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ORIGINAL RESEARCH

Development of a model of brain function change based on treatment of heterogeneous hemispheres on the depression of addicts

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Abstract

Objective: The aim of this istudy is to determine the model of brain function change based on treatment of heterogeneous hemispheres on the depression of addicts.
Materials and Methods: This research is a quasi-experimental study with a pre-test-post-test design with a control group, which 20 male addicts leaving in the city of Karaj, Iran. Beck Depression Inventory and Blood Test was used. We selected 20 out of 100 people at random and placed them in two experimental and control groups equally (10 experimental group and 10 control group). Evaluation of the subjects by the Depression Inventory and blood test before training and after training of the experimental group. The subjects in the experimental group were trained for 16 sessions 2 days a week, two hours a day, and the control group did not receive any intervention. The obtained data were analyzed using ANKOA statistical method and research data was analyzed with SPSS software version 22.
Results: the reuslts showed that the subjects in the experimental group after training were significantly different from the control group in their scores of depression and increase in chemical carriers (serotonin and dopamine). In other words, brain change model based on heterogeneous hemisphere treatment was effective on depression of withdrawal addicts with 95% probability.
Conclusion: Teaching a model of brain function change based on heterogeneous hematopoietic treatment was effective on depression in withdrawal addicts. approved.

Keywords: Development of brain function change model, Heterogeneous hemisphere treatment, Addict, Depression

Introduction

Achieving peace and security and avoiding depression and anxiety is one of the most basic human needs and has long been one of the basic human problems. Mental health is also a social need; Because the optimal functioning of society requires people who are in a good condition in terms of health and mental health (Dupaolo, 2010, Qarcheh Daghi, 2011).

Depressive Disorders: Depression is defined as a mental disorder that causes a constant feeling of sadness. The depressed person experiences physical and psychological symptoms that make daily life a serious challenge. When depressive symptoms last for more than two weeks, a person is diagnosed with depressive disorder. A person with depressive symptoms experiences the following:

- Feeling empty and sad most days
- Lack of desire for activities he already enjoys
- Weight loss or gain due to changes in appetite
- Feeling sluggish, lazy or anxious
- Fatigue due to low energy
- Low concentration or inability to concentrate and make decisions
- Thoughts of self-harm, death or suicide

Addiction: A condition in which a person naturally weakens the will to control the repetition of actions due to mental or chemical use. Although weakness of will is not a disease in itself, it is considered a disease due to its effects on a person's central nervous system.

Physical addiction: The body's physiological response to the entry and impact of new substances into the body, which usually occurs with the phenomenon of adaptability (physical resistance), due to reduced number of neurotransmitters in the central nervous system. Quitting physical addiction is associated with pain, insomnia, hypersomnia, and hangover. The duration of physical withdrawal is much shorter than that of mental addiction.

Psychological addiction: is caused by the pleasure and happiness of drug use. Precisely by disrupting the order of secretion of neurological mediators, a person suffers from psychological damage or contradictions. For example, the drug methamphetamine (glass opioid) increases the secretion of dopamine in the brain and causes agitation, euphoria, concentration, and so on. After stopping dopamine levels, the person becomes drowsy, depressed, distracted, and etc. The duration of the return of these neural mediators to normal is much longer and some even believe that there is no return. As a result, psychological addiction is much more deadly. Psychological addiction causes many former consumers to slip, even over periods of several years.

How drugs work in the brain and the destructive and irreversible effects of drugs on the brain

The brain undergoes long-term changes during drug abuse. If the brain tries to compensate for the loss or change of glutamate, a chemical that helps a person focus will have cognitive function. Basically, one will have a hard time reasoning and understanding the situation in which one is. He may respond more slowly than usual or delay his reaction. Substances change parts of the brain that control important things like judgment, such as decision making, behavior control, and things like memory or learning abilities. When all these sectors change, the drug user consumes more and more drugs, even if it is dangerous.

Drugs affect the human brain in a variety of ways, such as ecstasy, a drug that can kill cells in the cerebral cortex and interrupt thought processes. Cocaine, heroin and other substances also change the brain in other ways. Types of drugs by affecting brain function cause intoxication and cross-sectional pleasure, and therefore their long-term use causes major problems in neurological function. Neurological problems are among the most common side effects of drug use. Long-term use of drugs, psychedelics, or sedatives can cause lasting changes in the brain and can lead to depression or hallucinations. In addition, the addict's emotional dependence is very strong and in some cases may last a lifetime. (Jafar Mehvari, 2019).

When a person takes drugs, his brain changes the way it works. This makes him unable to resist drug motivation. He may feel the need for them, which is why many people have a hard time leaving without medical help. When they take drugs, the chemicals enter the brain and begin their journey to change the chemical arrangement of the brain. These chemicals disrupt the communication process, meaning that a person's nerve cells do not process

information, or send information as they should (Forouhar 2012).

Drugs are one of the external factors and affect the part of the brain that is responsible for drug addiction (limbic system). The limbic system is also known as the "brain reward system" and it changes with the things people use, such as eating, drinking and other life activities, which naturally activate the limbic system. Slowly the limbic system is affected by dopamine, and it is a chemical that plays a major role in how a person becomes addicted to drugs (Smith Robert J., 2011).

Drugs used by human beings all cause euphoria and intoxication. What all these compounds have in common is their ability to stimulate pleasure-related circuits in the brain. These circuits, which are common in most mammals, start in the abdominal segment and end in the middle fibers of the anterior brain to the nucleus accumbens. Numerous chemical systems such as dopamine system, sortonin, endorphin, adenosine, and GABA are associated with these pleasure circuits in the brain (Alireza Ebrahimi 2015).

It is not difficult to see the cause-and-effect relationship between chronic addiction and depression. A serious illness can cause major changes in people's lives (work, education, etc.), and limit their mobility and independence. A chronic illness can make some things impossible, and it can also reduce self-confidence and hope for the future. Therefore, it is no surprise that people with chronic addiction feel frustrated and sad. In some cases, the physical effects of the medication itself can lead to depression. Making a person more depressed when no action can be taken to change the difficult situation. A major part of a person's attention from past analysis is reviewing present mistakes, predicting the future (Greenberg 1991).

In this study, after discussing how these systems relate to each other and the pleasure circuits in the brain, the involvement of different chemical systems in the problem of addiction will be pointed out, and it is assumed that the development of therapy in the form of individual activity by activating the heterogeneous hemisphere in new learning and expectation of changes in brain function and stimulation of the chemical system (dopamine, serotonin and endorphins) and ultimately the treatment of depression in addicted subjects.

Brain flexibility theory: plasticity or neuroplasty that shows how experiences, changes the neural pathways in the brain. Long-term functional changes in the brain as we learn new things or retain new information, long-term fuctional changes in the brain happens, these changes in neural communication is what we call brain flexibility.

Brain plasticity and neurological changes in the brain can be:

1- due to learning, experience, and memory formation
2- or occur as a result of brain damage.

There are two types of neuroplasticity, including:

Functional plasticity: The brain's ability to transfer brain function from a healthy area to other affected areas.

Structural plasticity: The brain's ability to change the physical structure of the brain as a result of new learning.

Flexibility plays an important role in learning and memory. Research over the past two decades has revealed that two types of changes occur in the brain during learning: First, changes in the structure of nerve cells occur in the area where the synapses are located. Second, there is an increase in the number of synapses between nerve cells.

Scientists in the field of neuroscience (1990) have made significant progress in using a variety of methods to study the brain, such as studying the effects of drugs and chemicals on the brain (neuropharmacology), recording electroencephalography (ERP, EEG), recording cellular stimulation, and direct stimulation. The brain during surgery is indirect intervention in brain function (TMS) and advanced imaging using tools such as FMRI, PET and MEG.

Neuropharmacological theory states that neuropsychiatric disorders are caused by disorders in the regulation of brain chemicals and, consequently, some neural pathways that act like electrical circuits lose their function.

Neuroscience theory states that drug use has destructive effects on the functioning of electrical circuits in the brain. With the use of drugs, the patient temporarily feels well and the symptoms of neurological diseases are

alleviated, but in the long run, not only does his disease not improve, but he also suffers from another disease called addiction. About 60% of drug addicts suffer from a neurological disorder, the most common of which is depression. If a person has only a neurological condition such as depression, he or she can see a neurologist or psychiatrist and control the disease in period of 1.5-3 months, but if depression is accompanied by addiction, then a dual solution should be used because the patient is facing two diseases (Mashayekhi, 2011).

Hebb's theory of learning: Hubb believes that intelligence, perception, and even emotions are learned from experience. According to Hebb's theory, every environmental object we experience triggers a set of neurons called cell complexes. Heb (1949) believed that cell complexes of neural systems are "dynamic", not fixed and static. He has developed mechanisms, which neurons can join or leave cell complexes, giving complexes the opportunity to refine through learning or evolution. Thus, with perceptual transformation, there will be a slow growth in the complex; of course, 'growth' does not necessarily mean that the number of cells increases, but the cell changes.

According to Hebb, the whole cell complex is an intertwined nerve set that can be triggered by external stimulation, internal stimulation, or a combination of the two. When a cell complex is set up, we experience the idea of an event that represents that complex. As a result, and according to the above-mentioned indications, the researcher based on theories of brain flexibility in learning new activity as well as neuron proliferation and synaptic activity and stimulation of secretion of chemical vectors (serotonin and dopamine ...) decided to formulate activity-based therapy. Hemispheres (right or left) have taken to reduce the depression of addicts and proposed a hypothesis in this regard:

Neuropharmacology: The effect of the drug on the function of cells of the central and peripheral nervous system, which is divided into two categories: behavioral and molecular

Psychopharmacology: The effect of drugs on the psyche and brain is to observe changes in brain behavior. Psychopharmacology scientifically studies the effects of drugs on the mood, senses, thinking and behavior, and in this regard with neuropsychology on the effects of drugs on nerve cells) in differentiation.

Recording brain signals introduces us to the function of neurons in two ways.

Method 1: On one hand, we can understand their quantitative characteristics by processing brain signals and frequency bands. To reach such findings, it is essential that brain signals be recorded for a significant period of time at rest or during a cognitive or behavioral activity. This type of study can be done in normal people when performing different cognitive tasks and the differences in the quantitative characteristics of frequency bands in different cognitive tasks can be compared. On the other hand, healthy people with different groups of diseases such as psychiatric neurological disorders such as depression, schizophrenia, autism, hyperactivity, alzheimer's, etc. can be studied in this regard.

The second method is to study the brain signals when facing cognitive events, which is called event-related potential. Studies have shown that part of the brain which affected by drugs is the reward pathway, especially when connected to the nucleus accumbens. According to studies in mice with dopamine neurons in the tegmentum area, which the results have been confirmed by human studies, this neural pathway is also activated by natural stimuli such as food, water and sexual activity. However, drug overdose can ovwerwhelm the reward system by mimiking or blocking the finction of the nervous system.

Lateral hemispheres of the brain

The brain is divided into left and right hemispheres. The two hemispheres of the brain are connected by fibers or fibers of the corpus callosum. These two hemispheres interact with a community of filaments and nerve fibers called the corpus callosum that transmit messages from one hemisphere to another. Each hemisphere is in control of the opposite part of the body. In other words, the left hemisphere controls the right side of the body and the right hemisphere controls the left side of the body. If a stroke occurs on the right side of a person's brain, the person's left arm or leg may become weak or paralyzed. Of course, not all functions of the two hemispheres of the brain are common, and in general the left

hemisphere controls speech comprehension, mathematics, and the ability to write. The right hemisphere also controls creativity, spatial perception, artistic and musical skills.

Left-right asymmetry, which is also seen in the brains of most animals, is one of the first obvious signs in the early stages of brain development, which is formed by a kind of competition between the two hemispheres to absorb migrating nerve cells. The effect of asymmetric brain structure at all molecular, genetic, neuronal, neurotransmitter, anatomical and behavioral levels in the brain of healthy individuals or neurological patients with peripheral injuries, hemispheric disconnection and anesthesia of one hemisphere (by electrical stimulation or sodium amobar injection) Carotid artery) can be examined and observed. The best non-invasive research method is lateral studies to identify and evaluate the specific and normal functions that each hemisphere implements the instructions associated with them. In these behavioral tests, based on the advantage of anatomical organization of sensory and motor systems, methods can be designed and implemented to deceive the brain to clarify the operation of different areas of the brain.

Four theories in the field of lateralization

1- Laterality is relative, not absolute: Both hemispheres play a role in almost every behavior. For example, although the left hemisphere is important for language production, the right hemisphere also has some linguistic capabilities.

2- Brain location, at least as much as the side of the brain, is important in understanding brain function: in fact, it is often very difficult to position neurological injuries in a hemisphere in the absence of neurological data, even if its location is well known. Perhaps it is best to assume that many functions of the cerebral cortex are localized and that the hemisphere is just one of the features of positioning.

3- Lateralization is influenced by genetic and environmental factors: The brain organization of some left-handed people and women is less symmetrical than that of right-handed people and men.

4- Laterality has also been observed in a range of animals: At first it was believed that cerebral asymmetry is a unique feature of humans and is related to language, but the brains of songbirds, mice, cats, monkeys and apes are also descriptively and functionally asymmetric.

Anatomical and behavioral research in the brains of healthy people or neurological patients with peripheral injuries, mostly in people with hemispheric severance and anesthesia of one hemisphere.

Patients with lateral injuries: In the strongest experimental method to show lateralization of function is called "double rupture" and performed by Hans-Locas Tivber, two areas of the neocortex are functionally dissected by two behavioral tests, each test affected by one injury. It is a region and not another region. Left hemisphere injuries in right-handed patients usually cause defects in language functions (reading, writing, and speech) that are not caused by right hemisphere injuries. Therefore, the functions of the two hemispheres are fragmented. However, spatial homework, singing, playing musical instruments, and distinguishing phonetic patterns are more likely to be disrupted by injuries to the right hemisphere than to injuries to the left hemisphere. Since injuries of the right hemisphere disrupt tasks that are not disrupted by injuries of the left hemisphere and vice versa, then the two hemispheres suffer from double rupture (Khodapanahi, 2004).

Dopamine: Dopamine is a neurotransmitter that controls the body's voluntary movements and is linked to the brain's reward mechanism.

In other words, dopamine regulates pleasurable emotions. Substances such as cocaine, heroin, nicotine and opium increase the levels of this neurotransmitter. Dopamine is the most important transmitter of neurons in nerve centers, and many diseases are associated with impaired secretion. Dopamine-secreting neurons are called dopaminergic.

Serotonin: The chemical name of serotonin is hydroxytryptamine and is one of the most important neurotransmitters and modulators. Serotonin is an important inhibitory neurotransmitter that can have a profound effect on emotion, mood and anxiety. Serotonin is involved in regulating sleep, wakefulness and eating. Serotonin is also involved in perception. Hallucinogenic drugs such as LSD combine precisely with the sites of serotonin receptors, thus blocking the transmission of nerve impulses to alter emotional experiences. Although this light transmitter is not a hormone, it is also known as mood hormone. In most people, fasting and strict diets trigger behavioral reactions associated with anger or anxiety. Significant low serotonin is thought to be linked to conditions such as depression, suicidal ideation and obsessive-compulsive disorder. Many antidepressants work by affecting the level of this neurotransmitter.

Materials and Methods

This study was experimental research design with pretest-posttest with control group. The statistical population of the present study included addicts in Karaj. We randomly selected 30 addicts in Alborz Search Camp, but due to the Quaid virus problem, 19 samples were reduced to 20 addicts leaving. Due to the fact that the study population was 30 people, but due to the Quid virus problem, 19 samples were changed to 20 addicts who were quitting. Blood and urine tests (serotonin and dopamine) were performed and functional brain mapping (pet) was supposed to be performed, but due to the scarcity of this device and the priority of queuing with cancers, injectable injections should be under the supervision of the organization. Atomic energy provided to cancer patients only failed. Twnety addicts leaving and suffering from depression (according to Beck Depression Inventory and blood test), trained 10 of these people. And after training (treatment package of heterogeneous hemispheric activities for two months, two days a week and 2 hours a day) the experimental group and the control group (who have not been trained) through the Depression Inventory and urine test (Measurement of chemical transporters of serotonin and dopamine) were re-evaluated. Finally, posttest and pretest were compared.

Table 1: Mean and standard deviation of depression subscales of depression (sadness and life expectancy)

Variables	Group	N	M	SD
1. Sadness	Case	10	11.51	1.831
	Control	10	11.69	2.128
2. Life Expectancy	Case	10	12.935	1.11
	Control	10	13.165	1.204

Table 2: Mean and standard deviation of post-test depression subscales (sadness and life expectancy)

Variables	Group	N	M	SD
1. Sadness	Case	10	4.44	0.954
	Control	10	11.62	2.177
2. Life Expectancy	Case	10	18.47	1.198
	Control	10	13.07	1.135

Results

The present study was conducted to investigate the development of a model of brain function change based on the treatment of heterogeneous hemisphere on the depression in addicts leaving. Depression and its psychological and physiological consequences in substance abusers and their comparison with a group of addicts who have not received training in the treatment of heterogeneous hemisphere activities (right or left). Findings of this study showed that the study of emotion (depression) in the two groups of substance abusers, showed a significant difference between the two groups in the variables of depression and psychological consequences in the post-test and also substance abusers who were not trained in the variable of depression score. The purpose of this study was based on the results of a questionnaire and tests performed on subjects and analysis of research data. The development of a model of brain function change based on therapy was effective in depressed addicts leaving. The ideal goal of this study is based on the logic of prevention in increasing the number of addicts and providing mental health to families and ultimately society. The subjects had a low score in chemical carrier components and cognitive function and the highest rate in pre-test in depressive disorder and the lowest rate in depression in post-test and increased activity of chemical carriers (serotonin and dopamine) and after training the hemispheric

activity to the addicts under test after performing urine test and depression test on them in the post-test showed this treatment is effective in reducing depression in addicts. Based on the results obtained from Table 1-2, the test was significant. Considering the significant difference between the means with 95% probability, it is stated that the research hypothesis that the development of a brain function change model based on heterogeneous hemispheric treatment was effective on depression in withdrawal addicts.

Discussion

This study is consistent with the research of Davison (2003): Davidson et al. (2003) In an eight-week MBSR-controlled study on depressed people, noticed an increase in left ventricular cortex activity and antibody production. The left half of the anterior cortical region is involved in certain types of positive emotional expression, usually in depressed individuals. These findings suggest that new learning could affect the physiology of depression in vulnerable individuals. Training the presence of the mind based on the flexibility-neural pattern may actually affect the structural composition of the brain. There is evidence that a severely paralyzed arm can be moved after a stroke by continuing to try to use the limb. Slowly the "bad" arm "remembers" how to move, and perhaps even how to write and play a favorite game, such as tennis. The brain compensates for damage by reorganizing and reforming new connections. To reconnect, neurons must be stimulated through mental activity. Changes associated with further learning occur at the level of communication between nerve cells. New connections can be formed and the internal structure of existing synapses can change.

This study is consistent with the research of Kreinzer (2012): Kreutzer, (2012), Professor of Physiology and Neurology, University of California, San Francisco, showed that interneurons are very important for learning and memory and more than movement disorders potentially associated with psychiatric illness. Kritzer's team found that interneurons play a key role in nerve flexibility, which is the brain's ability to strengthen or weaken communication between neurons. By doing this, the brain can store information and procedural memories. Fast-spiking interneurons are like input guards for flexibility. This is very important for learning and memory. Internurons work to improve learning efficiency. The findings of Kritzer and his team show that neurons are also important for learning in other areas of the brain.

This research is in line with Zarrin (1999) research: In Iran, during Zarrin Dast research on addiction and chemical carriers of the brain (1999), Department of Pharmacology, Tehran University of Medical Sciences. In this article, after discussing how these systems relate to each other and the pleasure circuits in the brain, the involvement of different chemical systems in the problem of addiction is mentioned. All of the chemical transporter foci are somehow related to the anterior and descending fibers associated with the midbrain fibers, and the hypothesis that neural messages related to pleasure and reward are transmitted by a subset of the midbrain anterior fibers was formed.

Large limitations on exposure to the corona virus and limitations on the accumulation of people in one place, laboratory costs, position effects, and reminders of weaknesses and measurement errors (such as EPT measurements), which unfortunately were not met under critical circumstances. Also, the small number of subjects and the lack of control over disturbing variables due to the fear of coronation of people is reduced.

The results of this study should be considered with respect to limitations such as the effects of the situation and reminding of weaknesses and errors in measurement. Also, due to the small number of subjects and the lack of control over disturbing variables, care should be taken in inferring cause-and-effect relationships from the findings and generalizing them. It is suggested that future studies use functional brain scans and both genes.

Conflict of interest

Authors declare no conflict of interest.

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