

Virtual reality illuminates the power of opioid-associated memories

The brain acts differently when remembering environments associated with drug use

The number of drug overdose deaths in the US has never been higher. Most of those deaths—68 percent in 2017—have involved opioids. An estimated 10 million Americans aged 12 and older misused opioids in 2018.

Insights from virtual reality experiments could help break the cycle of addiction, suggests new research from Washington University School of Medicine, St. Louis.

Memories associated with drug use, such as where it occurred and who was present, can trigger craving and ultimately relapse. Researchers led by Dr. Sidney Williams, in the laboratories of Dr. Edward Han and Dr. Jose Moron-Concepcion, used virtual reality to study how these memories are made.

Mice playing an immersive virtual reality video game were taught to associate a specific room with morphine. They formed contextual memories of that environment—related to the emotional, social, spatial, or temporal circumstances of an event—that later triggered morphine-seeking behavior.

Certain brain cells called place cells, which are used to make a mental map of the environment, were active at important times during the experiments, the researchers find—and the pattern was different in the morphine-associated room than in a room associated with water rewards. Place cells are in the hippocampus, the part of the brain necessary for contextual memory formation. In these experiments, the investigators saw a surprising decrease in place cells when mice were seeking morphine in the morphine-paired room, but the activity of those remaining place cells became more selective. The brain formed memories of the drug-paired room differently than it did in other rooms, the researchers conclude.

This suggests special neural mechanisms are engaged by drug use which could explain the strength and influence of these memories. The findings also raise the possibility that drug-associated memories could be specifically targeted for disruption to break the cycle of craving and relapse.

Presenter: Dr. Sidney Williams

Media contact: Erin Colladay (ecolladay@acnp.org; 248-808-3445)