³.

The recent rise in opioid overdose related death rates has been shown to be substantially correlated with the increase in synthetic opioid production rather than prescription or heroin abuse. To place the current opioid crisis into an appropriate epidemiological perspective, the Center for Disease Control (2020) has defined the rise in opioid addiction and subsequent parallel increase in deaths caused by opioid abuse, into a conceptual summarization known as the Three Waves of Opioid Overdose Deaths⁴.

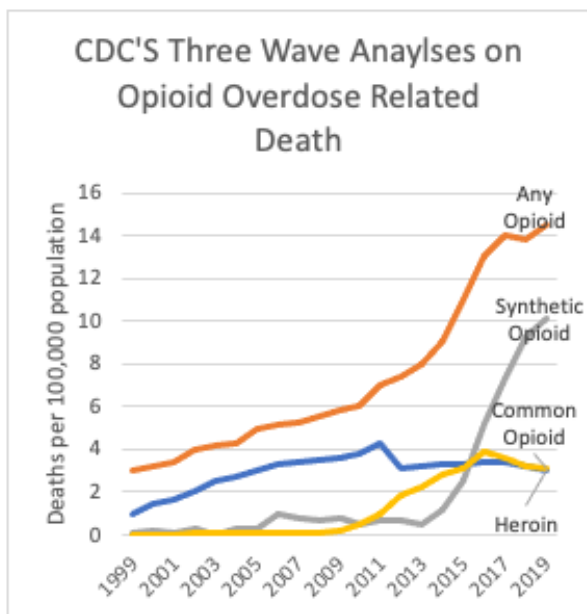


Image 1.2: based off Data from CDC⁴

The first wave is defined as the increase in provider prescribed opioids for pain management of cancer and non-cancer therapies, first seen in 1999⁴. This category includes both natural and semi-synthetic opioids and methadone therapies.

The second wave is defined by the Center for Disease Control as the rapid increase in overdose related deaths that involved the illicit drug heroin⁴, which according to a study by Rudd et al. (2014), this significant event began in the year 2010⁵. The third and final wave, is defined as the markedly significant increase in overdose deaths affiliated with synthetic opioids⁴.

According to a study conducted by Gladden et al. (2017) and O'Donnell et al. (2017), this wave was marked mostly by the increase in illegally manufactured fentanyl^{6,7,8}. In a report released by the Drug Enforcement Administration (2019), the market for illicit compounded synthetic opioids, such as illegal fentanyl, has been in fluctuation regarding drug composition. These substances are usually mixed with other illicit drugs such as heroin and cocaine but can also be mixed with counterfeit medications such as antidepressants⁹.

Statistics on Opioid Use Disorder

The U.S. department of Health and Human Services (HHS, 2020) conducted a national survey in 2019 which found that 10.1 million individuals had used an opioid prescription inappropriately, with 1.6 million people having had admitted to misusing prescribed opioids for the first time, in the past year¹⁰. This makes up almost one-third (roughly 37.8%) of the total adult population of the United States¹¹.

The survey also found that 1.6 million people had been diagnosed with an opioid addiction disorder in the past year and that 2 million individuals had used methamphetamines in the past year¹⁰. Finally, the survey found that 745, 000 individuals agreed to using heroin in the past year, and of that 745, 000 individuals, 50, 000 of those people had used heroin for the first time¹⁰.

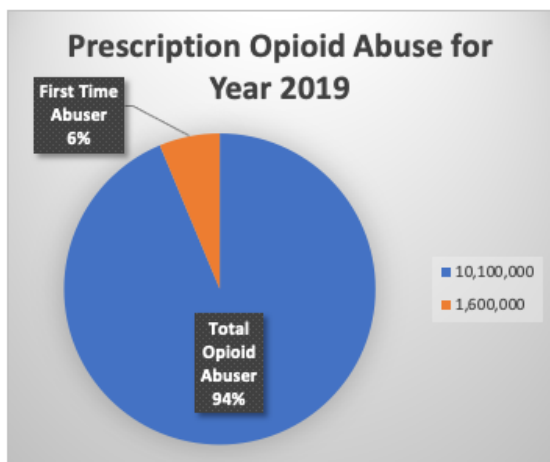


Image 1.3: based off data from HHS¹⁰

To further assess these numbers, more data can be analyzed in the 2017 report on adult prescription misuse report conducted by researchers affiliated with the Substance Abuse and Mental Health Services Administration (SAMHSA).

The misuse or incorrect use of prescription drugs is defined as the use of a prescribed medication that is in any way that a prescribing health care provider did not direct the patient to use said medication for, including:

- (1) Use of prescription medication that is not prescribed to that individual.
- (2) Used in greater dosage or for longer duration than the patient was informed to take said medication, or
- (3) Used in any way other than what the patient was informed by their prescribing health care provider informed them on proper use of the medication¹¹. For further clarification, these reported figures do not include the use of over-the-counter medications, nor does it include the proper use of legally prescribed medication.

In a study by Lipari et al. (2017), researchers found that 11.5 million adults had reported in the survey that they incorrectly used prescription pain relievers at least once in the previous year. 63.4% had reported that the most common reason for doing this was so that they could relieve physical pain¹¹. 5.7 million adults had misused prescription tranquilizers a minimum of one time in the previous year. 46.2% of these individuals reported that the contributing factor for this behavior was to relax or relieve tension, while 21.2% of individuals reported that they did this to help with sleep¹¹.

The survey reported that 4.8 million adults incorrectly used prescription stimulants at least one time in the past year. 28.4% of participants who reported this finding justified their action on the account that it helped them stay alert or awake, 26.2% of them reported it was to help them concentrate, and finally 22.4% of these individuals reported the reason for their action was to help them study¹¹.

And finally, 1.4 million adults incorrectly used their prescription sedatives at least once in the past year. 73.2% of these participants reported that the reason for misusing their medication was so that they could obtain help with sleeping. The Department of Health and Human Services has reported that prescription drug misuse is second only to marijuana use, as the United States most common type of illicit drug use and the second most commonly abused¹⁰.

Table 1.3: Individual provided reasons for prescription drug misuse, for individuals aged 18 and older, who have incorrectly used a prescription drug in the past year: 2015 (Reported in percentages)				
Main Reason for Misuse	Pain reliever	Tranquilizer	Stimulant	Sedative
Relive physical Pain	63.4	-	-	-
Relax	10.9	46.2	-	12.0
Help with Sleep	4.5	21.2	-	73.2
Help be alert	-	-	28.4	-

Image 1.4: data is based off study conducted by SAMHSA¹¹

It is also important to note that substance use, and addiction are not so easily separable as diagnostic and statistical entities. In a 2007 study, researchers found that 1.2 million individuals reported to be heroin users in the United States, and 5.2 million people reported that they had inappropriately used their prescribed opioid-based medication. Out these individuals who took part in this survey, 50% of the heroin users met the diagnostic criteria for addiction, and 11% of the misuse of prescription opioid group met the criteria for addiction³⁹.

Public Health Concerns

This opioid epidemic has had substantial consequences regarding the increase in morbidity and mortality rates of opioid related overdose deaths. Another area of national public health concern is the increase in intravenous infectious disease. According to the Center for Disease Control, individual states with the highest rates of reported drug overdose mortalities were due to intravenous (IV) heroin use¹.

States with highest reported IV heroin OD-deaths	Mortality Incident Report
West Virginia	57.8 per 100,000
Ohio	46.3 per 100,000
Pennsylvania	44.3 per 100,000
District of Columbia (D.C.)	44.0 per 100,000
Kentucky	37.2 per 100,000

Image 1.5: data reported from CDC¹

Injection drug use (IDU) is its own public health concern, with an estimated 1 million individuals reporting having used a form of injection drug use in the past year¹⁵. The increase in opioid injectable drug use has led to outbreaks of human immunodeficiency virus (HIV) as well as higher rates of intravenous transmitted diseases when used in nonsterile circumstances, these infectious diseases include hepatitis C virus (HCV), as well as bacteria and fungus that are known to cause a myriad of illnesses including endocarditis, osteomyelitis, and skin infections¹⁵.

The reported rates of HCV incidence have tripled between the years of 2010 to 2017, despite the availability of curative medications¹⁵. This increase in HCV has increased amongst all ages but has seen the largest spike in the age range of twenty to forty-five years of age, which has been positively linked to increase in injection drug use. The demographic group most at risk for injection drug use induced infectious diseases are young white females located in rural areas of the country¹⁵.

This increase in drug overdose death affiliated with IV opioid use has risen in parallel with a large increase in the reported incidence of IV-drug associated (IVDA) acute infectious endocarditis¹. Intravenous drug use spread fungal infections have risen from 2900 in 2013, to more than 20,000 reported cases in 2017¹⁵, along with an estimated 155,000 to 540,000 injectable drug use associated skin infections occurring every year¹⁵.

The microbial agent responsible for these various infections has been reported to vary depending on state and region throughout the country. Hospital admissions for intravenous drug associated heart infections had risen by 436% from 2012 to 2017 in the New England region of the country¹⁵, placing a heavy strain and burden on the emergency departments as well as cardiac centers¹³. There has been substantial increase in candida yeast infections, especially on the skin and other soft tissue, in the state of Tennessee (rising from 6.1% in 2014 to 14.5% in 2018), as well as an increase in intravenous drug induced osteomyelitis in Michigan by 35% in between the years of 2016 and 2018¹⁵.

The increase in intravenous drug induced osteomyelitis in the state of Michigan led to significant increase in mortality rates (around 5.5%) and an increased healthcare expenditure of over \$1.3 billion¹⁵. Sexually Transmitted Diseases are a major component of public health scope of practice, with a nationwide reporting service in which physicians and epidemiologist must comply in using to properly track these infectious diseases. Recently the United states has also seen an increase in reported sexually transmitted diseases, with increases in reported cases of gonorrhea, primary and secondary syphilis, and chlamydia¹⁵.

Increase in reported STDs might be correlated with increased risky sexual behavior affiliated with intravenous drug use, but it is a known risk factor that risky sexual behavior is linked to increased risk of HIV transmission. Specifically, there has been an increase in intravenous drug use induced stage 1 syphilis in the state of Missouri, and intravenous drug use induced HIV infections in the state of California¹⁵. The state of Missouri reported an increase in positive syphilis cases by 365% between the

years of 2012 and 2018, with small urban and rural areas being affected the most¹⁵.

Public health policy has been recently struggling with the opioid crisis, as there are numerous legislations that would lower the burden of the opioid crisis, but they have seen little resolve in the past recent years. Many medications that are available to treat opioid addiction as well as opioid overdose-related death are not as readily available to healthcare providers or patients for numerous reasons.

These include medication barriers such as prescribing restrictions, such as the inability to prescribe methadone outside of an OTP or the need for daily monitoring, and the X waiver requirement (a limitation cap on the number of patients that can be prescribed buprenorphine for the treatment of substance use disorders)¹⁶.

The rise in Telehealth services and telemedicine services in the past two years since the start of the SARS2-COVID-19 pandemic has shown more than promising capabilities in various fields of medicine. A strong public health utilization of the service could mean the reduction in many previously discussed issues surrounding the opioid crisis, but that would require increased government involvement in legislation that would increase budget spenditure and allocation of funds¹⁶.

The Consequences of Substance Addiction
on Families and Communities

The United States leads the world in opioid addiction and opioid overdose deaths^{13,14}. Opioid use and opioid dependency have extracted a heavy toll on the United States in the past recent decades. Not only in the substantial rise in the rates of morbidity and mortality, but opioid abuse and addiction has been linked with an increase in communicable disease transmission, crime and law enforcement expenditure, family distress, loss in national productivity, and increased cost as well as utilization of the health care system³⁷.

In a survey conducted by Substance Abuse and Mental Health Service Administration³⁸, they found that in between the years of 1999 to 2009, the average annual hospital admission for opiate dependence treatment increased from 280,000 to 431,000 for both rural and urban areas (SAMHSA, 2014).

The biggest concern to the American family and communities across the country is the increase in synthetic opioids such as illicitly produced fentanyl^{1,9}. The Center for Disease Control has reported that in the year of 2019 alone, more than 36,000 deaths were attributed to synthetic opioids, which was higher than any other form of opioid. This is an increase over 15% and accounted for nearly 73% of all opioid related deaths of the year of 2019¹.

This data was confirmed to be linked to illicitly produced fentanyl due to the CDC in collaboration with law enforcement agencies (both federal and state) investigating and comparing prescribed fentanyl reports to number of reported associated deaths. The findings showed that the number of reported fatalities and reports of illicit fentanyl use did not match fentanyl prescribing rate amongst pain management specialist¹.

The issue this presents is found further within the police and federal agencies investigations of these illicitly produces opioids. Fentanyl analogs are being manufactured at alarming rates, which include mixing these synthetic opioids with non-synthetic opioids such as heroin⁹.

Other substances have also been found in the composition of illicitly marketed synthetic opioids. Law enforcement agencies have identified compounds which have mixtures of heroin, amphetamines, and cocaine. There has also been in an increase in the production of illicit drugs that appear to be antidepressants or anti-anxiety medication but are laced with synthetic fentanyl⁹.

The problem this poses on communities, both rural and urban, is that of unwilling and unknowing opioid overdose amongst the younger populations. The demand for community attention, education, awareness, and outcry over this opioid crisis could not be higher in the current climate of our nation.

The Christian View on Addiction and
Addiction Therapies

As this dissertation aims at investigating the efficacy of Ministerial Counseling Therapy, Pastoral Counseling Therapy, and other Christian based cognitive behavioral therapy modalities, it is only appropriate to cover the collective viewpoint on addiction and addiction therapies encountered in the religion of Christianity. Christianity is a diverse religion, covering a wide array of denominations and practices. It is my goal to cover as many denominations as possible with respect to the focus of this thesis, the information below has been collected from the governing body of the denomination listed at the heading of the sub section.

The Catholic Church

The viewpoint on substance use disorders from the Catholic church is that addiction is viewed as a direct threat to both a person's body and their spiritual pathway to the kingdom of heaven¹⁷. Even though the church takes a firm stance against all forms of substance abuse, the catholic church understands that each person is fallible, that addiction is a biological disease that cannot be cured through prayer alone¹⁷.

The Catholic church considers addiction in all forms to be both a sin and a disease, that can be overcome with medicine and faith. If a member of the catholic church confesses to drug addiction, the church can and will provide resources to aid the suffering individual back to sobriety, which includes church ran drug and alcohol rehabilitation services¹⁷.

The Catholic church has increased the amount of Catholic-based addiction treatment centers, which have complete church or church agency affiliation, across the United States which utilizes faith-based cognitive behavior therapy along with medication assisted therapy¹⁷. These rehabilitation centers range from private centers, inpatient centers, outpatient facilities, and even local parish support groups.

The Orthodox Church

The Orthodox church recognizes that alcohol abuse and drug addiction are considered a national problem, and that society should unite to confront these issues. The Orthodox Church recognizes that alcohol and drug abuse are diagnosable illnesses that require both medical treatment and spiritual treatment as well. The Orthodox Church promotes a community approach to the treatment of substance use disorders and emphasizes community outreach and participation from those suffering to help aid in their journey to recovery.

The Orthodox Church agrees with the twelve-step program methodology and encourages members seeking medical and cognitive behavioral therapy to seek programs that utilize the twelve-step method in their program²⁰.

Protestant Denomination Organizations

After review of numerous Protestant church organizations many of the organizations promote the same stance on alcohol and drug addiction as well as parish members suffering from addiction to seek help. Most organizations promote the current medical community's stance on substance use disorders. This includes medication assisted therapy (MAT) along with cognitive behavioral therapy (CBT) with the cognitive behavioral therapy component comprising either a form of the twelve-step therapy model or ministerial counseling/ pastoral counseling modalities.

Below are Protestant church organizations that have unique and/or specified information regarding their stance on substance use disorder and those members who are seeking help.

The Episcopal Church

The Episcopal Church played a pivotal role in the foundation of the Alcohol Anonymous organization in the 1930's and has been a strong supporter of the Twelve-step method for treatment of addiction and have sense opened their churches up to host twelve step programs in various communities across the United States¹⁹. The Episcopal Church believes that addiction to both alcohol and drugs are illnesses that need to be treated with both medicine and faith-based therapies that emphasize spirituality as the core foundation of the program.

The Episcopal Church does not promote one program over another, but the church does recommend members seek a program that utilizes a twelve-step program in its cognitive behavioral therapy modality¹⁹.

The United Methodist Church

The viewpoint on opioid use disorders and addiction from the United Methodist Church is summarized in an official set of Methodist Principles¹⁸. These include:

1. Opposing the use of all drugs, except in cases of appropriate medical supervision
2. We encourage the church to develop honest, objective, and factual drug education for children, youths, and adults as part of a comprehensive prevention education program
3. We urge the church to coordinate its efforts with ecumenical, interfaith, and community groups in prevention, rehabilitation, and policy statements.
4. We encourage the annual conference to recognize the unique impact of drugs and its related violence upon urban and rural areas and provide appropriate ministries and resources
5. We strongly encourage annual conferences to develop leadership training opportunities and resources for local church pastors and laity to

- help them with counseling individuals and families who have alcohol and other drug related problems; counseling those bereaved by alcohol and other drug-related deaths and violence; and teaching stress management to church workers in communities with high alcohol and other drug activity
6. We urge redevelopment of more effective methods of treatment of drug abuse and addiction
 7. We support government policies that restrict access to over-the-counter drugs (such as ephedrine) derivatives that can be converted to illegal and addictive drugs
 8. We support government policies concerning drugs that are compatible with our Christian beliefs about potential transformation of all individuals.
 9. We urge all United Methodist churches to work for a minimum legal drinking age of 21 years in their respective states/nations.
 10. We support strong, humane law-enforcement efforts against the illegal sale of all drugs, and we urge that those arrested for possession

and use of illegally procured drugs
be subjected to education and
rehabilitation.

The United Methodist Church promotes the use of any rehabilitation center that is available to their members, and not impose the idea that their members should seek Methodist-only rehabilitation centers¹⁸. The United Methodist Church acknowledges and accepts all gold standard therapies for substance use disorder (SUD) and enforces no restrictions on any church member who is seeking medical aid in overcoming their addiction¹⁸

*Non-Trinitarian Based Christian
Organizations*

The Church of Jesus Christ and the Latter-
Day Saints
(LDS)

The LDS church stance on substance use disorder and addiction follows the guidelines on health practices as described in the *Word of Wisdom*²¹. The LDS church promotes the use of the LDS Addiction Recovery Program (ARP) for church members to seek when suffering from substance use disorder and addiction. The LDS Addiction Recovery Program utilizes an adaptation of the twelve-step recovery model that has been modified to focus on, and address, the LDS church's views on the concepts of atonement and repentance. The Addiction and Recovery Program utilizes a combination therapy modality that is in line with the current gold standard of therapy, which includes the use of medication as well as cognitive behavioral therapy²¹. The LDS Church also promotes the use of group therapy, including family-based therapy, in the addiction recovery program²¹.

Jehovah's Witness

The High Council of Elders accept and promote the standard model of medical care for the treatment of substance use disorders. Members are encouraged to seek help and encourage the use of a twelve-step model of recovery program²².

Review of the Opioid Crisis

It has been established that the opioid epidemic and crisis is a current public health concern that warrants a multi-level approach with an aim to lower the number of those suffering from substance use disorders, as well as opioid overdose-related deaths. The statistical projection on the opioid crisis is growing in both number of reported cases of substance use disorder, as well as opioid overdose-related deaths, and will continue to rise until the year 2035^{1,7,8,10}. The effect of this epidemic effects individuals, as well as families of those suffering from substance abuse disorders, and communities across the united states.

The burden of the opioid crisis is felt by these communities, which places a heavy critically felt burden on local law enforcement, emergency responders, and the medical community in whole. This is seen by the substantial increase in health care expenditure, which has increased by \$1.3 billion, in the past five years alone¹⁴.

In the past few years, there has also been an increase in other public health concerns that are associated with the opioid crisis, this includes the increase in intravenous drug use and intravenous drug related infectious disease (including HIV and HCV) which places community members more at risk for further disease outbreaks^{1,7,8,10}.

Opioid overdose-related death is an avoidable consequence of the epidemic and should be the initial focal point. Research has shown that medical-assisted therapy for emergency situations, as well as in addiction treatment is best for treating opioid related overdose and substance use disorders¹³.

Further research indicates that the use of combination therapy, consisting of medication assisted therapy and cognitive behavioral therapy) is the most proven to be effective at sustaining retention rates of those suffering from substance use disorders, especially those with opioid use disorders^{12,13}.

Christian based ministerial counseling services and pastoral counseling services, as well as the spiritual based twelve-step model of recovery, are types of cognitive behavioral therapy that have started to become more popular in medical and psychological research in terms of investigating the efficacy of these programs in sustaining long term retention rates in patients with substance use disorder.

The focus of this dissertation is to conduct a meta-analytic and systematic review of the current literature regarding Christian based cognitive behavioral modalities in the treatment of substance use disorders and opioid use disorders and report on the efficacy of these treatment models.

2

The Neuroscience of Addiction

An Introduction on Applied Neuroscience for Addiction

Most illicit substances of abuse act centrally on the brain and nervous system. These substances act on the brain with the goal to alter the mental state or to enhance performance. In short periods of time and in moderate doses, the neuronal synapses can rebound and heal from drug use leaving no long-lasting effects on cognitive functioning or memory retention²³. Long-term use of these substances can lead to an altering of the neurotransmitter receptor uptake, function, and eventually lead to tolerance and dependence.

Drug abuse is defined as the self-administered use of a drug, without the supervision or consent of medical council, that can lead to bodily harm of the user³¹.

There are many drugs of abuse that have various effects on the brain (refer to image 2.1), some will be explored in this dissertation in this section but not all will be covered in as much depth as opioid analgesics. In the Following section, we will explore the relationship between neurobiology and the application of neuroscience to obtain a better understanding in both drug addiction behavior and spirituality.

Common Drug of Abuse	Example
Opioid analgesics (narcotics)	Heroin, oxycodone, fentanyl
General central nervous depressants	Alcohol, barbiturates
Central nervous system stimulants	Amphetamines, nicotine, cocaine
Hallucinogenic	LSD, phencyclidine, mescaline
Marijuana	Cannabis
Sedative-Hypnotics	Alprazolam, diazepam
Inhalants	Toluene, nitrous oxide, amyl nitrate

Image 2.1: list of commonly abused substances and examples³¹

The neuroscience on spirituality will follow the neuroscience on addiction and will be covered in its own section. By the end of the upcoming section, there will hopefully be a substantial bridging of the two concepts in how the neurochemistry of one part of the brain can heavily influence and alter the neurochemistry of another area of the brain, and how religion and spirituality can be a powerful tool in combating addiction.

Role of Neurotransmitters

The human brain is composed of tens of trillions of cells known as neurons²³. Neurons make up the largest component of brain tissue and are highly organized in such a way that these neuronal cells can communicate to one another in an electrochemical process known as neurotransmission. Neurotransmission is the process of cellular communication that includes electrical impulse driven chemical gradient in a process that is termed synaptic transmission. For all upcoming information regarding the neuron, please refer to image 2.1 below for reference.

The neuron is comprised of a large cellular body, which is called the cell body or soma. This gives rise to multiple thin spine-like projections called dendrites. Dendrites connect to other surrounding neurons and receive incoming electrochemical signals. The signal is either relied or not relied depending on a process known as summation²¹.

Summation is the cellular process of one neuron receiving multiple synaptic relays from surrounding neurons. If the sum of the relays from the dendrites on a single cell body is the same, then the neuron will fire an electrochemical impulse and continue relaying the message to other neurons distal from itself²⁵. This signal is then relied from the dendrites through the cell body and down a structure called the axon.

The axon is lined with multiple pads of fatty insulated tissue, allowing the speed of the electrochemical impulse to travel much faster and be carried to other adjacent neurons in the vicinity²³. The synaptic cleft is where the axon of one neuron connects to the dendrite region of another neuron. Here, a neurotransmitter will diffuse across the membrane of the axon and fuse with the membrane of the dendrite on a specified protein receptor.

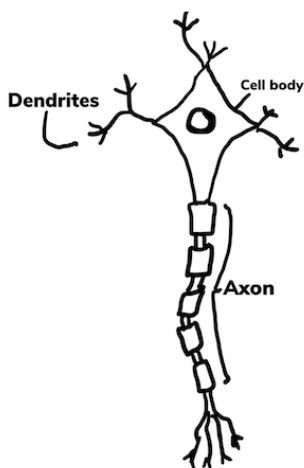


Image 2.2: anatomy of a neuron (image by N. Fitch)

The protein receptor will then activate highly intricate cell membrane proteins called ion pumps. Ion pumps are cell structures located on the membrane that help maintain the unequal concentrations of electrolytes, or ions, that are both inside and outside the cell. These ions include sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), and chloride (Cl^-), along with others, that are found both inside and outside of the cell. Of these ion pumps, the most important of which is the sodium-potassium ATPase (adenosine triphosphate) pump²³.

The sodium-potassium pump is important due to the innate resting polarity of the neuronal cell. Neuronal cells carry a negative charge inside of their cellular matrix, in respect to the outside of the cell which carries a positive charge. The sodium-potassium pump is the structure that is responsible for maintaining this charged gradient between the inside and outside of the cell.

This process is accomplished by moving sodium and potassium inside and outside the cell (respectively), which utilizes energy in the form of adenosine triphosphate (ATP)²¹. When a synaptic transmission reaches a neuron, the electrochemical impulse alters this gradient, changing the polarity of the neuron by forcing a rush of sodium ions into the cell and causing the resting potential of the neuron to change from a negative resting state to a positively charged state.

This positively charged state causes a wave like reaction to travel throughout the neuron, from the cell body to the axon, and this is the basis for neurotransmission communication between neuronal cells²⁸ (refer to image 2.2).

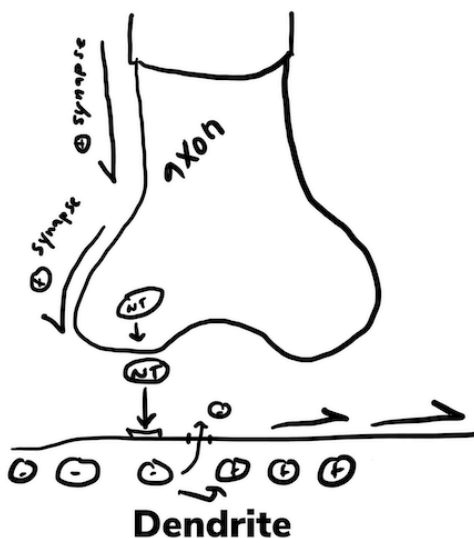


Image 2.3: neuron synapse communication (image by N Fitch).

Note that NT stands for neurotransmitter.

The cell membrane contains other types of protein channels that regulate the process of neurotransmission, such as gated ion channels, but this overview will serve the purpose of this dissertation.

Neurotransmitters are intracellular vesicles comprised of various chemical substances, that act on specified receptor sites on the receiving neuron to trigger a highly specified response from the brain²⁴. These neurotransmitters are what governs the multitude of physiological and psychological effects that each person experiences daily.

Neurotransmission which governs cognitive functioning in the brain is carried out mostly by amino acid neurotransmitters. These amino acid neurotransmitters can be in approximately two-thirds of the brain's neuronal cells, and almost in every region of the cerebral cortex and subcortices²³. The amino acid Glutamate is the primary excitatory neurotransmitter. Glutamate is deemed an excitatory neuron because forces an influx of sodium (and sometimes calcium) into the neuronal membrane, altering the cell's internal polarity to become positive, and thus force an excitation reaction and subsequent synaptic response from the neuron.

The primary inhibitory neurotransmitter of the brain is the amino acid-based neurotransmitter gamma-aminobutyric acid (GABA). Gamma-aminobutyric acid is categorized as inhibitory because when it binds to its receptor site on the cell membrane, it causes free chloride to enter the neuronal cell and alter the internal polarity to become more negative in consequence²¹. Most other classified neurotransmitters of the brain do not bind and interact with ion-channel protein receptors, rather these neurotransmitters act on receptor sites that produce a cellular driven physiological response by interacting with unique classes of proteins classified as G-proteins^{23,24,25}.

G Protein Coupled Receptor Signaling

The composition of G-proteins includes the variable molecular assembly of three subset molecules classified as alpha, beta, and gamma subunits^{23,24,25}. There are numerous prominent secondary messengers involved with neurotransmission in the brain. These secondary messengers include cyclic adenosine monophosphate (cAMP), cyclic guanosine monophosphate (cGMP), calcium, nitric oxide, prostaglandins (an arachidonic acid metabolite), and phosphatidylinositol²³.

G-protein coupled signaling receptors regulate the levels of these secondary messengers in the brain through controlling the number of enzymes available in the cell that are responsible for catalyzing the synthesis and break down of neuronal secondary messengers, with different effects produced depending on the G protein that is involved^{23,24}.

Type of G subunit	Primary Effect on Secondary Messenger	MOA
Gs	increase levels of cAMP	Activates adenylyl cyclase which catalyzes the synthesis of cAMP.
Gi	Decrease levels of cAMP	Inhibits adenylyl cyclase activity

Image 2.4: primary effects and mechanism of action for G subunits

Protein Phosphorylation

Protein phosphorylation is the regulatory process of secondary messengers by means of adding or removing phosphate groups from specific amino acid residues with the aid of two proteins. Protein kinases are responsible for adding phosphate groups to these amino acid residues. Protein phosphatases are responsible for removing phosphate groups from the amino acid residues. These phosphate groups are large and carry a negative charge, because of this they are known to directly affect the conformation and charge of selective proteins, which in turn affects their physiological function^{23,24}.

An example of this would be how the phosphorylation of certain ion channels would affect their ability to open or close, and subsequently affect their ability to regulate how much of the ion they are allowed to let into or out of the cell. Phosphorylation also effects the ability of ion channel receptors to bind to specific neurotransmitters and even let them interact with their G proteins^{23,24}.

Catalytic activity is also affected by this process, the phosphorylation of a channel can increase or decrease the neuron's capacity to synthesize cyclic adenosine monophosphate or cyclic guanosine monophosphate.

The brain contains numerous subtypes of protein kinases and protein phosphatases that exhibit differential regulation within the neuronal networks that make up the cortices and subcortices of the brain. Cyclic adenosine monophosphate will bind and activate cyclic adenosine monophosphate protein kinase, as does calcium bind and activate calcium-dependent protein kinases²³. Once these kinases are activated by their respected substrate, this starts a cascade of phosphorylation on target protein sites that produces additional effects on top of the neurotransmitters initial G protein coupled seconder messenger stimulus.

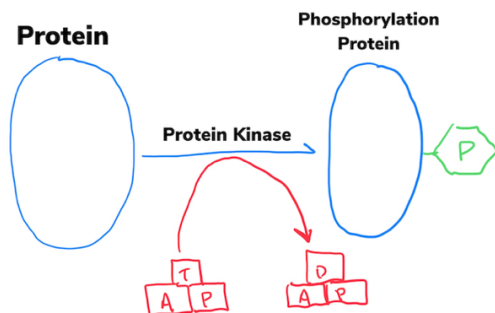


Image 2.5: protein kinase phosphorylating a protein
(Image by N. Fitch)

Due to the innate complexity and multiple effects of intracellular phosphorylation, a single stimulus from one neurotransmitter can influence virtually any and every chemical process regarding targeted surrounding neurons^{25,26}. Effects can be extremely short lived and rapid, such as altering the brains electrical activity. Other effects such as the altering of gene expression in the genome sequence of neuronal cells, can be a slower process and the observed effect can be longer lasting²³. The altering of a neuronal cell's response to certain neurotransmitters is primarily due to long lasting effects of phosphorylating kinases.

This adaptive cellular response alters the incoming neurotransmitter stimuli and target neuron response to either one neurotransmitter or many others. By increasing cell surface sensitivity towards one neurotransmission type, and decrease the available receptors for another, a neuron can regulate its sensitivity and responses to incoming neurotransmitter signaling. This concept is known as plasticity^{23,24,25}. Plasticity plays an important role in understanding drug dependency and addiction.

The final concept to cover in the basics of neurotransmission, is the concept of neurotransmitter agonist, antagonist, and mixed agonist-antagonist.

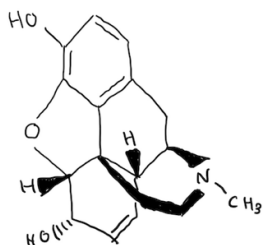
A neurotransmitter agonist is a substance that binds to the synaptic receptor site and increases the effect of the neurotransmitter at that target site. A neurotransmitter antagonist is a substance that binds to the same receptor site as the agonist but decreases or blocks the effect of the neurotransmitter at the target site. A substance with mixed agonist-antagonist properties will in some instances behave like an agonist, and while under others conditions the substance will behave like an antagonist³².

Drug agonist, antagonist, and agonist-antagonist do not alter the composition of the neuron they are binding to. For example, if the target neurotransmitter site is an excitatory receptor, then an agonist will increase the excitatory response of that site (increasing the internal gradient to more positively charged). If an antagonist binds to the same receptor, the antagonist will not change the receptor reaction to an inhibitory response, but rather lower the potency of the excitatory process.

Opioid Analgesic Pharmacology

Opioid analgesics are known as a class of medication and that have similar properties to the drug morphine. This is in reference to the analgesic (pain reducing) effect of morphine, without the loss of consciousness that is common with morphine use. Opioids also have a secondary title of narcotic analgesics. Opioid analgesics are isolated and derived from the alkaloid substance, opium. Opium is a dry powdered alkaloid exudate that comes from the fruit capsule (also known as a poppy) from the plant *Papaver somniferum* (the poppy plant)³². Opioid analgesics are separated into three classifications.

These classifications are natural opioids, semi-synthetic opiates, and fully synthetic opiates³². Natural opiates are the plant alkaloid extract referenced before. Natural opiates have an aromatic chemical structure that has a nitrogen ring (see image 2.6 for structure)³². Examples of natural occurring opiates include the drugs morphine, codeine, and thebaine (this is also known as paramorphine)³².



Morphine

Image 2.6: Chemical Structure of Naturally occurring opiates.

[Image by N. Fitch]

Semi-synthetic opiates are the first group of man-made opioid-based analgesics. These are synthesized in a lab and are synthesized from natural occurring opiates³². Examples of semi-synthetic opioids include hydrocodone, hydromorphone, and oxycodone. The illicit narcotic heroin is also classified as a semi-synthetic opiate.

Synthetic opiates, or also known as fully synthetic opiates are completely manufactured in a laboratory. Fully synthetic opiates are the most potent acting of the opioid analgesic regarding target effect on neurons and neurotransmitter action in the central nervous system^{32,33}. Synthetic opioids are entirely devoid of any naturally occurring opioids³³.

Examples of synthetic opioids include fentanyl and tramadol. The medication-assisted therapy medication, methadone, which is used in the detoxification portion of substance use disorder, is also part of this opioid analgesic category^{32,33}.

Opioid Classification	Illicit Examples	Medical Examples
Naturally Occurring Opiates		<ul style="list-style-type: none">• Morphine• Codeine• Thebaine
Semi-Synthetic Opiates	<ul style="list-style-type: none">• Heroin	<ul style="list-style-type: none">• Hydrocodone• Hydromorphone• Oxycodone
Synthetic Opiates	<ul style="list-style-type: none">• Illicitly manufactured fentanyl³⁴	<ul style="list-style-type: none">• Fentanyl• Tramadol• Methadone

Image 2.7: Opioid classification system, with examples.

(Note that any drug listed can be used illicitly, examples are listed as their intended purpose)

Aside from the natural and synthetic opioids, there are also compounds produced inside the human body that act on the same receptor sites as opiates do. These compounds are known as opiopeptins. Opiopeptins are endogenous opioid peptides that are produced by various cells in the body and are derived from specific polypeptide precursors³².

It is important to note the opiopeptin molecules as these endogenous protein complexes are used to explain the mechanisms of action that the various subtypes of opioids have on the central nervous system and peripheral nervous system, as well as other tissue types in the body.

There are three opiopeptins of clinical importance.

- Preproopiomelanocortin
 - This opiopeptin contains beta-endorphin; also, adrenocorticotrophic hormone (ACTH) and melanocyte stimulating hormone³².
- Preproenkephalin
 - This opiopeptin contains the pentapeptide compounds met-enkephalin and leu-enkephalin within its chemical structure.
- Preprodynorphin
 - Chemical compound includes the dynorphin subtypes dynorphin A and dynorphin B, along with the neoendorphins alpha and beta.

Mechanisms of Action Overview

The opioid analgesics act on the central nervous system at three distinct receptor sites, mimicking the function and action of the opiopeptins. These opioid receptor sites are G protein-coupled receptor sites (GCPR). Each of the three opioid receptor sites have a distinct receptor subtype, which are denoted with numbers. Opioids can be further classified as either an agonist, antagonist, or mixed agonist-antagonist properties.

The three receptor sites are classified as μ - (mu), κ - (kappa), and δ - (delta). The μ -opioid Receptor (MOR) has three subtype receptors, which are mu1, mu2, and mu3. The κ -opioid receptor (KOR) has three subtype receptors, which are kappa1, kappa2, kappa3. The δ -opioid receptor (DOR) has two subtype receptors which are delta1 and delta2³⁴. A summary of the specified functions of the opioid receptor subtypes can be found in image 2.8.

Opioid Receptor Site Kinetics

Opioids, as described before, are an analgesic. This means that they dull or numb pain as their primary pharmacological action on the central nervous system. The exact mechanisms of action for opioid analgesics at the cellular and intracellular level are not entirely understood, but there are known elements of opioid analgesics. All opioid analgesics activate the inhibitory guanine nucleotide binding protein (Gi) secondary messenger on the cellular membrane.

This binding of opioids to the receptor site inhibits adenylyl cyclase activity which lowers the amount of available intracellular cyclic adenosine monophosphate in the neuronal cell and decreases the activity of protein kinases³². Opioids bind to receptor sites and promote the opening of ion-channel proteins that are specific to potassium ions³².

This specified action increases the conductance of potassium at the cellular level, forcing the neuron to go into a state of hyperpolarization (the resting electrical charge is higher than normal) and subsequently inhibits the neurotransmitter communication between surrounding post-junctional neuronal cells.

Opioid analgesics bind to receptor sites and close the voltage-dependent calcium channels on pre-junctional nerve terminals that inhibit the release of neurotransmitters (substance P and glutamate) from the synaptic cleft of the axon³².

Opioid Receptor	Receptor Subtypes	Function
Mu Receptor/ MOR	<ul style="list-style-type: none"> • Mu1 • Mu2 • Mu3 	<p>Mu1: pain, responsible for opioid dependency</p> <p>Mu2: causes euphoria, dependence, respiratory depression, pupil dilation, decrease function of GI tract/ constipation</p> <p>Mu3: hypotension, dilates blood vessels.</p>
Kappa Receptor/ KOR	<ul style="list-style-type: none"> • Kappa1 • Kappa2 • Kappa3 	<p>All KOR subtypes</p> <p>Cause: analgesic response, diuresis, and dysphoria.</p>
Delta Receptor/ DOR	<ul style="list-style-type: none"> • Delta1 • Delta2 	<p>All DOR subtypes cause: analgesic response and decrease in gastric mobility.</p>

Image 2.8: summary of opioid receptor subtypes with function explanation³⁴

Opioids raise the threshold of pain perception by combining these elements and interrupting the transmission of pain through the spinal cord's ascending pain pathway located in the ascending spinothalamic tract in the ventral portion of the spinal cord as well as the ventral caudal thalamus in the brain³². Once the ascending pathway has been shut off, opioids have an agonist response on receptor sites in the descending modulatory pathway found within the periaqueductal gray area in the midbrain, rostral ventral medulla of the brain³². Opioids also have an antagonist role on the peripheral nervous system by raising the threshold to pain perception distally from the spinal cord. There is also a decrease to the emotional response to pain through opioid analgesics antagonistic action on the limbic areas of the brain³².

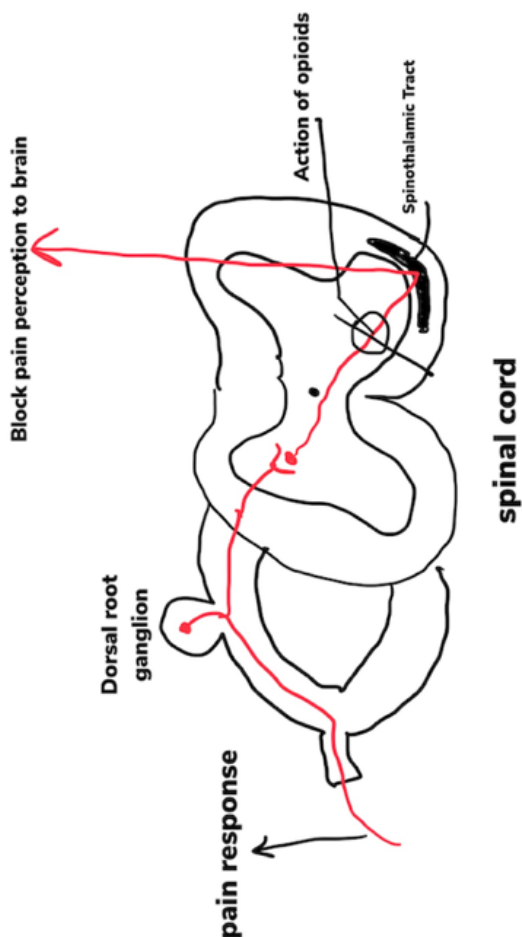
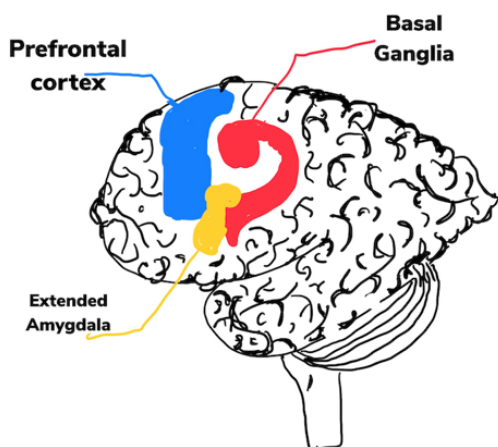


Image 2.9: action of opioids on the ascending spinothalamic tract within the spinal cord.
[Image by N. Fitch]

Role of the Opioid Mu2 Receptor in Addiction

The most important opioid receptor with regards to drug addiction behavior, is the Mu2 receptor. Mu2 opioid receptors have a high-density level within the limbic system of the brain³⁴. The limbic Center is the emotional center of the brain, which induces the sensation of euphoria (as well as lowering the stress perception response) in the brain. Mu2 receptors are also found in high density within the ventral tegmental area (VTA) of the brain's basal ganglia, the ventral tegmental area forms a neural network connection with the ventral striatum inside of the mesolimbic dopamine center.

Dopamine's action within the ventral striatum is to promote the feeling of reward, which leads to a chemically induced positive reinforcement feedback loop, and thus solidifies the dependency and addiction behavior in those with opiate addiction.



The Brain

Image: 2.9.1: Regions of the Brain associated
with Addiction³⁰
[Image by N. Fitch]

Tolerance and Withdrawal

Tolerance develops slowly over time, especially with repeated dosages. To get the same response in either pain management control or with the euphoric response in illicit drug use, the dose of opioid needs to be increased. Initially a psychological dependence is established with habitual opioid use. This is defined as the psychological need to take opioids as the feeling of euphoria and reward give the user a heightened state of reality which diminishes and subsequently crashes as the drug wears off in the central nervous system. The anthropomorphic and biometric indications for acute and subacute psychological dependency are constipation, seizures, pupil dilation, and mood change when opioids are not present.

As habitual and repetitive use continues, a secondary physical dependence develops that is correlated with the tolerance established at the cellular receptor level. As tolerance develops, the user will increase the dosage of the drug to feel the habit-forming response of the drug.

When the drug is taken in larger dosages, this leads to alarming physiological responses in the body. This includes respiratory depression, sedation, nausea and vomiting, suppression of cough reflex, dysphoria, and severe change in mood. If the drug is taken in too high of a dose, this is how opioid overdose occurs. Overdose occurs when the opioid is taken in such a high dosage that the pharmacological response of the drug at the brain stem suppresses the breathing center and cardiac control center lowering respiratory rate and breathing rate and putting the individual into a sedated comatose state that can rapidly lead to death³².

Repeated use of any substance will lower the amount of cell membrane receptors that are specific to that substrate. For example, diabetes mellitus type 2 is due to sustained increased blood levels of sugar which lower the cell receptor sites for the uptake of sugar on the surface of cell. The same goes for drugs of addiction, and when tolerance develops for opioid analgesics, there are more substantial and drastic physical consequences.

Physical dependence on opioid analgesics will eventually lead to symptoms of withdrawal. These are broken down into two classifications, abstinence withdrawal, and precipitated withdrawal.

Abstinent withdrawal

Abstinent withdrawal is defined as the surfacing of symptomology affiliated with the discontinuation of opioid analgesic administration^{31,32}. This will force the addicted individual to initiate “drug seeking behavior”^{32,33}, and present with autonomic hyperexcitability that may include the presence of goose bumps on the skin (a prominent sign of going cold turkey)³², severe muscle spasms, hyperalgesia (increase pain sensation throughout the body, lacrimation, rhinorrhea (runny nose), sweating, restlessness, dilated pupils, anorexia, tremors, flushing of the skin, irritability, and diarrhea^{31,32}.

These withdrawal symptoms will peak around 48-72 hours after the last dose of opioid analgesic was ingested. This is not a life-threatening withdrawal event (except in infants born addicted to opioid analgesics and the severely debilitated^{31,32}).

Precipitated Withdrawal

Precipitated withdrawal is seen when an individual suffering from opioid overdose is given the emergency antidote medication naloxone, which is an opioid receptor antagonist^{31,32,33}. Precipitated withdrawal has the same physiological response on the body as abstinent withdrawal, but peaks much sooner and much more potently. This physiological state is much harder to reverse with opioid receptor agonist than abstinent withdrawal, meaning that the user cannot reverse the effect of the antagonist medication by doing more of their drug of choice (I.e., heroin) making antagonist antidotes the preferred medication for emergency opioid overdose treatment as well as methadone for detoxification in medication-assisted therapy.

Key Highlights on Selected Opiates

Common Opioid Agonist

Fentanyl

Fentanyl has a shorter duration of action than morphine³² at the opioid receptor sites which makes synthetic illicit fentanyl a dangerous drug as users will reach tolerance levels faster and illicit symptomology at a much faster rate than other synthetic opioids.

Methadone

Methadone is the medication of choice for medication-assisted therapy in opioid use disorder and the most used during the detoxification process of rehabilitation. The reason for this is that methadone has a very long duration of action on the central nervous system.

This long duration of action means that methadone has a less severe abstinence withdrawal symptoms than any other synthetic opioid analgesic³² (especially when administered in a tapered dose reduction setting like detoxification rehabilitation).

Common Mixed Agonist-Antagonist

Buprenorphine

Buprenorphine is similar in function with methadone, as it also has a very long duration rate in the blood stream, and it is also used in the detox setting of medication-assisted therapy. The largest difference between the two is that buprenorphine is the least dependent liable than morphine and methadone³² due to the medication's long duration of action.

Another benefit of Buprenorphine is that it can induce precipitate withdrawal in opioid overdose cases where the individual has overdosed on a large dose of any opioid agonist, making it ideal when the amount of opioid use is unknown to the care provider.

Common Opioid Antagonist

Naloxone and naltrexone

These drugs are the most widely used medication that treats emergency situations of opioid overdose³⁵. These drugs, like buprenorphine, induce a precipitate withdrawal when administered to a patient suffering from opioid overdose.

Naloxone has a short duration of action, around 1-2 hours³², which can be used to diagnose opioid dependency or treat acute opioid overdose. The only concern with naloxone is that due to its short acting duration, multiple doses may need to be administered to reverse the effect of the opioid agonist.

Christian Neurotheology and Opioid Addiction

Opioid Agonist/ Antagonist Used in MAT	Pharmacodynamics	When Used	Benefits/ weakness
<u>Methadone</u>	Opioid Receptor Agonist	MAT: DOC for detoxification	<p>Benefit</p> <ul style="list-style-type: none"> • Long duration of action • Allows for tapering of drug which lowers dependency • Cheaper cost <p>Weakness</p> <ul style="list-style-type: none"> • Can still be abused as it acts on the same Mu2 receptors as Heroin • Needs monitoring
<u>Naloxone</u>	Opioid Receptor Antagonist.	DOC for emergency opioid overdose management in ED setting	<p>Benefit</p> <ul style="list-style-type: none"> • Fast acting • Readily available, can be obtained without a prescription <p>Weakness</p> <ul style="list-style-type: none"> • Short Acting • May need multiple doses to successfully reach a precipitate withdrawal in patient
<u>Buprenorphine</u>	Mixed Opioid Agonist/ antagonist	MAT Detox	<p>Benefit</p> <ul style="list-style-type: none"> • Long duration of action (the longest) • Will cause a precipitate withdrawal even with high dose opioid abuse <p>Weakness</p> <ul style="list-style-type: none"> • More expensive • More prescribing restrictions

Image 2.9.2: Summary of MAT Drugs of Choice (DOC)

3

Neurotheology: **The Neuroscience of Spirituality**

Introduction

Spirituality is defined as an individual recognition and belief that there is a higher power than oneself, and that there is something more to being human than purely the sensory experience³⁶. Spirituality is the defining sensation on the comfort felt when one acknowledges that there is more to one's existence than the ordinary and the mundane. Concepts that are taught and found in religious study, such as compassion, love, altruism, are brought to the forefront when an individual embraces their own sense of spirituality. Spirituality can be a powerful force in both psychology and in medicine, and recent studies investigating the power of spirituality have found hard evidence on the neuroscience on the mind, body, and soul connection. Religion is defined as a specific set of

beliefs and practices within an organized group or community⁵⁴.

By the definitions, spirituality and religion are two separate entities brought together within the same Venn diagram. Religion would seem to be more of a social construct, while spirituality lies in the domain of one's own psychological experience and inner mind. The connecting bridge that binds these two entities together, is that the organized beliefs and practices shared within a religious community are what build the foundation for an individual to find the power of their spirituality when needed to overcome suffering and hardships.

The twelve-step recovery model was one of the first cognitive behavioral therapy (CBT) models to embrace the utilization of spirituality in helping those suffering from substance use disorders (SUD). The twelve-step recovery model, founded in the 1940's, has become one of the most recognized and successful cognitive behavioral therapy models of the twentieth century till the present day. The success of the twelve-step recovery model in helping those with substance use disorder has launched

numerous studies in recent years over how the program has been so successful.

Many of these studies have even investigated the power of prayer and how prayer and spirituality can alter the chemistry of the human brain to help fight cravings of addiction. In the following section, we will investigate these findings and get a better understanding of the specific part of the brain that are affected by spirituality and prayer when facing substance use disorder.

I will first begin this section by covering core concepts of brain anatomy as it pertains to the neuroanatomy of spirituality. Afterwards I will be going further into specified regions of the brain and discuss the research that has linked these regions to religious and spiritual experiences and their importance in the treatment of substance abuse disorder.

An Introduction to Neuroanatomy

The Four Lobes of the Brain

The human brain is made up of two hemispheres, each containing four major region cortices (or lobes). Although there are eight lobes in total, the same four are identical in structure within both hemispheres and so when discussing neuroscience, they are commonly referred to as just the four with the left side of the brain being the most referenced of the two (no citation here, this is merely an observation of mine while learning neuroscience in medical school as well as rotating through neurology in internal medicine). These lobes are known as the frontal lobe, the temporal lobe, the parietal lobe, and the occipital lobe. The four lobes each contain a set of various tasks that the respective lobe is responsible for.

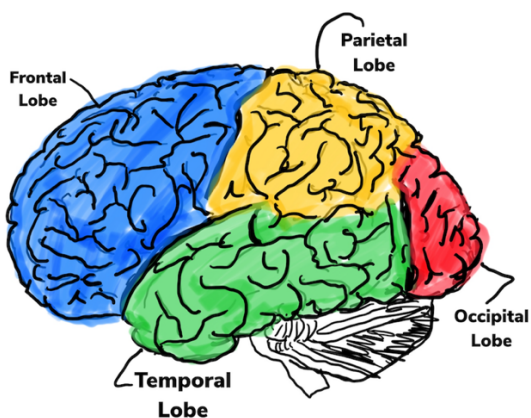


Image 3.1: The Four Lobes of the Brain
[Image by N. Fitch]

Frontal Lobe

The frontal lobe is the most anterior lobe of the brain. The general position of the frontal lobe lies behind the forehead of the skull, and above the eye sockets.

The general summation of frontal lobe function is mostly higher cognitive functions. Higher cognitive functioning includes the storage and retrieval of memories, the feelings of various emotions, the control of impulsive actions, mental problem solving, social interaction, and the simple function and control of the limbs (fine motor movement of hands and feet are controlled by the cerebellum, the small portion of brain behind the brain stem and below the occipital lobe). The frontal lobe contains the primary dopamine secreting neurons in the brain.

The frontal lobe is home to a very important Brodman area (Brodman area being a specifically mapped region of the brain) known as Broca's area. Broca's area is the motor-speech area of the brain and oversees regulating your breathing rate while speaking as well as signaling your throat muscles to produce vocalizations. Individuals with a damaged Broca's area will develop a condition called Broca's Dysphagia (or also known as Broca's aphasia) where they have a difficulty formulating sentences or remembering words.

Temporal Lobe

If you can image the brain as a boxing glove, then the temporal lobe would be the thumb of the glove. The temporal lobe is located behind the ears inside the skull. The temporal lobe is also the second largest lobe behind the frontal lobe, which is the largest. As this lobe sits adjacent to the ears, one of the primary roles the lobe plays are in the processing of auditory information brought to the brain by the ears. Another important role of the temporal lobe is in the creation and preservation of waking memory, as well as the processing of long-term memories. The temporal lobe is very important in helping a person recognize things (object recognition) and interpreting spoken and written languages. Individuals with multilingual skills have more robust temporal lobes.

The Brodmann area known as Wernicke's area can be found in the upper posterior temporal lobe. Wernicke's area is comprised of motor neurons that are responsible for the interpretation and comprehension of speech.

There is a tract of neurons that create an important circuit between Wernicke's area and Broca's area known as the arcuate fasciculus. Wernicke's area hears spoken words and relays the information to Broca's area so that words can be spoken back in reply. The arcuate fasciculus is an important anatomical structure that allows humans to carry out a conversation. Damage to Wernicke's area is known as Wernicke's Aphasia (or Dysphagia), which makes it difficult for those with this condition to understand words and properly communicate.

[The importance of noting Wernicke's area is that this region of the brain is commonly damaged in substance use disorders, especially in alcoholics. A condition known as Wernicke's encephalopathy is a serious consequence of chronic substance use disorder. The condition is comprised of three primary symptoms being generalized confusion and memory loss, ataxia (inability to coordinate the movement of arms and legs to walk or reach), and visual nystagmus (double vision and/or drooping eyelid). This condition is brought on mostly by severe and chronic alcoholism due to alcohol leeching the body of an important vitamin, vitamin B-1 (thiamine), which is not properly absorbed in the diet.]

Occipital Lobe

The occipital lobe is located directly opposite of the frontal lobe in the posterior end of the brain, located at the back of the skull. This lobe is responsible for the perception of visual imagery, including the color, form, and motion of things perceived by the eyes. Damage to the occipital lobe can lead to a variety of conditions known as visual agnosia's (Greek for ignorance, used to denote a condition where one cannot recognize or distinguish things). An example would be color agnosia, which is the inability to recognize colors (color agnosia is not the same as color blindness, as color blindness is a genetic condition where the person cannot see colors due to a deficiency of cone cells in the retina of the eye). Damage to the occipital lobe can create visual hallucinations.

The occipital lobe contains the primary visual cortex (PVC) which governs the perception of the shape, speed, and color of things. The PVC then relays this information to a neural tract called the ventral stream (which is comprised of two brain areas called visual area V2 and visual area V4), and the dorsal stream (visual area V3, visual area V5, and the dorsomedial area DM). The ventral stream oversees identifying the perceived object (due to neuronal connections with the memory centers of the brain), while the dorsal stream is interpreting the location of the perceived object and how it got there.

Parietal Lobe

The parietal lobe can be found behind the frontal lobe, above the temporal lobe, and in front of the occipital lobe. The parietal lobe is responsible for serving as a relay station for various sensory input that comes into the brain from all other regions and then transferring that information to where it needs to go. Major sensory input the parietal lobe is responsible for is proprioception, touch, and vision. Sensory input from the skin is sent to the brain and stops first in a region called the thalamus, before traveling to the parietal lobe.

Proprioception is the brains' ability to determine where the body relative to the space the body is located in. The parietal lobe is also important in processing language along with Wernicke's area discussed prior. Subcortical regions of the parietal lobe that are important to note are the superior parietal lobule (SPL) and the inferior parietal lobule (IPL). The role of the superior parietal lobule and the inferior parietal lobule is that these regions govern the awareness of the body and the self in relations to the external environment.

The parietal lobe is the part of the brain that has recently been shown to be the most involved with spirituality and events involving religion, prayer, and faith-based events. A more in-depth review of these sub-structures will be addressed shortly.

Subcortical Structures of the Brain

Thalamus

The thalamus is a dome shaped structure that lies in the center of the brain, underneath the four lobes and sitting atop the brain stem. The thalamus is the primary messenger hub of the entire central nervous system, which is largely due to its position as it connects the brain stem to the rest of the brain's cortical and subcortical tissues. The thalamus has numerous important tasks, including the relaying of sensory information (like sight, sound, touch, and pain), motor information (coordination of movement), and it also regulates the functions of consciousness, and sleep and wake cycles.

The spinothalamic tract runs up and into the thalamus and brings pain perception sensory information to the brain. This was covered in a previous chapter with the Mu2 receptors and opioids were covered, but to come full circle we can now appreciate how the mechanisms of opioid analgesics effects the brain by knowing where the drugs act and where their target sites are in the brain.

Prefrontal Cortex

The prefrontal cortex (PFC) is a cortical region that is the most anterior portion of the frontal lobe. The prefrontal cortex is the primary center of the brain that facilitates the orchestration and relay of information surrounding internalized thoughts that pertain to achieving internal goals. This is the last part of a human's brain to develop and happens after reaching adulthood. The PFC governs the execution of executive functioning, which includes routine planning, short- and long-term decision-making, short-term memory retention, expression of one's personality, and altering behavior when in social settings.

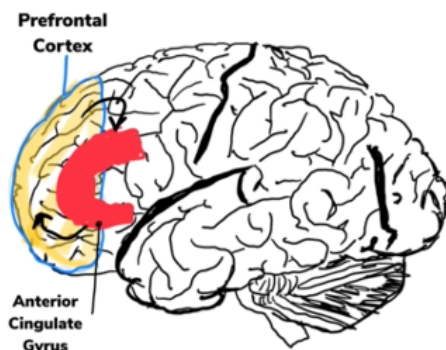


Image 4.2: Relationship of PFC to ACC
[image by N. Fitch]

The PFC is also the brain's designated moral compass, as it aids in determining if an act is good or bad. Consequences of actions are weighed and determined in the PFC as well by a structure called the anterior cingulate gyrus. The anterior cingulate gyrus (ACC) is a substructure of the prefrontal cortex that governs moral decision making, as well as ethical decision making and reward anticipation. Behind the ACC lies the posterior cingulate cortex (PCC).

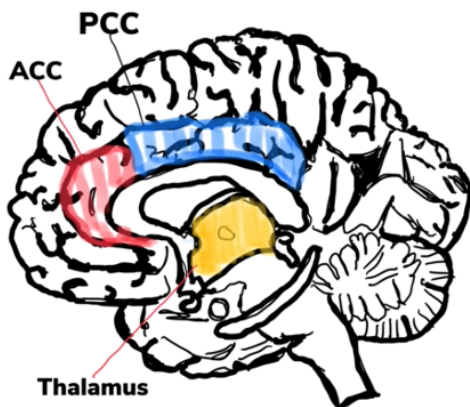


Image 3.3: Internal Midsection View of Brain
showing ACC, PCC, and Thalamus
[Image by N. Fitch]

The posterior cingulate cortex, like the thalamus and parietal lobe, is an information relay station that interacts with various other cortical and subcortical areas to carry out several functions. One of the most notable roles of the posterior cingulate gyrus is that is responsible for episodic memory retrieval for pain sensations (how one knows that a hot stove is a hot surface, so to speak). The posterior cingulate cortex acts as the primary node of a cerebral construct known as the default mode network (DMN).

The default mode network is a neural network which spans the bulk of the brain and that is made up by the posterior cingulate cortex, medial prefrontal cortex, and angular gyrus. The default mode network is a highly sensitive neuronal network that can be activated and deactivated easily. This network has been found to be substantially involved with spiritual and religious states such as prayer and meditation which will be covered shortly.

The Insular Cortex

Another important internal subcortical region of the brain is the insular cortex. The insular cortex is associated with inner consciousness. Notable functions governed by the insular cortex are compassion, emotion, empathy, interpersonal experiences, and self-awareness. The insular cortex has connections with the anterior cingulate cortex and communicates heavily with that subcortical structure. Control over one's own insular cortex allows for the autoregulation of one's heartbeat and breathing, a technique used in many spiritual activities like prayer and meditation.

The insular cortex has also been found to be linked to substance use disorder and addiction. Studies that have utilized functionalized magnetic resonance imaging (fMRI) have found that when addicts were exposed to certain cues that triggered addictive cravings that there was increased activity in the insular cortex³⁹.

The strong relationship the insular cortex has with addiction can be surmised from the structure's relationship with the mesocortical dopamine system. The mesocortical dopamine system is heavily involved with most all drugs of addiction as the release of dopamine within this system is what drives the reward feedback loop of addiction³⁹.

The Basal Ganglia

The subcortical basal ganglia are a collection of subcortical neuronal bodies that handle more relay functions but are critically important for any individual to carry out normal cognitive functioning and social behavior. The core unit of the basal ganglia is a structure called the corpus striatum, which is involved in several cortical synaptic activities regarding present and future planning, decision making, motivation, behavior reinforcement and perceptions of potential rewards related to behavior.

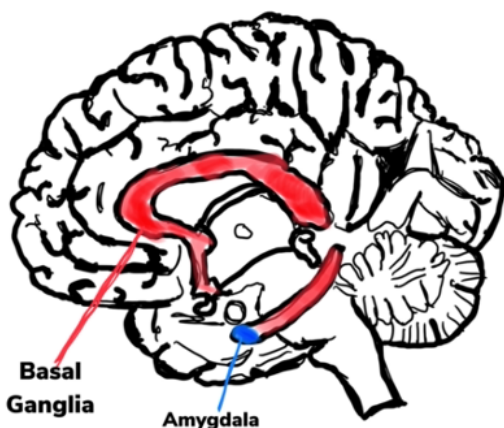


Image 3.4: Midsagittal View of brain showing basal ganglia and amygdala
[image by N. Fitch]

Amygdala

The amygdala is a subcortical structure that is a small, almond shape and sized, structure located on the tip of the curving horn of the basal ganglia. The primary function (and most referenced) of the amygdala is the structures' role in governing the emotional response process and fear conditioning. The amygdala can strengthen memories that are also tied to emotion and has been shown to be heavily involved in post-traumatic stress disorder⁴⁰.

Religious Practice and Spirituality Effect on Neurobiology

Studies utilizing functioning magnetic resonance imaging have shown evidence of both spirituality and religious practices having a profound effect on the brain^{43,44,45}. In a study conducted by Miller et al. (2013), researchers using fMRI scanning found that individuals who placed importance on religion and spirituality in their lives (but independent of attendance frequency) were found to have thicker cortices in the left and right parietal and occipital regions, the medial frontal lobe of the right hemisphere, and the cuneus and precuneus in the left hemisphere. These researchers also noted that these individuals were at a lesser risk for developing chronic depression disorders (n=103, $p < 0.05$)⁴⁴.

In another study by Newburg and Iverson (2003), researchers used single photon computed tomography (SPECT) on Franciscan friars while they conducted prayer. They found that while in Franciscan prayer, the friars had increased blood flow to their prefrontal cortex, inferior parietal lobes, and inferior frontal lobes⁴⁶.

A study conducted by Beauregard and Paquette (2006), found increased blood flow and heightened brain activity in the parietal and temporal lobes (with use of fMRI scans) of Carmelite nuns ($n=17$, $p<0.001$) who were in a state of union with God⁴⁷.

A study by Azari et al. (2001) evaluated the neurobiological effect of the recitation of psalm 23 by a small parish ($n=6$) of evangelical Christians in Germany by using positron emission topography (PET) scanning³⁸. The positron emission topography scanning showed increased activity of the right dorsolateral prefrontal cortex (BA-9), dorsomedial frontal cortex (BA-6), and right precuneus areas (BA-7) ($p<0.001$).

Each of these studies not only showed activation and alteration of anatomical neurobiology but had effects on the neurophysiology as well. The religious and spiritual state reached in these various studies acted were reported to influence the parasympathetic and sympathetic nervous system and alter the chemistry of the brain^{41,46}.

Through activation of both prefrontal cortices (RPFC and LPFC), those in high spiritual states will release high quantities of glutamate (global excitatory neurotransmitter) through a pathway that activates the parasympathetic nervous system. This is achieved through the control over their insular cortex and lowering of both the heart rate and respiratory rate⁴¹.

Eventually, this intense spiritual stimulation of the parasympathetic pathway of the right prefrontal cortex leads to unique physiological experience where there is simultaneous discharge of both autonomic nervous systems, in a condition known as ‘breakthrough’^{41,44}. Although there has been many proposed neurobiological pathways attempting to explain this phenomenon, the physiological model proposed by Newberg and Iversen (2003) is what has been depicted in this dissertation to try and encapsulate the proposed physiological mechanism of spiritual mindsets have on brain physiology (see image 4.5)

Other studies have shown similar findings regarding religious and spiritual states, and their effect on neurobiology. There have been observed findings of prayer and meditation increasing serotonin availability in the raphe nucleus which led to states of self-transcendence and spiritual acceptance⁴⁵. Studies have also shown that the inferior parietal lobule might be the most important structure that governs aspects of religiosity and spiritualism in altering of brain physiology⁴³.

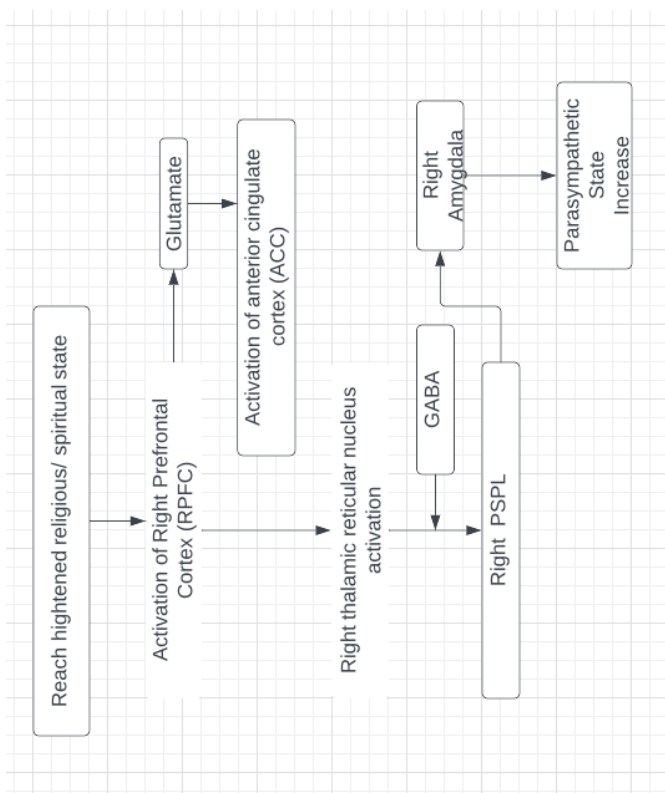


Image 3.5: Proposed neurobiological pathway of prayer effect on brain
[Adapted from Newberg and Iversen, 2003⁴⁶]

Conclusion on Neurotheological Findings

The importance of this section will be continuously pressed in the upcoming chapters, as it lays the foundation on how pastoral counseling, ministerial counseling, and twelve-step recovery model therapies are so potent and successful in helping individuals suffering from substance use disorders. Studies that have found hard evidence supporting the effect of prayer and spirituality on the brain have been very insightful in helping other research teams explore how spiritual and religious based CBT is in combination therapy for SUD and OUD.

4

Combination Therapy for Opioid Use Disorders.

Introduction

Opioid Addiction is defined as Opioid Use Disorder, which is defined by the DSM-V as a problematic pattern of opioid use leading to clinically significant impairment or distress⁵². Opioid Use Disorder can easily lead to opioid overdose and overdose related death incidences. To combat these outcomes, there is a gold-standard of therapy when treating both Opioid Use Disorder (OUD), and opioid related overdose.

Gold standard of care is a term used in medicine that implies that the therapy of distinction is the benchmark that is available under reasonable standard, with known results⁴⁹. The gold standard for treating OUD is the combination therapy of using both Medication-Assisted Therapy (MAT) in combination with Cognitive Behavioral Therapy (CBT)⁴⁹.

One of the factors regarding combination therapy is the primary outcome of retention in treatment. This is due to retention being associated with objective reports of decreased use and dependency on drugs, the increase and improvement in social functioning and overall quality of life, and finally the reduction in mortality rates affiliated with the dependent illicit drug⁴⁷. The efficacy of combination therapies has been well established and reported in numerous published articles.

In a study conducted in 2017, Patients who received combination therapy of CBT and MAT were more likely to become fully rehabilitated following a six-month follow-up than those who only received the medication-assisted therapy (54% rate for combination therapy vs. 16% for MAT only)⁵⁰.

Before continuing into a deeper exploration on this topic, it is imperative to note that most of the literature that reviews outcomes of multiple long-term studies on CBT efficacy exclude those who have diagnosed with Axis 1 disorders (dual diagnoses), pregnant women, and individuals who are currently incarcerated in federal prisons, as these individuals meet special exclusion criteria and fall outside of the golden standard therapy window.

Medication Assisted Treatment (MAT)

The current gold-standard therapy for the treatment of opioid addiction in the United States, is the combination of Medication Assisted Therapy (MAT), further classified as Opioid Agonist Therapy (OAT), and cognitive behavioral therapy (CBT)¹². In a study by the Substance Abuse and Mental Health Service Administration (SAMHSA, 2017), they found that Medication Assistant Therapy (MAT) had been shown to be clinically effective at significantly reducing the need for inpatient detoxification services for individuals addicted to both alcohol and opioid substances^{11,40}.

In a recent systematic review, retention rates for patients suffering from various substance abuse disorders (SUD), especially opiate- dependent patients, were found to have better outcomes than patients who did not receive medication-assisted therapy⁴⁴ (Timko et al., 2015).

Substance Use Disorders are defined as the recurring use of alcohol and/or prescription or illicit drugs that causes clinically significant impairment (including health problems, disability, and failure to meet major responsibilities with education pursuits, career, and homelife)⁴⁴. The reason for the success of medication assisted therapy is that MAT provides a tailored approach to medical intervention for these patients, as well as help facilitate the cognitive behavioral therapy as well^{11,52}. The goal of Medication Assisted Therapy is to assist the patient in complete recovery from their addiction, including the ability for these individuals to live a self-directed life⁴⁰.

The HHS and SAMHSA have found that MAT has been shown to improve patient survival, increase retention in combination therapies, decrease illicit opiate use and other criminal activities among those with substance abuse disorders, increase patients' ability to obtain and maintain employment, and improve birth outcomes among women who have substance use disorders and are pregnant^{11,52}.

The most prescribed and utilized medication for opioid agonist therapy is the emergency medication naloxone (usually administered as a nasal spray in the emergency department for patients who are being treated for opioid overdose). The most common medications used in the prevention of opioid dependency are the medications buprenorphine, methadone, and naltrexone^{11,40}.

Further research has shown that these medications, along with combination therapy with cognitive behavioral therapy (CBT), contribute to lowering an individual's risk of contracting life-threatening illnesses such as HIV or hepatitis C by lowering their risk of relapse^{51,52}. There are a variety of medications used in medication assisted therapy and the choice of medication therapy is dependent on the type of substance the patient is addicted to. The Food and Drug Administration has approved seven various medications for clinical use in medication assisted therapy.

These medications are used with the overall goal of alleviating withdrawal symptomology as well as relieve the psychological cravings a patient can experience after the addictive substance has caused chemical imbalances in the nervous system. The medications listed in image 4.1 are based on decades of evidence-based treatment trials and studies.

<u>MAT medication classification use</u>	<u>Name of GST medication</u>
Alcohol Use Disorder (AUD)	Acamprosate, disulfiram, and Naltrexone
Opioid Dependency Disorder (ODD)	Buprenorphine, methadone, and naltrexone
Opioid Agonist Therapy (OAT) for Opioid Overdose	Naloxone

Image 4.1: MAT medication classification, as listed
by SAMHSA^{11,40}

Antidotal medications, as well as the other medications used in medication assisted therapy, are approved by the federal drug administration (FDA)¹¹. Alcohol Use Disorder, as defined in the Diagnostic and Statistical manual of Mental Disorders (American Psychiatric Association, 2013), as a chronic debilitating disease characterized by uncontrolled consumption of alcohol as well as an obsessive preoccupation with alcohol⁴³. Medications used in the medication assisted therapy of Alcohol Use Disorder are acamprosate, disulfiram, and naltrexone.

Opioid Use Disorder, or previously known as Opioid Dependency Disorder, is defined in the Diagnostic and Statistics Manual of Mental Disorders (American Psychiatric Disorder, 2013) as the problematic pattern of opioid use leading to clinically significant impairment or distress⁵³.

The medications used in medication assisted therapy of opioid dependency disorder are most therapeutic when the patient is addicted to short acting opioids. Short-acting non-synthetic opioids such as heroin, morphine, and codeine, as well as semi-synthetic opioids such as oxycodone and hydrocodone^{40,42}.

The use of naloxone as a gold standard therapy for opioid overdose prevention has become a staple in most emergency departments in the united states, although there are still barriers in place in many states regarding access and use of the medication¹². Naloxone is an antidote that acts by reversing the toxic effect of opioids on the nervous system which leads to cardiac and respiratory failure and subsequently, death⁵². According to the World Health Organization⁵³ (WHO), naloxone is considered a substantial part of the medications considered essential to a functioning health care system.

Cognitive Behavioral Therapy (CBT)

Cognitive behavioral therapy (CBT) is a psychological or psychiatric intervention with the primary goal of reducing symptoms of various diagnosable mental health conditions, primarily depression, drug abuse and addiction, and anxiety-based disorders⁵⁵. Cognitive Behavioral Therapy has shown profound efficacy in substance abuse disorders⁴⁶ as both a monotherapy, and when used in combination therapy with medication assisted therapy (MAT) to treat substance use disorders (SUD). The importance of cognitive behavioral therapy lies in the fact that substance use disorders have a high reported rate of lifetime substance use and/or abuse, with a 30% failure of retention for alcohol, and 10% for other substances, along with an 8.5% chance of remission for alcohol use in one year sobriety and 2% for other substances⁵⁶.

The inability for opioid use disorder patients to stay off opioids after medication-assisted therapy is linked with lack of appropriate cognitive behavioral therapy, which has been proven to help keep people suffering from substance use disorders from relapsing back into use or addiction.

Cognitive Behavioral Therapy encompasses a wide variety of modalities that are used to tailor the therapy to the need of the patient. The broad-spectrum breakdown of CBT modalities is listed as either individual or group treatment. Most can be done in either groups or in one-on-one sessions with the therapist and patient. A summary on each of the more notable modalities are listed below, with a more in-depth review of both pastoral counseling support and spirituality in another section.

CBT modality	Individual Therapy	Group Therapy	Can be either
Motivational Intervention	+	+	+
Contingency Management	+	-	-
Relapse Prevention/ other treatments	+	-	-
Couples/ Family Treatment	-	+	-
Pastoral Counseling Support	+	+	+
Twelve-step programs/ Spirituality program	-	+	-

Image 4.2: Different CBT modalities and their settings

Motivational Intervention/ Interviewing (MI)

Motivational intervention is a cognitive behavioral method that focuses on addressing the motivation of the individual to seek treatment for their addiction. A common form of motivational intervention is a technique called Motivational Interviewing (MI).

Motivational Interviewing is a CBT approach that targets the individual's ambivalence toward changing their behavior relative to the recurring use of either alcohol or drugs⁵⁶. Studies have shown that the efficacy of this treatment modality is greater when the frequency of therapeutic visits are higher than normal in frequency⁵⁶.

Contingency Management (CM)

CM is a cognitive behavioral therapy technique that is based on the psychological school of thought known as operant learning theory, with use of a non-drug enforcer. The aim of the therapist is to pair a new non-drug reinforcing agent (such as a token, or monetary reward) with the neurochemical drive for the substance. If a patient is feeling the urge to drink alcohol again, instead of breaking their abstinence period and pursuing alcohol they should instead seek the new reinforcing agent. The therapist then monitors the patient with biological urine screens to ensure there is no drug relapse.

Over time, the brain learns to pair the hunger of addiction with the new reinforcer and ensure no more periods of relapse. Many meta-analytic trial reviews have shown that contingency management has been successful for patients diagnosed with alcohol, cocaine, and opioid use disorders with greater efficacy for opioid and cocaine use over alcohol⁵⁶. The problem with contingency management is that it is the most expensive CBT therapy, as the cost to provide non-drug reinforcers come at the cost of the mental health provider or their agency. The recent introduction in job-based reinforced contingency management has provided some relief in this area, as well as spouse/ partner or family reinforcers⁴⁶.

Relapse Prevention (RP)

Relapse Prevention focuses on identifying people, places, or things that might trigger a desire to seek the substance of addiction and preventing the patient from carrying out a relapse by developing an alternative cognitive response to these cues. This includes identifying key areas such as favorite bars, large social engagements, and even friends or family that might push the patient into the direction of relapse and having the patient remove these individual key factors from their life.

Relapse Prevention therapy also uses concepts of psychoeducation, problem-solving workshops, and helping the patient develop coping skills to help overcome their addiction. Relapse prevention has shown low efficacy regarding long term relapse prevention when analyzed by meta-analysis. Although it has shown promising results in the ability to improve a patient's psychosocial adjustment levels when exposed to identifiers⁵⁶.

Couples and Family Treatments

Due to the strong social environment tie with most substance abuse disorders, incorporating the patient's spouse, partner, and even family can have strong efficacious effect on promoting sustained abstinence with substance use disorders. Community Reinforcement Approach (CRA) is a popular method, and is similar in design to contingency management, where the therapist focuses on altering the patient's environment with the help of the spouse or family.

CRA has been linked to high efficacy in patients suffering from alcohol abuse disorder⁵⁶. Behavioral Couples Therapy (BCT) is a methodology where the patient is educated on the negative and detrimental reciprocity relationship between the substance they abuse and its effects on their spouse or partner.

Behavioral Couples Therapy involves a two-pronged approach with an overall goal of improving the spouse/partner's coping mechanisms with the substance abuse as well as improving the functionality of the relationship between the patient and their spouse. A recent study showed that behavioral couples therapy showed markedly efficacious results when used in alcohol abuse disorder, but there was not sufficient data to observe any efficacious correlation with other substances of abuse⁵⁶.

Efficacy of MAT + CBT in Patients with
OUD

One of the factors regarding combination therapy is the primary outcome of retention in treatment. This is due to retention being associated with objective reports of decreased use and dependency on drugs, the increase and improvement in social functioning and overall quality of life, and finally the reduction in mortality rates affiliated with the dependent illicit drug⁵⁷.

The efficacy of combination therapies has been well established and reported in numerous published articles. In a study conducted in 2017, Patients who received combination therapy of CBT and MAT were more likely to become fully rehabilitated following a six-month follow-up than those who only received the medication-assisted therapy (54% rate for combination therapy vs. 16% for MAT only)⁴⁷.

Reported efficacy of combined medication-assisted therapy with cognitive behavioral therapy is higher in patients who have undergone group cognitive behavior therapy (retention rate of 55%) than those who have done medication-assisted therapy with individual cognitive behavior therapy (retention rate of 21%) when in opioid care program, and when also compared to those who did combination therapy with only brief counseling in a primary care setting (retention rate of 33%)^{50,57}.

Patients with opioid use disorder that were part of a take-home combination therapy program showed to have higher rates of one year retention (retention rates reported as 74%) than those who were involved in a program that contained daily supervision (retention rates of 58%)^{50,57}.

There has been an increase in questioning the efficacy, especially when evaluating combination therapy used in the treatment of opioid use disorder, of combination therapy in recent systematic reviews⁵¹. These studies have suggested certain cognitive behavioral therapies are more favored than others, and this has led therapists to use a blanketed approach when selecting a modality for a patient population⁵¹.

One cognitive behavioral therapy might show substantial efficacy in one population, but when applied to a different population it has a much lower efficacy and retention rate. This, of course, is a true observation but it is not an issue that hasn't been addressed in numerous other articles that have assessed the efficacy of cognitive behavioral therapy when used in tandem with medication-assisted therapy.

Numerous meta-analytic studies have shown that certain cognitive behavioral therapy modalities are more efficacious at producing higher rates of retention with certain substance use disorders, and that while they might be more efficacious in one substance use disorder that does not imply that these different therapy modalities are equally efficacious with other substance use disorders^{56,57,58,59,60}. Medication-assisted therapy and cognitive behavioral therapy have been proven to be the most efficacious when used together to treat opioid use disorders.

5

The Efficacy of Christian-based Therapy in Substance Use Disorders

Introduction

Ministerial and Pastoral Counseling Therapy (MCT or PCT) is defined as a subtype of cognitive behavioral therapy counseling, in which the role of the therapist is held by a member of the clergy (who has formal academic and professional training in psychology) who provides religious based psychological services that follow the nation's standard of care⁶¹. The history of pastoral counseling begins in the beginning of the twentieth century when various church organizations began to incorporate the concepts of social work, psychiatry, and psychology into their seminary and theological training.

A Harvard University physician and professor, Dr. Richard Cabot, wrote and published an article in 1925 that promoted the idea that any candidate applying for ministry positions and education should receive clinical training along with pastoral work. In the same article, Dr. Cabot also noted that this style of training should mimic that of clinical medical students⁶³. The Reverend Anton Boisen, the 1930's, started implementing a practice of placing his theological students in the direct care of patients with mental disorders under the supervision of clinicians⁶⁴. It was after this that soon more and more seminary programs began to implement a standardized form of clinical pastoral education as part of their standardized clerical training. Along with this milestone, another event of that took place in the 1930's was the foundation of the American Foundation of Religion and Psychiatry (which is now known as the Blanton-Peale Institute).

This was the first organized entity that brought together clinical psychology and clergy seminary education and combined the two principles to collaborate and work on providing standardized and national training to ministerial theological students across the country. The American Association of Pastoral Counselors was founded in 1963 to provide professional certifications for pastoral counselors and pastoral counseling centers across America.

The history of the Alcoholics Anonymous (AA) organization has its origin story roots from an organization known as the Oxford Group. The Oxford Group is a non-denominational, altruistic movement which was modeled on Christian practices of the 1st century. The early affiliation to the Oxford Group principles laid the foundation for the twelve-step model of recovery regarding the idea of setting aside any objection and instead replacing it with spirituality.

Spirituality would defined here as forming a personal idea of God and giving your suffering in addiction over to this higher power. Members are taught to seek guidance from God and grow in strength using the *serenity prayer*, written by American theologian Reinhold Niebuhr in 1932⁶⁵.

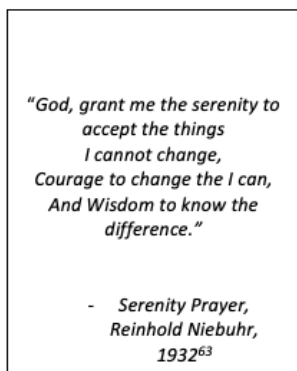


Image 5.1: The Serenity Prayer, used by AA and other spiritual based therapy models⁶³

The success of the alcoholic anonymous recovery model is achieved through undergoing a spiritual awakening by following the twelve-step recovery model (see image 4.3).

The (annotated) Twelve Steps⁶⁵

1. We admitted we were powerless over alcohol and that our lives had become unmanageable on our own.
2. Came to Believe that a higher power than ourselves could restore us to peace of mind.
3. Decided to turn down our lives over to the care of God *as we understood Him*.
4. Searched inward without fear or hesitation to create a moral inventory of ourselves.
5. Admitted to God, to ourselves, and to another person the exact nature of our wrongdoings.
6. Were entirely ready to have God remove all these wrongs from our own character.
7. Humbly asked God to remove the shortcomings.
8. Made a list of all persons we had harmed and opened the mind up to amend them all.
9. Made direct amends to any persons, when possible, except in a situation that would cause them injury or harm.
10. Continued to take a personal moral inventory, and when found wrong, admitted the wrong.
11. Through prayer and meditation improved the minds connection with God, *as we understood him*, asking only for his knowledge of his will for us and the power to carry that out.
12. Having had undergone a spiritual awakening as the result of these steps, tried to carry this message to other alcoholics and forever practice these principles.

Image 5.3: An annotated Twelve Steps, from the original AA twelve step recovery model⁶⁶

Since its creation, the twelve-step recovery model has become the primary model for most religious and spiritual based cognitive behavioral therapy modalities. The reasoning goes beyond the obvious (the references to God and prayer), as since its creation in the 1940's, the twelve-step recovery model has been shown to be one of the best models for treating substance abuse disorder, even in those who had no religious or spiritual background⁶⁸.

Research for Spiritual and Religious Based
Therapy Modalities

The 2020 Cochran Review of Twelve-Step
Recovery Model

The 2020 Cochran review of the twelve-step recovery model showed that individuals suffering from substance use disorder are more likely to reach an abstinent lifestyle and retain their abstinent lifestyle for longer periods of time than some other treatments⁶⁸. The review also noted that it performed at the same level with other modalities in drinks per day measures and other measures outside of abstinence^{68,69}. When the researchers compared Alcoholics Anonymous and other twelve step facilitations (TSF) to other substance use disorder interventions, a randomized controlled trial showed that the abstinent rate of the AA/TSF group was 42% overall, and that those involved in a non-AA/TSF intervention were at 35% abstinence at the same time length^{68,69}.

The researchers did clarify that not only did the subjects undergoing AA/TSF based intervention have higher abstinent rate, but those also who did not achieve the same level of abstinence in a similar time frame, did not have worse drinking outcomes or decline in health or habit^{68,69}.

AA/ TSF comparative Data	Performed better than non-TSF?	Statistical Evidence
RCT variant of 12 -month abstinence rate of retention	Yes	RR 1.21 95% CI 1.03 to 1.42 N= 1936
% of days abstinent	Yes	MD 12.91 95% CI 7.55 to 18.29 N= 392
Longest period of Abstinence	Yes	MD: 0.60 95% CI -0.30 to 1.50 n= 136

Image 5.4: Cochran Review on AA/TSF complete findings^{68,69}

Statistical Support for PCT with TSF on
OD

A study conducted by Heinz et al. (2007) found that in 169 individuals diagnosed with SUD, with either OUD or CUD, who were undergoing TSF with high INSPIRIT index levels reported higher levels of in-treatment retention rates, and drug free urine screenings. INSPIRITI index correlation was [$r=.16$, $p<0.4$] showing a weak correlation but a correlation was still apparent⁷². The variables reported in the discussion were that women and African American participants were more likely to report higher INSPIRIT index scores as well as report more pronounced spiritual and religious moments than the Caucasian males in the study, researchers suggest that demographics might play more of a role in the utilization of TSF or PCT than previously thought⁷².

Desmond et al. (1981) investigated efficacy of Pentecostal PCT amongst 248 Mexican American's who were diagnosed with OUD in San Antonio, Tx. Over a twelve-year period, 11% of the 248 group would enter Pentecostal PCT. After this period, the researchers found that 44% of the group showed higher levels of retention rates and abstinence from heroin (44% vs 33%)⁷⁰. The researchers concluded that among certain demographic groups, PCT/MCT programs that focus around sociotherapy which encompass psychodynamic and sociocultural mechanisms might be more effective at treating OUD and SUDs than other models of CBT⁷⁰.

Propst et al. (1992) investigated the efficacy of pastoral counselor therapy (PCT) and Religious content therapy (RCT) in treating clinical depression and found that RCT and PCT patients reported a significantly lower post-therapy depression rating and mood adjustment scores than did non-religious therapy groups⁷⁶. The researchers ran a double-blind ANOVA assigning patients and therapist at random,

then scored the post- therapy measurements using the beck depression inventory (BDI) to find a $t=4.68$ ($p<0.001$) for pastoral counseling and $t= 3.61$ ($p<0.01$) for religious content therapy⁷⁶. The researchers noted in the discussion how PCT was beneficial even for patients who had reported to be of a different denomination than the PCT or non-religious at all, but still reported increase in mood on their BDI following therapy.

There has been research supporting that OUD and SUD recovering individual reported statistically higher levels of faith and spiritually on INSPIRIT index scoring, as well as lower relapse rates than those who had continued to relapse⁷³. In a study investigating the effect of family-based CBT and RCT/ PCT on 1,174 individuals who were suffering from OUD and had started the process of rehabilitation, that the religious (PCT/RCT) variables accounted for significant and unique variance with regards to general-well-being index scores but that both family and RCT/PCT lead to increased retention rates and long-term abstinence rates⁷¹.

Conclusion

The nation is in the middle of a serious opioid epidemic that is looking to only to get worse over the next decade. The ripple effect of the opioid crisis is already being felt in communities both rural and urban across the United States, while driving up health care expenditure and placing burdens on law enforcement. The population demographics indicate that no community or group is safe from the effects of this national crisis. With the projected rise in opioid overdose-related deaths and opioid use disorder, the community need for academically and professional therapist will be higher than ever.

The research reviewed in this dissertation has shown that medication assisted therapy and cognitive behavioral therapy are the gold standard of treatment for patients who are seeking rehabilitation from opioid use disorder. The literature review illuminated the profound effect that spirituality, faith, and religious practice has on the central nervous system.

Finally, the review of current literature on the efficacy of spiritual based twelve-step models, pastoral counseling and religious counseling has on not only treating opioid addiction, but other substance abuse disorders and even depression. The conclusion of the literature on the efficacy of pastoral counseling therapy regarding its benefit in opioid use disorder is that it is beneficial and can be a powerful tool in helping both parish and non-parish members alike in breaking free from their addiction. But more research needs to be done specifically on Christian pastoral counseling and religious counseling specifically.

Most contemporary research on PCT and RCT application is broadly observing the CBT models under the umbrella term of general spirituality, since AA-TSF model reviewed in the 20202 Cochran review showed that TSF CBT showed statistically significant evidence that the spiritual based model of CBT was best for securing long term retention rates in alcohol addiction.

But more research outside of broad spirituality and alcohol use disorder is needed to get a better picture at how PCT and RCT with or without TSF is effective at treating individuals with varying mental disorders and condition.

Glossary of Terms

AA: Alcoholics Anonymous is a mutual aid fellowship that focuses on abstinence-based recovery from alcoholism utilizing the twelve-step recovery model program and twelve traditions.

ACC: anterior cingulate cortex is the frontal portion of the cingulate cortex, serves in higher cognitive functioning such as attention allocation, anticipation of reward, decision making, morality and ethics, and impulse control.

ACTH: adrenocorticotrophic hormone is a protein-based hormone produced in the anterior pituitary gland that is secreted in the flight or fight response and in acute and chronic stress.

Acute: short window of time, in medicine it is used to mean less than two months of duration.

ADP: adenosine triphosphate is the organic byproduct of adenosine triphosphate (ATP) after the cell uses ATP for energy.

ANCOVA: a one-way analysis of covariance is a statistical method of reporting, it is widely used in statistics in science, psychology, and medicine.

ARP: Addiction Recovery Program is the LDS (Mormon) church's adaptation of the twelve-step recovery model and used in the recovery facilities ran by their church organization.

ATP: Adenosine Triphosphate is the cell's primary source of energy and is used in almost every major cellular process in the body. ATP is obtained from consuming sugars, fats, and proteins and having these structures digested and absorbed in the gastrointestinal tract.

BCT: Behavioral Couple's Therapy is a cognitive behavioral therapy method that brings the patient's spouse or life partner into the therapy session to work on both their relationship and addiction. This model places more emphasis on accountability

cAMP: cyclic adenosine monophosphate is a secondary messenger found within cell membrane.

CBT: cognitive behavioral therapy is a psycho-social intervention therapy with the ministration goal of reducing symptoms of various mental health conditions and disorders. CBT is used primarily by therapist to treat addiction, depression, and anxiety disorders. CBT has been shown to improve emotional regulation and help individuals develop coping strategies.

CDC: Center for Disease Control is the united states government agency that is responsible for investigating disease outbreak on the epidemic and pandemic level. The CDC also covers a wide array of public health issues in tandem with the U.S. Department of Health and Human Services (HHS). Their headquarters is in Atlanta, GA.

CM: contingency management a subtype of cognitive behavioral therapy which uses the psychology principle of operant conditioning to achieve a change in behavior. Contingency management uses positive reinforcement methods by presenting the patient with a prize to continue to drive their good behavior.

CRA: community reinforcement approach is a therapy model that uses a group therapy model but is centered around members of one community.

DEA: Drug Enforcement Administration is the government agency responsible for monitoring prescription and illicit drug exchange in the United States. The DEA is also in charge of issuing licensing numbers to any clinical practitioner who has the authority to prescribe drugs. Their headquarters is in Arlington, VA.

DMN: default mode network is a collection of subcortical structures in the brain that active when a person is not focused on the outside world and instead is lost in thought in their own mind (daydreaming). The DMN is also involved in other numerous tasks in the brain, but other areas of note are goal orientated tasks.

DOA: drugs of abuse are any illicit or prescribed drug that is used in abundance by an individual until it causes harm to mind, body, and social life. Common DOA are alcohol, narcotics, nicotine.

DOC: drug of choice is a medical term that is used to note that a specified medication is the most recommended by all medical organizations through evidence-based research.

DOR: delta opioid receptor

fMRI: functionalized magnetic resonance image measures brain activity by recording blood flow to specific regions of the brain that are anatomically mapped and catalogued. The fMRI technique uses multiple magnetic fields that align the nuclei of cells in oxygen rich blood that in turn produce an image. It is utilized more in the field of research than in clinical medicine.

GPCR: G protein-coupled receptors are protein receptors that activate secondary messenger pathways inside of a cell when coupled with neurotransmitters in the brain.

HCV: hepatitis C virus is the virus responsible for causing the disease hepatitis C, which can lead to liver tissue necrosis and death. There are medications now available that can cure HCV.

HHS: U.S. Department of Health and Human Resources is the government agency that is responsible for any form of public health and social health services regarding policy making and trend tracking. The head of the HHS is the United States Surgeon General. Their headquarters is in Washington, D.C.

HIV: human immunodeficiency virus is the virus responsible for causing Autoimmune Deficiency Syndrome (AIDS) in human beings. There are medication regimens available that allow those with HIV/ AIDS to live a near to normal lifespan and alleviate other symptoms.

INSPIRIT: index of spiritual experience is a subjective survey measuring device that asks a set of questions on spiritual attitude and experiences then generates a scored index. Used in psychological research observing spirituality and religious experiences.

IPL: inferior parietal lobule

ISAM: International Society of Addiction Medicine was founded in 1999 and is a professional organization comprised of medical practitioners, physicians, and clinicians with the mission of addressing issues within the field of addiction medicine.

KOR: kappa opioid receptor

MAT: Medication Assisted Therapy the gold standard for treating substance abuse disorders such as alcoholism and narcotic addiction.

MI: motivational interviewing is a subtype of cognitive behavioral therapy that focuses on exploring and resolving ambivalence while motivating processes within the individual to bring about a change in behavior.

MOR: mu opioid receptor

MTC: Ministerial Counseling Therapy a cognitive behavioral therapy model where a clergy member who is academically trained in psychology and therapy takes the role of therapist. MTC mostly uses elements of the therapist religion, faith, or governing church organization but can provide services to any in need, parish member or not.

NIH: National Institute of Health is the leading agency in the United States government that is responsible for biomedical and public health research. It is a part of the HHS. NIH publication search engines are the most used by researchers when searching for articles to review. Their headquarters is in Bethesda, MD.

PCT: Pastoral Counseling Therapy [see ministerial counseling therapy]

PFC: prefrontal cortex the most anterior portion of the frontal cortex of the brain.

RP: relapse prevention is a subtype of cognitive behavioral medicine that aids in identifying and preventing high-risk situations using social support and development of coping skills. Relapse prevention has been found to be helpful in treating disorders such as substance use disorders, obsessive compulsive disorder, sex offense, obesity, and mood disorder/depression.

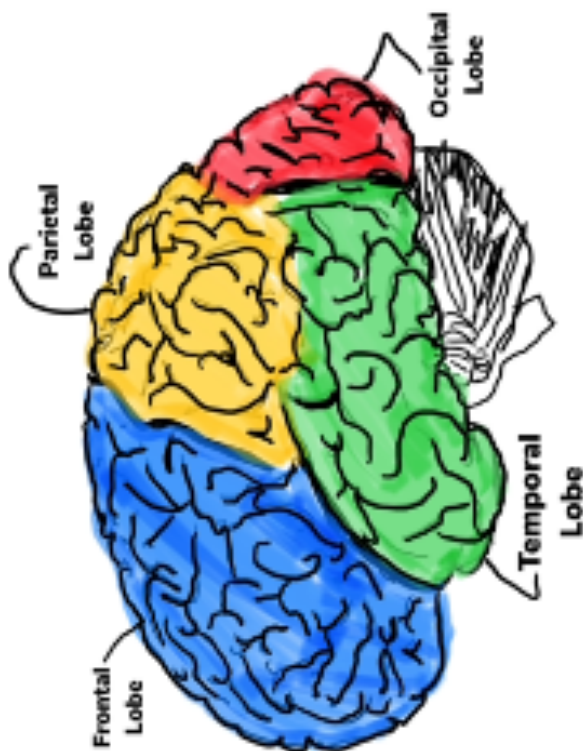
SAMHSA: Substance Abuse and Mental Health Service Administration is a subset of the HHS and oversees public health and epidemiological needs of mental health and substance abuse.

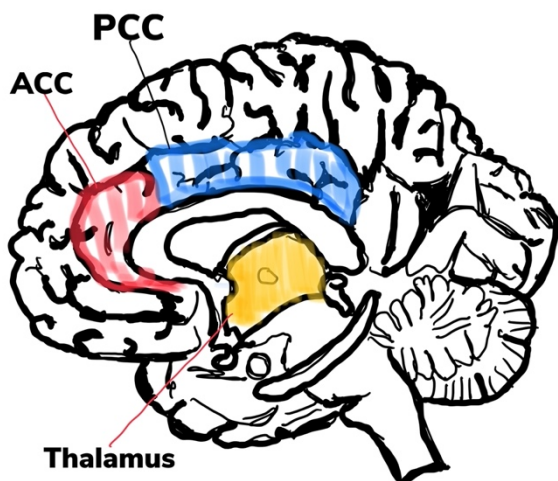
SPECT: single photon computed tomography is a type of central nervous system imaging device that uses single photon emission technology to take high resolution images of the brain.

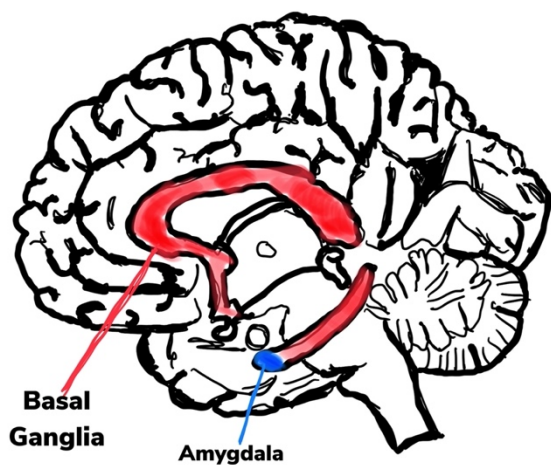
SUDs: substance use disorders are the umbrella term used in the diagnostic and statistical manual of mental health disorder (DSM) for any condition that involves the abuse or addiction to any of the known drugs of abuse.

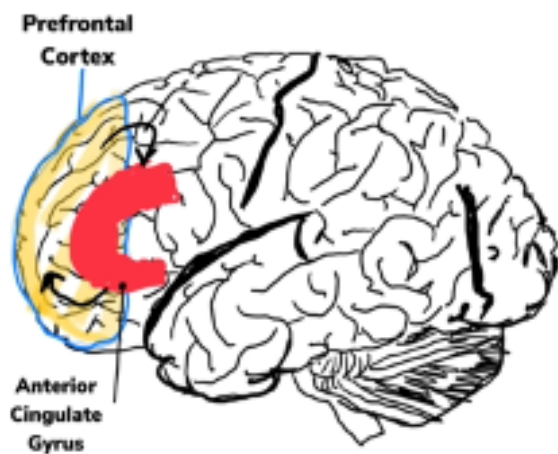
STD: sexually transmitted diseases are microbial infections that are spread through the act of unprotected sex with an individual that is a positive carrier of that microbial infectious agent. STDs can be prevented through abstinence measures or by using protective measures. Most of them can be easily treated with medication.

Quick Reference Charts of Neural Anatomy









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