Neurobiological correlates of alcohol-related Pavlovian-to-instrumental transfer and relapse behavior in alcohol dependence: the LeAD study

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Pavlovian-to-instrumental transfer (PIT) is an important phenomenon that may help understanding relapse behavior. Exposure to alcohol-related environments may induce craving and play a causal role in initiating relapses. Drug-associated cues are thought to acquire motivational properties via Pavlovian conditioning and to then control and generate drug-seeking behavior. At a neurobiological level, animal and human studies showed that PIT recruits the mesolimbic dopaminergic reward system including the nucleus accumbens. The research group "Learning in alcohol dependence (LeAD)" (funded by the German Research Council) investigated these learning mechanisms using a PIT paradigm with alcohol-related stimuli during functional magnetic resonance imaging. Here, subjects were asked to conduct an instrumental response (approach or non-approach towards initially neutral stimuli that were rewarded by money) while alcoholic drink pictures were displayed in the background. Here, we report first data of 31 recently detoxified patients, followed up over a period of six months and 24 control subjects. We found that alcohol-related background stimuli inhibited approach behavior in alcohol-dependent patients but not in healthy controls. On a neural level, this effect was associated with a stronger nucleus accumbens activation in the group of patients suffering from alcohol dependence. Crucially, both effects were present in low severe dependent patients and subsequent abstainers but absent in high severe dependent patients and subsequent relapers. The results point to potential resilience factors for relapse in alcohol dependence and will be discussed with respect to possible therapeutical implications.