

Brain mechanisms controlling drug addiction reinforcement



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Discuss how theories relate drug addiction to endogenous brain mechanisms controlling reinforcement, and look at how these theories may be used to improve the effectiveness of treatment of addiction

In psycho-biological terms addiction is regarded as the perceived need for a drug or substance and the potential for the subsequent re-use of that substance often manifesting itself in a pattern of drug induced behaviour. This has indicated a connection between the behavioural pattern of a user and the biological cravings that are associated with this pattern of behaviour. Due to this relationship between dependent and abusive behaviour patterns and the biological and psychological cravings for the wanted substances, research has gone into establishing the effects of drug addiction and their basis in psychology resulting in many neurobiological models.

In terms of patterns of behaviour, operant conditioning provides a convenient, easy and reliable way of adjusting any subject's pattern of behaviour under the conditioning of a controlled and changeable environmental. This has been conducted in research in an easily observable manner that was then able to account for factors pertaining to addiction and the potential for abuse through accordance to a pre-devised model. Through the notions of positive regard, response and reward and through shaping behaviours this could then be adjusted to test any independent variable. This acts as a convenient methodology for observing the effects of drugs and was devised by early Psychopharmacological researchers in a bid to examine the relationship between drug use and behaviour patterns. One such piece of seminal research that incorporated this relationship was conducted by Dews <https://assignbuster.com/brain-mechanisms-controlling-drug-addiction-reinforcement/>

(1953). In his founding study, Dew began a program of operant studies in an attempt to observe the behavioural effects of drugs to see how it could act as a precursor for addiction. His initial experiments on the behavioural patterns observed in animals led to the establishment that a schedule of reinforcement maintaining a pattern of behaviour could play a critical role in determining the effects of a drug (Dews, 1955). Through operant conditioning and behavioural observation he was able to discern that the dose-effects of the drugs used in his experiment varied in terms of performances that were maintained under two different schedules of reinforcement. However, he was also able to observe that there was a dose range in which the rate of behaviour would increase in one schedule condition, whilst it decreased in the other condition. This was an early indication that drug addiction depended upon the schedule as much as it did the dosage. Essentially, addiction was determined by patterns of behaviour as much as patterns of behaviour were determined by drug usage. In these early experiments, Dews was able to ascertain that stimulants would increase the probability of a pattern of behaviour as it pertained to the relevant classification of a drug. However, he was also able to note that the drug could decrease the probability of any given pattern of behaviour itself.

This research indicated that there was a variety of concepts at play within the role of addiction, such as tolerance, abuse, dependency and reward. In contemporary research, we can see that these factors have been incorporated in an attempt to identify the mechanisms in the brain that lead to dependency, abuse and addiction through the parsing of reward. This was devised by Berridge et al (2003) as the investigation to find the neuro-

pharmacological basis for three main psychological components essential to the parsing of reward and onset of addiction. These were the concepts of learning that included the explicit and implicit knowledge produced by associative conditioning and cognitive processes, an affect or emotion such as implicit 'liking' and conscious pleasure associated with the experience of the drug, and motivation; suggested as the implicit incentive salient 'wanting' and the accompanying cognitive incentive goals. Essentially, this three way split revealed that learning (Dews schedules of reinforcement), craving (the perceived effect of the drug) and habit (Dews patterns of behaviour) were the major contributing and operating factors in the role of addiction.

Examining these three essential components, Franken (2003) was able to discern an attentional bias that indicated the need for relevant clinical approaches and treatments. It was concluded that cognitive processes would mediate between the drug stimulus or craving and the subject's learned response to the stimulus and subsequent behavioural response (e. g., drug use, relapse). It was revealed that a conditioned drug stimulus produced an increase in dopamine levels in the corticostriatal circuit, in particular the anterior cingulate gyrus, amygdala, and nucleus accumbens, which in turn served in drawing the subject's attention towards a perceived drug stimulus. This process resulted in a motor preparation and a hyper-attentive state towards drug-related stimuli that, ultimately, promoted further craving and relapse. This meant that craving was induced by stimuli rather than by a depletion of drug within the body's circulation or the adherence to a schedule. The implications of this are that a person surrounded by stimuli is

more likely to be susceptible to the biological onset of craving and subsequent abuse or relapse than those who are dependent upon a schedule of reinforcement and behavioural pattern.

In subsequent research, the effects of a drug upon the user were tested against two groups; those of long term use and those of relatively short term use, in an attempt to see if there was a difference in the variation of tolerance, both cellular and behavioural. In a study conducted by Koob (2005) the immediate effects of drugs were compared to those observed after long-term exposure to see what role tolerance played. A neurobiological basis for drug dependence was proposed from the linkage between the cellular and behavioural effects of these drugs and the tolerance towards them. This meant that there was an inter-relation between behaviour and drug effect that could indicate drug dependence and subsequent treatment strategies.

Although there appears to be a relationship between the behaviour patterns of drug taking and a neurobiological basis for drug dependency that may indicate areas of potential treatment and areas of potential relapse and abuse, it would appear that this is based primarily on a system of perceived reward. However, earlier research has indicated a system that does not depend upon reward. Research by Koob et al (1998) suggested that it was drug 'seeking' that was associated with activation of reward neural circuitry. Whereas, drug addiction in its entirety involved a 'dark side' defined as a decrease in the function of normal reward-related neuro-circuitry and persistent recruitment of anti-reward systems, drug abuse did not. They proposed that understanding the neuroplasticity of this dark side of the <https://assignbuster.com/brain-mechanisms-controlling-drug-addiction-reinforcement/>

circuitry could be the key to understanding the vulnerability to addiction. This research can be seen as a way of indicating the effectiveness of the potential to relapse after the successful treatment for drug addiction as well as a way of determining the neurobiological potential for drug addiction.

> From these studies, we can see that drug addiction is linked to the neurobiological system of the brain that in conjunction with environmental factors such as stimuli, behavioural factors such as schedules, and cognitive factors such as reward, can be identified and treated through the addressing of reinforcements and their relation to cravings and dependency.

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