Essay

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Explain the role of the neurotransmitter dopamine in the **development** of substance use disorder. With reference to **instrumental conditioning**, how does dopamine support initial drug taking?

APA formatting

In the stages leading to the development of a substance use disorder, dopamine plays a large role in the likeliness for future administration of the substance through feelings of satisfaction and pleasantness. Voluntary actions and factors actuated by the user prior to administration further contribute to a development of substance use disorder, by means o Instrumental Conditioning conditioning. Reference?

Through the administration of substances, changed levels of dopamine affect the satisfaction and overall liking of the substance. Dopamine neurotransmitters exist throughout the human body, carrying chemical signals between the Incomplete/inaccurate ain, inclusive of signals relevant to feelings of pleasure. Substances - by nature - modify the levels of various neurotransmitters in the body to elicit a specific outcome. In substances that modify dopamine levels, they alter the body's functions to ultimately absorb more dopamine. For example, with the administration of Cocaine ne, the body's natural reuptake of excess dopamine neurotransmitters is blocked, causing more dopamine to be absor 1 . Furthermore, the administration of amphetamine-type substances causes a greater release of dopamine neurotransmitters from the vesicles that they are stored in, which also causes more dopamine to be absorbed.
Consequently, increased levels of dopamine in the body have the potential to affect the user's perception of their experience as being more Mesolimbic Pathway This may encourage the user to administer the substance again, in the pursuit of feeling happy, which may exacerbate the potent effects of the substance. As such, dopamine neurotransmitters play a primary role in the development of substance use disorders, as the change in their levels affect the satisfaction and liking of that substanc 2

Whilst dopamine levels can be affected through the ingredients in the substance, voluntary actions and voluntary environmental factors can too affect levels of dopamine, which too influence the liking of the substance and lead to possible developments of substance use disorders. Instrumental conditioning (also known as operant conditioning) is a learning framework whose end results associate a voluntary action with an expected reward - whether it be tangible or intangible. Instrumental conditioning is not limited to only the mind, by nature of the brain linking an action to a reward, but also

extensible towards the body's subconsciou Clear and accurate writing s functions itself. In light of substance use, if an individual regularly performs a set of voluntary actions, or places themself in an environment voluntarily, their body may be subconsciously conditioned to elicit a response. The body may associate voluntary actions with the aforementioned effects and implications of inflated dopamine levels, which can result in autonomous bodily reactions occurring when in that environment, even without the presence of the substance. Consequently, dopamine too plays a large role in the instrumental conditioning of drug-like responses, whereby dopamine aids the associative process between a voluntary action or environment and a response, causing the body to produce a similar reaction when faced with that action or environment.

Explain how **changes** in the functioning of the dopamine system lead to the development of withdrawal after drug use is ceased. With reference to **instrumental conditioning**, how does withdrawal contribute to ongoing drug use and relapse?

In the absence of once-regular administration, the development of withdrawal effects can be highly attributed as an effect of the body's overcompensation of functionality in its dopamine system. Additionally, as a result of possibly prior instrumental conditioning, voluntary actions and environments exhibit a tendency to lead a user to a state of withdrawal and possible relapse.

During prolonged use of dopamine-affecting substances, in an attempt to reach an inertial state of chemical balance, the body attempts to regulate its effects by increasing or decreasing the activity of the body's functions. Receptor desensitisation Tolerance neurobiology ection of receptors of the body's cell membrane, effectively reducing the number of absorbed dopamine neurotransmitters. Akin to this, down regulation kills Incomplete/inaccurate o also reduce the number of absorbed dopamine neurotransmitters. However, upon the removal or absence of the once-regular dosages of the substance, the body will continue to still operate in a compensating manner of reduced performance (having less active receptor cells until they activate or grow back), absorbing less of the dopamine neurotransmitters from the expected excess amount. Subsequently, without the presence of the expected excess amount of dopamine, the body instead absorbs fewer than usual amounts of dopamine, which may be inadequate or unsatisfactory for normal bodily oper Good . Whilst the number of active receptors is recoverable, the recovery process is slow, and will not lead to a full recovery (Foulds, 1996).

Consequently, users may enter a state of withdrawal where they exhibit effects opposite to what the substance provided. Were for a substance to be administered under the same voluntary actions and voluntary environments over a period of time, a user may exhibit involuntary bodily responses as a result of instrumental conditioning. Should these factors be experienced when the user is not under the influence of the substance, the involuntary conditioned response may induce elevated levels of withdrawal. Given previous positive experiences and peak highs (Foulds, 1996) when under the effects of the substance we, a user may feel compelled to take the substance once again, and enter a period of relapse. The Hazelden Betty Ford Foundation Butler Center For Research posits that "the intensified dopamine response in the brain that mood-altering drugs produce does naturally stop" (Ranes et al. 2016). This agrees with the notion that substances have long-lasting effects even whilst a new dose of the substance may be absent and extends to involuntarily bodily behaviour and responses.

Therefore, prolonged use of substance creates semi-permanent changes in the body's absorption mechanism, that when a user is no longer under active influence of the substance, he or she will result in a deprivation of dopamine and other affected neurotransmitters. In addition, actions and environments that may be conditioned stimuli as a result of operant conditioning can induce involuntary bodily response behaviours which may exacerbate the body's deprived state from overcompensated regulation, contributing to behaviours of relapse.

Discuss how drug-associated environmental cues can contribute to ongoing substance use and relapse. *Hint: You may choose to approach this from the perspective of positive or negative reinforcement theories of addiction.*

Chemical effects of substances on the brain and the body influence decisions and preferences, and are affected by both classical and instrumental conditioning. Compared to the voluntary nature of instrumental conditioning, Pavlovian Conditioning dictates an induced behaviour as a result of an auxiliary stimulant such as a sound or visible object. Regardless of the type of conditioning framework, environmental cues such as sounds and locations can act as conditioned stimulants to elicit a conditioned response.
These responses can include the desire to administer a substance, or the previously mentioned autonomous bodily responses. It is widely accepted that

dopamine is responsible in the process of decision making, where the option with the greatest reward is favoured (Schults et al. 2002). Hence should either response occur, the conditioned body will favour the decision to consume the substance as it will provide the greatest pleasure and or relief.

Conditioned Withdrawal

Pavlovian-instrumental transfer

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In application of the positive reinforcement theory, the administration of substances to elevate a user's feelings makes the substance a rewarding choice. In application of negative reinforcement, the use of substances to provide elevated comfort or to mitigate symptoms of withdrawal favour substance use as highly rewarding. Furthermore, involuntary bodily responses may induce a desire or craving for feelings provided by the substance. Therefore, the chronic use of substances as well as stages of relapse can be attributed to the effects of long-term conditioning. Weaning out of substance abuse and episodes of relapse is difficult as even simple environmental cues can trigger involuntary behaviours and responses.

References

Foulds, J. (1996). Cognitive performance effects of subcutaneous nicotine in smokers and never-smoker. Psychopharmacology 1996;127 31-36

Ranes, B. (2016). Drug Abuse, Dopamine, and the Brain's Reward System. Hazelden Betty Ford Foundation Butler Center For Research

Schultz, W. (2002). Getting formal with dopamine and reward. Neuron 2002;36 (2) 241- 263

Volkow ND, Fowler JS, Wang G, Swanson JM, Telang F. Dopamine in Drug Abuse and Addiction: Results of Imaging Studies and Treatment Implications. Arch Neurol. 2007;64(11):1575–1579. doi:10.1001/archneur.64.11.1575

Essay

GRADEMARK REPORT

FINAL GRADE

61 /100

GENERAL COMMENTS

Instructor

It appears you do not understand what a scientific essay is. You should use apa format and make sure you are referencing properly. You must use scientific experiments as evidence to support your arguments and review papers or scientific textbooks to gain a better overview of our current understanding. While this essay is not bad, you have not written what we were looking for and have therefore scored low marks.

PAGE 1

QM

APA formatting

Your writing is not in APA format. To maximize your marks, be sure to get the formatting correct.

Visit the website below to learn more:

http://www.apastyle.org

E.g. Indent your paragraphs, double space your writing etc.

QM

Instrumental Conditioning

Instrumental / operant conditioning is a form of learning that involves voluntary or operant behaviour, which is modulated by consequences. Reinforcers are consequences which follow voluntary behaviour and act to increase that behaviour, while punishers are consequences which reduce behaviour.

An example of this negative reinforcement, where a behavior is carried out to remove a negative consequence e.g. An addict taking a drug to avoid withdrawal. Positive reinforcement is another example, this occurs when a behavior is carried out because it leads to a positive consequence e.g. A person taking a drug to feel euphoric.

Additional Comment

A brief discussion of what instrumental conditioning is would be good here

QM

Reference?

Missing/inappropriate reference:

Not including proper references weakens your argument as you are not supporting yourself with appropriate evidence. This essay asked that you use only scientific papers or text books as references.

Also, be sure to not say "studies show" or similar, instead be sure to correctly reference each study you are discussing.

QM

Incomplete/inaccurate

This is incomplete or inaccurate, which may reduce your marks. Remember to use multiple high quality scientific papers and text books as sources and to re-write them in your own words to demonstrate your understanding.

Additional Comment

Communication within the brain is also very important.

QM

Cocaine

Cocaine acts as an inverse dopamine agonist, increasing extracellular dopamine in the synaptic cleft by inhibiting dopamine reuptake.

Comment 1

Absorbed where? Make sure you be specific and show a sophisticated understanding of the science to score higher marks.

QM

Mesolimbic Pathway

Whilst there are many dopaminergic pathways involved in a vast array of functions, extensive literature has established the mesolimbic pathway in particular is closely associated with reward and is therefore the most pertinent pathway in drug abuse (Adinoff, 2007; Kosten & George, 2002). Anatomically, the pathway originates in a dopamine rich nucleus of the midbrain, the ventral tegmental area, and projects primarily to the nucleus accumbens, but also to the hypothalamus and amygdala (Horvath et.al., 2007; Wise & Koob, 2014). Whilst this system is theorized to have developed in order to reward life promoting activities such as eating and mating, substances of abuse are also known to increase extracellular concentrations of mesolimbic dopamine (Kosten & George, 2002).

Additional Comment

You need to write to the standard seen above to score higher marks.

Comment 2

You need to point out that this is positive reinforcement

PAGE 2

QM

Clear and accurate writing

Make sure you write clearly and accurately in a scientific essay.

Additional Comment

Not sure what you mean by this

QM

Tolerance neurobiology

We were looking for a discussion of receptor down-regulation and desensitization and withdrawal. Desensitization reduces the effect of receptor binding by altering ion channels whereas down-regulation decreases the number of receptors available for the drug to bind to.

Additional Comment

see the above for a higher scoring discussion of these

QM

Incomplete/inaccurate

This is incomplete or inaccurate, which may reduce your marks. Remember to use multiple high quality scientific papers and text books as sources and to re-write them in your own words to demonstrate your understanding.

Additional Comment

receptors are not cells, they are on cells

QM

Good

PAGE 3

Comment 3

You need to mention negative reinforcement to score better marks.

QM

Quotes

Avoid direct quotes when possible, it is better to re-write things in your own words to demonstrate your understanding. Using too many quotes instead of writing for yourself will result in low marks in scientific essays.

QM

Pavlovian Conditioning

Pavlovian/classical conditioning is a learning process where a previously neutral conditioned

Pavlovian/classical conditioning is a learning process where a previously neutral conditioned stimulus (CS), such as a tone, is paired with a biologically potent stimulus (US), such as cocaine. The animal will subsequently express a wide variety of conditioned responses (CRs) to the CS. These CRs often resemble unconditioned responses (URs). URs are the natural responses that the animal had to the US prior to conditioning.

QM

Conditioned Withdrawal

In Pavlovian conditioning, conditioned withdrawal is the state that a drug user enters when they are presented with a CS which has been paired with a drug in the past (e.g. the environment they took the drug in), except that the drug has not been taken this time. The CS causes an uncomfortable withdrawal state in the drug user, which is relieved by drug taking. This encourages relapse, leading to a cycle of addiction.

QM

Pavlovian-instrumental transfer

Increases in extracellular dopamine not only mediate the primary reinforcing effects of psychoactive substances but contribute to the pavlovian instrumental transfer (PIT) of secondary stimuli that cause drug cravings and relapse (WHO, 2004, p.52). In PIT, secondary stimuli such as environmental cues and drug paraphernalia gain motivation value through repeated associations with rewarding stimuli, such as the neurobiological effects of psychoactive substances, in order to motivate operant behaviour, like drug administration.

Comment 4

This section seems a bit rushed. We were looking for a deeper discussion of PIT and / or conditioned withdrawal.