



# Prevalence and Sociocultural Patterns of Ecstasy Consumption

Rafael Nogueira Furtado<sup>1\*</sup>

<sup>1</sup>Pontificia Universidade Católica de São Paulo, PUC-SP, R. Monte Alegre, 984, São Paulo - SP, Brazil.

## Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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## ABSTRACT

This paper consists in a bibliographic analysis on the prevalence and sociocultural patterns of ecstasy consumption worldwide and, specifically, in Brazil. The abuse rates of ecstasy are increasing globally, so this article tries to determinate the users' profiles, which have been established in recent years. Analysis' content is presented by the following topics: 1) the history of ecstasy consumption; 2) its pharmacological and clinical features; 3) the sociocultural pattern of ecstasy use and its prevalence worldwide and in Brazil. Results show that ecstasy is consumed especially in party settings and nightclubs, by young single men, belonging to middle and high-classes. It is associated with a culture that values pleasure, freedom, youth, perceived as not dangerous. The substance, however, is not innocuous. It has dependence potential and the associated long-term physical and cognitive impairments are not fully known.

*Keywords: Ecstasy; synthetic drugs; drug addiction; public health.*

## 1. INTRODUCTION

According to the United Nations Office on Drugs and Crimes (UNODC), in 2015 alone, the

prevalence of ecstasy use was estimated in 0.45% of the global population, with ages between 15 and 64 years [1]. An amount corresponding approximately to 21,650

\*Corresponding author: E-mail: [mfurtado@yahoo.com.br](mailto:mfurtado@yahoo.com.br);

individuals worldwide. Ecstasy belongs to the Amphetamine-Type Stimulants (ATS) group, which includes similar substances, such as amphetamine, methamphetamine, methylphenidate, phenethyl, metcatinone, among others.

ATS are sympathomimetic compounds of indirect action. They act on the sympathetic nervous system, causing the release of noradrenaline and inhibiting its reception. Along with this, they act on the central nervous system, on the dopaminergic and serotonergic circuits, producing behavioral and perceptual alterations [2].

The synthesis of ecstasy (3,4-methylenedioxymethamphetamine, MDMA) resulted in a substance whose use leads to increased self-esteem, intimacy and closeness to other individuals, euphoria, elevation of physical and emotional energy [3]. Other effects may accompany these alterations, as increased body temperature, dry mouth, insomnia, anxiety, depression, memory disorders, sexual dysfunction, bruxism, among other complications.

The risks of using ecstasy have been underestimated by the young and adult population compared to other drugs such as alcohol, tobacco, marijuana, and cocaine. However, the substance is not harmless and may cause acute or long-term health impairment. Thus, this article seeks to conduct a bibliographic analysis on the prevalence and sociocultural patterns of its consumption worldwide and, specifically, in Brazil, systematizing available informations.

## 2. METHODOLOGY

This research consists in a bibliographic minireview, which collected studies from the scientific databases PubMed, BIREME, SciELO and LILACS. The main descriptors were the terms: ecstasy, MDMA, ATS, designer drugs, synthetic drugs, Brazil, club drugs, amphetamines. Inclusion criteria were articles on the prevalence and consumption patterns of ecstasy worldwide and in Brazil up to year 2014.

## 3. RESULTS

### 3.1 History of Ecstasy Consumption

The creation of ecstasy occurred in 1912, in Darnstadt, Germany, by the Merck laboratory [4].

The goal of the laboratory was to develop an appetite suppressant. However, the substance did not get to be commercialized, falling into oblivion, by scientific community.

During the 1950s, researchers once again became interested in MDMA, this time as a coadjuvant in psychotherapies [5]. Some therapists administered the drug as a mean to facilitate communication and introspection required in treatment. Ecstasy would be seen as safer for patients when compared to LSD, as it did not trigger drastic perceptual changes or flashbacks, accentuating empathy and the ability to insight. Still in the 1950s, the US military experimented with the drug for military purposes [4,5].

Its recreational and abusive use became common in the 1980s. A study conducted in 1986 at a southern university in the United States found that 8% of students consumed the substance [4]. In another study, conducted at Stanford University, also in 1986, 39% of students reported having used the drug at least once in their lifetime [5].

As a result of the growing abuse of the substance, in 1985 the Drug Enforcement Administration (DEA) had already classified MDMA as belonging to Schedule I of Controlled Substances, which contains compounds "with a high potential for abuse, without therapeutic benefit and unsafe use, even with medical supervision" [6]. In Brazil, the Health Surveillance Ordinance of the Ministry of Health N° 344, dated May 1998, would outlaw the use of ecstasy [6].

The drug has also been declared illegal in European countries. Its introduction to the continent was given for "spiritual" purposes during the 1980s by followers of guru Bhagwan Rajneesh [5]. One of the key themes of the diffusion and popularization of ecstasy as a recreational drug would be the rave parties: events initially organized by English producers, in local sheds and abandoned warehouses in the city of London. These events were characterized by the presence of electronic music, their long duration and the almost unanimous use of MDMA [4,5].

In 1990, such festivities were subject of police action in England, being forbidden. People who used to visit them, then moved to nightclubs, bringing ecstasy consumption to dance-clubber

culture. The rave parties, however, did not disappear, growing in popularity and reaching American soil in the 1990s [3, 5].

It is considered likely that ecstasy arrived in Brazil during this period. Coming mainly from Amsterdam, the Netherlands, the first significant quantities of the drug came in the country in 1994. The entry of the substance did not occur through trafficking, but informally, that is, through people coming from Europe bringing the drug to share with a select group of acquaintances [5].

In the year 2000, DENARC (Brazilian State Department of Drug Prevention and Repression Department) police discovered the first ecstasy laboratory in Brazil [7]. The laboratory was located in the eastern region of the city of São Paulo, and was set up in a kitchenette. According to the newspaper *Folha de São Paulo*, there was enough of the substance in place to produce 25,000 tablets [7].

Researches alert to the growth of ecstasy consumption in Brazil [1]. Estimates of this growth are based on increased seizures, discovery of clandestine laboratories, circulation of the subject in the media and on user statements. However, surveys of substance use are still scarce, so it can be underestimated.

### 3.2 Pharmacological Aspects of Ecstasy Consumption

Ecstasy can be consumed orally, through tablets, gelatin capsules, or powder mixed with liquids. There is also possibility of intranasal, pulmonary and intravenous administration. The preparations are not always pure, and may be accompanied by caffeine, LSD, amphetamines, paracetamol, among other substances [3]. According to Parrott, European studies point to a drop in the purity of preparations since the mid-1990s, when the number of precursors used in production increased [8].

When ingested, MDMA is distributed throughout the body, crossing the blood-brain barrier, producing its psychoactive effects. These effects are perceived between 20 and 60 minutes after consumption of doses of 75 to 100 mg, and can last from 2 to 4 hours [3]. In animal models, ecstasy administration provokes a two-phase response, involving short-term (24-hour) and long-term effects (extending for days to up to one year) [9]

The most notable short-term effect is the action of the drug on serotonin (5-HT) and its metabolite 5-HIAA. Ecstasy induces the release of 5-HT as well as inhibits its uptake. In addition, it blocks the action of the enzyme monoamine oxidase A (MAO A), involved in the metabolism of 5-HT [6].

After peak levels of the neurotransmitter, there is a drastic decrease in serotonin in the body. Its decrease, or depletion, can occur between 1 and 3 hours after drug use. In rats, an 80% decrease in serotonin levels is observed in up to 3 hours. The ecstasy effect of reducing activity of tryptophan-hydroxylase (TPH), involved in 5-HT synthesis, contributes to 5-HT exhaustion [6].

The action of ecstasy on the dopaminergic and noradrenergic system is more discreet. The drug stimulates dopamine (DA) release in dopaminergic synapses [6]. It is believed that the action of ecstasy on serotonin facilitates this release. As for noradrenaline, MDMA causes release of the neurotransmitter, especially at the peripheral level, through  $\alpha$ -adrenoreceptors.

This would explain some reactions such as increased heart rate, hypertension and arrhythmias. Psychiatric effects resulting from the use of the drug, such as panic attacks, may be the result of its action in the noradrenergic system [6]. Consumption of ecstasy also elevates blood levels of cortisol, prolactin, adrenocorticotrophic hormone (ACTH), dehydroepiandrosterone, and antidiuretic hormone (ADH) [6].

With regard to the long-term effects of drug use, the long-term reduction in brain levels of serotonin and its metabolites is outstanding, a reduction that in some cases extends for more than one year [5]. TPH activity is also diminished. It is noteworthy that the neurotoxicity of ecstasy to the human brain is still the subject of controversy.

However, some studies point to the presence of severe brain damage in continuous users of the substance. Kish demonstrated the existence of severe depletion of 5-HT in men of 26 years who have made continuous use of MDMA for 9 years [10].

Bienzonski and Meyer have reached similar conclusions, analyzing a large number of evidence corroborating serotonin depletion in animals and humans using the drug recreationally [11]. Even if little is known about the neurotoxicity of MDMA, it is suspected that

oxidative stress is a contributing factor to the phenomenon.

Death caused by ecstasy is not common, however, there are records of its occurrence. This outcome will depend on factors relating to the individual, the dose used and the environmental conditions. Patients with cardiac problems, such as arrhythmias and hypertension, are more vulnerable [3].

Overdose death is caused by certain complications, namely "acute asthma, allergic reactions, fulminant hyperthermia, seizures, disseminated intravascular coagulation, rhabdomyolysis, acute renal failure and hepatotoxicity." [3]. Accidental death may occur also due to risk behaviors after consumption.

### **3.3 Clinical Aspects of Ecstasy Consumption**

Based on the psychological and behavioral effects that it causes, MDMA came to be characterized as an entactogenic substance [5]. The term designates the set of sensations formed by: increased proximity of the individual to others and to himself, facilitated communication, empathy and sense of intimacy, subjective states of well-being and tranquility. However, falling into disuse, this term was no longer applied to describe the drug.

The clinical symptoms presented after the administration of MDMA are diverse. One of the peculiarities for which the substance is known is its ability to produce both stimulating and hallucinogenic effects [9]. Its action on dopaminergic and noradrenergic systems, as well as on serotonin, would explain this particularity.

Low doses of MDMA produce short-term tachycardia, hypertension, decreased appetite, tremor, trismus, bruxism, nausea, insomnia, headache, sweating and a critical increase in body temperature [3]. At high or repeated doses, it produces vomiting, ataxia, nystagmus, increased acuity for color, luminescence of objects, visual hallucination, increased sensitivity to cold, numbness and tingling of the extremities, crying, toxic hepatitis. Attention should be paid to the development of hyponatremia, that is, the decrease of electrolytes in the blood due to excessive water intake [12].

Among the residual effects that characterize this drug hangover are: insomnia, fatigue, dizziness and muscle pain. During this time, the manifestation of what is called midweek blues may occur. The expression corresponds to the presentation, after the use of ecstasy, of depressive episodes, resulting from neurochemical and behavioral changes [9].

It is discussed if MDMA can trigger the onset of long-term psychiatric disorders, such as depression, anxiety and psychotic conditions. Studies using the Beck scale for depression have found a positive relationship between ecstasy use and the onset of the disorder [13]. However, Roiser and Sahakian, having identified the same relationship, found no difference between ecstasy users and users of other drugs in relation to depression [14].

It is also observed an association between the use of MDMA and the onset of anxiety disorder. Thomasius et al. have shown that ecstasy users, when compared to the control group, score higher on anxiety scales. These findings were replicated by other researchers [15].

Among the cases described in the literature relating the use of MDMA with psychotic disorders, it's noteworthy the report about a 23-year-old man who developed the condition known as Cotard syndrome [16]. The syndrome consists of the presentation of delusions and hallucinations, concerning the belief that one is dead or that the body organs are paralyzed/rotten. The patient in this report used ecstasy weekly for 2 years, coming after this period to present hypochondriac delusions and olfactory hallucinations, consistent with the syndrome.

In addition to investigations into psychiatric complications, researchers seek to identify the occurrence of cognitive impairment resulting from the use of MDMA. An American study, conducted by the National Institute on Drug Abuse (NIDA), evaluated habitual and non-users of ecstasy, noting the presence of impairments in verbal and visual memory among those who consumed it repeatedly [9]. Prospective memory also appears to be impaired by consumption. Users tend to perform poorly when compared to the control group in tests involving this type of memory [17].

Sleep disorders have been reported frequently among MDMA users. In a study conducted by Ogeil et al., 65% of the interviewed users were

classified through the Pittsburgh Sleep Quality Index (PSQI) as presenting poor quality sleep [18]. In addition, the precariousness of sleep reported by these subjects could help to explain the negative effects experienced by them resulting from the consumption of the drug.

Although not completely elucidated, dependence on MDMA is a known phenomenon. Degenhardt, Bruno and Topp found that animals self-administer doses of MDMA, suggesting that the substance has a dependence potential. Human users report the development of tolerance and withdrawal symptoms of MDMA, two important aspects in the characterization of chemical dependence [19].

For the treatment of the condition, Fonseca and Lemos recommend interventions of cognitive-behavioral orientation. The Matrix Model is considered an effective therapeutic strategy, which combines behavioral, cognitive, family therapy, psychoeducation, counseling, 12-steps therapy and drug testing [2].

### **3.4 Prevalence and Consumption Patterns of Ecstasy**

#### **3.4.1 Ecstasy around the world**

According to UNODC, the prevalence of ecstasy use worldwide, in 2015, was 0.45% in the population aged between 15-64 years. In absolute numbers, this corresponds to the amount of 21,650 individuals. That year, more specifically, North America presented a prevalence of ecstasy use of 0.89% (2,860 individuals), South America 0.16% (440 individuals), the European continent 0.69% (3,750 individuals), Oceania 2.42% (610 individuals), Asia 0.43% (12,490 individuals), and Africa 0.22% (1,430 individuals) [1].

Roughly speaking, it is possible to trace the predominant profile of the habitual users of this drug and the associated behaviors. The ecstasy user is, on average, a young individual (up to 25 years old), male, heterosexual, single, has a complete or incomplete upper level scholarship, he is inserted in the labor market and belongs to the middle or high socioeconomic class [9, 6].

The drug is not usually perceived as bearing the stigma attached to other substances. It is embedded in a culture of consumption, characterized by appreciation of hedonism, freedom and subversion of norms [20]. Some

users claim that ecstasy is a fashion drug, an elite drug. Others claim that it works as a social lubricant, bringing people closer [21]. Even the subject who markets ecstasy is not identified with the marginalized figure of the drug dealer. He commonly mixes with middle and high classes young people, distributing the substance in a network of friends [9].

Its consumption occurs more commonly on weekends, in places such as nightclubs [3]. Studies have found a strong association between the use of MDMA and the participation of people in electronic music events/parties, especially those called Goa parties [21]. There are between episodes of use a spacing of two to three weeks. However, a more intense frequency of consumption, including daily, can be found, setting up abusive patterns of drug ingestion [3].

If, on the one hand, research indicates the search for pleasure and the increase of sociability as the main reasons for the consumption of MDMA, other works indicate that the drug is also used as a resource for self-medication and a mean of coping with adversity. According to a study conducted by Moonzwe, Schensul and Kostick, interviewed users, who were at different risk levels, used the drug as a way of dealing with negative life events [22].

These events consisted of physical and emotional abuse, such as rape, assault, intimidation; problematic relationships with family members, partners or friends; loss of loved peers; stressors such as financial difficulties, problems in work and health; among other complications. According to the authors, MDMA was used, aiming at coping with these situations. However, Hittner & Schachne states this phenomenon occurs only when no satisfactory psychological treatment had been undertaken [23].

Research, however, points to an association between ecstasy use and risk behavior. The impairment of the decision-making capacity of individuals under the action of the drug, coupled with the increased excitability caused by MDMA, would facilitate the engagement of these subjects in: driving of vehicles under intoxication, use of other substances and exposure to risky sexual relations, such as sex without protection and with multiple partners [24, 25].

It contributes to the association between MDMA consumption and risky sexual behavior the

simultaneous use of the drug with erectile medications, such as Viagra. A study with individuals using Viagra and methamphetamine showed that these subjects were more susceptible to contracting sexually transmitted diseases than those who used only one or none of the drugs [26,27].

The polyuse of psychoactive substances among ecstasy users is a well documented phenomenon. In a study published in 2008, all subjects who ingested MDMA reported having used at least one second drug [28]. According to the study, over a 90-day period, 100% of MDMA users consumed alcohol, 85% marijuana, 79% nicotine, 40% methamphetamine, 38% hallucinogens, 34% cocaine, among other drugs.

### **3.4.2 Ecstasy in Brazil**

Research conducted in 2009 with Brazilian students sought to determine the prevalence of ecstasy use, subdividing it into three categories: use in life, use in the last 12 months and use in the last 30 days. The results of the survey revealed that 7.5% of respondents had used the drug in their lifetime, while 3% used it in the last 12 months and 2% in the last month [1].

In the same year of 2009, 7.7kg of ecstasy were seized in Brazil. However, these numbers peaked in 2007, when 57.5 kg of the drug were seized. In 2010, the Brazilian state seized 2740 ecstasy tablets. Much of this amount comes through Europe, while the country sends to the continent shipments of cocaine [1].

If in the past Brazil did not stand out as a place for MDMA consumption, nowadays this reality has changed. Its use is not yet widespread, as crack, cocaine or cannabis, focusing on young, middle-class and high-class audiences. However, phenomena such as the reduction of the price of the drug can help its popularization [1].

Almeida, Garcia-Mijares and Silva conducted a study with 1140 Brazilian ecstasy users, outlining the patterns of use and associated risks among this public. 65% declared they belong to class A, 54.7% said they were students, 74% were single and 68% were men, between 22 and 25 years [24]. At the time of the research, the participants consumed on average 1.2 tablets per episode, presenting between 1.6 and 2.4 episodes of consumption per month. 36% had consumed between 6 and 20 tablets throughout their lives.

95% reported using the drug at parties and clubs, and 62% considered it easy to purchase [24].

Regarding drug use in the period prior to ecstasy consumption, 62% of respondents stated that they consume depressant substances such as ketamine or tranquilizers, 59% alcohol and 54% marijuana. During the use of ecstasy, 68.8% said they consume alcohol, 40% marijuana and 29% stimulants, such as cocaine and crack. After consuming ecstasy, 53% reported marijuana use, 34% alcohol, and 32% no drug [24].

The data collected by Almeida, Garcia-Mijares and Silva in 2009 find resonance in another research conducted in 1999, with MDMA users from the city of São Paulo. 47% of the subjects were between 18 and 22 years of age, 61.5% were men, 86% were single and 51% were middle-class [29]. 78% reported consuming the drug in raves, 59.2% of the subjects purchased the drug at the party site, with friends being the source of the acquisition for 53% of users. The same percentage of 38.5% of respondents reported consuming the drug at a frequency of once a week and also 38.5% once a month. 82% prefer to consume it at weekends or holidays [29].

The study in question also investigated users' attitudes towards consumption. 82% reported using the drug to dance, 53.8% to relax, 44% to stimulate the senses, 38% to feel happy, 23% to escape from reality or escape problems [29].

Of the subjects who considered the effects of positive ecstasy, 94.3% mentioned that they feel happy when using it, 85.7% are calm, 80% are warm, 80% are energized, 80% are in peace, 74% are close to others, 71% calm [29]. According to these reports, users of the city of Sydney, Australia, reported that the most frequent effects of the drug (not shown in percentage) were increased communication, openness of mind, closeness to other people, happiness, tranquility, openness to the environment, sensuality, euphoria, self-confidence, unconcern [29].

As a counterpoint, in an article published in 2012, Comis and Noto sought to identify the reasons why some subjects, recruited in the city of São Paulo, do not use ecstasy, or if one day did, they ceased their consumption. The study analyzed three groups: former medium intensity users (EX-M), former low intensity users (EX-L) and

individuals who had never used MDMA (NU) [30].

Most of the NU group pointed to family values and religion as being the most relevant protective factors. Half of the EX-L group chose these two factors as one of the factors responsible for stopping consumption. These two groups said they feared to disappoint their families or not to be accepted by them. Meanwhile, members of the EX-M group admitted that they were not influenced by family values or religious beliefs when making decisions [30].

In particular, the most important reason in the EX-L group to cease consumption were the physical and psychological complications associated with the drug. These complications included hangover, tremors, bruxism, as well as depression, anxiety, intense fear, attention difficulties. On the other hand, in the EX-M group, side effects from continuous and prolonged use were the main reason for abandoning ecstasy. The effects mentioned are weight loss, muscle pain, weakness, intense hangovers, bruxism, memory deficits, as well as the psychological complications found among users of low intensity [30].

Changes in lifestyle have also contributed to the disruptions. The changes cited by the interviewees, especially members of the EX-L group, consist of increased professional responsibilities, terms of relationships, personal growth. Nevertheless, it should be noted that most of the former users of medium intensity, although abstinent for 12 months, said that they would consume the drug again [30].

#### 4. DISCUSSION

This research aimed to determine the prevalence of ecstasy use in Brazil and the patterns of use associated with the drug, based on a bibliographic study. The analysis of the literature revealed, initially, the low number of publications dedicated to investigate the use of ecstasy by the Brazilian population. The first studies on the subject date from the end of the decade of 1990, when the drug begins to spread by the country, although in a circumscribed way.

Studies analyzed by this research investigated aspects such as physical and behavioral effects associated with the drug, sociodemographic profile of the user, risk and protection factors for consumption, risk behaviors and drugs polyuse

related to ecstasy. Most of these studies were designed to collect data in order to contribute to drug control measures.

The patterns of consumption in Brazilian population and the profile of its user are similar to those found in other parts of the world, such as Europe and North America. Ecstasy is consumed especially in party settings and nightclubs by single, middle-class, and young men, on a frequency of one or two tablets per month or week. However, ecstasy consumption can also be found in other populations.

The drug is associated with a culture that values pleasure, freedom and youth. Its users declare as main motivations to use, the desire to dance, relax, stimulate the senses, feel happiness, escape from reality and problems. It should be noted that ecstasy is perceived as a non-hazardous substance when compared to other drugs such as alcohol, tobacco, cocaine, marijuana. However, it poses hazards to health, since it has potential to dependence, and the associated long-term physical and cognitive impairments are not fully understood.

Thus, studies highlighting the protective factors against the use of ecstasy, such as the one carried out by Comis and Noto, deserve mention [30]. According to the authors, the main reasons for non-consumption of the substance are: fear of family disapproval, religion, negative short- and long-term side effects, lifestyle incompatible with consumption, among others.

Synthetic drug abuse prevention programs can be elaborated, aiming to strengthening these mentioned protection factors, through educational campaigns. They should focus on young singles, middle class, male, frequenters of electronic music events, motivated by seeking pleasure and intimacy experiences with their peers.

#### 5. CONCLUSION

Analysis of publications on the prevalence and sociocultural patterns of ecstasy consumption in Brazil revealed a low number of studies dedicated to the topic. Given the widespread abuse of synthetic drugs nowadays, their negative side effects and its potential for addiction, more research on ecstasy is needed. Health problems arising from drug abuse can be faced with the implementation of prevention and treatment policies. Establishing guidelines for these policies goes beyond the limits of this

article. However, it is hoped that through this analysis, more work will be fostered, to create strategies for the protection and care of synthetic drugs users.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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