Brain Research Reviews

Volume 18, Issue 3, Septemberâ€“December 1993, Pages 247-291

Full-length review

The neural basis of drug craving: An incentive-sensitization theory of addiction

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https://doi.org/10.1016/0165-0173(93)90013-P

Abstract

This paper presents a biopsychological theory of drug addiction, the â€˜Incentive-Sensitization Theoryâ€™. The theory addresses three fundamental questions. The first is: why do addicts crave drugs? That is, what is the psychological and neurobiological basis of drug craving? The second is: why does drug craving persist even after long periods of abstinence? The third is whether â€˜wantingâ€™ drugs (drug craving) is attributable to â€˜likingâ€™ drugs (to the subjective pleasurable effects of drugs)? The theory posits the following.

1. (1) Addictive drugs share the ability to enhance mesotelencephalic dopamine neurotransmission.

2. (2) One psychological function of this neural system is to attribute â€˜incentive salienceâ€™ to the perception and mental representation of events associated

salienceâ€™ to the perception and mental representation of events associated with activation of the system. Incentive salience is a psychological process that transforms the perception of stimuli, imbuing them with salience, making them attractive, â€˜wantedâ€™, incentive stimuli.

3. (3) In some individuals the repeated use of addictive drugs produces incremental neuroadaptations in this neural system, rendering it increasingly and perhaps permanently, hypersensitive (â€˜sensitizedâ€™) to drugs and drug-associated stimuli. The sensitization of dopamine systems is gated by associative learning, which causes excessive incentive salience to be attributed to the act of drug taking and to stimuli associated with drug taking. It is specifically the sensitization of incentive salience, therefore, that transforms ordinary â€˜wantingâ€™ into excessive drug craving.

4. (4) It is further proposed that sensitization of the neural systems responsible for incentive salience (for â€˜wantingâ€™) can occur independently of changes in neural systems that mediate the subjective pleasurable effects of drugs (drug â€˜likingâ€™) and of neural systems that mediate withdrawal. Thus, sensitization of incentive salience can produce addictive behavior (compulsive drug seeking and drug taking) even if the expectation of drug pleasure or the aversive properties of withdrawal are diminished and even in the face of strong disincentives, including the loss of reputation, job, home and family. We review evidence for this view of addiction and discuss its implications for understanding the psychology and neurobiology of addiction.

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Keywords

Drug addiction; Brain; Dopamine; Incentive motivation; Sensitization; Neuroadaptation; Nucleus accumbens; Striatum

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