Final Master Thesis

IMPACT OF PSYCHOACTIVE DRUGS ON MENTAL HEALTH

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMARY</td>
<td>3</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>4</td>
</tr>
<tr>
<td>CONFLICTS OF INTEREST</td>
<td>5</td>
</tr>
<tr>
<td>ABBREVIATIONS</td>
<td>6</td>
</tr>
<tr>
<td>TERMS</td>
<td>7</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>13</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>15</td>
</tr>
<tr>
<td><strong>Psychoactive Drugs:</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Neurotransmitters:</strong></td>
<td>19</td>
</tr>
<tr>
<td><strong>Risk Factors:</strong></td>
<td>21</td>
</tr>
<tr>
<td>RESEARCH METHODOLOGY AND METHODS</td>
<td>24</td>
</tr>
<tr>
<td>RESULTS</td>
<td>25</td>
</tr>
<tr>
<td>DISCUSSION OF THE RESULTS</td>
<td>38</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>45</td>
</tr>
<tr>
<td>PRACTICAL RECOMMENDATION</td>
<td>46</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>47</td>
</tr>
</tbody>
</table>
SUMMARY

Impact of psychoactive drugs consumption on mental health, by Esteban Garcia Cruz. The purpose of this research is to find factors related with drug consumption, which affect to mental health. The aim of research is to determinate the relationship between drug use and the development of mental disorders and to identify possible factors implicated in this association.

Objectives are:

1. To find socio-demographic factors implicated in drug consumption and mental disorders.
2. To evaluate the possible causality of psychoactive drugs consumption in mental disorders.
3. To compare consequences on mental health between different groups of drugs users.

The object of research are 50 anonymous questionnaire participants from both genders, with an age between 18-32, who consume or have consumed in the past psychoactive drugs.

The method of this research is based on a digital questionnaire, anonymously accomplished by 50 participants who gather inclusion criteria.

Expected results of research project: Frequent drug consumption, associated with other risk factors for mental health disturbance, can trigger mental health issues and worsen previous mental issues. People with familiar instability, past traumas and friends influence on drugs consumption is more likely to abuse drugs and develops mental disorders. People who start to consume drugs earlier have a higher risk of developing mental issues.
ACKNOWLEDGMENTS

I would like to express my deepest appreciation to all those who gave me the possibility to complete this report. A special gratitude I give to my research supervisor Dr. Aida Kunigėlienė, who accepted to be my supervisor and guided me in this research.

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A special thanks goes to all of the 50 participants of the questionnaire, who took their time out of their day and honestly answered every question of the questionnaire, allowing me use the results in order to get conclusions for this research.
CONFLICTS OF INTEREST

The author reports no conflicts of interests.
ABBREVIATIONS

- **ADHD**: Attention deficit and hyperactivity disorder
- **AMI**: Any Mental Illness
- **cAMP**: Cyclic adenosine monophosphate
- **CB1**: Cannabinoid receptor type 1
- **CNS**: Central nervous system
- **GABA**: Gamma-Aminobutyric acid
- **EDNOS**: Eating Disorder Not Otherwise Specified
- **MDD**: Major depressive disorder
- **MDMA**: 3,4-Methylenedioxymethamphetamine
- **MOR**: µ-opioid receptor
- **NIDA**: National Institute of Drug Abuse
- **PET**: Positron emission tomography
- **SMI**: Serious Mental Illness
- **SUD**: Substance Use Disorder
- **THC**: Δ-9-Tetrahydrocannabinol
- **UNODC**: United Nations Office on Drugs and Crime.
- **VTA**: Ventral tegmental area
TERMS

Any mental illness: a mental, behavioural, or emotional disorder. AMI can vary in impact, ranging from no impairment to mild, moderate, and even severe impairment.

Amphetamines: C₉H₁₃N or one of its derivatives (such as dextroamphetamine or methamphetamine) that is a stimulant of the central nervous system, is often abused illicitly, and is used clinically especially in the form of its sulphate C₉H₁₃N·H₂SO₄ to treat attention deficit disorder and narcolepsy and formerly as a short-term appetite suppressant.

Amygdala: a roughly almond-shaped mass of grey matter inside each cerebral hemisphere, involved with the experiencing of emotions.

Anhedonia: Loss of pleasure or interest in usual activities. It is a typical symptom of major depressive disorder.

Brain stem: the part of the brain composed of the midbrain, pons, and medulla oblongata and connecting the spinal cord with the forebrain and cerebrum.

Cannabis: drug derived from the family of plants that includes hemp. Cannabis can be smoked or eaten. Use of cannabis, due to it psychoactive substance THC, produces a mild sense of euphoria, as well as impairments in judgment and lengthened response time. Cannabis also refers to the psychoactive dried flower buds, leaves, or preparations (such as hashish) or chemicals (such as THC) that are derived from the cannabis plant.

Cerebellum: a large dorsally projecting part of the brain concerned especially with the coordination of muscles and the maintenance of bodily equilibrium, situated between the brain stem and the back of the cerebrum, and formed in humans of two lateral lobes and a median lobe.

Cerebral cortex: furrowed outer layer of Grey matter in the cerebrum of the brain, associated with the higher brain functions, as voluntary movement, coordination of sensory information, learning and memory.
Cocaine: a bitter crystalline alkaloid $\text{C}_{17}\text{H}_{21}\text{NO}_4$ obtained from coca leaves that is used especially in the form of its hydrochloride medically as a topical anaesthetic and illicitly for its euphoric effects and that may result in a compulsive psychological need.

Comorbidity: Comorbidity describes two or more disorders or illnesses occurring in the same person. They can occur at the same time or one after the other. Comorbidity also implies interactions between the illnesses that can worsen the course of both.

Deacetylation: is the removal of an acetyl group.

DNA methylation: is a process by which methyl groups are added to the DNA molecule.

Dosage: the size or frequency at which the drug doses are taken.

Dysphoria: a state of unease or generalized dissatisfaction with life.

Ecstasy (MDMA): a synthetic amphetamine analog $\text{C}_{11}\text{H}_{15}\text{NO}_2$ used illicitly for its mood-enhancing and hallucinogenic properties.

Formication: a sensation like insects crawling over the skin.

Gene expression: is the process by which information from a gene is used in the synthesis of a functional gene product.

Grey Matter: Grey matter, named for its pinkish-grey colour, is home to neural cell bodies, axon terminals, and dendrites, as well as all nerve synapses. This brain tissue is abundant in the cerebellum, cerebrum, and brain stem. It also forms a butterfly-shaped portion of the central spinal cord. The back portion of this butterfly shape is known as the posterior, sometimes called the dorsal grey horn. This region passes sensory information via ascending nerve signals to the brain. The front part, which is sometimes called the ventral grey horn, sends descending nerve signals governing motor activities to your autonomic nerves. A problem with the dorsal grey horn may affect your brain's ability to interpret sensory information, while issues with the ventral grey horn interfere with your body's ability to receive motor information; paralysis, tingling, and muscle weakness are often the products of damage to the ventral grey horn.
**Heroin:** a strongly physiologically addictive narcotic $\text{C}_2\text{H}_2\text{NO}_3$ that is made by acetylation of morphine and that is prohibited for medical use but is used illicitly for its euphoric effects.

**Hippocampus:** the elongated ridges on the floor of each lateral ventricle of the brain, thought to be the centre of emotion, memory, and the autonomic nervous system.

**Hypersomnolence:** is a sleep disorder characterized by excessive daytime sleepiness, excessive sleep periods each day (usually taken to mean more than 10 hours) and/or an inability to achieve the feeling of refreshment that sleep usually brings.

**Hypothalamus:** a region of the forebrain below the thalamus which coordinates both the autonomic nervous system and the activity of the pituitary, controlling body temperature, thirst, hunger, and other homeostatic systems, and involved in sleep and emotional activity.

**Lethargy:** a lack of energy and enthusiasm.

**Limbic system:** the limbic system is a complex set of structures that lies on both sides of the thalamus, just under the cerebrum. It includes the hypothalamus, the hippocampus, the amygdala, and several others nearby areas. It appears to be primarily responsible for our emotional life, and has a lot to do with the formation of memories.

**Mental disorders:** although this term cannot be defined objectively by employing the methods of science; DSM-V defines mental disorder as “a syndrome characterized by clinically significant disturbance in an individual's cognition, emotion regulation, or behaviour that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning. Mental disorders are usually associated with significant distress in social, occupational, or other important activities. An expectable or culturally approved response to a common stressor or loss, such as the death of a loved one, is not a mental disorder. Socially deviant behaviour (e.g., political, religious, or sexual) and conflicts that are primarily between the individual and society are not mental disorders unless the deviance or conflict results from a dysfunction in the individual, as described above.”

**Mental health:** WHO defines mental health as a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community. This definition does not indicate
that good mental health necessarily depend on the absence of psychiatric disorders, and in the other hand, people suffering from psychiatric disorders, can reach a state of well-being.

**Mental illness:** health conditions involving changes in emotion, thinking or behaviour (or a combination of these). Mental illnesses are associated with distress and/or problems functioning in social, work or family activities.

**Midbrain:** a small central part of the brainstem, developing from the middle of the three primary divisions of the developing vertebrate brain or the corresponding part of the adult brain between the forebrain and hindbrain. Also called Mesencephalon.

**Mood disorder:** Mood disorders are characterized by a serious change in mood that cause disruption to life activities. Though many different subtypes are recognized, three major states of mood disorders exist: depressive, manic, and bipolar. **Major depressive disorder**, commonly known as depression is characterized by overall depressed mood and anhedonia. Elevated moods are characterized by mania or hypomania. The cycling between both depressed and manic moods is characteristic of bipolar mood disorders.

**Neurotransmitters:** the chemicals that convey information between neurons. This is not the same as electrical action. Neurotransmitters may chemically excite the next neuron or inhibit it, and thousands of excitatory and inhibitory synapses may interact on a given neuron. Neurotransmitters may interact by opening or closing ion channels and by activating chains of chemical events called second Messenger systems, which may alter electrical activity and metabolic activity, protein synthesis, and gene expression. It is believed there are about 200 chemicals that serve as neurotransmitters.

**Psychoactive drugs:** substance that acts primarily upon the central nervous system where it alters brain function, resulting in temporary changes in perception, mood, consciousness and behaviour.

**Psychotic disorder:** Psychotic disorders are mental disorders in which a person’s personality is severely confused and that person loses touch with reality. When a psychotic episode occurs, a person becomes unsure about what is real and what isn’t real and usually experiences hallucinations, delusions, off-the-wall behaviour, chaotic speech and incoherency.
**Receptor**: a cell or group of cells that receives stimuli. Also refers to a chemical group or molecule (such as a protein) on the cell surface or in the cell interior that has an affinity for a specific chemical group or molecule.

**Reward circuit**: a group of neural structures responsible for incentive salience, associative learning, and positively-balanced emotions, particularly ones which involve pleasure as a core component. The reward pathway involves different parts of the brain, the most significant are the VTA, Nucleus accumbens and prefrontal cortex. Dopamine is released in the VTA, from where goes to nucleus accumbens (Mesolimbic dopamine pathway) and cerebral cortex (Mesocortical pathway).

**Route of administration**: the means by which a drug or agent enters the body. Common routes of administration include oral, rectal, inhalation, nasal and topical.

**Schizophrenia**: Is the most common psychotic disorder. Characteristic symptoms are changes in behaviour, delusions and hallucinations. These symptoms should last longer than six months to be diagnosed with schizophrenia. Those diagnosed with this type of disorder often show a decline in social function, school and work.

**Serious mental illness**: a mental, behavioural, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities. The burden of mental illnesses is particularly concentrated among those who experience disability due to SMI.

**Stimulants**: an agent (a drug in this case) that produces a temporary increase of the functional activity or efficiency of an organism or any of its parts.

**Striatum**: pair of masses of nervous tissue within the brain that contain two large nuclei of gray matter separated by sheets of white matter.

**Substance use disorder**: substance use disorders are a type of substance-related disorder that involve a pathologic pattern of behaviours in which patients continue to use a substance despite experiencing significant problems related to its use. There may also be physiologic manifestations, including changes in brain circuitry.

**Synapse**: the junction between axon and dendrite, where neurotransmitters transmit information between neurons.
**Thalamus:** the largest subdivision of the diencephalon that consists chiefly of an ovoid mass of nuclei in each lateral wall of the third ventricle and serves chiefly to relay impulses and especially sensory impulses to and from the cerebral cortex.

**Ventral tegmental area:** a midbrain structure that is rich in dopamine neurons. The VTA is part of the Mesolimbic dopamine pathway and an important part of the "reward system."

**White Matter:** the white matter of your brain and spinal cord is composed of bundles of axons. These axons are coated with myelin, a mixture of proteins and lipids, that helps conduct nerve signals and protect the axons. White matter's job is to conduct, process, and send nerve signals up and down the spinal cord. Damage to the white matter of your brain or spinal cord can affect your ability to move, use your sensory faculties, or react appropriately to external stimuli. Some people with damaged white matter suffer deficits in reflexive reactions.

**Withdrawal symptoms:** a wide range of symptoms (as nausea, sweating, depression, nervousness, headaches or insomnia) produced in a person by deprivation of an addictive substance.
INTRODUCTION

Impact of drugs on mental health is a topic of interest for many reasons. United Nations Office on drugs and crime (UNODC) world drug report shows that in the recent years, the drugs variety is bigger, and the consumption rates of psychoactive drugs keep increasing as well as its health consequences. [1]

In this research we will focus on how the main consumed psychoactive drugs can affect to mental health, and we will try to find possible factors that interfere with psychoactive drug consumption having an impact on mental health. Cannabis is the most consumed psychoactive drug in the world, especially by adolescents and young adults. Besides cannabis, other psychoactive drugs such as cocaine, amphetamines, MDMA (ecstasy) and heroin will be overviewed individually, as well as agent factors such as dosage, duration of use, onset and route of administration need to be explained, before approaching different aspects to discuss the possible psychoactive drug causality on mental health illness. [2]

To study the implication of psychoactive drugs on mental health first we need to approach the role of neurotransmitters on mental health and how psychoactive substances affect them. All psychoactive drugs alter dopaminergic levels. Dopamine, part of brain’s reward system, is involved in addiction, also plays a role in motivation, movement and cognitive functions such as memory and focus. Psychoactive drugs also alter other neurotransmitters such as serotonin, nor-epinephrine, endocannabinoids and endogenous opioids. Serotonin is involved in the regulation of sleep, appetite, mood, decision making, aggression, perception, memory, and anxiety. Nor-epinephrine which mobilizes the brain and body for action and regulates the so called fight or flight response, increasing alertness and vigilance; it is also involved in mood and arousal control. In the case of endocannabinoids and endogenous opioids, cannabinoids and opioids like Heroin respectively mimic their action. [3] It seems that psychoactive substances can affect mental health due to these alterations on neurotransmitter, however an important question to be addressed is if the association between psychoactive drug consumption and psychiatric disorders is due to a common underlying vulnerability in patients, which affect both, drug consumption and mental health.

To understand this comorbidity, in this research we will go through different factors that interact with drugs consumption and mental disorders development. Bad social conditions such as familiar instability, poverty, poor education, crime, negative influences, and environments with drug
availability are considered risk factors for drug consumption. Also individual conditions such as past trauma, personality characteristics and genetic vulnerability could contribute to drug use behaviour. [4] Many of these aspects, also seems to be a risk factor for the development of psychiatric disorder. This common vulnerability leads to problems finding evidence of psychoactive drugs as a causative factor of psychiatric disorders. [5]

Other further problems related to this topic are the brain complexity, as well as the action of all psychoactive drugs is not fully understood. On the other hand psychiatric disorders are genetically complex and seem to interact with other factors than psychoactive drugs.

It’s appropriate to use certain caveats here. First, the terms “substance use disorder” and “addiction” (using terminology recommended by the American Academy of Pain Medicine, American Pain Society, and American Society of Addiction Medicine) are used rather than “dependence”, it refers to the complex of behaviours that include withdrawal, tolerance, loss of control, compulsive use, and continued use despite adverse consequences. Second, in this research the term “drug” means psychoactive drug, according World Health Organization, *Psychoactive substances are substances that, when taken in or administered into one's system, affect mental processes.*

The **aim** of research is to determinate the relationship between drug use and the development of mental disorders and to identify possible factors implicated in this association.

**Objectives** are:

1. To find socio-demographic factors implicated in drug consumption and mental disorders.
2. To evaluate the possible causality of psychoactive drugs consumption in mental disorders.
3. To compare consequences on mental health between different groups of drugs users.
LITERATURE REVIEW

Since 1998 has been documented that prevalence of mental disorders is higher among population with substance use disorders (SUD). The results from the 2016 National Survey on Drug Use and Health report a higher incidence of mental disorders among people suffering SUD. According this report, 43.3% of adult population with SUD in the past year had any mental illness (AMI) and 13.6% suffered serious mental illness (SMI). While from adults without SUD in the past year, only 16% had AMI, and 4.5% had SMI. However this report also point mental disorders as risk factor for SUD, showing a comorbidity between them, more than giving a conjecture about SUD as causative factor of Mental disorders. [1] National institute on drugs abuse (NIDA) also advocate for this bidirectional comorbidity between addiction and other mental illnesses. [2]

Addiction as other psychopathologic consequences of drug consumption depends on agent factors such as the drug type, dosage, route of administration, duration of use and onset age of consumption. [6] Psychoactive substances can be natural as Marihuana, prepared from natural substances as heroin or fully synthetic as the case with amphetamines. Illicit Drugs also can be classified according its main effects in four groups: stimulants as cocaine or amphetamines, narcotics as heroin, hallucinogens as LSD, cannabis and depressants as benzodiazepines. [1] In this research we will focus on the main consumed drugs, Cannabis, Cocaine, Amphetamines, Ecstasy and Heroin.

Psychoactive Drugs:

Cannabis is a popular psychoactive substance, especially among young adults and adolescents. Estimations suggest that, 13.8 million people worldwide, aged between 1 and 16 years old, used cannabis in the past year. Furthermore most of psychoactive drugs users give their first steps with marijuana consumption. [1] Marijuana, has myriad cannabinoid compounds, from all of these chemicals, Δ9-tetrahydrocannabinol (Δ9-THC) is the psychoactive agent. Hash, made from the marijuana resin, contains high concentrations of Δ9-THC. The chemical structure of THC is similar to the brain neurotransmitter Andamide, an endogenous cannabinoid. This similarity allows THC to bind to cannabinoid CB1 receptors of the brain, and affect different brain areas where these receptors are located. CB1 receptors are mainly located in the hippocampus, amygdala, cerebellum, prefrontal cortex, and striatum. Due to the binding of THC with cannabinoid receptors, several regions of the brain are affected, and many short term side effects of marijuana consumption can occur: pleasure effect, loss of memory, thinking and concentration problems, learning issues, impair movement and coordination skills, sensory and perception disorders or mood instability. [7] It is believed that marijuana as other
drugs also raise dopamine levels in the reward system of the brain. This acute release of dopamine produces the euphoric feeling of being “high” and could lead to addiction and continuous consumption of cannabis. [8] Addiction leads to regular consumption and long-term side effects. There have been several studies to investigate the long term side effects of cannabis and how it affect to brain integrity. [9], [10], [11] One study showed evidence that repetitive consumption of cannabis is related with a decrease in the grey matter volume in those areas rich in CB1 receptors. These regions are involved in motivational, emotional, and affective processes. Furthermore, this study demonstrated that the degree of damage to these particular areas of the brain is proportional to the amount and frequency of consumption. [11] Others factor affecting cannabis use consequences are greater drug power as in the case of Synthetics cannabinoids and the early onset of consumption. [12] Long-term side effects are notably common when the consumption habit start before the brain is not entirely developed, as in the case of teenagers and young adults. [13] Cannabis use during adolescence raises 4-7 times the risk of developing addictions in a future. Moreover, a previous research suggests that cannabis use during adolescence is associated with an earlier development and a higher severity of psychotic disorders, notably in those with others risk factors for psychotic disorders. [14] As well, NIDA indicate that there is a possibility that regular marijuana consumption triggers the development of mental disorders like psychotic episodes, anxiety disorders or schizophrenia, especially in genetically vulnerable population. [15] Some authors have also found that cannabis use also worsen the course of the disease among patients with schizophrenia. [16] The neurobiological mechanisms to explain the relation between cannabis consumption and psychosis are not fully clear. Certain clinical studies propose that striatal dopamine alteration may explain this relation. [17] However, is difficult to find causality in these types of studies because there are others factors besides marijuana use that can be associated with the risk of mental illness or predispose to both marijuana use and mental illness. In the case of cannabis causing depression, a number of questions regarding this association, remain to be addressed due to the lack of literature about this association. Previous studies did not find evidence to prove the relation between cannabis consumption and this mental illness. [18]

Stimulants as cocaine, methamphetamines, amphetamines or ecstasy (MDMA) are the second most widely used type of psychoactive drugs after cannabinoids. [1] Stimulants activate monoamine neurotransmitters (dopamine, norepinephrine and serotonin) in the CNS and peripheral nervous system (see table 1). Monoamine neurotransmitters are distributed around the brain in the Midbrain, Hypothalamus, Ventral tegmental area and cerebral cortex. [19]
Table 1: Stimulant impact on monoamine neurotransmitters.

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<thead>
<tr>
<th>Neurotransmitter:</th>
<th>Altered by:</th>
<th>Causative effect:</th>
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<tbody>
<tr>
<td>Dopamine</td>
<td>Cocaine, Amphetamine. All drugs directly or indirectly alter Dopamine levels.</td>
<td>Pleasure and reward. Movement, attention and or memory deficit.</td>
</tr>
<tr>
<td>Norepinephrine</td>
<td>Amphetamines Cocaine MDMA (ecstasy)</td>
<td>Sensorial alterations; Anxiety; mood, sleep, memory, movement disorders.</td>
</tr>
<tr>
<td>Serotonin</td>
<td>MDMA (ecstasy) Cocaine</td>
<td>Euphoria and mood alterations, sexual desire, sleep and appetite disturbances.</td>
</tr>
</tbody>
</table>

Cocaine as a reuptake inhibitor, blocks the reuptake transporter’s action, in this manner allows more neurotransmitter to remain dynamic in the neural connection. [20] While amphetamines and ecstasy are releasers, cause neurotransmitter discharge into the synapse. [23] Cocaine and amphetamine consumption, briefly increments extracellular dopamine concentration in the reward circuit. [19] Different studies support the action of dopamine, as mediating the behavioural effects of stimulants. [21] [22] Stimulants (especially ecstasy) also raise synaptic levels of serotonin and norepinephrine and affect other various neurotransmitters systems. Increase of Serotonin could contribute to the behavioural rewarding from stimulant consumption. Norepinephrine discharge is associated with the subjective impacts of stimulants of changing potencies. [23] Glutamate may assume a vital role in relapse to cocaine or amphetamine misuse [24]. Stimulants additionally increment acetylcholine release and may cause an effect in the reward pathways. [25] Although the impact of stimulants depend on agent factors such as drug type, potency, dosage, route of administration and consumption frequency; and on individual factors as personal physiology or genetic; their general effect on human organism it is known. [26] Acutely, stimulants consumption leads to euphoria, increased energy and libido, reduced fatigue and appetite, increased self-confidence and alertness. [26] The dose range of cocaine for these responses are approximately 15-25 mg (Intravenously or smoked), 40-100 mg (sniffed) or 100-200 mg ingested; and oral amphetamine is around 10 times more potent per mg. [27] A higher dose, better drug potency or a different route can increase the effect and lead to other effects such as insomnia, anxiety, irritability, confusion, paranoia,
panic attacks and hallucinations, impulsivity and grandiosity. [28] Chronic use of stimulants can lead to several mental consequences. First symptoms can be paranoia, delusions and hallucinations; and later tactile hallucinations or formication. [29] After repetitive consumption, a decrease in neurotransmitter release can occur, leading to clinical features. Psychological and physical tolerance to the effects of stimulants can be reached. [30] Researches report down regulation of dopamine and decreased receptor availability in chronic stimulant users. [31] Loss in frontal cortex volume, enlargement of basal ganglia and others changes in brain structure are also related with chronic cocaine use. [32] Some cognitive impairment may remain during months following abstinence. [33] Cocaine and amphetamine withdrawal generate an intense reaction of psychological and behavioural symptoms. At the beginning, during days to weeks, hyper somnolence, strong cravings and depression are common withdrawal symptoms. Later a period of several weeks of dysphoria, lethargy and anhedonia. [34] Relapses are common, especially if there are environmental and social factors which promote consumption, and due to the contrast between “high” and “crash” states. [35] Stimulant consumption and psychosis development has been investigated by several authors. Some studies indicate us that a prolonged stimulant use (especially amphetamines) could induce to psychotic symptoms due to dopaminergic sensitization. [36], [37], [38] From amphetamine consumption, psychotic events can remain for years even after abstinence. [39] However these studies shows that not all individuals develop psychotic symptoms in the same conditions, some of them experienced psychotic episodes after using modest amount of stimulants while others needed higher amounts and some other people did not even develop any psychotic symptom after large dose and time consumption. In the case of depression, literature reports that continuous ecstasy consumption could lead to a permanent serotonin deregulation and cause depressive disorders. Studies founding a higher incidence of depression among MDMA users support the previous theory. [40], [41] Nonetheless, this association cannot be only attributed to MDMA consumption since MDMA users may consume others drugs.

Diacetylmorphine, commonly known as heroin is a highly addictive substance. It is synthesized from morphine by the process of deacetylation. Morphine is an active alkaloid ingredient found in Opium, which is obtained from poppy seeds. [42] The human organism produces endogenous opioids and uses them as neurotransmitters that modulate the response to pain. [43] Heroin can alter our brain by binding to the same receptors as the endogenous opioids peptides. [44] The opioid system contains three types of receptors, mu, delta, and kappa. [45] Heroin mainly acts on Mu receptor (MOR), which is the most exhibited opioid receptor in certain brain areas as the amygdala, thalamus, mesencephalon, and some brain stem nuclei. [46] Metabolized heroin, binds to MOR and activate G-proteins release which induce analgesia decreasing the secretion of nociceptive neurotransmitters. Also due to this
binding, GABA inhibitory neurons allows an increase of dopamine release in the reward system which produce the euphoric feeling and pleasure effect, due to this alteration in the limbic system, heroin reinforce drug taking behaviour leading to addiction. [47] Chronic use of heroin inhibits the cAMP production, in response to this inhibition; other cAMP production mechanisms are activated. With heroin withdrawal, the cAMP over production results in neural hyperactivity and withdrawal symptoms appear. [48] Besides a huge list of physical side effects of heroin, including death due to overdose, it is believed that heroin also contributes to mental health devastation. [49] Clinical studies have found certain evidences that associate chronic heroin consumption to the destruction of the brain’s White and Grey matter, which affect to people decision-making, behaviour control, and stressful situations response. [50] Prior literature shows co-relation between this structural brain change that could be caused by a regular use of heroin and other psychoactive drugs as cannabis, with affective and psychotic disorders. [51] For example, a recent study has provide evidence that there are micro structural abnormalities in the grey matter in frontal, temporal, and anterior cingulated regions of patient with schizophrenia. [52]

Previous studies show a establish relation between the early onset (before 15 years old) of psychoactive drugs consumption and development of addiction and other psychiatric disorders. Most of these studies have focused on marihuana consumers. This could be because there are not enough reported cases of others psychoactive drugs consumption apart of cannabis before the age of 15. A wide number of authors found that those who starting to use marijuana before or during the adolescence are more likely to develop addiction that those that their first use was during adult life. [53] There are different theories that try to explain this association, some point to the developmental processes occurring during adolescence, others point to the fact that an early onset users have more years ahead to develop addiction. Previous studies have shown that frequent and early onset of cannabis consumption is associated with emergence and severity of psychosis. [54]

**Neurotransmitters:**

There is evidence that psychoactive drugs consumption affect on one way or another to neurotransmitters in the CNS. [55] Some substances as cocaine alter neurotransmission by interacting with molecular components of the sending and receiving neuronal process while others as heroin mimic neurotransmitters. The effect of psychoactive drugs on the brain added to the brain capacity for adaptation, could lead to changes in perception, mood, consciousness, cognition and behaviour. [56] Additionally, the development of neuroimaging studies provides information to defend that many psychiatric disorders are a result of neurotransmitter system imbalance. [57]
Previous research showed that all psychoactive drugs directly or indirectly raise dopamine levels in the mesolimbic dopamine system, the so called “reward system”. [58] Although the theory defending that reward and addiction share a common neurobiological base underwent a dramatic revision, dopamine deluge in the brain’s reward system stills seems to play an important role in newer addiction interpretations. [59], [60] On the other hand, clinical neuroimaging studies using positron emission tomography (PET), found dopaminergic abnormalities, among different psychiatric disorders including; SUD, depression, schizophrenia, obsessive–compulsive disorder, autism, and attention deficit hyperactive disorder (ADHD). [61] For example, a research has provided evidence for the deregulation of dopaminergic activity triggering psychotic symptoms. [62] Other research found an association between dopamine down regulation and anhedonia, a main symptom of MDD (Major depressive disorder). [63]

The majority of psychoactive drugs consumption also alters serotonin levels in the brain. Substances such as stimulants, opioids, cannabinoids and especially ecstasy (MDMA) rise serotonin levels, which cause a posterior depletion of this neurotransmitter. [64] It is believed that serotonin system are related with mood disorders, MDD, schizophrenia, addiction, anxiety disorders, and Attention Deficit Hyperactivity Disorder (ADHD). Although the association mechanism between serotonin and some of these psychiatric disorders remains unclear and the literature defending this theory is insufficient, there are strong evidences that support the involvement of serotonin system in MDD and other mood disorders. [65]

Norepinephrine is altered by stimulants such as cocaine and amphetamines. [6] Previous studies have shown the implication of norepinephrine in depressive disorders. [66] A large body of evidence supports that both nor-epinephrine and serotonin, are neurotransmitter of major importance in the pathophysiology and treatment of depressive disorders. [67]

Δ9-tetrahydrocannabinol (Δ9-THC) the psychoactive agent of cannabis, due to his structural similarities with the Andamide, can bind to cannabinoids receptor affecting normal brain communication. [68] Several theories have been proposed to cannabis as a potent risk factor for schizophrenia and other psychotic disorders, some focusing on THC affecting neurodevelopment, others newer on interactions of THC with endocannabinoid-mediated synaptic plasticity. Whereas the neurobiological mechanism that induce psychosis is not fully understood. [69] [70] Marijuana consumption is also related to an increased risk of depressive disorders, however previous studies could not establish causality. [71]
Opioids as heroin, alter our brain by binding to the same receptors as the endogenous opioids peptides. The opioid system contains three types of receptors, mu, delta, and kappa. Metabolized heroin, binds to mu opioids receptors (MOR) and activate G-proteins release, which apart of inducing analgesia increase dopamine release. This alteration in the limbic system could explain the high addiction of heroin. [47] Rodent’s studies found some participation of MOR in the regulation of mood states. [72] This could raise a theory of the possible implication of MOR alteration with MDD.

**Risk Factors:**

Drug abuse it is seen by society as a personal decision in which drug consumers or addicts are fully responsible for it, however, there are factors that can condition this decision.

In one experiment Scientitics put a rat in a cage, alone, with one bottle filled with water and other is with heroin dissolved in the water. They found out that the rat became obsessed with the water-containing drug, and keep drinking it more and more. However, later in the 1970s, Bruce Alexander, a psychology professor, realized that these experiments possibly had errors. When you put the rat alone in a cage, it has nothing to do but take the drug. So Professor Alexander built Rat Park in a cage with food, tunnels and put plenty of rats. Again, the rats had both options, to drink drugged water or normal water. Although rats tried both water bottles, this time in a better environment they did not keep drinking the drugged water as in the previous experiment. [73] This experiment shows the relevance of the environmental factors on drug consumption.

The World Health Organization summarised reviews of research on individual and environmental risk and protective factors for drug use. This is presented in Table 2. On the other hand, a significant body of literature identified groups at higher risk of mental disorders due to shared vulnerabilities. Many of these vulnerabilities, such as familiar instability, poverty, traumatic experience or genetic vulnerability are also associated with drug consumption. For example, a previous research shows evidence that factors as familiar instability or traumatic events increase the risk of suffering mental health problems. [76]

<table>
<thead>
<tr>
<th>Table 2: Risk and protective factors for drug use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
</tr>
<tr>
<td>Genetic disposition</td>
</tr>
<tr>
<td>Victim of child abuse</td>
</tr>
</tbody>
</table>

21
<table>
<thead>
<tr>
<th>Personality disorder</th>
<th>Risk perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiar instability</td>
<td>Optimism</td>
</tr>
<tr>
<td>Poor performance at school</td>
<td>Health-related behaviour</td>
</tr>
<tr>
<td>Social deprivation</td>
<td>Ability to resist peer pressure</td>
</tr>
<tr>
<td>Past trauma</td>
<td>General health behaviour</td>
</tr>
<tr>
<td>Depression and suicidal behaviour</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Drug availability</th>
<th>Economic situation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poverty</td>
<td>Situational control</td>
</tr>
<tr>
<td></td>
<td>Social change</td>
<td>Social support</td>
</tr>
<tr>
<td></td>
<td>Peer culture</td>
<td>Social integration</td>
</tr>
<tr>
<td></td>
<td>Occupation</td>
<td>Positive life events</td>
</tr>
<tr>
<td></td>
<td>Cultural norms, attitudes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drug policies</td>
<td></td>
</tr>
</tbody>
</table>

Source: WHO Alcohol and Public Policy Group, 2004, p. 23 51

Previous literature suggests that genetic is responsible for around 50% of an individual’s vulnerability to addiction. Animal studies have found genes involved in mechanisms of drug response, neuroadaptation, reward system and molecular networks, which are directly related, with addiction and other mental disorders. [77] Furthermore, addiction studies on families, adopted people and twins, showed the possible heritability of addictions. However, although these studies found that the addiction risk was proportionally higher in those individuals that shared certain genetic similarities with an addicted relative, was observed that phenotypically concordant relatives had higher addiction risk than those who only had genetic similitude. [78] This study is a demonstration of the importance of the environment in the gene expression. However, it has many problems in providing evidence of addiction heritability due to genetic vulnerability of an individual comes from complex interactions among multiple genes and between genes and environmental factors. [79]

Genetic vulnerability, a part of being risk factor for substance use disorder is also associated with other psychiatric disorders. A large number of families, twin and adoption studies show certain evidence of genetic vulnerabilities as risk factors for schizophrenia and depression. For example, some authors found that if a person diagnosed with schizophrenia had a twin brother, this will have a much higher probability of suffering schizophrenia. [80] However, again due to genetic complexity and all the factors involved in gene expression it is hard to affirm the direct causality of genetic on mental health diseases.
It is believed that one of these factors involved in gene expression can be drug consumption, which changes the organism chemical environment triggering DNA methylation. Recent literature shows evidence of DNA methylation involvement in the regulation of gene expression. [81] In fact previous studies suggest that cannabis is a trigger for schizophrenia in genetic vulnerable people.[82] But this association seems to be more complicated than cannabis interacting with a single gene. Other study proposes a common genetic aetiology shared between schizophrenia and cannabis consumption, suggesting genetic predisposition for schizophrenia, as a risk factor for cannabis consumption. [83] This makes difficult to confirm cannabis as causative factor for schizophrenia, proposing a causal relationship in the opposite way.

Furthermore, NIDA suggest that many other psychiatry disorders are a risk factor for addiction, these hypothesis highlight the difficulty to establish a unidirectional casualty between drug consumption and psychiatric disorders. [84]

Previous researches provide information to suspect a co-relation between psychoactive drugs use and psychiatric disorders. Furthermore there is a big body of literature of different psychoactive substances, how they affect to the brain, consequences of these alterations on mental health and many factors that interfere with drug consumption and development of psychiatric disorders. However, due to the brain complexity and all the factors that interact together in both directions affecting to this co-relation makes difficult to establish an unidirectional casualty between drugs consumption and psychiatric disorders. This does not deny the fact that drugs are a risk factor for mental health. Although there are many studies about how psychoactive drugs affect the brain and the implication of these brain changes on mental health, the research on the associated factors for drugs consumption and mental disorders, remain limited.
RESEARCH METHODOLOGY AND METHODS

For the purpose of this research, the author has decided to use one of the classic research tools, a questionnaire. In order to address the questions observed in previous researches and to find possible factors involved with drug consumption that could affect mental health. The questionnaire contains 29 questions about personal conditions, social conditions, past traumas, genetic predisposition for mental illness or drug abuse, individual relationship with drugs and possible mental health consequences.

The questionnaire, in a digital form, was sent to 80 people, who answered it anonymously. From these, author selected 50 participants, which gather the necessary characteristics to participate in this research. Inclusion criteria of this research are:

1. People who consume or have consumed frequently or several times, at least one of the psychoactive drugs of interest for this research (Cannabis, Cocaine, Amphetamines, Ecstasy and Heroin).
2. People who consume or have consumed at least few times, two or more of the psychoactive drugs of interest for this research (Cannabis, Cocaine, Amphetamines, Ecstasy and Heroin).

The digital questionnaire allows us to skip the face-to-face interview with participants, providing them with enough time to think about their answer, respecting their privacy and making them feel confident to respond the questions in a more honest way, which provide us with more accurate results. The author tried to make the questions as clear as possible and gives a wide range of answers in order to avoid interpretation issues. As well, different types of questions were formulated in a dynamic form to avoid fatigue of participants while completing the questionnaire. On the other hand, one drawback of digital questionnaire is that it is hard to convey feeling and emotions of participants, which would help with interpretation of participant answers.
RESULTS

Questionnaire results:

- The 50 selected participants according inclusion criteria of this research (explained in the previous section) consume or have consumed different drugs at different frequencies according questionnaire. (Tab 1), (Fig 1)

<table>
<thead>
<tr>
<th></th>
<th>Regularly</th>
<th>Several times</th>
<th>On parties</th>
<th>Few times</th>
<th>Once</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannabis</td>
<td>19</td>
<td>19</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Ecstasy</td>
<td>5</td>
<td>7</td>
<td>17</td>
<td>11</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Cocaine</td>
<td>4</td>
<td>7</td>
<td>11</td>
<td>10</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>4</td>
<td>5</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Heroine</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>29</td>
</tr>
</tbody>
</table>

Tab 1. Drugs type and frequency of drug consumption.

Fig 1. Drugs type and frequency of drug consumption.
• From the 50 questionnaire participants, 62% are males and 38% females. (Fig 2)

Fig 2. Gender of participants.

• 50% of the questionnaire participants are single and 44% in a relationship, 6% of participants are married; any participant reported to be widowed or divorced. (Fig 3)

Fig 3. Marital status of participants.
• From the questionnaire participant 28% lives alone, 18% is living with friends or flat mates, 22% with his own family, 10% is living with their parents, 6% just with their mother and 16% lives with couple. (Fig 4)

![Fig 4. Participants living with](image)

• 18% of the people who answered the questionnaire were raised in a village, 32% in a town, 44% in a city centre and 18% in city outskirts. Few participants were raised in more than one place of the previous one. (Fig 5)

![Fig 5. Participants raised in](image)
• The vast majority of participants are either university students or finished already their university studies while around 20% finished their studies after high school. This question was not well formed by the questionnaire author, so the results are abstract and difficult to interpret.

• Related to professional status, 50% of the participants are studying, 28% are studying and working. Any of the questionnaire participants reported to be jobless. (Fig 6)

![Fig 6. Working status of participants.](image)

• Economic level of participants, in a scale from 0 to 5 (being 0 poverty and 5 very high economic status) was 3 for 33 participants, 4 for 12 participants, 5 for 2 participants, 1 for 1 participant and 2 for one participant. One participant did not answer this question. It is appropriate to clarify that this interview probably was shared mainly in a social circle of middle and middle-high economic level people. (Fig 7)

![Fig 7. Economic status of participants.](image)
• In a scale from 0 to 5 (being 0, no relationship at all; and 5, very good relationship). Father’s relationship was 0 for 4 participants, 1 for 2 participants, 3 for 8 participants, 4 for 19 participants and 5 for 6 participants. According to mother relationship, 2 participants rated it as 0, 4 participants rated it as 2, 12 participants rated as 3, 15 participants rated as 4 and 17 participants rated as 5. (Fig 8)

![Graph showing father's and mother's relationships](image)

*Fig 8. Participant’s relationship with parents.*

• 34% of the questionnaire participants have divorced parents. (Fig 9)

![Pie chart showing divorced vs. non-divorced parents](image)

*Fig 9. Divorced vs. Non Divorced participant’s parent.*
• 46% of participants reported feeling support from every family member, 42% only from few members of their family, 6% just from their mother, 2% just from their father and 4% reported not feeling support from any of their family members. (Fig 10)

Fig 10. Family support according participants.

• The vast majority of questionnaire participants reported to be happy with their social life. (Fig 11)

Fig 11. Participant’s conformity with social life.
• Half of participants reported being bullied at any point of their life, some of them are not sure about it and reported that maybe they were bullied; while 30% confirmed that they have not ever being bullied. (Fig 12)

![Fig 12. Bullying among participants.](image)

• More that one third of the participants reported that they suffered a traumatic experience during their life, a bit less that one third felt that they could have experienced a traumatic event and the same amount of people indicated that they did not experienced a traumatic event. (Fig 13)

![Fig 13. Traumatic experience among participants.](image)
• According to the questionnaire, 32% of participants have close family members with any kind of mental disorder, 8% have relatives with any kind of mental illness, 24% reported that possibly there are cases of mental illness in their families; while 36% do not know about any case of mental illness in their families. (Fig 14)

**Fig 14. Cases of participant’s family member with mental disorder.**

• 46% of the participants have a close family member with alcohol or drugs abuse problem, 16% have a relative with alcohol or drugs abuse problems, 2% thinks that maybe someone of their family has problems with alcohol or drugs but they are not sure, and 36% do not have any case of alcohol or drugs abuse in their families. (Fig 15)

**Fig 15. Case of Alcohol/Drug abuse among participant’s family**
• 96% of participants reported that at least one of their social circle do drugs. Related with the accessibility to drugs, in a scale from 0 to 5; most of the participants rated their accessibility to drugs with 4 or 5 points over 5. (Fig 15)

![Fig 15. Drug accessibility (in a scale form 0 to 5) according participants.](image)

• Majority of participants started to consume psychoactive substances between 18 and 23 years old, around one third started to do drugs between 16 and 18 years old and the rest of participants before the age of 15. (Fig 16)

![Fig 16. Drug consumption onset among participants.](image)
• The participants of the questionnaire, marked from a list of possible psychoactive drugs acute and chronic effects, which of them they experienced due to psychoactive drug consumption. 78% of participants reported feeling euphoria and happiness right after drug consumption, and half of them, according the questionnaire experienced feeling of relief. In the other hand a considerable number of participants reported effects such as changes in perception, mood changes and anxiety among others. (Tab 2) (Fig 17)

**Tab 2. Effects experienced by participants due to drug consumption.**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug addiction</td>
<td>7</td>
</tr>
<tr>
<td>Hallucination</td>
<td>16</td>
</tr>
<tr>
<td>Forgetfulness</td>
<td>12</td>
</tr>
<tr>
<td>Sleeping difficulties</td>
<td>17</td>
</tr>
<tr>
<td>Personality disorder</td>
<td>4</td>
</tr>
<tr>
<td>Raised confidence</td>
<td>24</td>
</tr>
<tr>
<td>Pessimist</td>
<td>9</td>
</tr>
<tr>
<td>Mood changes</td>
<td>29</td>
</tr>
<tr>
<td>Changes in perception</td>
<td>25</td>
</tr>
<tr>
<td>Confusion</td>
<td>16</td>
</tr>
<tr>
<td>Feeling of relief</td>
<td>25</td>
</tr>
<tr>
<td>Aggressiveness</td>
<td>9</td>
</tr>
<tr>
<td>Euphoria and happiness</td>
<td>39</td>
</tr>
<tr>
<td>Depression</td>
<td>17</td>
</tr>
<tr>
<td>Anxiety</td>
<td>23</td>
</tr>
</tbody>
</table>

![Fig 17. Effects experienced by participants due to drug consumption.](image)
From the 50 participants of the questionnaire, 12 reported to have suffered a mental illness in any moment of their life. (Tab 3) (Fig 18) From these 12 participants who reported being diagnosed with any kind of mental illness, 5 recognized to have done drugs before being diagnosed. 7 of the participants did not do any drug before being diagnosed, 2 of them, reported that they started to consume drugs as a consequence of their mental illness. (Fig 19)

**Tab 3. Mental illnesses reported by participants**

<table>
<thead>
<tr>
<th>Mental illness</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>2</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>2</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>1</td>
</tr>
<tr>
<td>Major depression</td>
<td>4</td>
</tr>
<tr>
<td>Depression and EDNOS</td>
<td>2</td>
</tr>
<tr>
<td>Schizophreniform disorder</td>
<td>1</td>
</tr>
</tbody>
</table>

**Fig 18. Mental illnesses reported by participants**

**Fig 19. Drug consumption by participants, before or after mental illness.**
• From the 50 participants of the questionnaire, 42% considers that drug consumption have affected to their mental health, 26% thinks that it could have affected to their mental health, while 30% does not believe that psychoactive drug consumption could have induced any kind of mental illness on them, one participant (2%) reports that drugs consumption did not affect to his mental health due to a cautious dosing. (Fig 20)

![Pie chart showing participants' opinions.](image)

*Fig 20. Participants opinion about psychoactive drugs consumption affecting their mental health.*
Associations from the questionnaire results:

- The 12 participants who developed mental illness, consume or have consumed different psychoactive drugs at least few times. (Tab 4) (Fig 4)

**Tab 4. Frequency of drugs consumption by participants who have suffered mental illness**

<table>
<thead>
<tr>
<th>Mental illness</th>
<th>Cannabis use</th>
<th>Ecstasy use</th>
<th>Cocaine use</th>
<th>Amphetamines use</th>
<th>Heroin use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>Several times</td>
<td>Several times</td>
<td>Regularly</td>
<td>Several times</td>
<td>Never</td>
</tr>
<tr>
<td>ADHD</td>
<td>Several times</td>
<td>Few times</td>
<td>Never</td>
<td>Regularly</td>
<td>Never</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>Few times</td>
<td>On parties</td>
<td>Once</td>
<td>Few times</td>
<td>Never</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>Regularly</td>
<td>Several times</td>
<td>Few times</td>
<td>Few times</td>
<td>Never</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>Few times</td>
<td>Several times</td>
<td>Regularly</td>
<td>On parties</td>
<td>Once</td>
</tr>
<tr>
<td>Major depression</td>
<td>Regularly</td>
<td>Regularly</td>
<td>Regularly</td>
<td>Regularly</td>
<td>Several times</td>
</tr>
<tr>
<td>Major depression</td>
<td>Several times</td>
<td>Few times</td>
<td>Never</td>
<td>Never</td>
<td>Never</td>
</tr>
<tr>
<td>Major depression</td>
<td>Several times</td>
<td>Few times</td>
<td>Few times</td>
<td>Few times</td>
<td>Never</td>
</tr>
<tr>
<td>Major depression</td>
<td>Several times</td>
<td>Several times</td>
<td>On parties</td>
<td>On parties</td>
<td>Never</td>
</tr>
<tr>
<td>Depression and EDNOS</td>
<td>Several times</td>
<td>Never</td>
<td>Once</td>
<td>Never</td>
<td>Never</td>
</tr>
<tr>
<td>Depression and EDNOS</td>
<td>Few times</td>
<td>On parties</td>
<td>Several times</td>
<td>On parties</td>
<td>Never</td>
</tr>
<tr>
<td>Schizophreniform disorder</td>
<td>Regularly</td>
<td>On parties</td>
<td>Several times</td>
<td>Several times</td>
<td>Once</td>
</tr>
</tbody>
</table>

**Fig 21. Psychoactive drugs consumed by participants who have suffered mental illness.**
• From the 12 participants who had suffered any kind of mental illness, 6 started to consume psychoactive drugs before the age of 18. (Fig 22)

Fig 22. Participants who consumed drugs before the age of 18 and type of mental illness.

• From the 12 participants with mental illnesses, 7 (58.3%) are women and 5 men. (Fig 23)

Fig 23. Gender of participants who had suffered any kind of mental disorders.

• From the 12 participants, 7 (58.3%) were raised in city centre. (Fig 24)

Fig 24. Place where participants who had mental illnesses were raised.
• Half of the participants who suffered from mental illnesses, reported to have a bad relationship (Rating with less than 3 points in a scale from 0 to 5) with their father. (Fig 25) In the case of mother’s relationship, 4 out of 12 participants who developed mental illnesses rated it with a score under 3. (Fig 26) Half of the participants have divorced parents. (Fig 27)

**Fig 25. Bad father’s relationship of participants who had mental illnesses.**

**Fig 26. Bad mother’s relationship of participants who had mental illnesses.**

**Fig 27. Participants with mental illnesses and divorced parents.**
• Only 1 participant out of 12 who have been diagnosed with any kind of mental illness, reported to feel support from every family member of his family. (Fig 28)

![Fig 28. Support from family of participants with mental illnesses.](image)

![Fig 29. Participants with mental illnesses who had a traumatic experience.](image)

• 7 of the 12 participants with mental illness reported a traumatic experience, 4 of them said that maybe they suffered a traumatic event while only 1 believes that she didn’t experience any traumatic situation.
• Related to genetic predisposition to develop mental illnesses; 7 out of 12 participants who have mental illnesses, have close family members with a mental disorder. (Fig 30) 11 out of 12 (91.6%) reported having a close family member with alcohol or drugs abuse problems. (Fig 31)

![Fig 30. Participants with mental illnesses and family member with mental disorder.](image1)

![Fig 31. Participants with mental illnesses and family member with drugs or alcohol abuse problems](image2)

• From the 12 participants who developed mental disorders, 7 consume or have consumed at least 2 psychoactive substances several times or regularly. While from the rest of participants who were not diagnosed with any kind of mental illness, only 9 consume or have consumed 2 drugs or more, frequently or several times.
• Statistics of associations of several risk factors for developing mental illness and mental illness of participants who consume or have consumed drugs, shows a positive correlation (odds ratio > 1) in all of them except for the risk factor “consumption before 18” which odds ratio shows a negative correlation. From the 11 associations with a positive correlation, 8 of them are statistically significant (P<0.05). (Tab 4)

<table>
<thead>
<tr>
<th>Association</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>Z statistics</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug consumption before 18 – Mental illness</td>
<td>0.9048</td>
<td>0.2489 - 3.2888</td>
<td>0.152</td>
<td>P = 0.8792</td>
</tr>
<tr>
<td>Women-Mental illness</td>
<td>4.2</td>
<td>1.0861-16.2422</td>
<td>2.080</td>
<td>P = 0.0376</td>
</tr>
<tr>
<td>City centre- Mental illness</td>
<td>3.2667</td>
<td>0.8622-12.3772</td>
<td>1.742</td>
<td>P = 0.0815</td>
</tr>
<tr>
<td>Bad Father’s relationship- Mental illness</td>
<td>5.6667</td>
<td>1.3614-23.5873</td>
<td>2.384</td>
<td>P = 0.0171</td>
</tr>
<tr>
<td>Bad Mother’s relationship- Mental illness</td>
<td>19.5</td>
<td>1.9170-198.3531</td>
<td>2.510</td>
<td>P = 0.0121</td>
</tr>
<tr>
<td>Divorced parents-Mental illness</td>
<td>4</td>
<td>1.0150-15.7637</td>
<td>1.981</td>
<td>P = 0.049</td>
</tr>
<tr>
<td>No support from family- mental illness</td>
<td>22.8462</td>
<td>2.6574-196.4105</td>
<td>2.850</td>
<td>P = 0.0044</td>
</tr>
<tr>
<td>Traumatic experience- Mental illness</td>
<td>3.6909</td>
<td>0.9653-14.1127</td>
<td>1.908</td>
<td>P = 0.05</td>
</tr>
<tr>
<td>Familiar with Alcohol/Drug abuse problems-Mental illness</td>
<td>29</td>
<td>3.3391-251.8672</td>
<td>3.053</td>
<td>P = 0.0023</td>
</tr>
<tr>
<td>Familiar with mental disorder- Mental illness</td>
<td>4.2</td>
<td>1.0861-16.2422</td>
<td>2.08</td>
<td>P = 0.0376</td>
</tr>
<tr>
<td>Amount and Frequency of drug consumption- Mental illness</td>
<td>4.8222</td>
<td>1.2294-18.9147</td>
<td>2.256</td>
<td>P = 0.0241</td>
</tr>
</tbody>
</table>

Tab 4. Statistics of research’s associations
DISCUSSION OF THE RESULTS

The objectives of this research were to find socio-demographic factors implicated in drug consumption and mental disorders, to evaluate the possible causality of psychoactive drugs consumption in mental disorders and to compare consequences on mental health between different groups of drugs users.

The questionnaire participants who gather the inclusion criteria (explained in the methodology section) were the majority male gender. This could support previous researches theory that men tends to abuse drugs more than women. However, in this research we did not have a control group of participants who have not consumed drugs to prove this statistically.

In the other hand, we found that women who consume drugs, are at higher risk to suffer mental illnesses than man that use psychoactive drugs. This could be due to a theory proposed in a previous research that women show more their emotions than men, who usually hide it. Apart of being women, others groups of people who consume drugs showed more vulnerability for mental illness than others, like participants with divorced parents over participants without divorced parents or participants who were raised in cities over participants who were raised in villages or towns.

Other socio-demographic factors like familiar instability, past traumas, genetic predisposition or easy access to drugs seems to be risk factors for the consumption of drugs, as WHO (Alcohol and Public Policy Group) indicated in 2004. However in this research, all the participants have consume drugs. To demonstrate this theory, we should have shared the questionnaire among a control group of people who have not taken any psychoactive drugs.

From all the risk factors included in the questionnaire, socio-demographic factors such as being woman, being raised in a city, familiar instability or genetic predisposition were confirmed as risk factors for mental illness in people who consume or have consumed frequently or several times, at least one of the psychoactive drugs of interest for this research, or people who consume or have consumed at least few times, two or more of the psychoactive drugs of interest for this research (Cannabis, Cocaine, Amphetamines, Ecstasy and Heroin). However, according the questionnaire results, we could not find evidence to associate drug consumption before 18 years old with mental illness development; which seems to be associated according previous studies.
Questionnaire results showed a possible association between drug consumption and mental illness; 24% of people who consume or have consume drugs also had mental illness diagnostic, and 42% of participants believe that, even without being diagnosed with any kind of mental illness, drug consumption could have affected to their mental health. Although, without a control group of people who have not consumed psychoactive drugs, we can not compare results and prove statistically implication of drug consumption on mental health; from the participant of the questionnaire, was observed that those who consumed 2 or more substances regularly or several times, are at higher risk of developing mental illnesses than the participants who consumed drugs in less frequency and amount.

**Limitations of the Research:** 50 participants for a study of this dimension might be insufficient. Other limitation of this research was the absence of a control group of people whose participants have not consumed drugs to compare results with participants who consumed drugs and get conclusions about the implication of drugs use and mental illnesses.
CONCLUSION

The aim of this research was to find possible risk factors that interact with psychoactive drugs consumption for the development of mental disorders. Previous literature suggests that psychoactive drug consumption affects to brain in different forms and could be a causative factor of mental disorders, however the literature about risk factors that interact with drugs consumption affecting to mental health, remain insufficient. In this research, we tried to find these socio-demographic factors and prove it association with mental illnesses. Although this research present some limitations to confirm evidence, according the results, we got the following conclusions:

1. Socio-demographic factors as familiar instability, past traumas, genetic predisposition and easy access to drugs could be risk factors for people who consume or have consumed psychoactive drugs.
2. People who consume or have consumed 2 or more psychoactive drugs regularly or several times, are at higher risk of developing mental illnesses than the population who consume drugs in less frequency and amount.
3. Drug consumption has worse consequence on mental health in: Women than men, people with divorcer parent over people without divorced parents and people who was raised in cities over people who was raised in towns or villages.
PRACTICAL RECOMMENDATION

This research shows the possible implication of drugs in mental health especially among people with vulnerabilities for mental illnesses; this could raise awareness among population about the consequences of a bad use of psychoactive drugs.
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