

Trabajo Fin de Grado 2018/19

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Título: ¿Existe relación entre la exposición prenatal al cannabis y el desarrollo de conducta agresiva?

Resumen

Numerosas investigaciones centradas en el estudio de los efectos que produce el consumo de cannabis a nivel psicobiológico han demostrado deterioro cognitivo, afectación de la memoria y de la atención. Sin embargo, muy pocos estudios han investigado los efectos que el consumo de cannabis durante el embarazo pudiera producir en la futura descendencia, en particular respecto a la conducta agresiva o violenta. En el presente trabajo se realizó una revisión bibliográfica que tuvo como objetivo intentar obtener conclusiones a este respecto. Para ello se realizó una búsqueda en cuatro bases de datos (Pubmed, PubPsych, Psynet y Science Direct), con las palabras clave: *cannabis*, *pregnancy* y *aggressive behavior*, y siguiendo unos criterios de inclusión claros (solo artículos de investigación, publicados entre 2008 y 2019, centrados en la marihuana y con muestra humana). Los estudios encontrados muestran ciertos denominadores comunes respecto a la muestra: bajos niveles educativos y socio-económicos, así como comorbilidad con el consumo de alcohol y tabaco. Respecto a la descendencia; en hijo/as de consumidoras de cannabis, se observa una somatometría fetal inferior a la media. Entre los 1 y 3 años se observan niveles bajos de atención y altos en impulsividad así como una elevada presencia de conductas externalizantes (hiperactividad, irritabilidad y agresividad), las cuales son más frecuentes en niñas. A nivel neurobiológico, se proponen posibles mecanismos implicados, destacando el papel del eje del estrés (hipotalámico-pituitario-adrenal; HPA) y de áreas cerebrales con deterioro tanto a nivel estructural como de conectividad a causa de la exposición prenatal (córtex prefrontal, amígdala e hipocampo). A pesar del bajo número de investigaciones realizadas de esta índole, los datos muestran una relación entre el consumo de cannabis durante la gestación y la presencia de alteraciones de conducta en la niñez. Estas alteraciones pudieran relacionarse con el desarrollo de conducta agresiva y violenta en etapas posteriores del desarrollo.

Abstract

Title: Is there a relationship between prenatal cannabis exposure and the development of aggressive behavior?

Numerous studies focusing on the effects of cannabis use at the psychobiological level have shown cognitive impairment as well as memory and attention deficits. However, very few studies have investigated the effects that cannabis use, during pregnancy, may have on future offspring, particularly with regards to aggressive or violent behaviour. Here, we reviewed the literature with the aim of drawing conclusions on this topic. To do so, four databases were searched (Pubmed, PubPsych, Psynet and Science Direct) with the key words: *cannabis*, *pregnancy* and *aggressive behaviour*. Clear inclusion criteria (only research articles published between 2008 and 2019 that focused on marijuana and human sample) was used. The studies found showed certain common denominators with respect to the sample: low educational and socio-economic levels, as well as comorbidity with alcohol and tobacco use. With respect to the offspring; in children of cannabis users, a lower than average fetal somatometry was observed.

Between 1 and 3 years old, low levels of attention and high impulsivity were found, as well as a high presence of externalizing behaviours (hyperactivity, irritability and aggressiveness), which are more frequent in girls. At the neurobiological level, possible mechanisms are proposed, highlighting the role of the stress axis (hypothalamic-pituitary-adrenal; HPA) and of brain areas with structural alterations and connectivity deficits due to prenatal exposure (prefrontal cortex, amygdala and hippocampus). Despite the low number of investigations, the data show a relationship between cannabis use during gestation and the presence of behavioural alterations in childhood. These disturbances may be related to the development of aggressive and violent behaviour in later stages of development.

1.- Introduction:

Drug consumption has been repeatedly associated with an increase in the presence of aggressive behaviour. Although not all people who use drugs are aggressive, there are many violent situations in which some type of drug use is present. (Allen et al, 1997; Paglia & Room, 1998).

Cannabinoids are some of the most consumed psychoactive substances in the world. Cannabinoids are extracted from *Cannabis Sativa*, which contains more than 400 chemical substances, being the D9-tetrahydrocannabinol (THC) its main component. Its ingestion produces psychoactive effects, altering the normal functioning of brain mechanisms, which leads to significant alterations in behavior; particularly affecting decision-making processes and executive control (ElSohly & Slade, 2005).

The existence of the endocannabinoid system and the CB1 and CB2 receptors allows the study of the mechanisms of action of exogenous cannabinoids. Located in numerous brain structures at the presynaptic level, the endocannabinoid system acts as a neuronal retrograde messenger, inhibiting the release of neurotransmitters to the intersynaptic space (Piomelli, 2003; Sugiura, 2009). This neurotransmission system is related to functions such as memory, energy balance and metabolism, stress response, analgesia, as well as emotion and motivation.

The maternal consumption of cannabis produces a lack of nutrients and oxygen to the fetus, generating a negative impact on its physical and neuronal development. The endocannabinoid system plays an important role in the processes of proliferation and cell differentiation throughout the body, mainly in the brain, so that cannabis consumption can alter them. Potential abnormal fetal brain development can affect the development of newborns in childhood and later adulthood (Suzuki et al, 1980; DiFranza et al, 2004).

Due to legalization in countries such as Uruguay, Canada, or the United States, its consumption has been remarkably widespread. That is why there is a need for studies that focus not only on the effects on mothers but also on the possible relationship of their consumption with consequences on the development of the offspring, particularly on potential aggressive or violent behaviour.

Objective :

The **main objective** of this study was to review the literature on this subject in order to know the studies carried out and their methodology.

Although our work is a bibliographic review and not an experimental study, we hope that the literature will show us that there is an indirect relationship between prenatal exposure to cannabis and the development of aggressive behaviors, just as the literature on neurobiology explains the relationship of such exposure to regulation and response to stress.

2.- Methods:

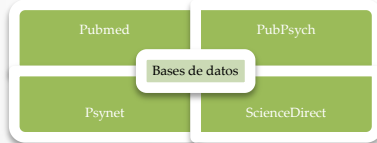
A bibliographic search of four databases was performed: Pubmed, PubPsych, Psynet and ScienceDirect. The search parameters used in the four databases were: **cannabis, pregnancy and aggressive behavior.**

Inclusion criteria:

- Research articles.
- Published between 2008-2019.
- Focused on marijuana.
- Human sample.

Exclusion criteria:

- Papers other than Research articles.
- Outside the 2008-2019 range.
- Drugs other than marijuana.
- Animal sample.



Search results:

- Pubmed: 7
- PubPsych: 3
- Psynet: 1
- ScienceDirect: 82

Final articles:

- Pubmed: 4
- PubPsych: 0
- Psynet: 0
- ScienceDirect: 4

3.- Results:

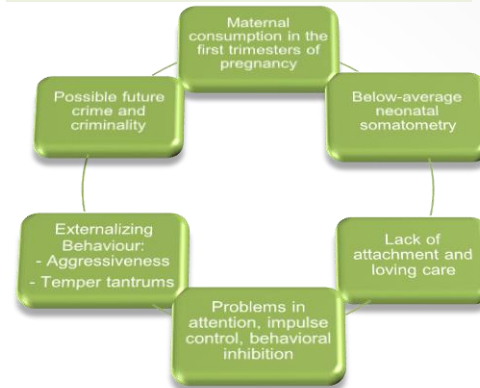
It has been demonstrated that the values referring to weight, size, circumference and length of the skull are common results in children exposed to THC during gestation, being lower than the average.

Around 18 months, there is a decrease in lactation and sensitivity and affectionate care for children in their upbringing, which is associated with possible future maladaptive behaviors.

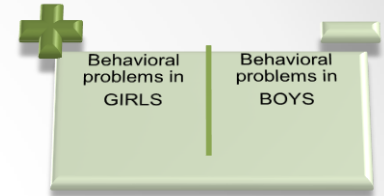
In the first years of age, we find more and more frequent behavioural problems, related to attention deficits, hyperactivity and impulsivity, disruptive and externalizing behaviours: aggressive behaviours and tantrums, difficulty in regulating emotions...

In terms of sex, there are notable differences in the first years of life, with more effects seen in girls than boys.

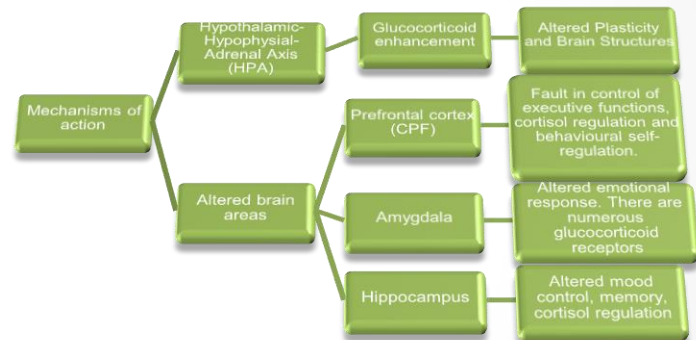
Cycle of exposure to cannabis and aggressive behaviour:



Behavioural problems at 18 months according to gender:



Mechanisms of action:



4.- Conclusions:

First of all, there are **very few research studies on the subject**. While there is more material with other drugs such as cocaine or tobacco, the literature focusing on cannabis use during pregnancy and subsequent violent behavioural developments in offspring is very sparse.

The characteristics of pregnant cannabis-using mothers follow a similar pattern: **low income, low education, single and with tobacco or alcohol consumption in addition to cannabis**. The presence of **aggressive tendencies and maternal depression, and the decrease in affection and sensitivity of care** have effects on the behavioural development of sons and daughters.

Both the **physical characteristics of newborns** (cranial circumference, fetal size, etc.) as well as **attention deficits**, behavioural alterations due to decreased **impulse control** and the presence of **externalizing behaviours** are traits that show a relationship with future behavioural problems such as aggressiveness, delinquency and criminality.

Girls show the **greatest aggressive tendencies and externalising behaviours** in the first years of life. With the passage of their development, it is the male sex that ends up showing more aggressive and criminal behaviors.

The **HPA Axis**, responsible for the body's response to stress, is noticeably altered in children exposed to cannabis during pregnancy, producing a dysregulation of glucocorticoid levels as well as its receptors, while areas such as the **Prefrontal Cortex, Amygdala and Hippocampus** are developed inadequately, altering their connectivity and architecture, resulting in failures of their functions.

Despite the limitations of correlational studies in determining how much consumption contributes to the profile, studies indicate that THC is a contributing factor.

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