



Brain activities and craving in response to gambling and non-gambling cues

What this research is about

Individuals with an addiction experience craving when they are exposed to cues related to their addiction. This is called cue reactivity. For example, images of poker games can lead to craving in individuals with gambling disorder. Research has proposed that the dopaminergic reward pathway is activated in cue reactivity. The reward pathway is involved in brain responses to rewards and motivates people to act in certain ways to get the same rewards. This pathway is altered in individuals with an addiction. The insula may also play a key role in cue reactivity. Recent research has found a connection between the insula and the reward pathway in addictions. Lesions to the insula have also been associated with a reduced urge to smoke in people with nicotine dependence.

This study examined craving and brain activities in response to gambling and non-gambling cues. Gambling cues were tailored to personal game preferences (i.e., slot machines, sports, roulettes). Non-gambling cues included food cues and neutral cues of objects such as furniture and clothing. Past research has found considerable overlap in brain responses to food cues and drug cues. For example, smokers show a decrease in brain responses to food cues and an increase to smoking cues compared to non-smokers. But it is not known if reaction to food cues would be altered in gambling disorder. This study compared craving and brain responses to gambling cues, food cues and neutral cues in men with gambling disorder and healthy controls without the disorder.

What the researcher did

This study involved 19 men who were in treatment for gambling disorder at the National Problem Gambling Clinic in London, UK. It also involved 19 men without the disorder as healthy controls. Those with gambling disorder had been abstinent from gambling for 2 to 120 days before they did the study. Functional magnetic resonance imaging (fMRI)

What you need to know

This study compared brain activities and craving in response to gambling and non-gambling cues in men with gambling disorder and healthy controls. Data from 19 men with gambling disorder and 19 male healthy controls were analyzed. The two groups did not differ in response to food cues or neutral cues. The gambling disorder group had increased activities in the insula and reward pathway after the gambling cues. They also reported greater craving after the gambling cues.

Increased activities in the insula and ventral striatum, particularly the nucleus accumbens, were observed for the gambling disorder group. The nucleus accumbens is part of the ventral striatum, which is involved in the reward pathway. There was also reduced functional connectivity between the nucleus accumbens and the medial prefrontal cortex. Functional connectivity refers to how different regions of the brain become active together during a task. The prefrontal cortex is part of the reward pathway, and its disruption can give rise to addictive behaviour. Participants who had greater craving in response to the gambling cues had decreased functional connectivity between these brain regions.

was used to scan brain activities during cue reactivity tasks. Participants were asked to eat a light meal about 2 hours before the scan.

Four sets of photographs were shown to the participants during fMRI scan. One set included gambling cues tailored to personal game preferences. Fourteen participants with gambling disorder were shown roulette and sports images and five were shown roulette and slot machine images. The healthy controls were matched as closely as possible (15

were shown roulette and sports images, and 4 roulette and slot machine images). The gambling cues also included images of the shop-fronts of bookmakers. Bookmakers are betting shops in UK that offer a wide variety of gambling games. Another set of photographs included neutral cues matched to the gambling cues (e.g., roulette was matched to an image of a touch screen not related to gambling). The third set included sweet food cues, and the final set included neutral cues matched to the food cues (e.g., furniture).

Participants rated their craving to gamble before the scan and after each set of cues. The researchers compared brain responses and craving ratings to different types of cues between the two groups. They also examined functional connectivity in response to different types of cues. Functional connectivity refers to how different regions of the brain become active together during a task.

What the researcher found

The gambling disorder group reported greater craving to gamble after the gambling cues compared to the neutral and food cues. There were no differences in craving ratings for the neutral cues and food cues. Craving was related to length of abstinence. Participants who had abstained from gambling for longer time reported less craving in response to the gambling cues.

Activities in the insula and ventral striatum, particularly the nucleus accumbens, were associated with craving. The nucleus accumbens is part of the ventral striatum, which is involved in the reward pathway. In the gambling disorder group, increased activities in these regions of the brain were observed in participants who reported greater craving after seeing the gambling cues.

In the gambling disorder group, there was also reduced functional connectivity between the nucleus accumbens and the medial prefrontal cortex. The prefrontal cortex is part of the reward pathway, and its disruption can give rise to addictive behaviour. Functional connectivity between these brain regions was tied to craving. Participants with greater craving in response to the gambling cues had decreased functional connectivity between these brain regions.

How you can use this research

This study can be used by treatment providers and researchers to understand cue reactivity in gambling

disorder. The results show that activity in the insula is associated with craving. Treatment providers and researchers may want to explore novel therapeutic approach that targets the insula. Future research can extend this work by comparing problem and non-problem gamblers on cravings and brain activities.

About the Researcher

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Gambling disorder, cue reactivity, craving, fMRI, connectivity

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