Rewarding and Aversive Effects in Drug Addiction

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Abstract

Accumulated evidence has shown that the rewarding effect of drug addiction is the most highlight topic regarding this problem. Rather, the aversion of abused drugs is the line of less research. The review focuses on how to balance of aversion and reward and then produce approaching or avoiding behaviors in drug addiction. Moreover, according to the Pubmed database, it was shown that the percentages of the reward learning or aversive learning for drug addiction. Research withdrawal symptoms appeared the most amounts of aversive studies in drug addiction. The conditioned place preference task revealed the most amounts of rewarding research in drug addiction. In conclusion, the aversion as well as reward of abused drugs is important to form the addictive behavior. Understanding the mechanisms of aversion and reward could help us to develop novel interventions.

Keywords: Drug addiction; Reward; Aversion; Paradoxical Effect; Experimental Animal; Morphine

The importance of reward and aversion in drug addiction

Drug addiction is an essential topic for the fields of psychology and neuroscience. However, a lot of studies related to drug addiction focus on the reward process or reinforcement [1-3]. Previous studies focusing on the neurobiological processes generally examined the mesolimbic dopamine system in rewarding effect of drugs of abuse. The ventral tegmental area projecting to the nucleus accumbens, the hippocampus, and the amygdala have been highlighted in the textbook [4] and abusers with addiction exhibited the hyperactivity in each neural substrate through the mesolimbic dopamine system [5]. However, the possible pathways driven by aversion are still unclear, and just a few studies investigated them.

According to these works, the balance of reward and aversion changes the magnitude of drug addiction [6], showing that understanding the behavior and the neural mechanisms for aversion and reward of abused drugs in addiction might be an alternative approach to examine the drug addiction.

Rewarding vs aversive measurements in drug addiction for the animal model

After reviewing the papers related to drug addiction, opiates addiction is the most amounts of publications and investigations. For opiates addiction, the measurement of reward and aversion in behavior can be divided into the rewarding tasks including drug self-administration and conditioned place preference tasks. The aversive tasks include withdrawal symptoms, conditioned place aversion, and conditioned taste aversion tasks.

Reward in drug addiction: drug self-administration and conditioned place preference paradigms

As reviewing the crucial medical database Pubmed during 1970 - 2019, it was found that the reward and drug addiction research occupied 13.45% for all papers related to reward and aversion of morphine addiction. CPP research has 21.77% of all studies related to

drug addiction in morphine's reward and aversion learning. Obviously, the most amounts of the rewarding learning for drug addiction are the drug self administration for the animal model of morphine.

Aversion in drug addiction: withdrawal symptoms, conditioned place aversion, and conditioned taste aversion paradigms

On the other hand, the withdrawal symptoms induced by morphine are the most popular studying topic in morphine addiction. The task of the withdrawal symptom of the animal model has 56% for the reward and aversion of morphine for drug addiction. Interestingly, there was a little research to examine the aversive effect of morphine using the conditioned place aversion or conditioned taste aversion tasks. The research of the conditioned place aversion task occupied 5.38% for all reward and aversion research of morphine addiction. Even though, the conditioned taste aversion research has only 2.35% for reward and aversion learning for morphine addiction. Therefore, for morphine addiction, the studies of morphine-induced withdrawal symptoms are the most amount of research in drug addiction. Except for the withdrawal symptoms, the aversive effect of morphine is rather less than that of morphine's rewarding effect.

Conclusion

Morphine produces conditioned place aversion, conditioned taste aversion, and withdrawal symptoms; moreover, morphine induces reward in the drug self-administration and conditioned place preference. The paradoxical effect-reward and aversion can be obtained at the same time. Understanding the neural mechanism as well as the behavior mechanism is important to develop novel interventions. The balance between reward and aversion induced by morphine may be an important milestone for further studies aimed to investigate more deeply this problem, even when it could be caused by other drugs.

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