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Short Communication

Psychoactive Substances Disorders: Neurophysiological Effects and New Findings in Cognitive Replacement

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Abstract

Chronic exposure to psychoactive substances is a severe global public health problem, which associated with comorbidities has caused neurological changes in the long term. Cognitive alterations occur mainly in inhibitory or executive control, working memory or visuospatial abilities, related to the severity or time of use of illicit drugs and alcohol. Although it is an approach explored in the medical field, it is still unclear in the literature to what extent the disorders of the use of psychoactive substances can cause neurophysiological effects in the long term and how the cognitive rehabilitation can minimize these alterations of the circuits neural. From that, we conducted a review of the Pubmed, Medline and Lilacs databases. The literature shows that cognitive impairment may affect treatment since lower executive function and memory deficits are associated with less readiness to change drinking behavior. Thus the association of psychosocial therapies with cognitive rehabilitation becomes necessary.

Keywords: *Drug Abuse; Cognitive Dysfunction; Cognitive Rehabilitation*

Disorders of the use of illicit psychoactive substances and alcohol are public health problems worldwide [1]. Many of those with alcohol use disorder also have drug use disorders and vice versa. Furthermore, comorbidities between substance abuse/alcohol and other psychiatric disorders occur in at least 50% of users, being anxiety, mood disorders and antisocial personality disorder the most prevalent comorbidities [1]. Dependent people are also more likely to exhibit behavioral changes, such as impulsivity, risk-taking, and decreased motivation for activities, even after periods of drug withdrawal. It suggests that chronic drug use induces long-term changes in neural circuits [2].

Patients are undergoing treatment for illicit substance use show changes in cognitive functions, such as inhibitory or executive control, working memory or visuospatial skills, in which cognitive impairment is related to the duration and severity of dependence, showing that the greater for cognitive impairment, the weaker the results of treatment [3]. Chronic exposure to psychoactive substances is related to lasting changes in the function of nervous system structures. It including nucleus accumbens, deficits in the role of the dopaminergic system, changes in glutamate release and reduced integrity in grey matter in several distinct regions of the brain, including the prefrontal cortex, insula, thalamus, cerebellum, hippocampus [2,4-6].

The Ventral Striatum nucleus accumbens (NAc) is involved in assigning importance to signals paired with the drug which in turn can modulate the reward experience related to behavior or sensations. The principal NAC cells are GABAergic projection neurons that receive afferent glutamatergic coordinates from the various cortical and limbic regions of the brain. Fluctuations in excitatory synaptic force and long-term glutamate release in central spiny neurons (MSNs) induced by repeated exposure to drug abuse may be a driving factor behind drug demand and relapse [2,5,7].

Recent studies have shown that cocaine use induces deficits in long-term, possibly permanent, dopamine system function through the dopamine transporter (DAT), where cocaine tolerance is readmitted by minimal drug exposure even after recovery of the DAT function during prolonged periods of abstinence [8]. Another structure of the nervous system involved in the neurophysiological mechanisms of drug abuse is the hippocampus, an essential region for memory function, which may present with dysfunction caused by prolonged ingestion of ethanol [4]. The dorsolateral prefrontal cortex (DLPFC) is an area of the brain considered as the biological substrate of the psychological processes necessary for successful self-regulation. DLPFC stimulation reduces the craving for alcohol. It suggests that DLPFC plays a role in regulating alcohol cravings [7].

A wide variety of treatments for abusive use of alcohol and other drugs have been tried and used in the standard treatment of patients with substance use problems, both pharmacological and psychological. Various alternative therapies have also used, for example, neurofeedback, art-based treatment, yoga, meditation [1] and cognitive rehabilitation, a subject rarely addressed in the literature, but one that becomes necessary in the process of detachment from addiction. Among the psychosocial and behavioral therapies, we can mention the 12-Step Facilitation, brief interventions, Behavioral Cognitive Therapy and Motivational Improvement Therapy [9].

Psychosocial therapies act in an attempt to identify, process, and change thoughts and feelings. Thus, such therapies play a relevant role in the treatment of emotional dysregulation. A standard feature among drug users seen as an aggravating factor for adherence, the individual's persistence in therapy against addiction and may manifest as alexithymia, characterized by a reduced ability to identify and describe emotional states, as well as a life of reduced expectations [10].

Cognitive impairment may affect treatment since lower executive function, and memory deficits are associated with less readiness to change drinking behavior. The development of new brain imaging technologies and behavioral testing approaches has led to substantial progress in understanding the nature and course of alcohol-related neurocognitive impairments. Currently, cognitive rehabilitation encompasses interventions that make use of relatively simple muscle movements, rhythmic breathing exercises, aerobic exercise, meditation, or combined physical and mental interventions to train neurophysiological systems that support cognition, affect regulation, motivation, and resilience to stress. Thus, cognitive rehabilitation is a promising strategy to facilitate neurocognitive recovery, and the best treatment results achieved in the abstinence period where "natural" improvements in cognition will occur [11].

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