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Correlation between attention and memory skills by NEUROPSI in patients attending the AA rehabilitation center

Correlación entre las habilidades para la atención y la memoria mediante NEUROPSI en pacientes que asisten al centro de rehabilitación AA

RON-GONZÁLEZ, Osmara Valeria†, ONTIVEROS-VARGAS, Angel Adrian, SOTO-RIVERA, Jesús Abraham and SALAS-NAME, Sagrario Lizeth

Universidad Juárez del Estado de Durango, Facultad de Psicología y Terapia de la Comunicación Humana, México.

ID 1st Author: *Osmara Valeria, Ron-Gonzalez* / **ORC ID:** 0009-0009-8652-5767, **Researcher ID Thomson:** HNV-7651-2023, **CVU CONACYT ID:** 1280502.

ID 1st Co-author: *Angel Adrian, Ontiveros-Vargas* / **ORC ID:** 0000-0003-1321-0990, **Researcher ID Thomson:** 3055407, **CVU CONACYT ID:** 1003209

ID 2nd Co-author: *Jesús Abraham, Soto-Rivera* / **ORC ID:** 0000-0002-9154-6978, **Researcher ID Thomson:** X-3314-2018, **CVU CONACYT ID:** 954357

ID 3rd Co-author: *Sagrario Lizeth, Salas-Name* / **ORC ID:** 0000-0002-1282-626X, **Researcher ID Thomson:** X-9347-2018, **CVU CONACYT ID:** 639389

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Abstract

Attention and memory are the main neuropsychological functions which serve to develop learning in humans. These intellectual and cognitive faculties are essential to achieve goals or not during daily life. Objective: to identify the correlation between attention and memory neurocognitive skills, with the help of the NEUROPSI Neuropsychological Battery in patients attending "AA" rehabilitation centers. Methodology: This study is exploratory, non-experimental, observational, cross-sectional and correlational with a descriptive statistical analysis. Contribution: in the present study the following results were found: regarding Pearson's correlational analysis between attention and alcohol consumption, a moderate positive significance was found with r=.50, p=.52 and with a reliability of 0.01 which indicates that the greater the consumption of alcohol, the greater the alteration of the ability for attention and concentration. And in terms of memory, it was found that the greater the consumption of alcohol, the greater the alteration of the ability for visual memory with an r=.53, a p=.55 and with a reliability of 0.01.

Neurocognitive Functions, Neuropsychological evaluation, NEUROPSI, Addiction

Resumen

La atención y la memoria son las principales funciones neuropsicológicas las cuales sirven para desarrollar el aprendizaje en el ser humano. estas facultades intelectuales y cognitivas, son primordiales para lograr metas o no durante la vida diaria. Objetivo: identificar la correlación entre las habilidades neurocognitivas atención y memoria, con ayuda de la Bateria Neuropsicológica NEUROPSI en pacientes que asisten a centros de rehabilitación "AA". Metodología: El presente estudio es de tipo exploratorio, no experimental, observacional, transversal y correlacional con un análisis estadístico descriptivo. Contribución: en el presente estudio se encontraron los siguientes resultados: en cuanto al análisis correlacional de Pearson entre atención y el consumo de alcohol, se encontró una significancia positiva moderada con una r=.50, una p=.52 y con una confiabilidad de 0.01 lo cual indica que a mayor consumo de alcohol mayor alteración de la habilidad para la atención y concentración. Y en cuanto a la memoria, se encontró que a mayor consumo de alcohol mayor alteración de la habilidad para la memoria de tipo visual con una r=.53, una p=.55 y con una confiabilidad de 0.01.

Funciones neurocognitivas, Evaluación neuropsicológica, NEUROPSI, Adicciones

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† Researcher contributing as first author.

Introduction

The studies that have been carried out in the field of cognitive neurosciences have opened up the possibility of making great strides towards a more precise structure in terms of drug rehabilitation treatment. At the same time, this has given mental health professionals an understanding of the way in which the neurological alterations presented by drug-taking patients have gradually opened up new fields of research.

Within these studies it has been found that the problem of substance use, specifically "drugs", is extremely complex as the use and maintenance of addictions is multifactorial, meaning that different contexts are associated with the patients' lives. These factors can be: Family, work, social, emotional, medical, etc. problems.

However, in spite of the great advances that neurology has achieved, there are still several studies in progress which seek to provide answers to all these problems in order to generate an increasingly effective treatment for the rehabilitation of these patients with addictions.

The neuropsychological alterations caused by drug use are many and all of them have to do with the deterioration of memory and attention, which are executive functions considered superior because of their importance and how essential they are for carrying out executive, behavioural and decision-making functions.

For this reason, the research focuses on investigating what happens at a cognitive level when there is or has been drug use.

Rationale

Cognitive skills are essential for the challenges we face on a daily basis as human beings, since it is through them that we make decisions, interpret intentions, generate options, determine the consequences of our actions and have a broad critical thinking.

William James (1890) defined attention as "the taking possession of the mind in a clear and vivid way of several simultaneous objects or trains of thought".

If this selectivity did not exist, all this information would be of a great magnitude and would be totally disordered and therefore no activity would be possible. Within conscious activity, the selection of fundamental processes takes place.

Mnemic processes are highly complex, as they involve a wide repertoire of neural structures in the brain, from the cerebral cortex to the cerebellum. (Portellano, 2005).

Drug use is well known to slightly or severely damage brain connections, which leads to a significant deterioration in attention and memory, for example, the use of inhalants has been shown to affect memory, concentration and motor perceptual difficulties and disorientation. It has also been found that there is a correlation between context and age for a person to start using addictive substances.

Problem

Drugs are addictive substances within which there are two main types: "legal" drugs such as alcohol and tobacco, and "illegal" drugs such as cannabis, cocaine, heroin, etc.

The effects produced by these drugs are carried out within the central nervous system and their direct effects are: Inhibitory, excitatory, narcotic or hallucinogenic. These involve the participation of neurotransmitters such as dopamine in brain functioning.

Drugs are also often classified as hard or soft, depending on their rapid addictive potential, however, this classification is no longer used today.

The World Health Organisation defines "addiction" as a global health problem due to high drug use and its repercussions (WHO. 2004).

Neuropsychological assessment helps to find and define specific characteristics in people with addictions, and makes it known that the use of addictive substances causes long-term or short-term damage. In this way, strategies for the rehabilitation of these patients are organised.

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Drug and alcohol abuse is closely linked to the development of mental illnesses mainly linked to cognitive impairment leading to brain problems such as dementia especially in patients with other types of pathology.

Hypothesis

Ho: "attention and memory are not affected in drug rehabilitation patients".

Hi: "attention and memory are affected in drug rehabilitation patients".

Objectives

General objective

To find out the correlation between attention and memory using the NEUROPSI test in patients undergoing rehabilitation in "AA" centres.

Specific objectives

- To identify the current state of neurocognitive functions using Neuropsi in patients in "AA" rehabilitation.
- Prevalence of the substances most used by patients with drug dependence.
- To find out the relationship between substance use and the alteration of neurocognitive functions.

Theoretical framework

Background

The use of psychostimulants over time has been linked to a large number of problems and alterations in the Central Nervous System, which has been demonstrated in different studies.

Drugs have different classifications, but CEDRO (2018) organises them by their effects and consequences on the central nervous system: Stimulant Drugs: which are those that increase the sensitivity of the nervous system and are divided into two types; 1) Major Stimulants such as Cocaine, PBC, Amphetamines and Bronchodilators. 2) Minor stimulants: Nicotine, caffeine and alcohol. Depressant drugs: Inhalants; Terokal, Gasoline and Benzine. Hypnotics; Sleeping pills and sedatives. Anaesthetics; Pain relieving tablets. Opiates; Heroin, Morphine and Methadone (Portugal Fárfan & Vallejos Fernández pp. 23-24).

Cognitive impairment is currently seen more and more in young people, which is attributed to the consumption of drugs and substances harmful to health, which cause damage and lesions at the neuronal and cerebral level that are irreparable.

Human beings have capacities and faculties to organise, inhibit, plan, monitor our behaviour and be flexible when faced with novel situations (Echeverria, 2017, p. 238).

However, memory and attention, which are higher cognitive functions that help us plan and organise our behaviour, are severely affected by the consumption of addictive substances. This impairment is shown as the difficulty to have an adequate behaviour hindering its inhibition (Portugal Fárfan & Vallejos Fernández pp. 23-24).

Attention

Attention" is defined as the process of selecting information, it is the consolidation of action programmes that in a certain way are chosen and maintained.

Attention is made up of: Volume: is the number of signals that transmit and make flowing associations that can be sustained in the centre of an intelligent consciousness, establishing a dominant character.

Stability: The permanence with which salient processes retain their dominant character.

Oscillations of attention: These have to do with the cyclical character of the process by means of which we specify contents of all conscious activity, they also acquire dominant value or lose it.

And the factors that determine attention are: orientation, volume and stability of attention, and store the relationship with the structural factors of perception. Another external determinant of the sense of attention is the novelty of the stimulus.

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And the internal factor depends on the subject's own activity. To this group of factors belongs the influence of the subject's needs, interests and dispositions, as they affect his perception and the course of his activity.

There are two types of attention: voluntary: this is where the human being decides what he/she wants to pay attention to. And the involuntary: this type of attention has to do with external stimuli, how intense and interesting they seem to us in order to capture our attention without first asking for permission.

Psychic processes are inherent and can only be carried out by the awake state of the cortex, which has an optimal level of activation. We have then that the activating reticular formation consists of two subtypes or levels, one ascending and one descending, where the function of the ascending reticular system is the activation of the cortex and the regulation of its state of activity. It is responsible for delivering activation information to the cortex.

This is of great importance, since it is through this system that the selective excitation systems that initiate in the cerebral cortex reach the brainstem nuclei and are the result of the higher forms of human conscious activity.

The activating reticular system is made up of ascending and descending fibres, which in turn form a neurophysiological apparatus underlying what we call the orientation reflex.

This is any kind of unconditioned reflex, manifested by a series of electrophysiological and motor reactions which are always present.
It refers to the way in which we move and perform an activity and become aware of it.

Verbal instruction or verbal signalling

In order to maintain attention in an activation and for it to last for a long time, it is necessary to give verbal instruction so that the person does not lose attention in this indication, an example of a technique called mindfulness comes to mind, where the moderator or therapist gives indications and repeats them constantly, which does not allow the person to lose attention to what is being worked on in the exercise.

Aleksander Luria (1962) highlighted selectivity and permanence as essential characteristics of attention; in this way he conceived attention as the factor responsible for extracting the essential elements for mental activity, the process that maintains vigilance over the course of mental activity.

Memory

It is the imprinting, retention and reproduction of traces of previous experience (Briefs of Human Behaviour, 1994).

Memory is a neurocognitive function that makes it possible to record, encode, consolidate, retain, store, retrieve and recall previously stored information (Portellano, 2005).

Neurophysiological aspect of memory

In Breviarios de conducta humana of 1994, Lorente de No and McCulloch established the existence in the cerebral cortex of structures that allow excitation to circulate for a long time in closed circuits. One of the bases of this study was that it was already known that in the axons of single neurons there are branches that return to the body of the same neuron and connect directly with it and do so with certain dendrites of the same neuron, thus creating the basis for the permanent circulation of excitations within closed circular chains or reverberating circuits of excitation. However, there is reason to believe that in the nervous system there are also certain more complex structures of neuronal networks in which stable excitatory reverberation circles function. These structures are functional complexes of neurons, linked together by other "intercalary" neurons, where their function is to transmit excitation from one neuron to another, ensuring the long-lasting flow of excitation through networks of greater complexity or "reverberant circuits".

The neurophysiological basis of short-term memory is reverberant circuits, according to some researchers. On the other hand, ribonucleic acid makes a specific modification when the same stimulus is followed, which has served as a basis for researchers to suppose that it constitutes the biological seat of memory (Briefs on Human Behaviour, 1994).

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Thus, we have that short-term memory is based on the movement of the excitation of the reverberating circuits and long-term memory on the growth of the axodendritic apparatus of the neuroglia, and perhaps the formation of new synapses, although it has not yet been demonstrated, but all the studies are directed towards this.

Short term memory

It is the process of initial retention of information for a short period of time ranging from a few fractions of a second to several minutes, although some authors place the time limit of short-term memory at 30 seconds (Portellano, n.d.).

Long-term memory

It is the ability to retain information for longer periods of time or permanently. It also refers to the ability to recall information after an interval of time in which the subject has focused his or her attention on another task. It allows us to encode, store and retrieve information and has a theoretically unlimited capacity, since throughout life we can continue to carry out successive learning processes such as riding a bicycle or learning new languages. (Portellano, 2005).

Sensory memory: this type of memory makes immediate recognition through our senses.

Short-term memory or immediate memory: this basically encodes information with linguistic characteristics. This temporary storage can last from hours to weeks.

Long-term memory: this is a permanent storage, where memories are stored. It is divided into 3 types of memory:

Semantic memory: refers to our knowledge of the world, it helps us to know the meaning of things, their function and characteristics.

Episodic memory: stores all those memories of our past.

Procedural memory: used to store the learning of specific skills, e.g. writing, walking, reading. These are behaviours that have already been assimilated by the subject and are supposed to be done autonomously without stopping to think about how to do them.

Working memory

It is made up of three components:

Phonological cycle: the material is stored according to its phonological characteristics.

Visuospatial sketch: has the capacity to store the spatial and visual properties of limited amounts of information.

Central executive: this space is where attention, coordination and filtering of information by means of long-term memory are allocated, and where information retrieval strategies, logical reasoning and arithmetic calculations are applied (Baddeley, 2000; Baddeley and Hitch, 1974).

In order to understand what memory is, it is necessary to emphasise that the following three stages are necessary to have a memory:

1.- Recording the information so that it then passes into short-term memory (Shiffrin and Atkinson, 1969).

Retention: is the association of information concepts.

Retrieval: is where information is transferred to the conscious long-term memory.

Amaral et al. (2012) carried out a study establishing the difference between cocaine and cannabis addicts, and it was determined through their evaluation that there are relevant neurocognitive deficiencies in the deterioration of attention capacity, working memory, speed of thought processing, inhibitory control and decision making, compared to cocaine addicts only, resulting in greater difficulty in mental flexibility.

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Other research found that: People who consumed depressants and stimulants showed more difficulty and worse performance in activities related to decision-making, planning and mental flexibility; the results showed that this situation is closely related to the time of consumption (Álvarez, et al. 2008 p. 22).

Cognitive impairment due to drug use

The effects of drug use on people end up developing alterations in all their executive functions, which hinder the ability of individuals to inhibit themselves and avoid using drugs. However, it should also be taken into account that for a recovering addict the deprivation of these substances will bring about behavioural and physiological changes which are presented as deficits in executive functions.

According to Corral and Cadaviera (2002), neuropsychological affectations, physiologically speaking, are present in the perceptual-motor, visuospatial, memory and executive functions; these alterations occur in most cases of drug addiction and are correlated with different deficits in the structures and their functions.

There are some experimental studies with rodents described by Nestler (2001) where it has been proven that the acute administration of psychostimulants such as alcohol and opiates leads to an increase in the activity of the dopaminergic reward system, which in the most vulnerable individuals results in the onset of addiction.

NEUROPSI

Brief Neuropsychological Assessment in Spanish.

It is a tool used in neuropsychology, it is reliable and its main objective is to estimate a wide range of neurocognitive functions in geriatric, neurological, psychiatric patients, or patients with various medical problems. The application time is approximately 25 to 30 minutes.

The scoring method provides very specific qualitative and quantitative information. The data obtained independently for each cognitive ability gives an individual profile in which the few or many skills that the person has are highlighted. The areas evaluated in the test are orientation, attention and concentration, memory, language, visual-constructive processes, executive functions, reading, writing and calculation.

Likewise, this neuropsychological evaluation test has different ranges of age and schooling, the ages are from 16 to 30, 31 to 50, 51 to 65 and 66 to 85 years, and the schooling is from 0, 1 to 4, 5 to 9 and more than 10 years of study (Ostrosky, et al. 2000).

Research methodology

The present study is exploratory, non-experimental, observational, cross-sectional and correlational with descriptive statistical analysis.

The complex variables of attention and memory were analysed to determine the correlation between these neurocognitive functions, as well as the signal variables: age, gender and schooling.

Likewise, for the statistical study of the population characteristics, measures of central tendency and dispersion were used.

Inclusion criteria were considered to be patients who attended the alcoholics anonymous first of May group in Durango, Dgo, who wished to participate in the study and had signed a previous letter of informed consent, therefore those patients who did not wish to participate were excluded; as an elimination criterion, those patients who decided to withdraw their informed consent at any time during the evaluation, or those who still had active drug use were discarded; due to this criterion, 3 cases were eliminated, leaving a total of 20 valid cases.

Procedure

Participants were patients who attend a 24-hour alcoholics anonymous group called Primero de Mayo in the city of Durango. Data collection was carried out during the period of September 2020, culminating at the end of September of the same year.

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Informed consent was obtained after signing the informed consent form in accordance with the official Mexican standards 004-ssa3-2012 on clinical records and 040-ssa2-2004 on information, and the instruments for data collection and interpretation of the results were applied.

For the study of neurocognitive functions in the patients, the NEUROPSI BRIEF neuropsychological evaluation was used, which is a brief, reliable and objective instrument that allows a broad spectrum of cognitive functions to be evaluated.

It consists of 6 sections that evaluate neuropsychological functions, which are the orientation section with 3 items, attention and concentration with 3 items, the memory section with its sub-sections of encoding and recall memory which consist of 5 items between the two sub-sections, the language section consists of 5 items, the reading and writing section consists of 3 items and finally the section of conceptual and motor executive functions which consists of 7 items.

Rated by the following values: high normal, normal, moderate and severe. Each item is rated according to each sub-area and according to the age range and level of schooling of each subject assessed.

The identification of the signalistic variables and academic performance (gender, age and school average) was obtained through the application of a clinical survey.

Statistical analysis of the information obtained was carried out using Excel software.

Results

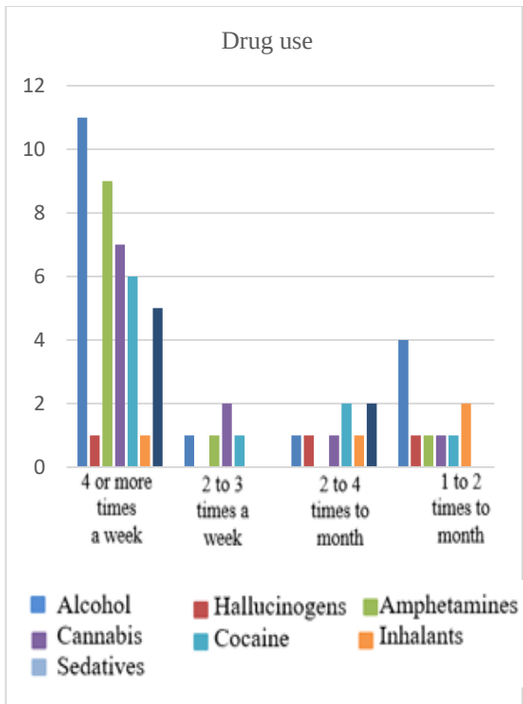
The sample consisted of 20 participants who attend the 24-hour Alcoholics Anonymous group "Primero de Mayo", of whom 3 (15 %) were women and 17 (85 %) were men. The average age of the participants was 33 years, with a minimum of 20 years and a maximum of 69 years. The educational level of the persons who participated in the evaluation was: 4 persons finished primary school, 8 persons finished secondary school, 6 persons finished high school and 1 person finished university.

In order to find out the percentage of people who used drugs and how often they were used, a survey was carried out, which was found in the clinical history, asking what type of substances each person used and how often they were used.

The results showed that the most frequently used substances 4 or more times a week were alcohol, the most used substance by 11 people, followed by amphetamines in second place, the most used substance in a week by 9 people, and the least used substances in a week were hallucinogens and inhalants.

The substances consumed less frequently, between one and two times a month by the people evaluated, continues to be alcohol, which is still in first place, with 4 people using alcohol between one and two times a month, followed by inhalants, with two people using inhalants only a few times a month, while all the other substances such as hallucinogens, amphetamines, cannabis and cocaine are all consumed less frequently.

The following graph 1 shows the drug use of the persons assessed, which was obtained from the clinical history taken before starting the assessment.



Graphic 1 Drug use

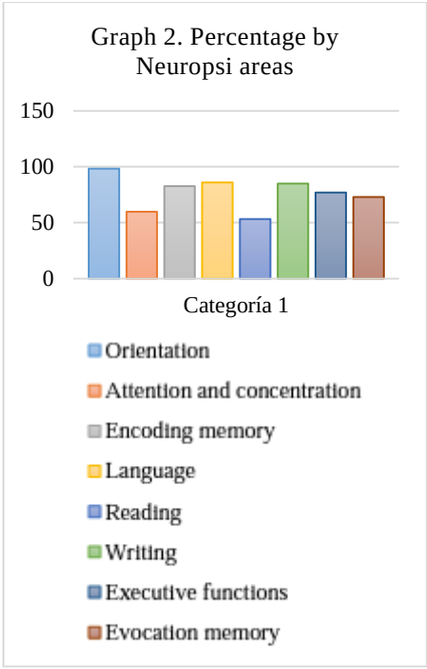
The results obtained from the NEUROPSI neuropsychological evaluation were obtained thanks to all the areas and sub-areas evaluated. We can see that the highest percentage was 40% of people with a normal result, followed by 15% with a mild result, 25% with a moderate result and finally 20% with a severe result, thus adding the mild, moderate and severe results, we have that 60% of the population has alterations of neurocognitive functions (see table 1).

	Persons	Percent
Normal	8	40 %
Mild	3	15 %
Moderate	5	25 %
Severe	4	20 %

Table 1 NEUROPSI Results

The reliability of the results obtained by means of the brief neuropsychological battery in Spanish NEUROPSI was 0.05, which is a good reliability value. Likewise, by means of the parametric student t-test used in the study, it was possible to identify the relationship between the data obtained; the greater the consumption of toxic substances harmful to health, the greater the affectation of neurocognitive functions, mainly in the areas of attention and concentration, memory, executive functions and reading.

Graph 2 shows the results obtained in the areas assessed using the Neuropsi neuropsychological battery. According to the score of each evaluation: arranging the percentages from highest to lowest score, first is orientation with 98.33 % of correct answers, followed by language with a percentage of 86 %, writing with 85 %, coding with 82.7 %, executive functions with 77 %, recall memory with 73 %, attention and concentration with 59.81 % and in last place is reading with 53.3 %.



Graphic 2 Percentage by NEUROPSI áreas

Correlational analysis

Next, regarding the Pearson correlational analysis between attention and alcohol consumption, a moderate positive significance was found with an r=.50, a p=.52 and a reliability of 0.01, which indicates that the higher the alcohol consumption, the greater the alteration in the ability to pay attention and concentrate.

	Average	Anxiety score
Correlation of Pearson		.50*
Sig. Bilateral		.52
N.	20	20
*Correlation is significant at the 0.01 level (bilateral).		

Table 3 Correlation between attention and concentration and alcohol consumption

In the following Pearson correlational analysis, between memory and alcohol consumption, a moderate positive significance was found with an r=.53, a p=.55 and a reliability of 0.01, which indicates that the higher the alcohol consumption, the greater the impairment of visual memory ability.

	Average	Anxiety score
Correlation of Pearson		.53*
Sig. Bilateral		.55
N.	20	20
*Correlation is significant at the 0.01 level (bilateral).		

Table 2 Correlation between visual memory and alcohol consumption

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Conclusion

This study is related to what Cooper-Kahn (2009) mentions since he postulates that the skills that are out of control due to drug use are: inhibition, mental switching, emotion control, initiation, working memory, planning, self-control. And in this research we found that, according to the high consumption of addictive substances in this population, there is a 60% damage in terms of neurocognitive functions. Thus, it was found that the degree of consumption of toxic substances harmful to health is indeed linked to the damage it causes directly to neurocognitive functions: attention and concentration, memory, executive functions and reading.

The main consumption of addictive substances found in the "Primero de Mayo" Rehabilitation Centre was the following.

According to Pearson's correlation, it was found that the greater the amount of alcohol consumed, the greater the alteration in the superior abilities of attention and memory, where concentration is primarily affected in attention and visuospatial memory is damaged in attention.

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