

Cognitive Effects of Drug Abuse

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Abstract

There is lack of studies that exhaustively work on the cognitive consequences of psychotropic substance abuse. Literature shows that the most affected cognitive processes because this abuse is learning, memory and cognitive flexibility. Recent data using experimental Psychology tasks have pointed out that consumer population has significantly greater Reaction Times than the non-consumer population in these three cognitive areas. Drug-rehabilitation centers must take into account neurocognitive stimulation within the treatments they offer to this kind of patients.

Keywords: Substance abuse; Neuropsychology; Cognitive impairment; Learning; Memory; Cognitive flexibility; Mental footnotes

Introduction

The necessity of quantitative methods of measuring, Recreational drugs is the major cause of impairing the Central Nervous System (CNS; World Health Organization [WHO], 2005); altering both consciousness [1] and behavior [2]. The influence of drugs on the CNS materializes through the drug's action mechanisms on neurotransmitters and neuromodulators, such as [3]:

- a) Nicotine, on nicotinic acetylcholine receptors;
- b) Alcohol, on gamma-amino butyric acid (GABA) and glutamate N-methyl-D-Aspartate (NMDA) receptors;
- c) Marijuana, on cannabinoid receptors1 (CB1R);
- d) Morphine and heroin, on endorphins (EDFs); and
- e) Amphetamines, methylphenidate and cocaine, on the active dopamine transporter (TAD).

The high-level cognitive functions reside on the cerebral cortex [1]. Cognition is the ability of acquiring, storing, retrieving and using knowledge [4]. In this sense, substance use and abuse are para-normative manners of altering the neuronal systems that underlie cognitive functions. In other words, drugs alter "functional systems" [5]. Among these functions, learning is defined as the relatively permanent change in the behavior from the experience [6]; knowledge, strategies, skills, beliefs and attitudes are implicit in the definition. Substance abuse makes it slower the performance of this cognitive process [7]. On the other hand, memory is the capacity of the CNS for encoding, storing, organizing, or retrieving information [8]. Specially, in the consumption of marijuana [9], this cognitive

function is affected. Likewise, compulsive alcohol consumption is related to alterations on executive functions such as planning, self-regulation, impulse control and decision making [10].

The so-called executive functions are the most complex functions performed by human beings [6]. These highest-level functions are supported by the interaction of nuclei located in the prefrontal cortex. In general terms, the prefrontal cortex facilitates the adaptation of the human being to new situations. In this sense, cognitive flexibility is the ability to change criteria in monitoring strategies for performing tasks [11], by restructuring the "mental footnotes" [12-14] associated to those contexts. Executive functions are the most sensitive functions to the impairment produced by recreational drugs [15]. When environments change, human beings need to inhibit the automatic responses, which are evoked in their cognitive systems, and carry out more adaptive behaviors [11]. Cognitive flexibility allows subjects to select new strategies to develop a task [6]. In measuring cognitive impairment, the studies in the literature mainly use questionnaires [3,4,6,7,15-21]. Nowadays, there is a new tendency [22-27] to use quantitative methods (by using experimental Psychology tasks) for evaluating cognitive damage. By using Reaction Times (RTs), it is possible to quantify the differences more sensitively and to test the level of impairment between cognitive functions.

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