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IMPACT OF BIOLOGICAL, PSYCHOLOGICAL, AND SOCIAL FACTORS ON SUBSTANCE USE DISORDERS, AND PREVENTION APPLICATION.

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Contents

1. Chapter (1) – Abstract

Substance use disorder (SUD) can be defined as the physical and psychological inability to stop using addictive substances, despite the complications and social problems that the use of such substances may cause. This inability might be due to the withdrawal symptoms that occur when substance use stops suddenly.

Many researchers link the causes of SUDs and motives for substance use and, consequently, abuse, first with psychological disorders (such as depression and anxiety) and second with social factors (such as peer group pressure, poor parental supervision, addicts in the family). However, many scientists today also link SUDs with genetic factors, individual brain reward system mechanisms, family history, childhood, trauma, personality traits, and gender.

The negative impact of SUDs extends beyond a person's health to their life, family, and society. Moreover, the number of people suffering SUDs is increasing year on year (World Drug Report, 2020). According to DSM-5, SUDs result from the use of 10 separate classes of drugs: (1) alcohol; (2) caffeine; (3) cannabis; (4) hallucinogens; (5) inhalants; (6) opioids; (7) sedatives; (8) hypnotics, or anxiolytics; (9) stimulants (including amphetamine-type substances, cocaine, and others); and (10) tobacco (American Psychiatric Association (APA), 2013).

2. Chapter (2) – Introduction

Substance use disorders (SUDs) have seen rapid growth worldwide in recent years. The phenomenon of SUDs affects all social classes and cultural levels and a wide range of age groups. In this dissertation, through a narrative literature review, we examine the cause(s) of SUDs and the most influential risk factors. The literature reviewed covers recent theories and models discussing the cause of addiction. It was concluded that SUD development involves many different factors, including psychological, social, familial, and biological. These factors are all interlinked on different levels, and none is the sole cause of SUDs. In our opinion, easy access to drugs represents a crucial risk factor for developing an SUD. SUD prevention strategies are reviewed and presented in the dissertation in detail with a focus on cannabis use. As regards the treatment of cannabis use disorder (CUD), we concluded that the best available treatment is counselling therapy, with many researchers endorsing the 12-step facilitation programme combined with cognitive behaviour therapy programme.

In this research, I have capitalised on my personal experience of 15 years as a cognitive behaviour therapist in clinic in Kuwait, through lessons learnt from treating wide range of mental disorders including SUDs.

How do SUDs Develop?

According to DSM-5, the habit is formed when SUDs directly activate the reward pathways instead of achieving reward system activation through adaptive behaviours. The drugs typically activate the system and produce feelings of pleasure, often referred to as a "high". Furthermore, individuals with lower levels of self-control, which may reflect impairments of brain inhibitory mechanisms, may be particularly predisposed to develop SUDs (APA, 2013).

SUDs development is a complex interplay of genetic, environmental, and psychological factors. According to the biopsychosocial model (Engel, 1977), genetic predispositions significantly contribute to an individual's vulnerability to SUDs. Twin, family, and adoption studies have consistently demonstrated heritability in SUD behaviours (Kendler et al., 2003; Agrawal & Lynskey, 2008). Genetic variations in neurotransmitter systems, such as dopamine and serotonin, have been implicated in the risk for SUDs (Blum et al., 1990; Dick et al., 2007).

Environmental factors play a pivotal role in SUDs development. Adverse childhood experiences, trauma, and exposure to substance use within the family or peer groups contribute to an increased susceptibility (Dube et al., 2003; Kendler et al., 2016). Socioeconomic factors, including poverty and lack of access to education, may further amplify the risk (Marmot, 2005; Grant & Dawson, 1997).

Psychological factors, such as personality traits and mental health conditions, also play a crucial role. Individuals with traits like impulsivity and sensation-seeking are more

prone to developing SUDs (Zuckerman, 1994; Verdejo-García et al., 2008). Co-occurring mental health disorders, such as depression and anxiety, often precede or accompany the onset of SUDs (Merikangas et al., 2010; Swendsen et al., 2010).

The developmental pathway of SUDs is best understood through an integrated perspective considering the bidirectional influences of these factors. Gene-environment interactions and epigenetic modifications further contribute to the complex understanding of SUDs development (Kendler & Eaves, 1986; Uher et al., 2014).

SUD Research Gap

Over the past 50 years, researchers have shown great interest in investigating SUDs and their prevention. Between 1971 and 2017, 13,685 papers related to illicit drugs, tobacco, and alcohol use disorders and treatment were published (Tran et al., 2019). Despite this vast global trend of publications on SUDs, we have noticed that most research papers focused on the US and rarely considered the different local contexts of different communities. A significant amount of literature is available on SUDs and dependency in terms of genetic factors, brain reward mechanism, psychological issues, and sociocultural issues (Lowinson et al., 2004). However, we could not find many scientists discussing the association between biological, psychological, and social factors and SUDs and clearly linking them.

The subject of SUDs is complicated and not well understood, which makes them difficult to diagnose and treat (Colon-Rivera and Balasanova, 2020). With this dissertation,

we intend to contribute to the topic by carrying out a literature review to identify the aetiology and course of addiction through the association, if any, between biological, psychological, and social factors of SUDs.

Research Questions

The main question of this dissertation is to assess the factors that influence SUDs, after which attention is drawn to prevention and counselling. In that context, we need to understand the link between biological, psychological, and social factors of SUDs and the impact each of these factors has on them. Hence, we focus on the causality effect between SUDs and all three factor types. Thereafter, through those three factors, we discuss the available prevention and treatment techniques with a focus on cannabis sativa only. Thus, we review the available prevention techniques and discuss what treatment is best.

Aim of the Study

SUD stands as a complex challenge, representing both a physical and psychological struggle against addictive substances. The pervasive nature of SUDs goes beyond an individual's health, impacting their familial relationships and reverberating through society. The intricate web of causes, ranging from psychological disorders to genetic factors, necessitates a comprehensive understanding. As the prevalence of SUDs continues to rise globally, there is a pressing need to bridge the existing gaps in research,

especially in exploring the intricate connections between biological, psychological, and social factors contributing to the development of SUDs.

This thesis seeks to explore the multifaceted realm of SUDs, considering the complex interplay of factors that propel individuals towards addictive behaviours. The genesis of SUDs is often traced back to psychological disorders and social influences such as peer pressure or inadequate parental supervision. However, recent scientific discourse has broadened the scope, including genetic predispositions, the individual's brain reward system mechanisms, family history, childhood experiences, trauma, personality traits, and gender as contributing elements. Through an exhaustive literature review, this study aims to explain the complex associations between these factors, shedding light on their collective impact on the development and course of SUDs.

The substantial growth in SUD cases underscores the urgency of addressing this issue comprehensively. Drawing from the DSM-5 classifications, which encompass diverse substances from alcohol to tobacco, our study aims to unravel the complex trajectory leading to SUDs. This exploration involves understanding the reward pathways activated by substances, the pleasure derived from drug use, and the role of impaired self-control in predisposing individuals to SUDs. By explaining these mechanisms, we aim to enhance the understanding of how SUDs develop and identify potential intervention points.

Despite a prolific outpouring of research on SUDs over the past decades, there remains a noticeable gap in understanding the complexities of the issue across diverse local contexts. This study aims to address this gap by exploring the biological,

psychological, and social dimensions of SUDs, with consideration of different communities. While existing literature has extensively covered genetic factors, brain reward mechanisms, and sociocultural issues related to SUDs, the integration of these facets into a cohesive narrative is lacking. Our research endeavours to contribute a comprehensive perspective by linking these factors in a more unified manner, fostering a holistic comprehension of SUDs.

Central to our study are critical research questions that guide the exploration of SUDs. We seek to assess the influencing factors behind SUDs and redirect focus towards prevention and counselling strategies. By scrutinizing the causality effect between biological, psychological, and social factors, we aim to unravel the complex layers of influences shaping SUDs. Moreover, our investigation extends to the evaluation of available prevention and treatment techniques, with a specific emphasis on cannabis. By examining the existing prevention methods and deliberating on optimal treatment approaches, we aspire to contribute valuable insights to the ongoing discourse on tackling the complexities of SUDs. Through this dissertation, we seek to pave the way for a better understanding of SUDs, fostering improved diagnosis, prevention, and treatment strategies.

3. Chapter (3) - Literature Review and methodology

Literature Review

The subject of SUDs is complicated and not well understood, which makes it difficult to diagnose and to treat (Colon-Rivera and Balasanova, 2020). With this dissertation, we intend to contribute to the subject of SUDs by carrying out a literature review leading to identifying aetiology and the course of addiction through the association, if any, between biological, psychological, and social factors on SUDs.

Methodology

In an effort to dig deeper into the subject of SUDs, a narrative literature review of relevant studies (identified through existing evidence-based research articles, reviews, meta-analyses, and current findings) was carried out by conducting a survey of scholarly sources on SUDs in recent years to gain an overview of current knowledge and relevant theories and identify gaps, if any. In the literature review, the existing literature was critically analysed as a basis for the discussion and conclusion.

Keywords: addiction, substance use disorder, marijuana, cannabis, brain reward system, compulsion models, genetics and addiction, addiction treatment, addiction prevention.

The exclusion criteria were that articles should not be written before 2008 or address food addiction or non-substance-use behaviours (gambling, video gaming, internet, social media, and sex addiction). We performed a search on the following databases: Science.gov, PubMed, and Google Scholar, using the inclusion terms in the keywords. The search concluded on 2nd July 2021. More than 50 scientific papers were reviewed, after which the findings were organised and categorised to address the research questions.

4. Chapter (4) - Contents and results

Worldwide Prevalence and Predictors of SUDs

According to the latest statistics from the United Nations Office on Drugs and Crime, approximately 36 million people suffer SUDs worldwide and approximately 269 million people used drugs in 2020 alone. SUD death prevalence is significant as well. In 2019, approximately 180 thousand deaths were directly linked to SUDs (World Drug Report, 2020).

The number of drug users worldwide has increased over the past 20 years by more than 28%. However, the ratio of number of people who use drugs to number of people with SUDs is approximately 7:1 (some 36 million people with SUDs of the 269 million people who used drugs in 2020). In other words, SUD patients represent 0.7% of the population aged 15–64, which is considered low (World Drug Report, 2020). However, considering the number of people who use substances as a means of temporary pleasure, the risk and consequences when/if they develop SUDs can be serious and life-threatening.

According to the National Centre for Health Statistics, in 2019, in the US alone there were over 70 thousand deaths related to drug overdoses, as compared to 37 thousand deaths 10 years ago (Hedegaard et al., 2020). Hence, deaths related to drug overdoses doubled in 10 years in the US alone, despite the fact that population growth there was very low during the same period. In this context, it is vital to manage the challenge of SUDs in society as early as possible.

Many well-known public figures have died from drug overdoses, which has increased public interest in drugs and drug overdoses. As early as the 1880s, the founder of psychoanalysis, Sigmund Freud, found that he had been addicted to tobacco since he was 20 years old and to cocaine for 15 years. Even though cocaine addiction led to the death of one of his friends, the concept of substance use was not frowned on by either the scientist or society (Southwick, 2011). Fatal overdoses among celebrities have continued over the past years, such as the deaths of famous singers Elvis Presley, Michael Jackson, and Prince, all of which were related to drug overdoses. Indeed, there is no doubt that the number of individuals with SUDs is increasing, and the evidence of deadly consequences is difficult to ignore. These basic facts led the U.S. government to start the "war on drugs" in the 1970s. However, modern society's tolerance of drug use, coupled with the legalisation of recreational drugs, has made the war on drugs less intense, and decisions concerning a healthy life are left more in the hands of the individual.

Many researchers have investigated the factors that influence the transition from substance use to substance dependency (which occurs among between one third and half of users, depending on the substance), and many of the studies we reviewed focused on nicotine and alcohol. A "National Epidemiological Survey on Alcohol and Related Conditions" study was carried out in the US in 2002, repeated in 2013, surveying a wide population for periods of between four and 27 years (Lopez-Quintero et al., 2011). The study concluded that nicotine users are at highest risk of transiting to dependency (68%), followed by alcohol and cocaine users (≈21%), while cannabis users are at the lower end (9%). However, transition to cannabis or to cocaine dependency happened fastest. Looking at the factors influencing the transition, the researcher claims that individuals' environment and background (e.g., being a member of a minority group, living in a city, and living in

poverty with a low level of education), individual psychiatric disorders, and dependence comorbidity, as well as genetic factors, all affect vulnerability to transition (Lopez-Quintero et al., 2011).

SUD poses a significant challenge in Arab countries, notably in the United Arab Emirates (UAE). Despite the stern religious condemnation, cultural disapproval, and the illegal nature of drug trafficking, the UAE finds itself entangled in the global epidemic of SUD. The surge in the prevalence of this disease can be ascribed to several factors, with the geographical location of the UAE being a pivotal one. Situated at the crossroads between southwest Asia and the global consumer market, the country has become a critical node in the trafficking route for illicit substances (Alblooshi et al., 2016).

According to the 2014 World Drug Report, the UAE emerges as a primary transit country for the air-trafficking of illicit substances, playing a crucial role in the global distribution of narcotics. This underscores the urgent need for comprehensive strategies to address the issue, as the nation becomes intricately linked to the broader challenges posed by the international drug trade. The rapid growth in population and societal shifts further exacerbate the problem, particularly impacting the younger demographic. The need for a nuanced understanding of substance use disorder in the UAE and among individuals of Arabian ancestry becomes evident, necessitating thorough research and detailed exploration to formulate targeted preventive measures (Alblooshi et al., 2016).

In 2009, three studies delved into data retrieved from patients admitted to psychiatric wards in hospitals and clinics across the Arabian Peninsula. These studies aimed to provide insights into specific socio-demographic variables and shed light on the

most prevalent substances of use, including alcohol, heroin, and cannabis (hashish). The review of this data offers a foundational understanding of the patterns and trends within the region, enabling the identification of key risk factors and vulnerable groups (Alblooshi et al., 2016).

Despite the cultural, religious, and legal barriers, SUD in the UAE cannot be overlooked. It is imperative to recognize the complex interplay of factors contributing to this issue, from the nation's geographical location in the global drug trade to the societal shifts influencing the younger population. As the link between SUD and the demographic of Arabian ancestry remains underexplored. Such investigations are crucial for developing targeted preventive measures and intervention strategies that are culturally sensitive and rooted in the unique context of the UAE (Alblooshi et al., 2016).

SUD Identification and evaluation

Evaluating SUD is a complex process that demands expertise from qualified healthcare professionals. The assessment integrates various methodologies to paint a comprehensive understanding of an individual's circumstances. The initial phase involves screening through tools such as the AUDIT (Alcohol Use Disorders Identification Test) and ASSIST (Alcohol, Smoking and Substance Involvement Screening Test). These concise questionnaires or interviews aim to pinpoint potential signs of SUD, offering a preliminary insight.

Following the screening, a clinical interview takes centre stage. This in-depth conversation explores the individual's history of substance use, analysing its impact across diverse facets of life, including physical, mental, social, and occupational domains. Simultaneously, the exploration encompasses the possibility of co-occurring mental health conditions, adding a layer of complexity to the assessment.

Supplementing the process, additional information is gathered from collateral sources such as family members, friends, or other healthcare providers. This external perspective provides valuable insights that contribute to a more comprehensive evaluation. Laboratory testing, involving urine or blood tests, is another facet, though it is important to note that these tests alone do not conclusively determine the presence of SUD.

Formalized assessment tools, like the DSM-5 criteria, play a pivotal role in establishing a diagnosis. These standardized instruments provide a structured framework based on specific criteria, facilitating a systematic and reliable approach to identifying SUD.

It is crucial to underscore that SUD assessment is not a one-time event but rather an ongoing process. This iterative approach allows healthcare professionals to monitor progress and make necessary adjustments to treatment plans. Additionally, the importance of self-awareness and honesty in the assessment process cannot be overstated, as accurate information is paramount to effective evaluation.

Seeking professional assistance is imperative for an accurate diagnosis and access to appropriate treatment options. The collaboration between individuals and healthcare professionals ensures a thorough and tailored approach to addressing SUD, acknowledging its multifaceted nature.

In the realm of SUD assessment, the utilization of computerized adaptive tests (CATs) stands out as a remarkably efficient approach. These CATs exhibit a dual advantage of minimizing both the time commitment required from patients and clinicians, while simultaneously ensuring a high level of diagnostic accuracy. The efficacy of CATs in evaluating substance use disorders has been well-established in adult populations through rigorous validation processes (Adams et al., 2024).

In extending the application of CATs to adolescent populations, a critical need arises for tailored assessments that consider the unique characteristics and challenges of this demographic (Adams et al., 2024).

SUD effects

SUD constitutes a pervasive issue with multifaceted repercussions, profoundly impacting diverse facets of individuals', including physical health, mental well-being, and social and occupational functioning.

Concerning physical health, prolonged SUD manifests deleterious consequences on vital organs. The liver, heart, lungs, brain, and other essential organs become

susceptible to damage contingent upon the nature of the substance used. Moreover, SUD engenders an augmented vulnerability to infections, attributed to the compromised immune system induced by these substances. SUD also disrupts proper nutrition, resulting in deficiencies in essential vitamins and minerals.

On the mental health front, SUD exhibit conditions such as anxiety and depression, exacerbating these challenges. Chronic SUD causes cognitive impairments, impacting memory, learning, attention, and decision-making. In severe instances, certain substances can induce psychosis, characterized by hallucinations and delusions, further accentuating the mental health toll.

SUD strains relationships with family, friends, and romantic partners, include decreased productivity, absenteeism, and potential job loss. Financial difficulties arise from the exorbitant costs associated with substance acquisition and legal entanglements, compounding the societal impact.

Additionally, individuals grappling with SUD confront an elevated risk of accidents and injuries due to impaired judgment and coordination resulting from substance use. Legal consequences loom large, as the possession or use of illicit substances can lead to legal repercussions, including incarceration. In the worst scenarios, SUD ends in overdose and mortality, stressing on the critical need for comprehensive intervention strategies.

It's important to remember that these effects can vary depending on the specific substance used, the individual's unique situation, and the severity of the SUD.

Substance Classes

Different classifications for the classes of substance are available, for example according to their effect on the body, according to their formulation, mechanism of action, where they are commonly used, or their legal group as per the local laws. Looking at the classes of substances affecting much of the population today, for the scope of this dissertation we use the DSM-5 classifications: alcohol; caffeine; cannabis; hallucinogens (phencyclidine or similarly acting arylcyclohexylamines, and other hallucinogens, such as LSD); inhalants; opioids; sedatives, hypnotics, or anxiolytics; stimulants (including amphetamine-type substances, cocaine, and other stimulants); tobacco; and other or unknown substances (APA, 2013). Moreover, we consider the simplified Myers's (2013) classifications of the substances according to their effect on the body, dividing substances into depressant, stimulants, and hallucinogens. It should be noted that some substances, such as cannabinoid drug, fall into all three categories, each of which is outlined in further detail below.

Depressants

The word "depressant" comes from the verb "to depress" and refers to the central nervous system; a depressant will not make the individual feel depressed, as the name might imply. Depressants work by calming the neural activities and slowing the bodily functions. Depressants slow down the messages between the brain and the body, leading to slower

individual response to the surrounding environment and lower concentration. Depressant effects range from feeling relaxed and calm at low doses to feeling very sleepy, becoming unconscious, and impaired judgement at higher doses and even death. Depressants include alcohol, barbiturates, benzodiazepines, and opioids (heroin, morphine, codeine, opiates), cannabis, GHB (gamma-hydroxybutyrate), and ketamine (Myers, 2013).

Stimulants

Stimulants work by increasing the neutral activities and speeding up the messages between the brain and the body, leading to the arousal of the bodily functions, keeping the individual awake and energetic, provoking weight loss, and enabling them to maintain a good mood, which is helpful when there is a need to increase performance. However, at larger doses stimulants will increase the heart rate, elevate blood pressure, and cause fatigue, depression, anxiety, and seizure. Stimulants include cocaine, methamphetamine (ecstasy MDMA), amphetamines (speed and ice), nicotine (tobacco), and caffeine (Myers, 2013).

Hallucinogens

Hallucinogens, as the name implies, cause hallucinations. They can be either synthetic or natural substances. Hallucinogens work by affecting the neural circuit, causing distraction to perception, altering the sensations of seeing, hearing, smelling, tasting, and feeling, changing the sense of reality, and producing unusual thoughts. Hallucinogens make the individual feel floating, numbness, confusion, and distraction and, at a higher dose, cause hallucination, memory loss, anxiety, paranoia, and aggression. Hallucinogens include cannabis (marijuana), ketamine, LSD (lysergic acid diethylamide, and acid), and arylcyclohexylamines (psilocybin and magic mushrooms) (Myers, 2013).

Impact of Biological Factors

In most cases, the choice to take drugs begins with voluntary action; then, the transition to addiction occurs because of changes in behaviour, which are driven by changes in the brain and in the body. The inability to control the person's behaviours and the craving for the substance are results of the desire to feel pleasure again. Naturally, the brain discharges chemicals, such as dopamine, that lead to a feeling of pleasure. In the case of drug abuse, however, the rate of secretion of these chemicals is much greater, leading to a feeling of euphoria and a desire to experience this feeling again and again. Then, with the repetition of this experience, the person is unable to achieve the same feeling from the same dose and gradually increases the dose until they reach a point of loss of pleasure. Still, however, they continue to use the drugs to prevent severe withdrawal symptoms.

The main cause of drug addiction is not yet known. However, many researchers have shown evidence that different factors may contribute to it, such as environmental, genetic, social, and psychological factors. Moreover, different theories have been developed to explain addiction behaviour. In the eighteenth-century addiction was considered a sin, punishable by law and rejected by society; this is also known as the moral model. Later, addiction was considered a disease that required treatment, and the only treatment available was simply abstinence from taking the substance; this was the disease model. The brain reward model was discovered in the early 1950s and, with the psycho-dynamic model for treatment introduced by Sigmund Freud, therapy was one of the options for treatment based on it. Then came habit theory, focusing on habit-forming behaviour. There are also behavioural economic theories, which are value-driven and compare the value of drugs to non-drug rewards (Loganathan & Ho, 2021). In this section, we review the current prominent theories in relation to the biological factors of addiction.

Brain Reward Model

The brain reward model was developed in the early 1950s. Recent work by Miller and Carroll, which is based on animal models, explains the biological factor of addiction through the reward function model (brain reward system), which involves neurobiological and neuroadaptive mechanisms in the development of addiction. The most important brain reward neurotransmitter, dopamine, is activated by addictive drugs. Evidence shows a decrease of specific neurochemical mechanisms in specific brain reward neurochemical systems in the extended amygdala (dopamine, opioid peptides, GABA, and endocannabinoids), and these neurotransmitters are dysregulated during addiction. Later in

the course of addiction, negative emotions develop toward abstinence from drugs due to the dysregulation of brain stress and antistress systems. Researchers also claim that SUDs, over time, dysregulate the brain reward system as a whole. It is important to note that all addictive drugs have in common that they enhance the dopaminergic reward synaptic function in the nucleus accumbens (Miller & Carroll, 2012; Gardner, 2019).

Today, researchers claim that using brain imaging techniques makes the prediction of vulnerability to addiction possible. As an example, a cocaine addict's brain image would show a lower level of D2 dopamine receptors defects in the brain's frontal regions, including less blood flow, lower metabolism, and less dense grey matter (a brain difference shared by alcoholics) (Miller & Carroll, 2012). Human imaging studies also indicate an increase of dopamine in proportion to self-reported euphoria, confirming the dopamine theory (Prom-Wormley et al., 2017). However, it is important to note that researchers have not studied the same brain imaging over time to see if any real changes occur over time and confirm the intensity of change in relation to substance use (Miller & Carroll, 2012).

The Brain Reward Model explains the neurobiological mechanisms that underlie the development of SUD. As explained in the literature, according to this model, the mesolimbic dopamine system plays a central role in the reinforcement of drug-seeking behaviour and the subsequent development of addiction (Koob & Volkow, 2010). Dopamine, a neurotransmitter, is implicated in the brain's reward circuitry, and its dysregulation is a key factor in the progression of SUD.

The initial consumption of substances activates the mesolimbic dopamine system, leading to a surge in dopamine release in the nucleus accumbens, a critical region

associated with reward and reinforcement (Nestler, 2005). This heightened reward signal reinforces the association between substance use and pleasurable feelings, creating a positive reinforcement loop that motivates continued drug-seeking behaviour. Neuroadaptations occur over time, resulting in tolerance, where higher doses are required to achieve the same rewarding effects, and sensitization, wherein the brain becomes hypersensitive to drug-related cues (Nestler, 2005).

Chronic SUD leads to synaptic and structural alterations in the brain, affecting regions responsible for decision-making, impulse control, and stress regulation (Koob & Volkow, 2010). The resulting neuroplastic changes contribute to the loss of control over substance use, the emergence of compulsive drug-seeking, and the prioritization of drug-related stimuli over natural rewards (Volkow & Morales, 2015). Furthermore, the negative emotional states associated with withdrawal motivate individuals to seek substances to alleviate discomfort, perpetuating the cycle of addiction (Koob & Le Moal, 2008).

Circuit Model

The circuit model of addiction, based on the repetitive exposure of substances to animals, gives a theoretical justification for addiction and adaptation behaviour (Lüscher, 2016). The circuit model hypothesis assumes that addiction occurs due to increased levels of mesolimbic dopamine in the mesolimbic dopaminergic system, which could be a consequence of neuronal circuit alterations (Preedy, 2016). Researchers have found that a surge in mesolimbic dopaminergic system causes drug-evoked synaptic plasticity, which

alters the circuit function and leads to drug-adaptive behaviour, that is, addiction (Lüscher, 2016).

The Circuit Model posits a neurobiological framework that explains the intricate interplay of neural circuits contributing to the initiation and maintenance of addictive behaviours. Drawing upon extensive research in neuroscience, this model assumes that the dysregulation of specific neural circuits, encompassing reward, motivation, and cognitive control systems, plays a pivotal role in the aetiology of SUD (Volkow & Morales, 2015). The mesocorticolimbic dopamine pathway, particularly implicated in reward processing, assumes prominence in this model as dysfunctions within this circuitry are associated with heightened vulnerability to addictive behaviours (Koob & Volkow, 2010). Moreover, the prefrontal cortex, crucial for cognitive control and decision-making, interacts dynamically with subcortical regions, influencing impulsive behaviours observed in individuals with SUD (Goldstein & Volkow, 2011).

Neuroadaptations within these circuits, occurring through repeated substance exposure, contribute to the development of a chronic and relapsing pattern of SUD (Everitt & Robbins, 2016). The Circuit Model emphasizes the intricate nature of these neurobiological processes, incorporating genetic, environmental, and developmental factors that modulate circuit function and susceptibility to SUD (Kauer & Malenka, 2007). Integrating insights from both preclinical and clinical studies, this model provides a comprehensive framework for understanding the neural mechanisms underneath the complex nature of SUD development (Kalivas & Volkow, 2005).

In conclusion, the Circuit Model offers a sophisticated and comprehensive perspective on the neurobiological foundations of SUD development. By explaining the complex interactions within key neural circuits, this model advances our understanding of the complexities inherent in addictive behaviours and provides a foundation for developing targeted interventions and therapeutic approaches in the realm of SUD.

Value-based neurobiological model

As suggested by its name, this hypothesis refers to the decision-making system, which is based on value and the valuation of options; hence, the decision would be driven by the expected pleasure versus the expected punishment. During the course of addiction, the brain prioritises the drugs as the reward of choice, and the neurobiological explanation for that lies in the dopaminergic system (Loganathan & Ho, 2021). Although the valuation system remains functional in individuals with SUD, it has been disrupted to prioritise drugs, either for the purpose of euphoria-seeking or dysphoria escape (Loganathan & Ho, 2021). The valuation between "wanting" and "liking" triggers the dopaminergic system, in the sense that a substance can be "wanted" but not "liked". The value model suggests that drug-related "wanting" signals interact with the dopaminergic system, increasing the value of drugs to reach the desired states (Loganathan & Ho, 2021).

Within this model, the neurobiological components are complexly linked to the valuation processes that underlie decision-making in the context of SUD. According to studies (Bickel, Johnson, Koffarnus, MacKillop, and Murphy 2014), the model suggests

that individuals assign subjective values to substances based on both the neurobiological effects of the substance and the individual's own preferences and experiences.

Neurobiologically, the mesolimbic dopamine system is implicated in reward processing and plays a pivotal role in the valuation of substances. As assumed by researchers (Volkow, Fowler, and Wang 2003), dysregulation in this system can lead to altered reward sensitivity and an enhanced valuation of substances, thereby contributing to the development of SUD. Additionally, the insula, a region associated with interoceptive awareness, contributes to the subjective valuation of substance-related stimuli (Naqvi and Bechara 2010).

From a behavioural economics perspective, the Value-Based Neurobiological Model integrates insights from temporal discounting and delayed rewards. Individuals with SUD exhibit an increased preference for immediate rewards over delayed, larger rewards, reflecting a shift in subjective valuation (Bickel et al. 2014). This temporal myopia contributes to impulsive decision-making and a heightened susceptibility to SUD (Bickel et al. 2014).

In conclusion, the Value-Based Neurobiological Model provides a comprehensive framework for understanding the development of SUD by integrating neurobiological processes with behavioural economic principles.

Genetics

Multiple neurotransmission pathways, especially in the dopaminergic system, are influenced by genetics. Studies have consistently demonstrated that genetics influence the vulnerability to addiction, and roughly 50% of such vulnerability is believed to be genetic. One empirical study, involving 500 individuals, demonstrated that the monoamine oxidase A gene is linked to the initiation of substance use. Although the influence of genetics on SUDs is being investigated rigorously by many researchers, limited studies have been carried out on understanding genetic mechanisms in relation to addiction (Gardner, 2019; Prom-Wormley et al., 2017; Fite et al., 2018). Enhanced comprehension of the genetically-mediated mechanisms in the neurobiology of SUD opens up greater possibilities for the development of treatment and prevention strategies grounded in both behavioural and biological approaches (Gardner, 2019; Prom-Wormley et al., 2017; Fite et al., 2018).

Genetics plays a significant role in the development of SUD, with a growing body of research explaining the complex interplay between genetic factors and susceptibility to substance abuse. Twin, adoption, and family studies have consistently demonstrated a heritable component in the risk for SUD (Kendler, 2003; Tsuang, Bar, Harley, & Lyons, 2001). Familial aggregation of SUD has been documented, indicating that individuals with a family history of SUD are at an elevated risk of developing similar issues (Goldman, Oroszi, & Ducci, 2005).

The heritability of SUD is polygenic, involving multiple genes with modest individual effects (Agrawal & Lynskey, 2008). Specific genetic variations, such as polymorphisms in genes related to neurotransmitter systems (e.g., dopamine, serotonin),

have been implicated in predisposing individuals to SUD (Nestler, 2014). The reward pathway, particularly involving the mesolimbic dopamine system, has garnered attention, with variations in genes like DRD2 and DRD4 associated with vulnerability to substance dependence (Blum et al., 1990; Noble, Noble, & Ritchie, 1993).

Environmental factors also interact with genetics, influencing the expression of susceptibility genes (Kendler & Eaves, 1986). Gene-environment interactions may manifest in diverse life stages, from prenatal development to adolescence, contributing to the trajectory of SUD vulnerability (Caspi et al., 2002; Dick et al., 2009).

In conclusion, the heritability of SUD is well-established, with genetic factors contributing significantly to susceptibility. The polygenic nature of SUD involves multiple genes interacting with environmental influences, highlighting the complex interplay that shapes an individual's risk for developing substance abuse problems.

Gender

Women transit from substance use to addiction more rapidly than men. Another study focussing on opioids found the same, that women transit quicker than men to addiction. On the contrary, another study found no evidence of gender difference in relation to SUDs. Women with SUDs have higher rates of developing mental disorders, including depression, anxiety, eating disorders, and trauma, than their male counterparts (Polak et al., 2015). For nicotine, specifically, women respond less favourably than men to nicotine replacement therapy. This might be due to the fact that women smoke not for the nicotine

effect but to deal with stress (Polak et al., 2015). Generally, women are at higher risk of developing nicotine dependency than men.

As regards transgender individuals, whether male-to-female transgender women or female-to-male transgender men, they live with continuous life stressors, such as being victimised, homeless, unemployed, having experienced a difficult childhood, and being discriminated against, with limited access to medical care and support. These stressors make transgender individuals vulnerable to mental disorders. There is a strong association between hormone therapy, HIV, and SUDs among transgender individuals, which puts them at higher risk of substance abuse than the population (Polak et al., 2015).

The relationship between homosexuality and SUD is a complex and multifaceted phenomenon, requiring a complex examination within the existing academic debate. Research has explored the intersectionality of sexual orientation and SUD, acknowledging the importance of understanding how societal factors, stigma, and identity formation contribute to the development of SUD among individuals identifying as homosexual. Studies have delved into the unique challenges faced by the LGBTQ+ community, shedding light on disparities in substance use patterns and prevalence rates compared to their heterosexual counterparts (Mustanski et al. 2011 and Marshal et al. 2008).

The minority stress model proposed by Meyer (Meyer, 2003) suggests that the experiences of discrimination and social marginalization faced by individuals with non-heteronormative sexual orientations contribute to elevated stress levels, subsequently increasing the risk of engaging in maladaptive coping mechanisms such as substance use.

Furthermore, Hatzenbuehler (Hatzenbuehler, 2009) explains the role of stigma, emphasizing how discriminatory experiences can directly impact mental health outcomes, creating a pathway towards SUD as a form of self-medication.

Identity formation and the exploration of sexual orientation during adolescence and young adulthood are critical periods wherein individuals may be particularly vulnerable to the development of SUD. Savin-Williams (Savin-Williams, 2001) highlights the challenges faced by sexual minority youth, including higher rates of SUD, often attributed to a combination of internalized stigma, social isolation, and the quest for acceptance. Moreover, the social environment and cultural context play pivotal roles, with varying degrees of acceptance influencing the likelihood of substance use among individuals with non-heteronormative sexual orientations (McCabe et al., 2010).

In conclusion, the intricate interplay between homosexuality and SUD highlights the importance of adopting a multidimensional perspective. The literature suggests that societal factors, minority stress, and identity formation significantly contribute to the vulnerability of individuals identifying as homosexual to the development of SUD.

As the data supports gender differences in relation to SUDs, with women at greater risk than men, especially pregnant and transgender women, it seems reasonable to consider different gender-based treatment options (Polak et al., 2015).

The diminishing gender gap in SUDs, once characterized by a higher prevalence in men, underscores the imperative to comprehend sex and gender distinctions in the aetiology and perpetuation of SUDs. Notably, biological sex disparities manifest across

various systems, encompassing brain structure and function, endocrine function, and metabolic function. Additionally, gender, defined by environmental and sociocultural roles for men and women, plays a pivotal role in influencing the initiation and trajectory of substance use and SUDs (McHugh et al., 2018).

While adverse medical, psychiatric, and functional repercussions linked to SUDs are frequently more severe in women, it is noteworthy that men and women exhibit no substantive variations in SUD treatment outcomes. Despite emerging trends in the literature, the intricate interplay of biological and environmental factors complicates the understanding of sex and gender differences in SUDs (McHugh et al., 2018).

Sex and gender disparities manifest across various facets of addiction, with a notable illustration being the widely acknowledged "telescoping effect". This phenomenon underlines that women tend to meet the criteria for, or seek treatment for SUD in a shorter duration of drug use compared to their male counterparts. The telescoping effect is evident across diverse drug classes, spanning opioids, psychostimulants, alcohol, cannabis, and nonpharmacological addictions like gambling. However, it is crucial to note the presence of conflicting reports, some suggesting no noticeable distinctions between men and women, while others indicate a faster trajectory to addiction in men. These variations hint at an augmented susceptibility in females, not only in terms of usage but also in the development of addiction-related features, such as excessive drug consumption and a compromised ability to control drug use, particularly under extended-access drug self-administration conditions (Towers et al., 2022).

While neurobiological disparities between males and females are presumed to influence psychostimulants and various drugs alike, scant information exists regarding sex-specific variations in the neurobiological effects of alcohol, opioids, nicotine, and methamphetamine. The existing knowledge gap underscores the need for comprehensive exploration into the intricate interplay between sex, gender, and neurobiology concerning different substances. Understanding these nuances is paramount for devising effective prevention and treatment strategies tailored to the unique vulnerabilities and responses observed in both men and women (Towers et al., 2022).

Ethnicity and Race

As regards the impact of ethnicity and race, different empirical research papers give different results depending on the substance in question. One study found no difference in tobacco use prevalence according to race/ethnicity (Pagano et al., 2018). Another study showed that Hispanic women are less likely to develop alcohol use disorder than White women. Black men with SUDs are less likely to continue substance use than Whites but more likely to do so than Hispanics (Evans et al., 2021). The findings in relation to ethnicity/race and SUDs are inconsistent, which is not surprising since other influential factors must be considered, such as financial status, education, and geographical location. Taking all these factors into account might shed some light on the ethnicity/race prevalence of SUDs in more than one dimension.

The complex link between ethnicity and SUD constitutes to be the focus of literature, exploring both socio-cultural and biological dimensions. The literature point

out ethnicity's substantial impact on susceptibility to SUD, revealing variations in risk factors across diverse ethnic and racial cohorts. Social determinants, encompassing cultural norms, socio-economic inequities, and systemic disparities, significantly contribute to the intricate tapestry shaping substance use patterns within specific ethnic contexts. For instance, culture stress and experiences of discrimination emerge as salient contributors to heightened rates of substance use among certain minority populations. Additionally, investigations into genetic predispositions and variations in drug metabolism underscore potential biological underpinnings of ethnic disparities in SUD susceptibility.

Impact of Psychological Factors

Addiction is profoundly associated with thoughts and behaviour. Many different models explain the psychological prospect of addiction; here, we emphasise the most recent models and important aspects of the psychology of addiction.

Extensive literature features the significant role of various psychological factors in influencing vulnerability to SUD. Psychosocial determinants, including but not limited to personality traits, stress, trauma, and mental health conditions, emerge as pivotal contributors shaping the route towards SUD. For instance, individuals with specific personality traits, such as impulsivity or sensation-seeking, may be more susceptible to engaging in substance use as a coping mechanism. Furthermore, experiences of trauma and chronic stress have been identified as risk factors that may precipitate the onset of SUD.

Comorbidity with Mental Disorders

Individuals experiencing emotional stressors, such as depression, anxiety, trauma, and suicidal thoughts, are at high risk of developing a mental disorder. It is well documented in the literature that comorbidity between SUDs and mental disorder goes both ways: individuals suffering a mental disorder are at higher risk of SUD, and at the same time individuals with SUDs are at risk of developing a mental disorder.

It is possible that comorbidity is due to shared vulnerability, leading to both mental disorders. However, there is not enough evidence to explain the association between the two as a causal relationship. As an example in support of the causal relationship, individuals with mental disorders who are vulnerable to SUDs must have the prerequisite of self-medication or another causal mechanism (Swendsen et al., 2010). A recent study by Smith et al. (2017) found a well-established negative correlation between SUD and mental health. Equally, it is possible that comorbidity between SUDs and other mental disorders is not causal or directional. The root causes of both disorders are usually similar, for example, trauma, child abuse, stress, etc. However, this cannot be considered as evidence of causality. Moreover, the majority of SUD patients suffer from comorbid mental disorders (Shantna et al., 2009).

Habit and Compulsion Models

The decision-making process of an individual suffering an SUD is bypassed in the presence of a stimulant substance (Loganathan & Ho, 2021). The habit and compulsion model emphasises the fact that the individual has no option but to continue the substance use, since, over time, they develop a "habit". This model is in line with the disease model discussed in the Impact of Biological Factors section.

One study suggests that SUD is primarily driven by extreme goal-oriented drug choice under negative affect, not by habit or compulsion. The negative affect is overcome by forcefully increasing the expected drug value and outweighing abstinence goals (Hogarth, 2020).

The relationship between the Habit and Compulsion Model and the development of SUD forms a crucial aspect of understanding the underlying mechanisms contributing to addictive behaviours. This theoretical framework suggests that the transition from recreational substance use to compulsive drug-seeking behaviour is driven by the gradual reinforcement of habitual patterns. According to this model, initially, substance use may be driven by positive reinforcement, such as the pleasurable effects of the drug. Over time, habitual engagement with the substance becomes ingrained, leading to the development of automatic and compulsive patterns of use. The Habits and Compulsion Model suggests that neural adaptations occur, particularly in the mesolimbic dopamine system, reinforcing the association between drug-related cues and the rewarding effects of substance use. Consequently, this model provides insights into the development of compulsive drug-seeking behaviours characteristic of SUD, highlighting the role of habit

formation and neural mechanisms in the progression from initial substance use to a more entrenched, compulsive pattern.

Behavioural Economic Theory

As the name implies, the behavioural economic model suggests that a debate over drug use versus non-drug use is always active within the substance user's thoughts, where drug use behaviour usually wins in order to satisfy the urge for pleasure. As the substance user progresses into the course of addiction, the drug use versus non-drug use debate continues, and again the drug use behaviour wins; however, this time it wins for a different motive, which is to relieve the substance user of withdrawal symptoms (Loganathan & Ho, 2021). The drug use versus non-drug use debate also considers a focus on alternatives, other reinforcements, or rewards, such as education, careers, religious engagements, and physical activities (Shanmugam, 2017).

The behavioural economic theory offers a comprehensive framework for understanding the development of SUD by explaining the complex interplay between decision-making processes and substance-seeking behaviours. This theoretical perspective suggests that individuals weigh the costs and benefits associated with substance use, with the decision to engage in drug-seeking behaviour influenced by various factors, including the availability, cost, and perceived value of the substance. According to this model, individuals with SUD may exhibit altered decision-making processes, prioritizing immediate rewards associated with substance use over long-term consequences, despite potential negative outcomes. The behavioural economic theory

further suggests that factors such as stress, impulsivity, and environmental cues can exacerbate these decision-making biases, contributing to the development and maintenance of addictive behaviours. By exposing the underlying mechanisms driving substance-seeking behaviours, the behavioural economic theory offers valuable insights into the aetiology and progression of SUD.

Attachment Theory

Attachment theory is based on the idea that, for survival reasons, children develop a natural and unconditional form of attachment during their early years of childhood with one important relationship, who is usually the caregiver. If this relationship is interrupted or completely cut off, it leads to mental disorders, including SUDs, later in life. Attachment theory suggests focusing on dealing with this broken relationship as a means to treat SUDs (Rinker, 2019). The attachment and SUD behaviour model has gone through a number of reviews that seem to agree that inadequate childhood attachments may lead to SUDs. The justification is that drug use can replace the attachment relationship. However, the range of the bond between attachment and SUD behaviour still needs to be investigated by research (Rinker, 2019).

The attachment theory provides a valuable lens for comprehending the development of SUD by explaining the influence of early attachment experiences on subsequent addictive behaviours. According to this theoretical framework, individuals form attachment patterns during early relationships, which influence their emotional regulation and coping strategies throughout life. Research suggests that insecure

attachment styles, characterized by difficulties in forming secure and trusting relationships, may predispose individuals to seek solace and emotional regulation through substance use. Individuals with insecure attachment patterns may employ substances as a means of coping with relational stressors and emotional distress. Moreover, substance use may function as a substitute for secure interpersonal connections, perpetuating a cycle of maladaptive coping mechanisms.

Self-Medication Theory

The essence of the self-medication theory is that individuals with SUDs or chronic pain use self-medication as a coping strategy to deal with other stressors in life. The self-medication theory of addiction is based on the idea that the substance user is not seeking to achieve euphoria but to relieve dysphoria. However, many professionals do not support the self-medication theory and regard it as irresponsible, on the grounds that it promotes leniency towards addiction, which could push SUD patients to self-denial rather than seeking proper treatment. Self-medication positions, instead, push for the treatment of underlying stressors that may lead to SUDs, such as depression, which can be treated with a specific antidepressant instead of smoking cannabis (Adinoff, 2009). In today's society, with our awareness of medical protocols, it is becoming common knowledge that regular self-medication is considered dangerous and can lead to addiction.

According to this theoretical framework, individuals with pre-existing mental health issues may engage in substance use to manage symptoms such as anxiety, depression, or trauma-related distress. The self-medication hypothesis suggests that

individuals may perceive substances as a coping mechanism to alleviate emotional pain or psychiatric symptoms, ultimately contributing to the progression towards SUD. This theory underscores the interplay between mental health and substance use, emphasizing the importance of addressing underlying psychological distress in the prevention and treatment of SUD. Recognizing the link between self-medication and substance use vulnerability is crucial for developing targeted interventions that address both the substance use and the underlying mental health issues.

Personality Traits

Personality traits associated with SUDs, specifically "impulsivity", indicate an important tendency to addiction. Impulsivity is defined as a rapid, unplanned behaviour with little thought for the consequences. It is also associated with a wide range of mental disorders, such as bipolar disorder, borderline disorder, and Parkinson's disease, among others. Empirical research, using self-reported data, shows evidence that personality traits such as impulsivity are strongly associated with various SUDs (alcohol, tobacco, opiates, and cocaine (Mitchell & Potenza, 2014).

Research suggests that specific personality traits, such as impulsivity, sensation-seeking, and neuroticism, play a pivotal role in influencing susceptibility to SUD. Individuals characterized by high levels of impulsivity may exhibit a tendency to engage in impulsive and risky behaviours, including substance use, as a means of seeking immediate gratification. Similarly, sensation-seeking individuals may be more inclined to explore novel and stimulating experiences, increasing their likelihood of engaging in

substance use. Moreover, individuals with high levels of neuroticism, marked by emotional instability and heightened reactivity to stressors, may resort to substance use as a maladaptive coping mechanism.

However, other researchers oppose the personality trait hypothesis in relation to SUDs and claim that it is widely accepted that an addictive personality does not exist, and no one personality type is predisposed to SUDs. Instead, a range of personality disorders has been linked to opiate and cocaine use (Franques et al., 2000).

Maturity

The difference between maturity and immaturity is shown in whether an individual can align their actions, beliefs, and values. In the case of addiction, these three factors are misaligned, and priorities are maladjusted. One empirical study reveals that individuals with SUDs lack emotional maturity more than other individuals under similar conditions (Mortazavi et al., 2012). Maturity comes with age, and it would make sense that younger people are more inclined to try drugs than older and mature individuals. Maturity is not a straightforward function of age: it can be developed, and it can be learnt. It makes sense to think that if an individual remains opposed to learning maturity, they can be predisposed to addiction.

Adolescence is a critical period of vulnerability to SUDs, not only because of immaturity but also because during this period the brain pathways (i.e., neural circuits) that enable people to experience motivation and rewarding experiences are still developing.

These pathways include, among others, regions called the anterior prefrontal cortex and ventral striatum (Thatcher & Clark 2008). Moreover, the adolescent and adult brains appear to differ with respect to the brain regions that primarily respond to novel stimuli. It appears that the adolescent brain responds to novel stimuli largely through a brain structure known as the amygdala. This is part of the brain's limbic system, which, among other functions, is involved in controlling emotions. In contrast, the adult brain increasingly uses higher cognitive functions (i.e., executive functions) mediated by the frontal cortex to interpret novel stimuli. Variations in how these neural pathways develop may contribute to the risk of SUDs during adolescence (Thatcher & Clark 2008).

To summarize, different theories explain substance use through different psychological factors, and no one theory gives enough evidence to predict SUDs or discover their root cause. However, convincing empirical studies have narrowed the psychological factors to child history and comorbidity with other mental disorders. Building on that, such psychological factors can also predict a tendency to SUDs.

Research suggests that the level of emotional and cognitive maturity may influence an individual's susceptibility to engaging in substance use behaviours. The process of maturation involves the development of executive functions, impulse control, and decision-making capacities, all of which play integral roles in resisting the initiation and progression of substance use. Young individuals, particularly during adolescence and emerging adulthood, may be more vulnerable to the allure of substance use due to ongoing brain maturation and the still-developing capacity for assessing risks and rewards.

Impact of Social Factors

Social factors influence our life through daily exposure to our social setting, whether in a positive or negative way. The social factors that contribute to increased risk of SUDs include living environment, peer group pressure, peer relationships, popularity, bullying, culture, religion, parental supervision, family, race, gang association, and availability of drugs. More than one of these factors may be present simultaneously, in which case there is an increased likelihood of developing SUDs. Several theories have been developed to explain the influence of social factors, as outlined in more detail below.

Social Learning Theory

Social learning theory suggests that human behaviour is determined by functional relationships between personal factors, the external environment, and the behaviour itself. People learn from each other. SUDs are viewed in this model as resulting from the functional relationships between an individual's personal characteristics, social environment, and drug behaviours. In other words, social learning theory assumes that the strong bond between society and individuals is there to motivate responsible behaviour. Once this bond is weakened or broken, the individual breaks traditional rules and behaves in an unhealthy and irresponsible manner, such as indulging in substance use (Smith, 2021; Shanmugam, 2017).

According to this theoretical perspective, individuals learn behaviours, including substance use, by observing and imitating the actions of significant others within their social context. Social learning mechanisms, such as reinforcement and modelling, contribute to the acquisition and maintenance of substance use patterns. Exposure to substance use behaviours within peer groups, family settings, or broader social networks can influence an individual's attitudes, norms, and expectations regarding substance use, ultimately impacting their likelihood of developing SUD.

Role Modelling Theory

In line with social learning theory, if individuals are considered role models by society and are involved in substance use, others can be affected and might follow. Moreover, if there is a tolerance of SUD behaviour within a society, the role model effect can become even stronger (Shanmugam, 2017).

This theoretical framework suggests that individuals learn and internalize behaviours, including substance use, by observing and imitating the actions of influential figures in their social sphere. The presence of positive role models who engage in responsible and moderate substance use may serve as a protective factor against the development of SUD, while exposure to negative role models engaging in excessive or problematic substance use may increase susceptibility. The Role Modelling Theory underscores the significance of interpersonal influences, emphasizing the need for preventive interventions that consider the behaviours demonstrated by individuals serving as role models within an individual's social context.

Stress and Coping Theory

Researchers claim that if an individual is unable to deal with life stressors, they are at higher risk of substance use. The individual is unable to manage the stressors, then becomes alienated and falls into SUD (Shanmugam, 2017). Indeed, there is accumulating evidence from empirical and population studies that highly stressful situations and chronic stress increase the risk of SUDs. Changes in stress tolerance and dopaminergic pathways occur during substance use, including changes that involve motivation, self-control, and the adaptive processes necessary for survival, which might be the adaptive processes for addiction (Sinha, 2008).

Social Settings

Social settings also play a key role in determining vulnerability. Life challenges, such as poverty, create continuous stressors on individuals, making them vulnerable to substance use to allow them a temporary escape from the stressor. Under associative learning theory, community members learn substance use from one another, while under conditioning theory, they influence one another (Shanmugam, 2017).

Social Norms

Social norms are relative and can be thought of as moving targets and unspoken rules. If a society accepts substance use or sympathises with substance users, the act of substance use becomes normal. Social norms influence a person's perception of any situation and can even make improper situations acceptable to others (Shanmugam, 2017). As an example, smoking cannabis in Amsterdam is acceptable, whereas in Kuwait smoking cannabis will not only lead to a prison sentence but would bring shame and disgrace on the person's family.

Family Influences

The influence of family on the person outweighs that of the community, school, and workplace. In the case of SUDs, the influence can be positive or negative. It can be positive in the sense of protection against the use of substances in the first place or of offering support and guidance if an individual falls into a substance use habit. It can be negative as families tend to be ashamed of members suffering from an SUD, and they may try to hide the patient and keep the problem secret, which would indirectly encourage the SUD behaviour (Shanmugam, 2017).

People learn from each other and from their experiences in the environment in which they are living. The learning is further enhanced if it comes from someone important and someone who is part of daily life. The influence of people around us, the community, and the social setting entice people to do things in groups, both good and bad. As an

example, people consume alcohol in groups but also carry out charity work in groups. Having outlined some of the most prominent theories around the relationship between SUDs and the impact of social factors, we turn to an examination of the prevention techniques suggested, with a focus on cannabis.

Prevention Techniques: Cannabis Use Disorder

Due to the wide use of cannabis, including synthetic cannabinoid compound, we chose to focus on CUD as an example of SUD prevention techniques. Cannabis is, in fact, the most widely-used illicit drug under international control, used by approximately 188 million adults worldwide (Hall and Lynskey, 2020). Cannabis plants have over 400 chemical entities, of which more than 60 are cannabinoid compounds. The main active compound, delta-9-tetrahydrocannabinol (d-9-THC), is the psychoactive ingredient (Atakan, 2012).

According to DSM-5, CUD is diagnosed if at least two of the following occur within a 12-month period: (1) cannabis is often taken in larger amounts or over a longer period than was intended; (2) there is a persistent desire or unsuccessful effort to cut down or control cannabis use; (3) a great deal of time is spent in activities necessary to obtain cannabis, use cannabis, or recover from its effects; (4) craving, or a strong desire or urge to use cannabis; (5) recurrent cannabis use resulting in a failure to fulfil major role obligations at work, school, or home; (6) continued cannabis use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of cannabis; (7) important social, occupational, or recreational activities are given up or reduced because of

cannabis use; (8) recurrent cannabis use in situations in which it is physically hazardous; (9) cannabis use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by cannabis; (10) tolerance, as defined by either a need for markedly increased amounts of cannabis to achieve the desired effect, or markedly diminished effect with continued use of the same amount of cannabis; or (11) withdrawal syndrome as specified in the criteria set for cannabis withdrawal, or Cannabis is taken to relieve or avoid withdrawal symptoms (APA, 2013).

According to DSM-5, three risk factors are associated with CUD: (1) temperament and behaviour style, such as antisocial personality disorder; (2) environmental factors, such as academic failure, an unstable or abusive family situation, a family history of a substance use disorder, ease of availability; and (3) genetic influences (APA, 2013).

About one third of cannabis users' transit to CUD, with a higher risk for men from an ethnic minority group, early-onset cannabis users, and individuals with adverse events in childhood, such as physical, psychological, or sexual abuse, as well as household dysfunction (Feingold et al., 2020). Understanding the key risk factors for transition to CUD indicates the path to developing a prevention strategy. It is important to highlight that prevention strategies are bound by geographical area and, to make them even more effective, should target a specific audience with a specific message which is related directly to it.

Prevention Through Awareness

Public awareness and public education are the first line of defence against cannabis use and, consequently, CUD. Many models suggest how to deliver public awareness and education, but all should include CUD risks and health complications. They should also eliminate the myths around cannabis, such as that cannabis is not as dangerous as tobacco. Public education will not be complete without the involvement of and positive support from the family, parents, schools, and the community. Support from the home, school, and community must be strengthened with up-to-date knowledge about CUD, risks, red flags, and how to deal with CUD patients.

A study carried out on the effectiveness of prevention programmes for cannabis use in schools found that non-interactive knowledge-building lecture programmes showed minimal reductions in cannabis use, whereas interactive programmes with a focus on social competencies showed greater reductions in such use (Tobler et al., 1999). This finding supports the idea that public awareness and public education are an important element of prevention techniques if, and only if, the content and a mode of delivery are right for the audience. Joint awareness programmes between community, family, and school would contribute significantly to preventing CUD.

Part of awareness programmes consists of guiding individuals with past trauma to seek professional help as early as possible. This group includes all high-risk individuals, such as males, those from minority groups or with financial challenges, and those who have comorbid depression and anxiety. One successful prevention technique entails changes in a community's social norms and expectations related to SUDs; for example, reduced

prevalence of smoking was recorded in the US following the change in the community's social norms (Prom-Wormley et al., 2017).

Despite the benefits of public awareness initiatives, challenges and potential drawbacks exist. One challenge is overcoming the existing societal normalization of cannabis use, which may hinder the acceptance of educational efforts. Additionally, the evolving legal landscape around cannabis may impact the effectiveness of these programs. Balancing the presentation of risks without inducing fear or misinformation poses another challenge. Furthermore, assessing the long-term impact of these awareness campaigns on behavioural change requires rigorous evaluation methodologies.

To achieve a holistic and sustained impact, public education efforts must involve key stakeholders such as families, parents, schools, and the community. Inclusion of up-to-date information about CUD, recognizing warning signs, and offering guidance on dealing with individuals affected by CUD is essential. Research suggests that family involvement, in particular, plays a crucial role in prevention and intervention strategies (Chen et al., 2017; Hartwell et al., 2016). Schools serve as pivotal platforms for disseminating information, emphasizing the importance of age-appropriate, evidence-based curricula. The community, including healthcare providers, law enforcement, and local organizations, should collaborate to create a supportive environment that reinforces the messages from public education initiatives.

Positive family, school, and community support enhance the effectiveness of public education efforts. Families can contribute to prevention by fostering open communication, addressing risk factors, and promoting healthy alternatives to substance

use. Schools play a central role in imparting knowledge and skills that can serve as protective factors against CUD. Community engagement ensures a coordinated approach and facilitates the dissemination of information through diverse channels. It is imperative that these support systems work synergistically to address the multifaceted aspects of CUD prevention and intervention, recognizing the dynamic nature of public awareness and education in this domain.

In conclusion, public awareness and education are integral components of the first line of defence against cannabis use and CUD. While challenges and potential drawbacks exist, the benefits of well-structured programs are substantial. Involvement from families, schools, and communities is essential for a comprehensive approach, and the information provided must be accurate, up-to-date, and tailored to the needs of diverse populations. The success of these initiatives hinges on collaborative efforts and ongoing evaluation to ensure their effectiveness in mitigating the risks associated with cannabis use.

Prevention Through Government Policies

Government policies also play a role. A recent U.S. study looking at the states that have legalised cannabis versus those which have not found that cannabis use was higher in those that had legalised it (Goodman et al., 2020). There is financial benefit for the government, through tax, to legalise cannabis and take the trade off the black market and put it into legitimate licensed businesses. However, making cannabis easily available will increase the number of individuals who use it for recreational motives. Moreover, using cannabis leads to the use of other, more potent, drugs. Direct and indirect advertising of

cannabis must be banned since it targets teens and young people specifically. Government has direct control of increasing or decreasing the number of CUD patients through its policies. Unfortunately, it is still too early to see the impact of legalisation policies since a limited number of governments around the world have legalised cannabis, and the majority of those who have done so only legalised it during the past two decades.

Prevention Through Monitoring

One important component of a successful prevention technique is the availability of accurate medical data on cannabis use. In many countries, part of the basic medical procedure is data collection from patients, with the data fed back into the public health surveillance system. However, when it comes to CUD, one of the most advanced medical system countries in the world, the US, still lags in regard to basic data requirements.

A recent study, conducted in 2020, evaluating the data available for cannabis use in the US found significant limitations on current CUD surveys and confirmed that the available data has significant limitations on monitoring cannabis use. The researchers recommend that related authorities should focus on making high-quality data available to allow for the development of cannabis use policies and prevention strategies (Geissler et al., 2020). CUD data is needed to estimate the magnitude of the problem, identify segments of the community at higher risk, and develop an action plan for possible interventions. Having comprehensive data will not only provide insight into CUD but also enhance the level of care that can be provided to CUD patients.

One of the most important factors for a successful CUD prevention strategy is to establish a comprehensive surveillance system that provides periodically updated data. Such data will also allow for prediction of trends when/if policy or environmental conditions changes, creating a live moving target to follow. CUD data collection should become a national, or perhaps an international, collaboration through which health care providers and hospitals regularly report CUD cases. Data collection can be carried out (1) electronically, using advanced technology and artificial intelligence; (2) by appropriate interview reports, that should be standardized; or (3) through live-monitoring reports prepared by professionals while monitoring individuals at high risk (e.g., teachers monitoring students or doctors monitoring patients). Moreover, once a comprehensive surveillance system is in place for CUD data collection and aggregation, data analysis should be performed regularly to provide judgment and propose an action plan.

Finally, CUD prevention techniques do not only target the masses. Tailored prevention techniques can be developed that target specific segments of a society or specific groups in a community. Genetic and biological factors in an individual should be considered in order to increase the efficiency of the tailored prevention technique. For example, in one study, CUD is predicted by sex-dimorphic interactions of the MAOA gene with childhood abuse (Fite et al., 2018). Having data such as this allows more forceful prevention techniques which should target such individuals as early as possible. Having considered prevention options, we turn to consider how CUD is treated.

Treatment: Cannabis Use Disorder

The objective of treatment is to make a person stop cannabis use, remain cannabis-free, and be productive in family, work, and society. The beginning of treatment for a CUD patient starts when the patient realises that the addiction has a significant negative impact on their life. The next step is to determine an appropriate treatment programme that helps restore the patient's normal life so they can feel happiness and reach psychological stability without the need to use cannabis. No one treatment fits all cases, and the appropriate treatment depends on several different factors, such as the stage of CUD the patient has reached and duration of cannabis use, among others. The treatment programme may include one or more of the following: (1) detoxification, (2) sessions of psychotherapy that help to change the person's view of cannabis use, and (3) pharmacological interventions. Continuous follow-up of CUD patients after the end of treatment is one of the most important elements to prevent relapse. Each component of the treatment programme is further detailed below.

Detoxification

The detoxification process for Cannabis Use Disorder (CUD) serves as a critical initial treatment step, involving the systematic removal of the psychoactive substance THC (delta-9-tetrahydrocannabinol) from the body. This phase aims to facilitate the physiological and psychological transition to abstinence, mitigating the withdrawal symptoms associated with cannabis cessation. Withdrawal symptoms are integral to the detoxification process, and their effective management is pivotal in preventing relapse.

Among the common withdrawal symptoms experienced during cannabis detoxification, insomnia emerges as a prevalent challenge. Adequate management of insomnia symptoms during the detoxification phase is essential for optimizing treatment outcomes and enhancing the likelihood of treatment success.

Managing withdrawal symptoms, including insomnia, during cannabis detoxification offers several advantages. Successful symptom management contributes to increased patient comfort, adherence to treatment protocols, and overall treatment effectiveness. Addressing insomnia specifically is crucial, as untreated sleep disturbances can exacerbate other withdrawal symptoms, potentially leading to treatment discontinuation. Moreover, effective insomnia management fosters a conducive environment for the patient to engage in therapeutic interventions, counselling, and other components of the comprehensive treatment plan.

However, the detoxification process is not without its challenges and potential drawbacks. Some individuals may find the detoxification phase emotionally and physically taxing, which could impact treatment adherence. Additionally, the risk of relapse remains, as the process of detoxification alone does not address the underlying psychological factors contributing to cannabis use. The effectiveness of detoxification as a standalone treatment is debated within the literature, and its role within a comprehensive treatment plan must be considered in the context of individual patient needs and characteristics (Grau-López et al., 2020).

In addressing the management of insomnia during cannabis detoxification, various therapeutic modalities can be employed. Non-pharmacological interventions such as

cognitive-behavioural therapy for insomnia (CBT-I) have demonstrated efficacy in improving sleep outcomes for individuals undergoing substance use disorder treatment (Ritterband et al., 2012). Pharmacological options may also be considered in specific cases, although caution is warranted due to the potential for dependence on sleep medications.

In conclusion, the detoxification process for CUD represents a crucial initial step in treatment. Effective management of withdrawal symptoms, particularly insomnia, plays a pivotal role in treatment success. However, the pros and cons of the detoxification process should be carefully weighed, considering its limitations as a standalone treatment and the need for a comprehensive therapeutic approach addressing both physiological and psychological aspects of cannabis use disorder.

Psychotherapeutic interventions

Therapy works by identifying the root cause of CUD and trying to deal with it. Then, methods are identified for coping with cannabis cravings, and patients learn how to complete the course of treatment and are given tips for preventing relapse. The success of therapy depends on the person's determination to make a change and on identifying the root cause of CUD. A wide range of therapies can be used to treat CUD, including cognitive behavioural therapy (CBT), contingency management, motivational interviewing, dialectal behavioural therapy, rational emotive behaviour therapy, matrix model, 12-step facilitation, psychosocial problem-solving, group counselling, family counselling, and spiritual and faith-based groups.

The 12-step facilitation therapy also includes the spiritual approach. It indicates that the foundational concept of a spiritual approach to SUD is that of powerlessness. If SUD patients concede that they are powerless in regard to their substance abuse behaviour and powerless over their actions when they seek the substance, then they can despair of their willpower and look for other powers to help them abstain. The 12-step facilitation programme takes the spiritual approach that the external power is God, yet there is no specific interpretation of whether this being is God, Allah, Jehovah, or Shiva. Some patients are keen to distance themselves from religion altogether. In essence, the most important part of the spiritual approach is to despair of willpower and leave treatment to the external power. The 12-step facilitation programme is in line with the disease models of addiction in assuming that the SUD behaviour is beyond the patient's control and that to control this behaviour, the patient must seek the intervention of an external power (Dossett, 2013). A recent study confirmed that the 12-step facilitation program participation at baseline was associated with better outcomes at follow-up, and many studies endorsed the program effectiveness for treating SUDs (Woodhead et al., 2020).

CBT for SUDs has demonstrated efficacy as both a monotherapy and part of combination treatment strategies (McHugh et al., 2010). Evidence from several empirical studies shows that the effectiveness of CBT sessions for SUDs is higher than that of other therapies, and for CUD specifically. Moreover, the durability of treatment effects over time is also higher than other types of therapy. One study reported that 60% of patients treated with CBT showed no sign of relapse after one year (McHugh et al., 2010). However, another study supports the effectiveness of combinations of therapies, specifically CBT, motivational enhancement therapy, and contingency management or psychosocial problem

solving. For children and adolescents, family therapy interventions have shown promising results (Kroon et al., 2019) (Gray & Squeglia, 2017). However, another study using large-scale trials demonstrated that even with the best treatment and care, adolescents with SUDs rarely achieve long-term abstinence (Gray & Squeglia, 2017).

Referring to the value-based neurobiological model discussed in the biological factors section, one recent study showed evidence that value-based cognitive interventions, or, in other words, decision-making strategies, have shown promising results over the last decade, including approach and attention bias training, mindfulness and goal-management training, contingency management, and working memory training. These treatments aim to increase the value of non-drug rewards, reduce the value of drug rewards, and regulate emotional reactions (Loganathan & Ho, 2021).

Pharmacological treatment

Today, pharmacological treatment is only used to treat disorders associated with CUD, such as depression and anxiety, as well as prevent relapse and reduce withdrawal symptoms. Since dopamine has a key role in the addiction biological process, blocking dopamine neurotransmission was expected to block the reinforcing effects of drugs and, therefore, to reduce addiction-related behaviour. However, evidence suggests that dopaminergic antagonists are not effective to treat addiction; this might be due to dopamine playing a critical role in psychostimulants but a much less important one in cannabis abuse (Solinas et al., 2018).

Our research shows that, to date, no medications have been licensed for CUD treatment. Moreover, recent researchers claim that the argument for treating CUD with SSRI antidepressants, mixed-action antidepressants, bupropion, buspirone, atomoxetine, anticonvulsant gabapentin, oxytocin, and N-acetylcysteine is weak (Kroon et al., 2019).

However, a study conducted in 2019 tested a fatty-acid-amide-hydrolase inhibitor drug on males with CUD and found that those who received the drug had fewer withdrawal symptoms, and used less cannabis four weeks later than those who were give the placebo (Kroon et al., 2019).

Referring to the brain reward model discussed in the biological factors, and the fact that cannabinoids activate, and endocannabinoids mediate, brain reward and brain relapse circuits, it might make sense to develop cannabinoid CB1 receptor antagonists as anti-addiction medications (Gardner, 2019); however, we could not find any records of any pharmaceutical entity working on this hypothesis. Moreover, as discussed earlier (in the literature review, under Personality Traits), impulsive behaviour indicates vulnerability to SUD. Accordingly, pharmacological interventions targeting impulsivity may be effective for CUD treatment (Rinehart & Spencer, 2021).

With reference to treatment, it is important to mention that treatment and recovery are not a reversal of the addiction or pathology. Rather, they entail a learning process and a development to something more. Learning from the addiction and recovery experience enables the person to emerge with a better future quality of life (Best et al., 2015).

5. Chapter (5) – Discussion

It is widely accepted that addiction can happen to anyone and that it does not discriminate against any walk of society. It might start innocently, through a prescription from a doctor to treat a certain condition, for example insomnia or severe lower back pain. The patient increases the dose and frequency, and addiction naturally starts to creep into their life.

In many cases, the trigger to embark on a substance use journey is an “innocent experience” or a substance taken as a means to solve another underlying condition, such as depression, anxiety, or a stressor. As it is so easy to indulge in such “innocent experiences”, the number of SUD patients is increasing year on year worldwide.

Some classes of drugs nominated by the DSM-5 as addictive are legally available for sale to the public; for example, alcohol, caffeine, tobacco, and cannabis can all be legally bought in some countries. Allowing a substance to be available increases the risk of an “innocent experience”, possibly leading to SUDs.

SUDs are a serious complication, possibly leading to death. In the US alone, over 70 thousand deaths were related to drug overdoses in 2019 (Hedegaard et al., 2020).

Adolescents and Addiction

As adolescents progress towards maturity, their awareness of influential life situations becomes clearer, which affects their emotional responses and social behaviour. The environment around an adolescent shape their emotional responses; sociopsychological atmosphere, societal norms, and societal values are some of the key factors.

The adolescent's environment is one of the most important factors that influence the development of their behaviour for a long time to come.

The vulnerability of the adolescent lies in the individual's thoughts, which translate external events into an emotional response. For example, negative social settings could be expressed in the form of anxiety, depression, or addiction. An adolescent seeking thrills might be challenged to try drugs to reduce boredom, relax, boost their energy, or achieve a sense of confidence.

The rodent model literature suggests that adolescents are at higher risk of SUDs than adults. In contrast, adolescents are less sensitive to withdrawal effects. Studies examining neuronal function have revealed several age-related effects but have yet to link these effects to vulnerability to SUDs (Schramm-Sapyta et al., 2009). Due to the special psychological settings of adolescents, one study shows that even with the best SUD treatment care, they rarely achieve long-term abstinence (Gray & Squeglia, 2017), making prevention the best possible treatment option for this age group. It is suggested that prevention is enabled through public awareness and public education, and by endorsing

government policies to protect this vulnerable segment of the society. Investing in prevention targeting adolescents would pay off in the long run; as the well-known Greek proverb says, “a society grows great when old men plant trees in whose shade they shall never sit”.

Understanding Addiction

In recent years, it has become widely acceptable to attribute SUDs or susceptibility to substance abuse to inherited genetic factors (Gardner, 2019) (Prom-Wormley et al., 2017) (Fite et al., 2018). Yet, these assumptions need more research to be scientifically proven to an acceptable level. The most robust biological theory of addiction is the mesolimbic dopaminergic system reward theory. Typically, the use of drugs to relieve physical pain is one of the biologically-acquired causes, for example opium as pain relief for certain diseases (e.g., in the form of morphine, heroin, codeine, and meperidine). Starting opium treatment without searching for the actual cause of the disease may lead, in many cases, to dependence on the drug without the patient intending any immoral abuse.

The effects of SUDs are not limited to biological changes but extend to psychological, social, and cultural areas of life. The psychological dimension has been extensively studied and researched in the areas of abuse and addiction. However, a lingering question that remains unanswered is whether psychopathological or personality traits can be considered a cause and effect of SUDs. Although psychological studies based on learning theory were discussed earlier (in the literature review, under Impact of Social Factors) and have shed some light on various aspects of the SUD problem, they cannot describe the phenomenon with its multiple dimensions.

The misuse of drugs leads to fundamental changes in the personality, as it makes the person susceptible to psychological and psychotic diseases. Cannabis addiction has severe effects, the most important of which are anxiety, panic attacks, and paranoia,

especially for new users, cognitive weakness, especially regarding concentration and memory, and delayed reactions.

Unfortunately, culture promotes drug use both directly and indirectly. Media portrayals of cannabis users suggest they are feeling euphoria, accompanied by loud laughter and fund. The observer can also sense the cannabis user's sharper perception of visual senses and elegance. Despite the fact that the effect of cannabis varies from one person to another, depending on the method of use and the amount taken. One example of the drugs-promoting culture is the unique integration of cannabis into youth culture worldwide. The indirect cultural promotion of cannabis started at the time of pop music culture and is still alive and at the heart of the new pop music culture and loud parties among young people. The media are among the social channels that spread the culture of substance abuse and have changed the social norms: where there used to be rejection substance abuse, today there is a high level of tolerance of substance use. It can be assumed that there are groups of young people who do not use drugs, but are psychologically ready to do so because of the media effect and change in social norms.

The relationship between SUDs and cultural stance (whether society approves, rejects, or maintains a neutral front regarding substance use) is an obvious one. In today's world, drugs are not limited to one society, in terms of production, import, smuggling, and distribution mechanisms across borders. In contrast, the 269 million substance users (World Drug Report, 2020) live in different social contexts with diverse cultures, whether they favour, oppose, or are neutral toward substance use. Over the past 10 years, more and more developed societies have introduced new laws legalising the use of cannabis for medical

and for recreational reasons, under the pressure of changing cultural trends in public opinion.

Without taking social and environmental factors into account, it is difficult to obtain a complete causal explanation of SUDs. Society, as a large habitat, determines both the supply and demand for drugs, and it sets standards of behaviour. It is not easy to identify or measure the results and effects of a number of complex and interacting variables that contribute to the formation of society, but we can focus on some pivotal dimensions in social life, the first of which is the effectiveness of the family.

In the family, parents and children form the attachment behavioural models discussed earlier (in the literature review, under Impact of Psychological Factors). If the family has a positive role in care, protection, upbringing, and fulfilment of basic physical, health, educational, economic, social, and other emerging needs, it has a great influence on shaping attitudes, values, and behaviours. It can also have a negative role if an atmosphere of tension, turmoil, pathological and psychological problems, exploitation, and drug abuse prevails.

The family structure does not stand in isolation from the society surrounding it, the first level of which is the group of friends, as they are an indirect part of the family. The danger of this appears in each influencing the other in drug abuse. Problems can be further aggravated in developing and poor countries, where widespread unemployment, random child labour, and family breakdown lead to more serious problems, including homelessness.

Effectiveness of CUD Counselling

SUD, with its multiple dimensions, is a very complex problem at a global level. It includes interlinked biological, economic, social, psychological, environmental, moral, and religious factors. Each of these factors has its own weight, which varies from one society setting to another and from one social class to another. In our view, the principal common factors relate to are the biological, cultural, and value dimensions.

Generally, SUD patients need to undergo prolonged treatment, but the first step of treatment is for the patient to recognise that their substance use has a significant negative impact on their life. The next step of treatment begins with determining an appropriate treatment programme for the patient's condition that restores their normal life and balances their mind, body, and soul without the need to use drugs.

Determining the appropriate treatment depends on several different factors, such as the effect of drugs on the person, the duration of their use, and type of substance, among others. Therefore, it is not possible to generalise one type of treatment for all SUD patients. Rather, treatment is determined for each SUD patient individually.

Counselling psychology and behavioural therapy treatments help identify the basis and cause of drug addiction and deal with the root cause appropriately, drug cravings, methods for coping with treatment, and tips for preventing relapse. The treatment programme's outcome would be to help change a person's view of drug addiction and support them to follow a healthy lifestyle to achieve a long life.

Proven therapy techniques that have worked for SUDs patients are CBT, contingency management, motivational interviewing, dialectal behavioural therapy, rational emotive behaviour therapy, matrix model, and 12-step facilitation (Miller & Thomas, 2021).

A recent study confirmed that 12-step facilitation programme participation at baseline was associated with better outcomes at follow-ups, and many studies endorsed the program effectiveness for treating SUDs (Woodhead et al., 2020). However, another study supports the effectiveness of combinations of therapies, specifically CBT, motivational enhancement therapy, and contingency management or psychosocial problem solving. For children and adolescents, family therapy interventions showed promising results (Kroon et al., 2019; Gray & Squeglia, 2017). Another study of large-scale trials demonstrated that, even with the best treatment and care, adolescents with SUDs rarely achieve long-term abstinence (Gray & Squeglia, 2017).

Based on the value-based neurobiological theory, using approach and attention bias training, mindfulness, and goal-management training, contingency management as well as working memory training have proven to be effective in treating SUD patients by increasing the value of non-drug rewards, reducing the value of drug rewards, and regulating emotional reactions (Loganathan & Ho, 2021).

It is clear from the most recent available research papers on the effectiveness of therapy for SUD patients that each individual patient requires a tailored therapy programme that fits their needs and supports their journey to healing. More empirical research is needed

to evaluate the effectiveness of therapy under different conditions and for different segments of society. Mapping the effectiveness of these different therapy techniques might be helpful for psychologists and psychiatrists deciding on the best treatment approach for their patients.

The challenge for treatment remains in cases when the main cause of addiction was that the individual sought relief from chronic pain. Although alternatives are available for dealing with chronic pain, none is comparable to opioid-based medicines, which are highly addictive, and use of opioid therapy for the treatment of chronic pain management is widespread today (Cheatle et al., 2014). One study suggests developing a therapeutic relationship with chronic pain patients and their families so that pain medications can be used without abuse concerns and proposes a set of strategies for physicians to follow. Chronic pain patients have an urgent and serious need for immediate treatment, and if such patients also suffer SUD, or have suffered SUD in the past, there is a high likelihood of relapse. Current medical guidelines and recommendations have a gap in dealing specifically with patients who suffer chronic pain and have suffered SUD during their life (Cheatle et al., 2014)

It is unclear whether patients suffering depression resort to substance use, SUD patients suffer depression, or causality works both ways; that is, there is a “chicken or the egg” debate. The onset of substance abuse and depression remain unclear. A recent study confirms that it is not possible to understand long-term opioid therapy for chronic pain without understanding the close and multifaceted relationship of this therapy with depression (Sullivan, 2018). Even if treatment is obtained and SUD is overcome, the risk

of returning to addiction remains high, especially if the substance that a person has become addicted to is used again.

Answers to the Research Questions

Even though the latest research papers use the most advanced technology for laboratory analysis and medical imaging, addiction remains a complex behaviour with multidimensional relationships on many levels. In order to simplify addiction behaviour, scholars have broken it down into different factors which influence and lead to it.

A great deal of evidence supports the neurobiological theory for addiction, which is based on the idea that addiction is a chronic, relapsing brain disease, characterised by compulsive drug seeking and use despite harmful consequences. There are many gaps in this model as a standalone justification for addiction, such as the fact that recovery is a social experience and not merely a biological dimension. Moreover, we accept that addiction is chronic exposure to rewarding stimuli causing the behaviour of consuming more, but the addictive nature of the drugs itself cannot be ignored, as the theory suggests (Heather et al., 2018).

The link between biological, psychological, and social factors in SUDs is not simple to measure and assess. Each of these factors could be looked at as a positive driver to prevent SUD and, at the same time, a driver to increase the risk of SUD. As an example, from a psychological factor point of view, anxiety disorder could drive a person to use a substance such as cannabis to ease the symptoms of anxiety; at the same time, a person

diagnosed with anxiety disorder might be more fearful to try new things, including substances.

Substance abuse cannot be divorced from its social, psychological, cultural, political, legal, and environmental contexts: it is not simply a consequence of brain malfunction (Heather et al., 2018). In our opinion, each individual's addiction story is different, and only a review of the combination of the different factors influencing that individual can lead to the proper diagnosis and suggest the right treatment.

With the many theories of factors driving addiction, and the justification of why some individuals develop SUDs and others do not by biological, psychological, and social factors, in our opinion and from my professional experience as a CBT therapist, easy access to drugs represents the most crucial risk factor by far. Thus, the factors driving addiction are interconnected, but each factor has a different effect on each individual; however, the ease of obtaining drugs is the defining point.

In summary, successful SUD prevention requires strong cooperation at all levels of society. Prevention might be the most economical and safest route for societies to manage the SUD challenge. Counselling therapies are the only proven treatment techniques, specifically the 12-step facilitation programme combined with CBT. Pharmacological intervention is not yet available.

Research Limitations

The subject of this dissertation is broad and complex; when the exposé was developed, unfortunately, little guidance was available, given Covid-19 containment measures. Moreover, the methodology chosen, a cross-sectional literature review of evidence-based papers issued after 2008, was not structured and mainly based on data and research from the US. Due to the nature of addiction, most of the theories are built around animal models, and we found limited literature using human data and samples for empirical research. In human research, information on SUD is generated from self-reporting, without objective methods for confirmation. Furthermore, in most of the reviewed literature, gender differences were not clearly documented; in the case of the genetic research papers we reviewed, it was ignored. Finally, due to the time constraints imposed by preparing the dissertation in the relatively challenging time of four months, further investigation of the pathology of disease and racial-ethnic difference effects was not possible, which could impact some points of the dissertation.

Future Research Direction

The subject of addiction and SUDs continues to be a challenge not only to individuals but also to scientists, governments, and societies. Health-related, economic, and social issues all impact the way we deal with SUDs. Understanding the science of SUD requires further investigation of the neural mechanisms related to addiction and craving. With the development of medical imaging, it makes sense to build a database for diversified

brain imaging for SUD patients over time, to allow for predictability and possible personalised treatment, which may lead to identifying biological markers of addiction.

On the treatment front, we anticipate future research to investigate personalised prevention and treatment methods for addiction, as well as researching for addiction anti-craving drugs. In regard to legislation and data collection, meanwhile, we anticipate that future research study will review the existing data after legalisation of some substances for medical and recreational reasons such as tobacco, alcohol, and cannabis and address the debate between the legalisation and illegalisation of such substances. Further investigation can also be undertaken of the best available information and technological systems to collect data about addiction, such as wearable devices for SUD patients, which can bring a new perspective on addiction behaviour altogether.

Last but not least, as we stated before, it is our opinion that easy access to drugs represents a major risk factor for developing SUDs, and the easiest access is through health professionals, especially for chronic pain medication. A call is made for future studies to address this easy access through health professionals and the management of substances. The story of Sigmund Freud and his doctor friend, who provided Freud with an assisted suicide using morphine, should be considered with current guidelines and policies.

6. Chapter (6) – Conclusions

We conclude that the main cause of drug addiction remains unknown. Much of the literature reviewed put forward theories and models to explain the cause of addiction. There is a great deal of evidence that different factors may contribute to addiction, such as environmental, genetic, social, and psychological factors. Similarly, the tendency to SUD involves many different factors, whether psychological, social, familial, or biological, none of which can be the sole determinant of drug dependence (Franques et al., 2000).

The link between different factors that contribute to addiction is not simple to measure and assess. Each of these factors could be looked at as a positive driver to prevent SUD and, at the same time, a driver to increase the risk of SUD.

In our opinion, everyone's addiction story is different, and only a review of the combination of the different factors influencing that individual can give a proper diagnosis and suggest proper treatment. We have gone through evidence that easy access to drugs represents a crucial risk factor for developing SUD.

SUD prevention requires cooperation not only at government level but all the way down to family relationship level. Prevention methods have proven successful; however, the continuous changes in legislation regarding substances needs to be aligned with new prevention strategies.

Current available treatments for CUD are mainly counselling therapies, many of which have proven successful; however, the 12-step facilitation programme combined with

CBT has been the most endorsed by researchers. Pharmacological intervention is not yet available.

Given the complex interplay of factors contributing to addiction, it's imperative to adopt a multifaceted approach in both understanding and treating substance use disorders (SUDs). Beyond the traditional models of causation, we must acknowledge the deeply personal narratives underlying each individual's journey into addiction. These narratives often weave together a tapestry of environmental influences, genetic predispositions, social dynamics, and psychological vulnerabilities.

Moreover, as we strive to unravel the mysteries of addiction, it becomes increasingly clear that there is no one-size-fits-all solution. Each person's struggle with substance use is unique, necessitating a tailored approach to diagnosis and treatment. This underscores the importance of holistic assessments that consider the intricate web of factors shaping an individual's relationship with drugs.

In light of these insights, it's evident that effective prevention and intervention strategies must extend beyond clinical settings to encompass broader societal structures. This entails fostering supportive environments that mitigate risk factors while nurturing resilience and coping mechanisms. By fostering open dialogue and community support networks, we can create a more compassionate and inclusive framework for addressing addiction.

Ultimately, while pharmacological interventions may offer promising avenues for future treatment, our most potent weapon against SUDs lies in our collective capacity for

empathy and understanding. By embracing the complexity of addiction and approaching it with humility and compassion, we can move closer to a future where individuals are empowered to reclaim their lives from the grips of substance dependence.

7. Chapter (7) - Bibliography

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