

Structure And Function Of The Brain

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The brain is the most complex organ in the body, and it serves as the center of the [nervous system](#). The function of the brain is to control other body organs. The composition of the brain is comprised of specialized nerves. It is also made up of some supportive tissues. The brain is a very delicate organ which is covered by the skull. The skull is composed of many bones to protect the brain. The cranium is the part of the skull where the brain exists. The spinal cord is attached to the rear of the lower part of the brain. The brain and the spinal cord are collectively known as the Central Nervous System (CNS). The specialized nerves send and receive messages or electrical signals through the brain and the spinal cord.

The brain's main function is to control the body, and it serves as the control center for the body. It receives the messages through nerve signals, and on the basis of the information received by the nerves, it sends a message through new signals. Functions of the body, like controlling the body balance and movement, emotions, vision, speech, consciousness, and internal functions like body temperature, heart rate, and breathing, are controlled by the different parts of the brain.

Types Of Brain Cells And Their Function

There are two main types of cells present in the brain

1. Nerve cells: Nerve cells are also known as the neurons. To make the nervous system work, nerve cells carry electrical signals throughout the body. These are very delicate cells, and they cannot be replaced or repaired if they get damaged. In the body, nerve cells are the longest cells.
2. Glial cells: Glial cells are also known as the neuroglial cells. The function of the Glial cells is to protect, support, and feed the neurons. Glial cells are of different types named as ependymal cells, astrocytes, microglia, and oligodendrocytes.

Parts Of The Brain And Their Function

There are three main parts of the brain.

Cerebrum: The largest part of the brain is Cerebrum. There are two halves of the Cerebrum. One is known as the right cerebral hemisphere, and the other is known as the left cerebral hemisphere. The nerve fibers, Corpus Callosum, serve as the bridge between these two hemispheres. The right side of the body is controlled by the left hemisphere or the left side of the Cerebrum, while the left side of the body is controlled by the right hemisphere or the right side of the Cerebrum. The outer part of the

cerebrum is called the grey matter or cerebral cortex, and the inner part of the cerebrum is called the white matter. Grey matter is made up of neurons, and the white matter is made up of the axons.

These nerve cells send and receive the signals between the brain and the body. Both hemispheres are divided into five parts, each called lobes: frontal lobes, temporal lobes, parietal lobes, insula, and occipital lobes. Each lobe performs different functions. The movement of the body, behavior, emotions, speech, and memory are controlled by the frontal lobe. The frontal lobe also performs intellectual functions like reasoning, planning, decision-making, problem-solving, and thought processes. The temporal lobe controls the emotion, memory, and hearing functions. It also controls the speech of some dominants. The parietal lobe has control over sensations like pressure, pain, touch, and temperature. It also controls the spatial orientation. The occipital lobe has control over visual information. Insula's function is to process information through sensory experience and interpret it in an emotional context.

Cerebellum: The Cerebellum is positioned at the back of the brain under the cerebrum. Just like the cerebrum, the cerebellum also has grey matter and white matter. The cerebellum is also divided into two parts: the right hemisphere and the left hemisphere. The functions that are controlled by the cerebellum are a balance of the body, movement, reflexes, posture, actions like walking and talking, and the collection of sensory information.

Brain stem: At the base of the brain, a cluster of nerve tissue creates the brain stem. It is the connecting point of the cerebrum and cerebellum with the spinal cord. The brain stem consists of three parts: the midbrain, medulla oblongata, and pons. The midbrain is also known as the mesencephalon. The function of the brain stem is to control and send information to or from the other parts of the brain to the rest of the body. It controls the body temperature, blood pressure in the body, heart rate, thirst and hunger, digestive system, and breathing.

Other parts of the brain include:

1. **Cerebrospinal Fluid (CSF):** A water like transparent and clear liquid in the brain to protect the brain and the spinal cord is known as Cerebrospinal fluid (CSF). It surrounds the brain and serves as a cushion for the protection of the brain. The function of the CSF is to provide nutrients to the brain through blood and remove waste material.
2. **Meninges:** Three layers of tissue form membranes around the brain and the spinal cord. Through these membranes, the CFS flows in the brain and the spinal cord.
3. **Corpus Callosum:** The Brain's largest nerve fibers that build connections between the two cerebral hemispheres.
4. **Thalamus:** It acts as an information relay station between the brain and the nervous system. It is situated in the middle of the brain.
5. **Hypothalamus:** Under the thalamus, there is the hypothalamus that controls the hormones secretions, appetite, blood pressure, sleep patterns, emotions and body temperature.
6. **Pituitary gland (master gland):** In the center of the brain, a pea-sized small organ that is

responsible for releasing hormones that control the adrenal and thyroid glands. It is also responsible for the physical and sexual development.

Spinal cord: From the brain stem to the lumbar region, a thick column of nerves runs along the back of the body, covered by vertebrae. Just like other parts of the brain spinal cord also has grey and white matter. The spinal cord serves as a passage of most of the information sent and received by the brain and the body through spinal nerves. Spinal nerves control the functions of the body like bowel, bladder control, movement, and breathing.

Part 2

A distressed brain

The distressed brain: Stress is of two types: good stress and bad stress. We will learn about the negative type of stress, which is also known as distress, and its effect on the brain and its function. Distress is harmful to the body and the mental health of a person. Stress is acceptable but distress and threat are not acceptable. The hippocampus is the main part of the brain that gets affected by distress, which is very crucial for cortisol. Through distress, the cortisol gets weaker, and it has a bad effect on the local memory of the brain and the immune system of the body. An indexing system and perceptual mapping also get affected due to a distressed mind. So through a distressed mind, not only the cognitive abilities of the learner get affected but the immune system of the body to fight against the diseases also suffers. There are three levels of stress, of which distress is the highest level.

The highest level of stress or distress may also be represented as the trauma. (Stone & Bray, 2015) The lowest level of stress is acceptable as there is no exceptional hormonal secretion or negative effect on the memory. A moderate level of stress is a bit harmful to the mind as it affects the brain and memory negatively. Trauma or distress is extremely harmful to the hippocampal functions. It regulates the excessive secretion of the amygdala. Through distress and trauma, neuronal death occurs in the hippocampus.

Causes of the distress may include problems like if we are in a situation and we don't know how to solve it, or we don't have the means to solve the problem, or in a situation where we don't want to solve the problem, if the risk is higher related to the solution of the problem, when the control over the surroundings is low, or when we have repeated experience of intense and stressful situations. The effect of moderate stress is good for learning. For example, it may provide the students a motivation to compete with each other and get good grades or to win the race by exerting extra effort. However, the distressed mind may cause the students or the learners to underperform. The stress levels should not be higher or lower as both result in the underperformance of the learner. The stress level should be moderated as it provides the brain control over the decisions and cognitive abilities to perform well in difficult situations without distress.

According to the research, there are many social forces or stressors that cause a stressful environment for students or adults. These forces cannot be avoided as these forces are part of the everyday life of them. It may include noise, selfish bosses, unpleased colleagues, insensitive family members, broken machines, screaming children, financial problems, and many other environmental stressors that cause a distressed mind and have a negative impact on the performance of the learners. For a student, social and environmental stressors like fear of the unknown, fear of being bullied, fear of getting low grades, flop projects or assignments, insensitive teachers, financial problems, broken promises, etc., may pressure the brain and affect the performance of the children. On these social and environmental factors, the control of the students is very low but it can be avoided by having a strong support system. The research data shows that the students who have a strong support system from high achieving fellow students, mentors, and helping teachers are able to perform really well than the students who have a weak support system or just have parental involvement rather than social support. (Verger et al., 2009)

Teachers and the school management should provide the students with a comfortable, nice, and friendly environment to support the students in order to make them feel relaxed. This will be the only way that can help them avoid the distressed situation.

Part 3

Memory model and the educational implications

According to memory theorists, there is a difference between the memory of a person/ student and his learning. Learning is identified as the process of getting new information or a new skill acquired based on that information. Through learning and getting exposed to some experience, the students may acquire a permanent change in their mental representation. On the other hand, memory is defined as the capability to remember the information that was learned by the person previously. It is not necessary that anything that is learned will remain in the memory for a long period of time. In the learning and memory process, there are three stages involved: storage, encoding, and retrieval stage. (Campbell et al., 2004)

Storage: In this stage, the actual information is collected and stored in the memory, and this process is known as storage. For example, if a student puts this information in mind that the class will start at 9 a.m., this will be the storage stage of the learning and the memory process.

Encoding: When people are exposed to more information and they store it in their memory, they try to add some more information to it to remember that information. This process is known as the encoding process. The additional information or the relevant data that is attached to the information can be based on their personal experience. For example, if a student wants to store information like the date of the examination, i.e., 28-12-2018, he can relate it to the birthday of his friend to remember the information.

Retrieval: At this stage, the person will find or recall the information once stored in his memory so that he can use that information again. In some cases, retrieval of the information is a simple process but in some cases, it is a very difficult task. For example, recall the name of the doctor whom you visited 6 months ago.

Dual-Store Model of Memory

There are three components of human memory that are commonly known as the dual-store model of memory. These three components are after-image, primary memory, and secondary memory. Other terms used for these components are a Sensory register, short-term or working memory, and long-term memory. The dual-store model of memory is represented in the following figure:



This model is known as the dual-store model with reference to the difference between the short-term and the long-term memory. Input here means the information from the environment collected by a person. Information enters the sensory register at the first stage, and it is held there for a shorter period of time. After a few seconds of processing, the information moves toward the working memory or the short-term memory. Information processes in the short-term memory for not more than one minute, and it should be forwarded next to the long-term memory.

There is a two-way flow of information between long-term memory and short-term memory for processing and storing the information in the long-term memory. This is represented by the two arrows in the figure. Some information in the short-term memory requires already stored information from the long-term memory to process and store new information. The information that is not being processed by the sensory register and the short-term memory components will be lost or forgotten from the memory system. Such information does not proceed toward long-term memory. Memory can be lost from the long-term memory too, but it takes time to forget about the information that is present in the long-term memory. The human memory system is similar to the process of selecting and storing important documents in an organized manner. Information is stored in long-term memory, just as organized documents on a shelf or in the folder of the stored files in a computer.

Although the memory and the learning theorists are not sure about the structure and the functions of the memory, they have provided many generalizations and the implications of the information that can be useful for educational practices and learning of the students, which are discussed below:

Grab Attention: from the model of learning, we came to know that for keeping the data in long-term memory, attention is required. Similarly, if teachers want their students to keep in mind the information they are providing to the students for a longer period of time, they should provide the students with an atmosphere where they can pay attention to the information provided and focus on the study more.

Interactive sessions: By asking frequent questions from the students, teachers can maintain and keep the attention of the students where it should be. Through this way, students will listen to the lecture with more attention and learn in a better way.

Variety of topics and presentation slides: By providing a variety of topics, teachers can grab the attention of the students. Boring topics or repeated information may not help the teachers to make the students attentive. Also, graphical media or presentation-style lectures may help the students to better learning.

Frequent breaks: Frequent breaks should be provided to the students as the bombardment of information may make the students less attentive, and they would show less interest in the topic. Our brain needs to have a break to process the information in a better way.

Minimize distraction while working individually: If the teacher has assigned the students individual assignments, he should provide an atmosphere where there is no distraction. Only then can they work in a better way and can process information in their mind appropriately. Distraction may lead them to be less attentive and less effective.

Part 4

Brain's Attention

Attention to the information and its effective processing is very crucial in order to learn anything. It is not only applicable to students but every single person in the world who wants to store and learn information for a long period of time. If a student is not paying attention to what his teachers are saying, he would not be able to learn that information. Such information is represented as the forgotten or lost information that does not get processed and stored in the mind. For long-term retention of information, attention of the brain is required; otherwise, the input or the information will be lost. For example, during a class, a less attentive student might listen to the whole lecture, but after the lecture, he would not be able to remember what the teacher has just taught. This happens when the students do not focus on the lecture. Rather, they focus on the other objects from the surroundings or the class. For grabbing the attention of the brain of students, teachers should take the following strategies for capturing the attention of the students if they want their students to learn in a proper way.

Graphical content and attractive visuals: To capture the attention of the students and make the minds of students attentive, interesting material should be used by the teachers. These interesting materials may include a graphical representation of the boring data in colorful ways or with interesting shapes and images that keep the mind attracted to the information.

Frequent intervals: The learning of the students should be provided in a way that they have time to

process the given information without any hustle, and breaks should be given to them so that the mind may get the time to relax and keep the information stored in a better way. The brain will understand things easily if it is not working continuously.

Ask Questions: To keep the minds of the students attentive, the teachers should ask the students frequent questions. In this way, they will be more involved with the teachers and the lectures. Their mind will remain more attentive if they know that the teacher may ask them to participate in the discussion. Interactive sessions are of the greatest help for the student's and teachers' better understanding and learning.

Individual work and less distraction: Most of the students prefer to work in a calm and silent place when they have to work on an individual assignment. Such an environment provides them an opportunity to focus on the work and do the task in a proper way. The distractive atmosphere may cause difficulty in understanding and staying attentive to the tasks assigned.

Seat the students near their teacher: A study shows that the students who sit near the teacher or in the first row may pay much more attention to the lecture than those who sit at the end of the class. Students who are easily distracted should sit near the teacher in the front rows so that they may pay more attention.

Monitor the students: Monitoring the students may help the teacher to identify the behavior of the students. The teacher may know by observing which student is attentive and giving a response to the appropriate stimulus and which student is not attentive. In this way, students will also feel conscious about their distracted activities when they are monitored and pay more attention to the lecture.

Slow information processing: To keep the attention towards the provided information the working memory is supposed to have a limited capacity. Work or information load may cause the slow processing of the brain and the information may not be properly processed and stored. Due to the bombardment of the data the brain cannot pay attention to all information.

Part 5

The first journal article that is selected to see the relevance of the research work with the book topics is "Trauma and Young Children: How the Problem Plays Out," and the authors of this article are Jenifer Stone and Susan Bray. This article is about the trauma or the highest level of the distressed brain of the students and the causes of this distress; it also explains the stressors of the distress.

The 2nd article selected for the comparison of the ideas and the ways to treat the problem from the book's ideas is "Psychological Distress in First-year University Students: socioeconomic and Academic Stressors, mastery and Social Support in Young Men and Women." This article is written by authors Pierre Verger, Jean-Baptiste Combes, Patrick Peretti-Wattel, Viviane Kovess-Masfety, Frédéric Rouillon, Marie Choquet, and Valérie Guagliardo.

In the first journal article, the highest level of the stressed mind is discussed, just like it was discussed in the book. The highest level of stress or trauma has a very negative impact on the minds of the children, and it is unacceptable. The distressed mind or the children with trauma are found to have underperformance. This research shows that educators do not realize the huge number of children having such stress and trauma. Out of a hundred, 26 children are having stress issues. The reasons for the trauma in children are more like the reasons discussed in the book. These reasons include bullying or abuse, being neglected, parental custody and control issues, fear of the unknown or parental alcoholism or substance abuse. All these factors affect the children and the students from their early childhood but no one realizes this problem at the initial stages. These factors are very bad for the children as it has a very harmful effect on the mental and physical health of the student. Which in return affects the learning and performance of the children.

The study shows that trauma has a negative impact on brain development that, in turn, has major consequences on the learning ability of the children. It also impacts the social and emotional growth of the children negatively. Due to trauma, the children may face a lack of physical growth as well. The changes that occur in the brains of the children due to trauma also change the behavior and the performance of the children in their classroom. The authors of this article studied the behavior of the traumatic childhood and provided the teachers and the counselors the information that can help them identify the traumatized children. They have also provided some trauma-sensitive changes in the syllabus of the classes where there are children with distressed minds to help them play out the problem they are facing. According to the authors, schools should have school counselors who can help teachers identify and treat traumatized children. Authors have identified a solution to this problem: the teachers should work on the play theory for the children facing any kind of stress, which will help them reduce the stress level from negative to the positive side, and they can get a better and healthy life.

In the second article, the authors discussed the stressors that are linked to psychological distress among university students and their university life. This article helps to understand the impact of socioeconomic stressors on the psychology of students and its effect on the brain. The authors have also provided protective strategies for such distressed minds. The students ages 18 to 24 years were accessed to learn about the negative impacts of socioeconomic stressors on their psychological behavior and the mental state of the students at the university. And the protective strategy that the authors provided is social support. The concept we have discussed in the book as well. In the book, we have studied that the social support system is a technique that can be helpful for reducing and eliminating distress from the life of a person. In this article, we will find the impact of the social support of friends, family, teachers, and mentors to help remove the psychological distress faced by university students.

According to the authors, the mental health and the proper function of the brain of students have gained significant importance in the research. Previous research has shown that the number of university students who are facing the problem of psychological distress is higher than any other group of people, and it has become a significant topic of study research. The mental health of the

students is considered as the most important thing to have better learning opportunities and growth options. If the students have a problem with their mental health, they may face many problems in competing with the other people in the class. The results of this study show that the negative impact of socioeconomic factors on mental health and psychological distress cannot be proved by the sample they have selected for the research. This means that socioeconomic factors are not the reasons for psychological distress. Other reasons and factors may be studied further to get an idea of the reasons for poor mental health due to psychological distress. The authors have discussed that the result of the protective factors, i.e., mastery and social support, has a positive impact on reducing psychological distress. This means that the protective strategies to cope with the bad stress that were provided in the book were found to be true, and they have a positive impact on mental health stability and the removal of psychological distress.

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