

## KNOWING AND INTERPRETING STUDENTS' EMOTIONS IN A PANDEMIC CONTEXT USING BRAIN WAVES\*

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### **Abstract**

*Knowledge of development stages in correlation with biological and psychological age is an indispensable element in ensuring an efficient teaching activity. Starting from the idea that the experiences lived during childhood and adolescence influence the behavior of the future young adult we focus on the causes that led to the installation of a certain type of behavior. Teachers in the university environment report visible differences in behavior between students of different ages. These differences need to be carefully considered, as they can guide the teacher towards an appropriate approach to the student's learning style. A special category is represented by middle-aged students. They are easily distinguished by the independent spirit, being self-controlled individuals who consider that they are distinguished from their younger colleagues by the experience accumulated during their life. The behavior adopted by these students is correlated with the presence of medium frequency Beta brain waves that define a relaxed learning style. Also, the way middle-aged students perceive the educational process differs from that of younger students, because they tend to focus on the practical component, while younger students focus more on the theoretical component. The behavior of young students is correlated with the presence of high-frequency Beta brain waves, the situation in which many chemicals are produced in the body caused by high levels of stress. Maintaining this condition for a long time has harmful effects on the whole body, producing major imbalances both mentally and physically.*

**Key words:** COVID-19 pandemic; Brain waves; Levels of stress; The educational process; Students.

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## 1. Introduction

The concept of flexibility in thinking highlighted with the help of the Gaussian curve helps us to have a deep understanding of how students perceive academic life, but also the causes that determine them to adopt a certain learning style.

The context of the COVID-19 pandemic accelerated the digitalization of the educational process, which led to the emergence of new unforeseen situations. The sudden transition from face-to-face education to online education was a time when both teachers and pupils / students became aware that online education is much more difficult than they would have thought before. The absence of physical interaction between student teachers or between students was the cause of anxiety. Many individuals have experienced anxiety while working from home or online education, and people who were previously diagnosed with various psychological disorders have come to suffer from panic attacks or even worsen pre-existing pathology.

All these changes have produced effects in the Romanian educational system, and now it is more important than ever to give importance to the psycho-affective component of students.

The opposite of mental flexibility is rigidity. Most teachers in university education frequently encounter the problem of "rigidity in thinking" of fresh graduates of high school. However, this aspect is not only found in the case of "fresh out of school". It is noted that most of the time students who have completed other university studies or are older tend to look at things in an extremely rigid way, because of their maturity they are not so easily shaped, being characterized by inflexibility. This psycho-rigidity greatly influences the quality of life of the individual both professionally and personally. Adopting a rigid lifestyle can decrease the chances of career success, because the individual goes on the premise that he has accumulated a certain amount of information necessary for the chosen field of study and no longer sees the usefulness in improvement or continuing education.

Also, the concept of flexibility is directly proportional to the optimal state of neuropsychological health (Badea, 1998, p. 55). Flexibility in thinking stimulates the individual's creativity and increases his ability to adapt to new, unforeseen situations (Badea, 1998, p. 55).

## 2. The Role of Mental Flexibility in The Educational Field

The European educational model - promotes the fragmentation model. This model of fragmentation emphasizes the efficiency of successive learning, being in opposition to simultaneous learning (Badea, 1998, p. 86). Specialists in the field of education support the idea that any stage of the learning process that is omitted leads to a major imbalance in the knowledge base. Most European countries have the following main objectives:

- Achieving performance in the chosen field of study;
- Development of intellectual capacity, but also of creativity;
- Stimulating dynamics in thinking and promoting new concepts;
- Adapting students to crisis situations; efficient management of educational resources.

Improving students' skills and encouraging them to actively participate in ongoing projects (Budnyk, 2016). Therefore, the concept of mental flexibility guarantees the achievement of the desired results by correctly addressing the situations with which the individual comes in contact, easily adapting to new events. The etiology of thinking rigidity is extremely varied ranging from minor causes such as very strict, formal family education to major causes such as psychiatric disorders (psychopaths, oligophrenia) (Badea, 1998, p. 56). Mentally rigid individuals are also those who accumulate throughout their lives numerous failures both in terms of career and private life. These individuals tend to self-sabotage by installing an excessive state of anxiety manifested by fear of rejection. Also, they do not do very well in unforeseen situations, because they do not have the ability to manage their intellectual resources in order to find optimal solutions.

### **3. The Learning Process: from Preschool to Adult**

The learning process is a complex mechanism with defining features for each period of life (Aamodt, 2013, p. 143). In the preschool stage this process is difficult to implement, not because of the difficulty of the notions to be taught, but because we work with a young child who has not accumulated other educational experiences throughout life. Basically, this period significantly marks the intellectual development of the future school and even the future adult. Disruptions of the educational act occurred in this phase can have multiple negative effects on the way the child perceives the education system and its usefulness. Therefore, it is very important that a teacher who works in the preschool environment to pay special attention to the particularities of physical and mental development of the child. Also, the teacher must keep in mind that in the preschool stage the child effectively assimilates information through learning through play. In addition to providing the information necessary for good intellectual development, the role of the affective / emotional component must also be emphasized. Neglecting this component often leads to poorer school results, as well as behavioral disorders due to overwork. The child must be constantly encouraged by both teachers and the family. The existence of a school failure must be seen by the child as another stage of his development that requires additional work and ambition to succeed in achieving his goal (Chifan, 2015, pp. 3-4).

The next stage, that of the little schoolboy, is characterized by the abundance of imagination and creative spirit. Therefore, we can see that little schoolchildren really like compositions, because it gives them the opportunity to enter their own magical universe. If in terms of creativity the situation is ideal, the memorization process is quite difficult and requires additional time and effort. Another problem of this stage is the ability to synthesize the information received. Many schoolchildren tend to mechanically store a large amount of information without going through a logical filter. At a certain moment, the state of fatigue occurs, which determines the student to avoid the exercise by memorization. It must be guided by teachers towards rational learning procedures through which to extract essential information. Thus,

the effect of overload will be greatly diminished, and the storage of information will be long-lasting (Carcea, 2001, pp. 27-33).

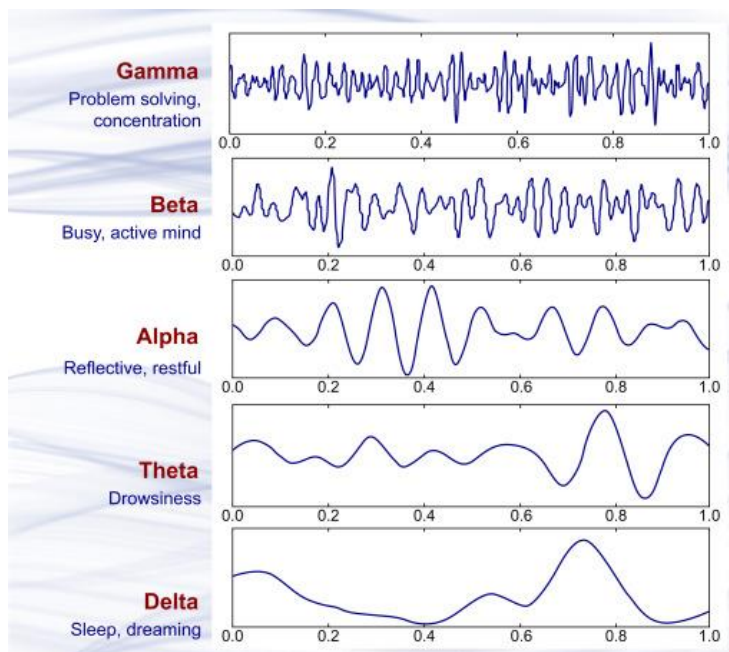
The stage of the high school student - accelerated development both physically and mentally. Possibly the most difficult period in a person's life, being marked by a huge accumulation of biological and psychological changes that will influence the behavior and personality of the future adult. The pedagogical approach of adolescents aims at the teacher's ability to keep him focused on the subject approached, without leaving room for the installation of monotony. At this stage, an important role is played by the group of friends. Most school failures or even school dropouts can occur as a result of a negative influence from the circle of friends. It is absolutely normal for a teenager to want to integrate socially in a group, but the chosen group is also the one that will make its mark on the way he will perceive the educational act and on his behavior in society (Carcea, 2001, pp. 27-33).

The adolescent period is characterized in terms of intellectual development by increasing perceptual and representational abilities. It is also observed the efficiency of attention (voluntary, involuntary and post-voluntary attention) due to the accumulation of a large amount of information, but also of lived experiences. At this stage, even memory undergoes certain changes, especially from a qualitative point of view, because logic-based memory will be predominant. Memory training increases intellectual performance, and the adolescent will be able to correctly and quickly understand a series of useful information (Carcea, 2001, pp. 27-33). Regarding the social development of the adolescent, it can be noticed that a special place belongs to communication. Socialization leads to the development of new interpersonal relationships, but also to the improvement of previous ones. If in the case of younger schoolchildren the need for socialization was more obvious in the case of girls, reaching the age of adolescence and boys will feel the need to communicate more especially with people close to them (Dispenza, 2019, p. 179).

The young adult - at this stage the memory undergoes a process of continuous restructuring. In terms of motivation, a central place is occupied by the career: obtaining a better job, advancing to the workplace, obtaining performance in the chosen field of study. A defining aspect of this period is professional maturity. Professional maturity is influenced by a number of aspects such as: objectivity in choosing a career, the chosen field of study correlated with the intellectual abilities and skills of the individual, the level of professional training (Dispenza, 2019, p. 180).

#### **4. Brain Waves - Mechanism of Action**

From a medical point of view, brain waves are recorded using an electroencephalogram (EEG). The frequency of brain waves is varied; they can have low, medium or high frequency. As is normal, there are major differences in frequency of wakefulness (high-frequency brain waves) and sleep state (low-frequency brain waves), with an intermediate state being semi-consciousness when predominant. medium intensity brain waves.



**Figure 1. Recording brain waves using EEG**

Correlation of biological age with the degree of development of brain waves - up to the age of two it can be seen that most brain waves are low frequency (Delta waves). This is also the explanation for the problem related to the fact that newborns and infants spend most of their time asleep, they are awake for a short time. In adults, these Delta-type waves are present in the sleep state. In the case of very young children, even in the waking state, the Delta waves are also the ones that act mainly (Dispenza, 2019).

Between 2 and 5 years, the beginning of the development of brain waves is highlighted, a fact that can be captured with the help of an electroencephalogram. This period coincides with the appearance of Theta-type waves characterized by trance state. Thus, children of this age tend to believe everything they are told by adults, because they live more in their own universe than in the real world. Any statement made during this period must be thought out very carefully, because it can have a major impact and reach directly into the child's subconscious. Therefore, parents are advised to avoid certain phrases that, although they may not have a special meaning for them as adults, in the case of the child can cause behavioral injuries through emotional impairment (examples: "your brother is smarter", "boys should not to cry", "girls are prettier"). From the age of 12, there will be an acceleration of the developmental level in the brain defined by the appearance of high frequency waves (Beta waves). In turn, Beta waves are divided into three categories: low frequency Beta waves, medium frequency and high frequency waves. With the onset of adolescence, the middle and high frequency waves are

noticeable, the low intensity ones are characteristic of the younger ones. In the case of adults, Theta waves can appear when they are in a trance, which makes them much easier to program. In the trance state, the “wall” disappears, separating the conscious level from the subconscious one (Dispenza, 2019).

The fastest brain waves are represented by Gamma waves. They define an extremely intense activity in the brain. They can appear in states of ecstasy, deep sadness or states of empathy with those around them. This category of brain waves outlines a complex, superior activity that requires high energy consumption. Basically, in these moments when Gamma waves act, an intense metabolic process takes place at the cellular level that trains the functions of several organs and requires a high degree of awareness (Dispenza, 2019).

In the definition of the three categories of Beta brain waves - the low frequency ones - the state of relaxation predominates, but without complete disconnection. They most often occur when we read a novel or watch a movie / series. In this situation the attention is maintained without exertion.

Medium frequency Beta waves: their appearance is conditioned by the action of stimuli from the external environment. This intensity requires increased attention, requiring an increased degree of concentration. One of the situations in which we encounter this type of brain waves is represented by the educational (learning) process. Thus, stimuli from the external environment reach the level of the cerebral neocortex in which they are assimilated and systematized in order to create a mental level (Dispenza, 2019).

High-frequency Beta waves: these are highlighted in stressful situations, mental, physical and emotional overload. At the level of neurons there is a hyperexcitability which leads to the elimination in the body of chemicals with harmful effects (example; adrenaline produced by the adrenal glands). The release of adrenaline induces an increase in blood pressure and pulse (occurrence of hypertensive phenomena, cardiac arrhythmias, in case of extreme stress can occur even myocardial infarction) and changes in respiratory flow (Amen, 2018, pp. 91-92). The role of these brain waves is to help us avoid imminent danger, so it has a beneficial effect, but only for a short time. Maintaining this state of maximum concentration affects the whole body and can even lead to the phenomenon of burnout. Also, in individuals with intense brain activity over a very long period of time, a decrease in the body's immunity may occur. Therefore, it is very important for people to understand that the excess of high frequency Beta can lead to altered mental and somatic health. In certain situations, this imbalance produced in the body is extremely difficult to manage and may require both medication and psychotherapy sessions (Dispenza, 2019).

## **5. Use of Mindfulness as an Adjustment to Psychotherapy in Optimizing Brain Wave Functioning**

A key element of psychotherapy sessions is the integration of the concept of mindfulness. To achieve this goal, the clinical psychotherapist is forced to look at the patient from another perspective, a much broader one, to surprise him in all its

complexity (Pollak, 2016, pp. 217-218). In general, the therapy session focuses on the problem stated by the patient and loses sight of his analysis in relation to other people or other conditions imposed by the company in which he operates. The use of mindfulness, especially in Romania, is reluctant, because not enough information is known to give the therapist the conviction that it is an effective procedure in ameliorating various psychological disorders (Langer, 2020, p. 83).

The concept of mindfulness encompasses four programs that can be used in psychological practice:

- Reducing stress based on mindfulness;
- Cognitive therapy based on mindfulness;
- Behavioral-dialectical therapy;
- Acceptance and commitment therapy (Pollak, 2016, p. 218).

Frequently used is cognitive therapy for individuals with depression or anxiety, these are two constantly growing mental disorders. The causes that have led to increased cases of depression or anxiety are mainly stressful situations that act on the individual for a long time (Langley, 2018, pp. 203-215). This leads to the rupture of the mental balance through overwork. Another condition that can be treated with the help of a mindfulness program, more precisely with the help of behavioral-dialectical therapy is represented by Bordeaux personality disorder (very effective in patients who have experienced episodes of suicide or drug / alcohol addicted patients) (Pollak, 2016, p. 219). The mere knowledge of mindfulness programs and the possibility of their implementation is not enough to obtain satisfactory results. An important factor that can influence the success of therapy is the patient's motivation and openness to the implementation of this concept. Due to the fact that most patients end up in the psychotherapy office in advanced stages of emotional distress, they are willing to try new recovery techniques. At the opposite pole are patients who oppose new techniques and who do not want to minimize verbal therapy in favor of introspection and meditation (Ruppert, 2012, p. 261).

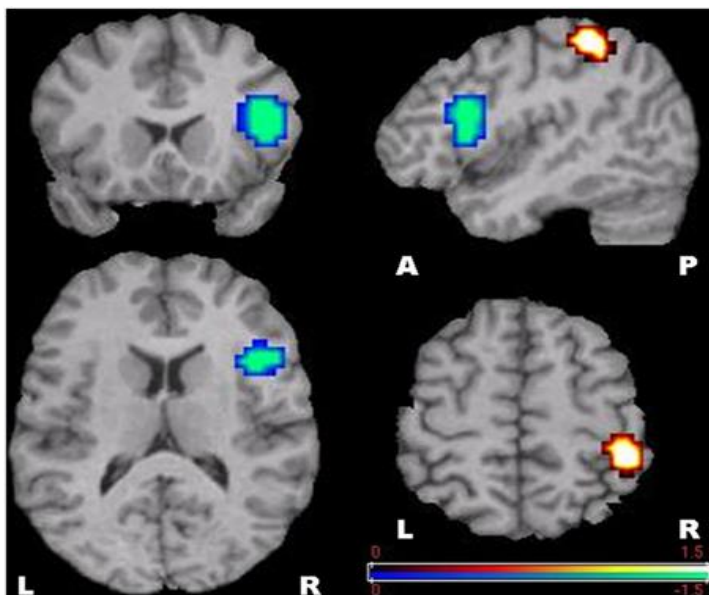
The correct choice of the mindfulness-based therapy program is largely influenced by the clinical experience of the psychotherapist. The application of an inadequate program will lead to the failure of the therapy, as well as to the progressive alteration of the patient's condition. Therefore, it is very important for the therapist to carefully analyze the personality and behavioral characteristics of the patient, as well as his motivation for the success of the psychotherapy process. Also, another very important aspect is represented by the fact that the therapist has the obligation to present to the patient all the information related to this concept of mindfulness, both advantages and disadvantages, so that in the end the patient is sure he made the right choice. In psychological practice, it is essential to gain the patient's trust, and this requires total transparency, sincerity on both sides and empathy (Pollak, 2016, p. 255).

An important aspect of mindfulness is the changes that occur on the electroencephalogram (EEG) during the practice of meditation. Clinical trials using EEG have shown that an increase in electrical activity at the neuronal level has been

observed. This interpretation of EEG was also performed in the case of epilepsy patients, clearly proving that the practice of meditation is beneficial (Delorme, 2020).

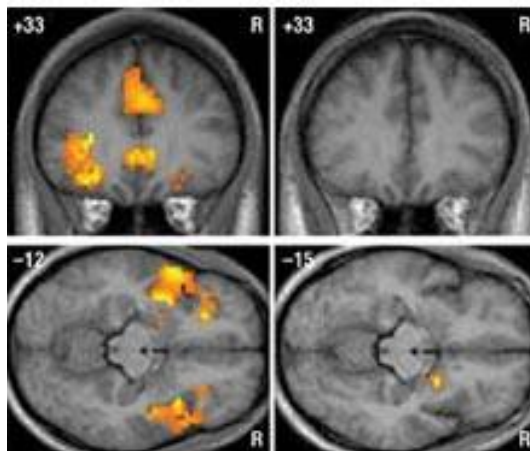
Also, the use of nuclear magnetic resonance can guide the doctor in order to establish a definite diagnosis of a mental illness. MRI studies have generated images that show changes that occur in the brain in various stressful situations or with high emotional load.

Another important feature is the ability to differentiate with the help of MRI of mentally healthy individuals and those with pathologies.



**Figure 2. Gamma brain waves captured by MRI. It can be seen that mental synchronization is the presence in the right posterior parietal cortex, while asynchronization occurs in the lower right frontal gyrus (Ishii, 2014)**





**Figure 3. Brain MRI - brain activity in the empathy-generating centers of the limbic system in normal individuals (left) and psychopathic individuals (right) when exposed to a violent image**

### **5.1. The benefits of meditation on the brain**

Although meditation is a complicated process that requires patience, but also time, its benefits on the human brain are numerous. Through this technique there is a deep relaxation that gives the patient the opportunity to control certain harmful habits, practically giving him the opportunity to repair his mistakes to a large extent. During meditation, maximum receptivity of the nervous system occurs (Murphy, 1997, pp. 74-75).

The most important beneficial effects of meditation on the human body are the following:

- Reducing stress and anxiety;
- Increasing the ability to concentrate;
- Adjusting the emotional balance;
- Giving up harmful habits;
- Improving the immune system;
- Adjuvant in case of panic attacks;
- Increasing performance.

### **5.2. Case Study**

We conducted a case-by-case study between young and middle-aged students. The study was conducted within the discipline of Histology, using pedagogical observation as a tool.

The reactions of the students were much better highlighted during the internship hours as opposed to the course. This fact is due to the involvement in the practical activity during the internship, the course being characterized by a predominantly passive participation of students.

From the first stage, significant differences in behavior were observed between the studied subjects. Being an introductory practical paper, I did not have expectations about providing answers from students in terms of the content of the presentation, because it is a new discipline for them, not being studied in general school or high school to have a starting point. At the end of the presentation, I wanted to make a brief recap of the notions taught and I noticed that middle-aged students were more active and more involved. The young students had a certain degree of hesitation. We also noted that the young students, although they were hesitant to solve some items, they proved to be attentive during the internship, accumulating the necessary information. This hesitation was motivated by young students by the fact that the faculty is a new environment for them and they need time to adjust to both the team and the rigors imposed. In the following internships, the young students showed more involvement.

Another aspect observed was that middle-aged students defend their opinions much better and with better arguments, unlike young people who often do not fight for their own opinions and tend to be influenced much faster. An advantage of young students is that they can still be shaped, guided, with flexible thinking. Mature students are characterized by rigidity in thinking. They consider that due to their age they have accumulated a life experience that gives them security, certainty in the decisions they make. At the same time, they are reluctant to approach a different style of learning, and are also skeptical about using new technologies or learning methods. This inflexibility in the thinking of mature students often makes it difficult for teachers to require both a good professional training in the field of study and a good knowledge of psychology in order to determine the students to adapt to current study requirements.

Fake news has led to the onset of other phenomena than public misinformation. They led to the division of society and the accentuation of the concept of discrimination. Basically, the society was divided into two camps: the camp of those who support vaccination and believe in its beneficial effects on health and the camp of anti-vaccination people. This division of individuals results in the occurrence of violence. Verbal violence is most frequently noticed, only in extreme cases it can lead to physical violence. Even among students, there have been numerous conflicts on this topic of anti-covid vaccination<sup>19</sup>, and bullying manifestations can be seen especially in the online environment on social networks (Alexa, 2014).

This short period of time has given rise to much speculation, being the starting point of many conspiracy theories. Few know, however, that messenger RNA platform was not discovered in a hurry now, but about 15 years ago, but did not benefit from financial resources to be able to be used to its full capacity and for various medical purposes (from treatments up to vaccines).

The causes of mistrust in COVID vaccines<sup>19</sup> come largely from information from the external environment (especially online and the media). People should document official and up-to-date sources on the evolution of the pandemic and the

effectiveness of the vaccine. Such sources are represented by medical scientific articles, medical books, online medical education platform.

## 6. Conclusions

The concept of flexibility in thinking is of particular importance in the field of education. Optimizing this concept leads to success for both the student and the teacher. The case study conducted by us highlighted the existence of major differences in terms of rigidity / flexibility in thinking of students of different ages. The results of the study emphasized once again the importance of knowing the psychology corresponding to the age of mental development. Also, another element of novelty brought to the fore was that of the mechanism of action of brain waves, as well as the ways of recording them using the electroencephalogram. Understanding how brain waves work is an important step in determining whether or not there is a psychological pathology or mental disorder.

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