Addiction as a hijacked desire

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The fact that addiction is persistent is due to the brain. Or rather the changes in the brain that are the result of the intoxicants entering it via the bloodstream. These intoxication molecules fit wonderfully well on the receptors of neurotransmitters that transmit the nerve signal. Ecstasy means a changed perception of oneself, of others and of the world around. But is that a sufficient explanation for addictive behaviour?

With repeated use - frequency and dose are important - neuroplasticity occurs. The artificial receptor occupation intensifies neuronal activity longer and more powerfully and new connections will form. *What fires together wires together*, is Donald Hebb's well-known mantra. Comparative brain scans show that .....Robins, Volkow, etc., are more likely to be affected by impulse control.

Loss of impulse control can maintain frequent use or hinder abstinence. But these phenomena do not explain the strong craving or craving for the drug. Where does the drive to keep using come from, despite the negative consequences of that addictive behaviour?

Initially, excessive pleasure seeking was the main explanation. Alcohol, tobacco and drugs, but also tranquillisers and painkillers, are known as stimulants. Neurobiologically they have in common that they increase the presence of dopamine in the Mesolimbic reward system, especially in the Accumbens nucleus. This is also the case with GHB and laughing gas, with gambling, but not with the psylocibin from magic mushrooms.

Neuropsychologists, Kent Berridge and Terry Robinson, did not follow this pleasure hypothesis. From experimental animal research, they concluded that two systems are active, each with its own neurotransmitter: endorphins encoding psychological pleasure, "Liking", and dopamine standing for "Wanting". Dopamine encodes desire. In substance abuse, desire artificially increases not pleasure. This hijacked desire ensures that substances are increasingly valued positively and the motivation to use often exceeds the burden they cause.

Dopamine also plays an important role in associative learning or classical conditioning. Dopamine associates the context in which use occurs with use itself. Visiting a café, a coffee shop, a festival, is no longer neutral. It is as if one is already using on the way there. Curbing the behaviour is then difficult or impossible.

Sometimes the desire is so strong that it becomes an urge, but not always. How can this be explained?

Wolfram Schultz studied the dopamine peak that precedes the reward, or in our case the use of drugs. This phasic dopamine peak occurs at signals that are associated with the reward and predict the reward, such as the bell in Pavlov's dog. Salivary secretion is activated in preparation for consumption. Schultz showed that the level of dopamine release differed according to what was predicted from the experience.

The dopamine activity dropped if the reward was the same, i.e. as expected. If there was no reward, the dopamine peak did not occur, but if there was more reward than predicted, the peak was much higher. Thus, desire is controlled by the changing context variables. It is not the dopamine peak that

is rewarding, the dopamine peak precedes the search behaviour for the reward. By responding to the context, the dopamine mechanism encodes economic utility. This motivates us to choose the most reward. Because of the artificial increase in dopamine, addictive substances always seem more rewarding than expected; if they are available, they must be consumed!

A few examples can illustrate this mechanism: A smoker smokes more if he has a larger supply of tobacco. Each subsequent glass of alcohol seems as attractive as the first. Large packs of benzodiazepines or narcotic analgesics lead to more self-medication. It is not only the physical availability that counts, but also the psychological one: extra money at the beginning of the month increases the desire for intoxicants or gambling. Online gambling is more tempting than a lottery because it is so easily available through an app and gives immediate results.

However, Schultz's reward-prediction-error theory also offers a perspective on controlling that urge for substances. If the context suggests that the product is much less available or not available at all, the urge is much less strong, and therefore more controllable.

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