



# Psychopharmacological relationship between psychoactive substances and violent behavior in Moroccan spectators: a cross sectional study

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## Abstract

The relationship between drugs and violence can be analyzed from very diverse perspectives, ranging from the study of fundamental biological mechanisms to that of measures faced with the dissemination of illicit drugs. This study aims to examine the relationship between psychoactive substances consumption and behavior violent in a sample of adolescents from the province of Kenitra, Morocco. A total of 311 spectators (Morocco) are participating in this study. (56 females and 255 males) aged 13 to 47 (mean age = 26 years). Structured individual interviews were conducted using a questionnaire composed of 20 closed and five open questions designed specifically for the purposes of the study<sup>1</sup>. The questionnaire, administered face to face, focused on the sociodemographic profile of the young person and his parents, his level of study, the sporting and cultural activities he practiced, the socio-economic level to which he belongs and his state of work. Participants were also questioned about their physical and mental health, their profile as a consumer of psychoactive substances (substances consumed, frequencies, addiction) and their history of delinquency – particularly in relation to illicit drug trafficking. Eighty percent of participants (243/302) reported using at least one psychoactive substance. This includes alcohol (49%), maajoune (30%), cannabis (14%), heroine (1%), hallucinogens (5%) and amphetamine (1%). The study reveals that spectators engaged in league sports are more prone to consuming alcohol and cannabis compared to those not in league sports. Additionally, associations were observed between ethnolinguistic groups and the use of alcohol, cannabis, maajoune, as well as alcohol and cannabis combinations This study supports other research which demonstrates that consumption of psychoactive substances is correlated to violent behavior in spectators. Preventive measures should be implemented, specifically focusing on adolescents based on their socioeconomic and educational level characteristics.

**Keywords:** Drug consumption, alcohol, cannabis, sport performance, adolescents, Morocco

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## 1. Introduction

Sports practices are very widespread in our societies and contribute to the psychosocial development of those involved. Leading to undeniable health benefits, they are most often a source of individual and shared pleasures and emotions. However, it also seems that they can generate or be the consequence of psychological suffering [1]. The use of substances is therefore common among athletes, whether to improve performance or to decompress before or after major events. We propose, after having reported some definitions and epidemiological data, to present both the factors favoring the use of a psychoactive or doping substance in a sporting environment and the consequences of this use. Finally, we will discuss the measures to be implemented in terms of prevention [2].

A psychoactive substance is a substance that, when ingested or administered, alters mental processes, such as cognitive functions, mood, or affect. Addictive behavior is defined by the repeated inability to control a behavior and the continuation of this behavior despite its negative consequences (physical, psychological, family, professional, social) [3-5]. Doping behavior is the use of a substance in the goal of overcoming a real or perceived obstacle for performance purposes. The obstacle may be an exam, a job interview, a sporting competition. Doping is the use, during sporting competitions, of prohibited substances or methods included on a list established by the World Anti-Doping Agency. Conduct at risk consists of exposure to a non-negligible probability of injury or death, of harming one's personal future or of putting one's health or that of others at

risk [6-8]. Psychoactive substances, usually described as “recreational”, can be used to improve sports performance. Remember that at the beginning of the 20th century, Tour de France cyclists sometimes drank a little champagne to give themselves a boost before a descent [6]. More recently, a survey carried out among STAPS (Sciences and Techniques of Physical and Sports Activities) students in several French universities showed that 13% of them had already used cannabis with the aim of improving their sporting performance [5]. In addition, competitions generate anxiety, and the use of drugs could sometimes appear as a remedy to relieve it, which would explain why, among young high-level athletes, those who participate in the most prestigious competitions are more inclined to consume tobacco and alcohol [6]. Several animal models were used in the objective to study the interaction between animal Behavior and chemical drug administration [7-15].

Violence occurs mainly in family, marital and road environments. According to the “Living environment and security” survey carried out each year by the Ministry of the Interior, of the 143 violent deaths within couples in 2021, 24% of the perpetrators and 18% of the victims were under the influence of violence at the time of the facts, 10% of the perpetrators had consumed other psychoactive substances. 43% of women who had suffered rape or attempted rape believed that the perpetrator was under the influence of alcohol or another drug. In 2019, alcohol was involved in 31% of fatal road accidents. A large study dating from 2013 showed that dependence on alcohol or another drug increased the risk of aggression towards an intimate person by 3. Finally, work carried out in the USA in 2005, involving 1867 young people with an average age of 16 followed for 5 years, showed that drug consumption was significantly associated with the appearance of violent behavior [16-18]. The consumption of substances classified as stimulants promotes violent behavior. These are particularly cocaine, amphetamine and methamphetamine. Alcohol, although classified as a depressant, is also part of it because of the disinhibition it causes and which promotes violent behavior when provoked and in individuals with a fighting temperament. Cannabis/marijuana is rarely involved except in the event of a bad trip [19-22]. Violence due to economic and systemic models is rarer than that due to the psychopharmacological model which alone will be addressed here. It is based on the fact that drugs stimulate the reward circuit, a circuit composed of structures responsible not only for desire and pleasure but also for emotions such as anger and aggression. The biological and cellular mechanisms of the shift towards these negative emotions are not currently correctly deciphered. However, the available data show that certain personality traits on the one hand, and the nature of the substance as well as the mode of consumption on the other, seem to play an important role. This leads to improved memory, attention, and learning, with an associated increase in hippocampal volume [23]. The psychosocial perspective emphasizes the social benefits of engaging in behavior with peers, fostering cooperation, respect for rules, and potentially influencing brain function positively [24]. Given the diversity of findings, our study aims to contribute additional insights. Its objective was to assess the relationship between psychoactive substances consumption and behavior violent in a sample of adolescents from the province of Kenitra, Morocco.

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## 2. Materials and methods

### 2.1 Studied population

A total of 311 adolescents (145 girls and 167 boys) (mean age = 15 years SD = 1.3) from some districts of the province of Meknes (Morocco) were participated in this study.

### 2.2 Psychoactive substance assessment and calcul of Proportional Reporting Ratio (PRR)

Structured individual interviews were conducted using a questionnaire composed of 20 closed and five open questions designed specifically for the purposes of the study 1. The questionnaire, administered face to face, focused on the sociodemographic profile of the young person and his parents, his level of study, the sporting and cultural activities he practiced, the socio-economic level to which he belongs and his state of work. Participants were also questioned about their physical and mental health, their profile as a consumer of psychoactive substances (substances consumed, frequencies, addiction) and their history of delinquency – particularly in relation to illicit drug trafficking – and, more broadly, on the manifestation of violent behavior committed by the young person in football stadiums.

To determine the relationship between violence and drug type, the proportional ratio (PRR) was calculated for each drug using the Evans method. The PRR compares the proportion of violent cases associated with each drug to the proportion of violent cases associated with all other drugs assessed. The strength of this relationship is assessed using the chi-square test of independence, with an  $\chi^2$  value.

### 2.3 Identification of violence act

We considered a violence act as any case report containing one or more of the following Physical violence (Fight between supporters of the same team or pushing one or more supporters; Throw an object on the lawn or break objects and equipment; Invading the Lawn; Physically assaulting law enforcement), Verbal violence (Threatening other supporters; Insult or use racist or xenophobic remarks; Vulgar and insulting songs or insulting supporters); Cyberviolence (Threatening fans on the internet, insult supporters on the internet, spreading false rumors about supporters or players on the internet, Insulting or threatening players on the internet); Symbolic violence (Fan whistles are provocative, Fan chants are provocative, provocative tifos, Banners that insult or carry a message are provocative. If a case report contained more than one of these terms, it was assigned to the most severe event term in the order listed above.

### 2.4 Statistical analysis

Descriptive statistics were calculated, including weighted frequency and proportions for categorical and weighted average variables, and standard deviations for continuous variables.

## 3. Results and Discussions

In the six-month study period, we identified six evaluable drugs that accounted for 302 spectators in the kenitra city (Morocco). This total included 186 (55%) cases

meeting the violence criteria. The violence cases included 141 reports of verbal violence, 130 physical assaults, 31 cases indicating symbolic violence, and 10 cases described as cyberviolence. The spectators were 18.5% female (66% with violent behavior) and 91.5% male (62.6% with violent behavior). The mean age was 26 years (Table 1). Eighty percent of participants (243/302) reported using at least one psychoactive substance. This includes alcohol (49%), maajoune (30%), cannabis (14%), heroine (1%), hallucinogens (5%) and amphetamine (1%) (figure 1).

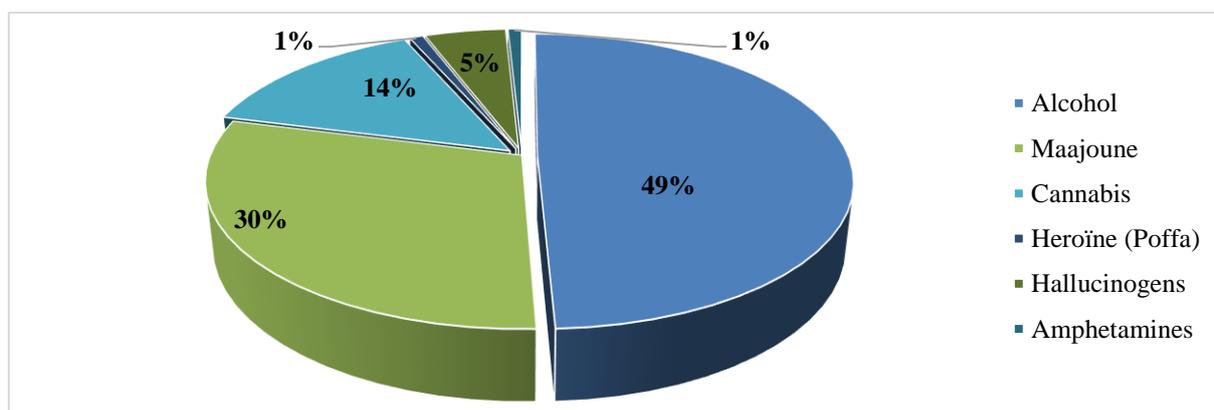
This current study attempts to evaluate the relationship between psychoactive substances (alcohol, cannabis, Maajoune, heroine...) and violent behavior in sample of spectators from Kenitra city (Morocco). It is important to emphasize that the consumption of such produced by young adults is poorly documented and poorly understood. The results show a positive correlation between drugs and violent behavior. Not all people who are alcoholic and/or under the influence of psychoactive substances become violent. Also, the interaction between violence and drug taking has been the subject of numerous studies in an attempt to determine the factors triggering violence [25-29]. The most recognized explanatory concept today was proposed in 1985. It includes three distinct models: the psychopharmacological model where violence emerges due to the effects of the product on the economic model where obtaining drugs involves violent actions such as theft, burglary, beatings or even murder; the systemic model which is aimed at the traditionally very violent environment dealing with the drug market and trafficking, the neurobiology of the brain and cognition involving three pathways ; Dopamine pathway, norepinephrine pathway and serotonin pathway leading to increase of the secretion of cortisone responsible for behavior changes (figure 2).

Experiments on laboratory animal models suggest that consumption patterns also influence the triggering of violence. Methamphetamine or saline was administered to mice whose aggressiveness was assessed by the occurrence of biting attacks. Methamphetamine was administered twice daily for 3 days at a total dose - day 1: 3 mg/kg, day 2: 7 mg/kg, and day 3: 11 mg/kg. The following two weeks, they received 12 mg/kg/day for 3 days. This administration protocol was intended to mimic what happens in humans who experiment with a drug, gradually increase the doses due to the development of tolerance and become dependent on it

[30-35]. Several studies in neuropsychology have shown that subjects who regularly consume cocaine have, on the one hand, a reduction in empathy and, on the other hand, alterations in so-called executive functions such as mental flexibility, planning, decision-making, and the ability to inhibit actions. The decline in empathy, often associated with antisocial personality, is linked to difficulties in emotional regulation. These emotional disorders would lead to erroneous interpretations of the behavior of others, which, associated with executive function disorders, would facilitate the transition to violence [36,37].

The prevalence of consumption of psychoactive products among students, whether alcohol, cannabis, tobacco and energy drinks, are very high. This finding confirms the conclusions of other studies showing that the prevalence of use of these substances is much higher among young adults, including undergraduate students, than in other age groups of the Canadian population [38,39]. It is not the intention of this paper to argue that the importance of physical education is its benefit to academic achievement. The overall health benefits of organized physical activity are probably much more important than possible academic benefits. However, when policy makers need to make difficult decisions about where to spend public funds and administrators need to make decisions about where to focus resources in a climate of academic accountability, a proven relationship between drug consumption heavy metals contamination and brain health leading to behavior changes [40-44].

One review of research that concluded a positive relationship between physical and mental skills expressed concern that reviewed studies did not demonstrate causality. Most reviewed studies used correlation designs. Reviewed experimental studies had design weaknesses. One study with an experimental design in that the independent variable was manipulated did not use random assignment or matching to control for preexisting group differences [45]. The brain is made up of a complex set of neural circuits that are organized into networks to process sensory inputs, relay them to the cortex, then translate them into behavioral or psychological outputs. The variety of behaviors requires that certain networks, and therefore certain brain structures, be selected according to the different types of situations experienced by the subject. This selection is carried out by modulator neurons [46].



**Figure 1.** Distribution of types of psychoactive substances according to the proportion of spectators.

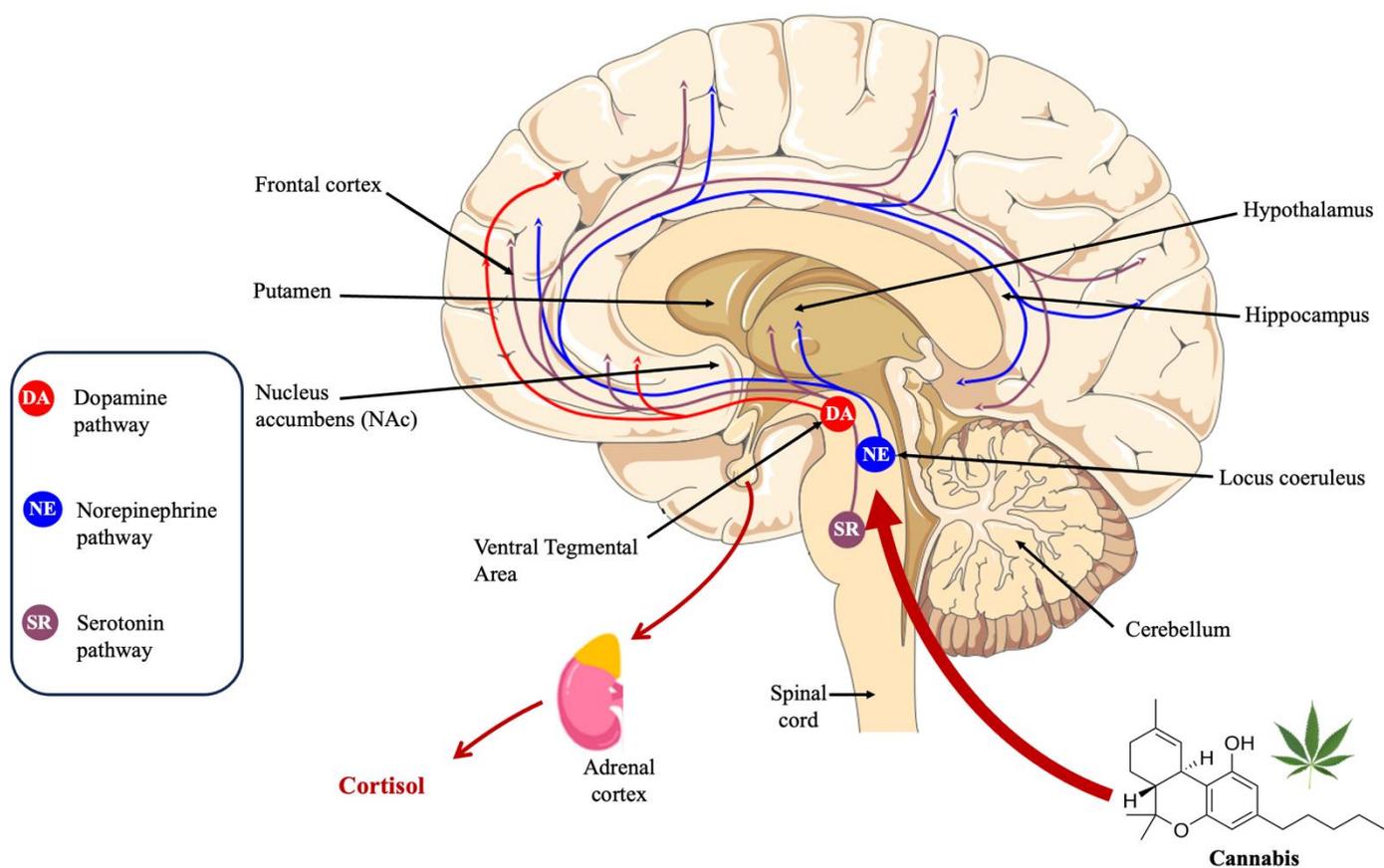
**Table 1.** Demographic characteristics of participants.

|                                    |                          | Violence |    | Significance |
|------------------------------------|--------------------------|----------|----|--------------|
|                                    |                          | Yes      | No |              |
| Gender                             | Female                   | 37       | 19 | ***          |
|                                    | Male                     | 159      | 96 |              |
| Age classes (years)                | 10-20                    | 76       | 27 | **           |
|                                    | 21-30                    | 80       | 61 |              |
|                                    | 31-40                    | 31       | 23 |              |
|                                    | 40 and more              | 9        | 4  |              |
| Family situation                   | Single                   | 99       | 65 | *            |
|                                    | Married                  | 52       | 39 |              |
|                                    | divorced                 | 45       | 11 |              |
| Level study                        | Analphabet               | 39       | 19 | *            |
|                                    | primary                  | 95       | 33 |              |
|                                    | Middle school and higher | 62       | 63 |              |
| Professional activity              | Without work             | 94       | 42 | NS           |
|                                    | work                     | 102      | 73 |              |
| Psychoactive substance consumption | No                       | 17       | 40 | ***          |
|                                    | Yes                      | 168      | 75 |              |

NS : non significant  $p > 0.05$  ; \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**Table 2.** Psychoactive substances and its association with violence behavior.

| Psychoactive substance | Violence cases | PRR | P-value |
|------------------------|----------------|-----|---------|
| Alcohol                | 67             | 1.1 | <0.05   |
| Maajoune               | 55             | 1.4 | <0.05   |
| Cannabis               | 31             | 1.6 | <0.01   |
| Heroine (Poffa)        | 2              | 1.8 | <0.01   |
| Hallucinogens          | 10             | 1.7 | <0.01   |
| Amphetamines           | 2              | 1.8 | <0.01   |



**Figure 2.** Sagittal section of brain showing the three main sets of modulatory neurons involving in behavior changes related to cannabis addiction.

The cell bodies of noradrenergic, serotonergic and dopaminergic neurons have their cell bodies located in the midbrain, respectively the locus coeruleus, the raphe and the ventral tegmental area/substantia nigra.

#### 4. Conclusions

This study supports other research which demonstrates that consumption of psychoactive substances is correlated to violent behavior in spectators. Even more so, cannabis, being now legalized and easily accessible, adolescents seem to trivialize its consumption and the harmful effects on their health. These results require thinking more about the responsibility of organizations and city councils with regard to the health of these persons.

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