



The Relationship between Emotional Self-Control and Coping Mechanisms -Applications of Neuroscience in Education

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Abstract

Recent research in the neurosciences, that has been increasing recently, is beginning to develop significantly relevant conclusions regarding aspects of brain function. Two of the central concepts derived from the enrichment of the field of knowledge of the human brain and mind refer to neuroplasticity and epigenesis. Understanding the coping mechanisms in the educational context is the passport to a state of mind-brain-body balance that allows a better management of the teacher-student alliance. Through the given research we aim to study by statistical comparison, the difference in self-control depending on the person's gender and the relationship between coping mechanisms (VI) and self-control (VD) depending on gender. The research group consists of 260 adults, non-clinical population from Romania, aged between 22-65 years, and following the comparison according to gender, we note that there are different coping mechanisms for men and women that are associated with fragile self-control, only one behavioral coping mechanism being common to both categories: aggressive behavior. For women, recurrent thinking about how terrible the experienced event was, impulsive behavior without considering the consequences, manipulative and non-transparent behavior, as well as aggressive, brutal behavior are associated with fragile self-control. For men, aggressive, brutal behavior and focusing only on one's needs, regardless of whether the consequences of one's actions have negative consequences on others, are associated with fragile self-control.

Key words: Comparison; coping; correlation; difference; self-control

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1. Introduction

This topic is important both for the field of psychology / psychotherapy, and for the educational field, because the processes of understanding and learning related to the educational performance take place through changes in brain activity, which produce changes at the cortical level. When the teacher-student relationship is very good, there are changes in the activity of the parietal cortex, an area involved in solving problems and finding solutions. By talking about their experiences, students can identify dysfunctional patterns and change them. Psychological adjustment/coping to the stressors of everyday life induces endocrine responses at the level of the nervous system, as well as the secretion of the hormones involved, especially steroid ones, by the hypothalamic-pituitary-adrenal axis.

The right hemisphere, the limbic system, the mirror neuron system are neural aspects studied to understand how the human brain processes, encodes and recodes experience. In the student-teacher relationship, where the alliance (psychological safety) is activated, as the student connects with the teacher, the mirror neurons in the student's brain pick up the nonverbal signals of his outer experience and begin to register it in the brain as his own inner experience.

The purpose of the research is to determine the relationship between coping mechanisms and emotional self-control in adulthood, and subsequently develop and implement a psychotherapeutic program to improve/change the coping mechanisms for both men and women.

The objectives of the research are: the development of the research project by different psychological methods and techniques for investigating coping mechanisms and the determination of the relationship between coping strategies and self-control in adulthood.

The obtained results that contribute to the solution of the important scientific problem consist in the establishment of coping strategies and their impact on the emotional self-control of the adults, as well as the implementation of a psychotherapeutic intervention program afterwards.

Novelty and scientific originality. For the first time at the national level, the experimental study of the emotional self-control and coping strategies in adulthood is carried out and a psychotherapeutic program for changing coping strategies can be developed and applied on adults.

Various authors have developed a series of theoretical and practical studies on coping mechanisms. Regarding the relationship between coping and emotional self-control, several studies had been conducted in the last 5 years, the results being very interesting for the professionals in the psychology field:

- A study focused on the analysis of linear relations between personality, self-regulation, coping strategies and achievement emotions for the undergraduate students. Evidence of associative relations between personality factors, self-regulation and coping strategies was found. The neuroticism factor had a significant negative associative relationship with Self-Regulation; especially important was its negative relation to decision making, and coping strategies focused in emotion (de la Fuente et al., 2020);
- A study highlighted the role of religiosity, self-control skills and emotional attachment style as risk factors for coping with stressful situations. Participants were recruited from junior high schools located in the Northern Triangle region of Israel. Poorer self-control skills, and anxious and avoidant emotional attachment style were each associated with a greater likelihood to engage in passive coping skills. In addition to positive correlation between religiosity and active coping skills in response to stressful situations, these findings suggest the cross-cultural relevance of these risk factors for effective coping with stress (Agbaria, 2021);
- One-hundred and sixty-two parents of children with severe epilepsy were enrolled in the survey during the hospitalization of their child at the Danish Epilepsy Center on the family, coping style responses, sense of control, and the level of parental

perceived stress. Serial mediation models demonstrated a mediating effect of self-control and emotional coping (EMCOP) response between child behavioral difficulties and both parental stress and family impact. Low level of control was associated with a higher level of EMCOP response, and a high EMCOP response was associated with greater perceived stress and family impact. Social support ceased to be a protective factor for parental stress in the presence of decreased self-control and higher levels of EMCOP response (Jacobsen & Elklit, 2021);

- A research conducted in Indonesia revealed that self-regulation directly affects the students' academic coping strategies and psychological capital during online learning in the Covid-19 pandemic. The pedagogical finding of this study can improve the quality of learning during the Covid-19 pandemic which is expected to be applicable not only in Indonesia but also in other countries, particularly in southeast (Sinring & Nurfadhilah 2022);
- Higher scores on self-control correlated with better adjustment (fewer reports of psychopathology, higher self-esteem), less binge eating and alcohol abuse, better relationships and interpersonal skills, secure attachment, and more optimal emotional responses and the positive effects remained after controlling for social desirability. Low self-control is thus a significant risk factor for a broad range of personal and interpersonal problems (Tangney, Boone, Baumeister, 2018) .

The applicative value of the work: the obtained results can contribute to the foundation of a good practice guide, both from a theoretical and a practical point of view, in the evaluation of the personality profile both from a clinical and psychological point of view work, in the personnel selection activity.

Implementation of scientific results. The results can be used in the process of training psychologists in the field of psychotherapy, but they are also a guide for psychologists who carry out specific activities of personality assessment, both from a clinical point of view and for the selection and recruitment of personnel in organizations.

The aim of the research is to identify the cognitive, emotional and behavioral coping mechanisms that have on emotional self-control in adulthood. The research objectives are:

- to identify the link between coping and emotional self-control according to gender;
- to study the difference in emotional self-control depending on the gender of the person.

The hypothesis of the research is the following *there is a difference between men and women in terms of self-control, and the coping mechanisms that are related to self-control differ by gender.*

2. Coping as a student's subpersonality – developing resilience in the education process

The student has a set of sub-personalities, which are developed on the perception of world and life, and reality in general. Many of the subpersonalities are formed in childhood in contact with the significant adults in the student's life (parents, teachers, etc.).

The subpersonalities manifest in *adaptive coping mechanisms* as follows:

- The student shows **assertiveness**, relates to reality with confidence and concrete direction, to solve the educational problems he faces. In the relationship with third parties, he respects interpersonal limits, expresses firmly and concisely what he feels and thinks;

- The student **relates socially**, joins others to face problems together, gets involved in solving problems together with the other participants in the educational act, taking into account their needs;

- The student **seeks social and emotional support** in the relationship with other people (teachers, parents) to receive the support he needs, and overcome the events he may face in the educational environment;

- The student **acts with caution**, carefully analyzing the options before carrying out any action, shows caution in relation to situations that may affect his school situation.

At the same time, the student can manifest *maladaptive coping mechanisms* in the educational environment, as follows:

- The student acts by **instinct** - he approaches educational tasks based primarily on his intuitions in stressful situations he reacts impulsively. He tackles problems without thinking too much about the consequences for his educational situation;

- The student exhibits **avoidant behavior** - performs alternative / different activities to avoid coming into direct contact with the educational tasks. At the same time, he abandons the problems he has to take on, waiting for the solutions to appear without his own and conscious effort;

- The student **acts indirectly** – the student prefers to approach educational tasks in a dual way, influences or manipulates the environment, the context or other people to solve the respective situation without taking responsibility directly;

- The student **acts antisocially** - the student prefers to approach educational tasks taking into account only his needs, he acts regardless of whether the consequences of his actions have negative consequences on others;

- The student **acts aggressively** - the student prefers to tackle educational tasks quickly, decisively, solves the problem quickly, takes control at any cost, acts with the aim of dominating and disarming others.

When a sub-personality is present, the role played is so convincing that the person strongly believes that the role is actually true. At the same time, the coping mechanism related to this subpersonality is the one that mediates the student's relationship with the school/academic environment and the educational tasks to which he/she must adapt, concretizing in his deep (cognitive) structure learning and understanding, and in his surface structure (behavioral) the final product of the act of education.

In relation to the development of resilient coping mechanisms, Graham's approach (2013) should be mentioned, which refers to the integration of a neuroplasticity process and involves a 3-level approach:

- the first is defined as the circuit to resonate with the other, manifested by the activation of empathy, compassion through affective resonance with other people. We thus use the interaction between our brain and the resilient brain of the other to strengthen our activity in the circuits of the prefrontal cortex and develop abilities to respond adaptatively to external demands.

- the second level of resilience development is called the focusing network which is involved in focusing attention on an object, task;

- the third level refers to the defocusing network that includes the functioning of the structures on the sides of the cortex (a lateral circuit) to orient us in time and space.

This network is engaged in more diffuse experience, being activated from a perspective of the state of being rather than being attentive. It operates primarily in the right hemisphere and allows us to relearn and rewrite neuronally encoded strategies through the focus network. In Graham's view (the two networks and related neural structures) work together to support our resilient coping mechanisms.

3. Coping mechanisms and their neuronal encoding

In order to understand how coping mechanisms work and how we can act adaptatively to the demands of the external environment, it is important to understand how the human brain works. Neuroscience research, that has been recently booming, is beginning to develop increasingly relevant conclusions regarding hitherto unseen aspects of brain function. The brain learns patterns and habits of behavior by focusing attention on an experience and this causes the activation of nerve cells, neurons, in different parts of the brain. This activation causes other

activations in the nerve cells in the rest of the body. The experience can be an external event (for example, the barking of a dog on a street when we walk) or an internal response (such as the reaction of fear of that dog and meeting him).

When neurons are activated in response to experience, they send electrical and chemical messages to other neurons through the gaps that separate them (sometimes creating synaptic connections with more than five thousand neurons simultaneously). *This neuronal messaging and synaptic connection strengthens the brain's response pathways.* (Graham, 2013, p. 10). Being in a social context, the reactions of others then activate another response in us, such as reassurance when a person next to us protects us from possible danger (in the example above, the barking dog). These quick connections to the brain, the neural connection, and the connection to the other person to process the sense of a safe or dangerous situation can only take milliseconds. But as one experience repeats itself, the thousands of neurons that activated together and created the neural network of the initial response tend to reactivate by consolidating that network and preparing the brain to respond in the same way when it encounters a similar situation.

Hebb's theory conveys that when we are confronted with new experiences and information, we learn by associating new stimuli with known memories in the form of pre-existing synaptic patterns. Thus, the superior models of understanding appear through new, more consolidated synaptic circuits (Dispenza, 2019). So, exposure to repeated experiences and repeated activation of the same connections strengthens the power of connections. Thus, these strengthened synaptic connections become neural pathways. When circuits are stable, the power of neural networks of memories and associated meanings makes it very likely that we will respond to the same or similar experiences in ways we have already responded to. *This coding process is called conditioning by researchers.* Conditioning creates automatic behavioral patterns by encoding patterns of neural activation of repeated responses to experience, stabilizing the neural circuits of that learning, and storing those patterns of response in implicit (unconscious) memory (Graham, 2013, p. 11). If a pattern of behavior is used regularly, in the end it no longer requires a focus on it; neural circuits are stabilized in the brain, allowing us to respond automatically to a similar situation. *Creating behavioral habits through conditioning is the brain's way of responding effectively* (Graham, 2013, p.11). Without conditioning, we should re-learn everyday things from the beginning: how to lock the door, how to tie our laces, and so on.

Conditioning can also be used to create adaptive coping mechanisms. If we take the example of an unwanted and unexpected event, a generator of stress, in the category of factors encountered in daily experience, such as traffic jams when you are already late, preconditioning determines whether or not we panic, or if we are present to call available resources. In activating resilience, the internal response is most important, the external stimulus being less important. Hence the individual differences in resilient behaviors: an external stimulus can activate resilient behavior in one person and trigger a blockage in another.

4. Neuroplasticity - rewriting coping mechanisms and brain architecture

Rewriting neural circuits to activate an adaptive coping mechanism response is a capacity of the brain that functions through a complex mechanism called neuroplasticity. *Neuroplasticity is the mechanism by which conditioning-activated circuits are rewritten and represent the ability of our brain to create new neurons (and connections between them, implicitly new neural networks and circuits* (Graham, 2013, p. 12). Neuroplasticity is how we can develop new coping mechanisms or regain resilience and thus take us out of the area of conditioning that may not have been optimal. The limbic brain reacts to events in milliseconds and automatically does not need a conscious effort controlling all the neural circuits related to our response to stressors. The amygdala, the alarm center of the system, processes the initial perceptions of fear or danger outside the conscious and extracts from the implicit memory the information it needs to assess the situation in terms of safe / dangerous. If the situation is considered dangerous the amygdala sends electrical and chemical signals along the neural pathways to the prefrontal cortex demanding

action. These instinctive survival responses are those we involve when other conscious strategies have not been learned or are temporarily unavailable.

This is why it is so essential to strengthen the prefrontal cortex to regain our resilience. *A strong, mature prefrontal cortex can regulate the invigorating or stopping response of the nervous system and stifle the fear response of the amygdala* (Graham, 2013, p.16) An important aspect of the new studies shows that the expression of emotions influences the immune system. In the social context, the expression of emotions causes changes in physical appearance (relaxation, tension, smile, frown) and behavior (aggression, submission), all with the involvement of our physiology and effect in changes in the activity of the immune system. For example, in one study, couples were asked to discuss an issue they were facing for 30 minutes. Biological parameters were assessed by blood tests before, during, and after this discussion, and short-term neuroendocrine changes were highlighted (Vedhara & Irwin, 2017).

The prefrontal cortex can be considered the executive center of the brain. As a result of its ability to integrate, the prefrontal cortex can regulate survival responses in the lower brain. It coordinates information from two different memory systems: implicit memory, which is outside our consciousness, and explicit memory, which is in our consciousness. This capability is essential for re-editing the models of the oldest packaging.

The prefrontal cortex supports us in not being permanently panicked, through conscious reflection and analysis it allows us to modulate our energy and not get stuck emotionally. It is responsible for the processes of giving (giving in to the feelings of others), empathy (understanding the meaning of the feelings of others) and self-awareness (understanding our own and our own story). This rewiring is what increases our ability to respond flexibly, the neurobiological platform of resilience and the adoption of adaptive coping mechanisms.

The frontal orbital cortex allows information from external stimuli to be associated with what we feel supporting the connection between information and emotion. We are talking here about two distinct but interrelated processes: interoception and exteroception. Interoception refers to the process by which we observe our internal state, the perception of internal sensations that contribute to the subjective experience of our state. Exteroception refers to information from the outside environment that is significant for assessing the situation in terms of safety or danger (Kain & Terrel, 2018).

Executive functions, from top to bottom, are integrated by the prefrontal cortex, primarily by coordinating the functioning of the right and left hemispheres of the brain. The upper brain has two hemispheres that respond differently to experience: the right hemisphere, working with the emotional side, and the left hemisphere involved in logic, and the dynamic integration of these functions and pathways supports neuroplasticity and neural integration. Many structures in the right hemisphere process the experience we receive through our senses (such as visual images and sensations of movement) and our emotions, as well as our relationships with others. The right hemisphere processes our experiences holistically as a whole.

Due to its extensive neural connections to the limbic system of the lower brain, the source of our most primitive emotions, the right hemisphere, is sometimes referred to as "our emotional brain." The verbal and speech processing centers are located on the left side of the brain. The left hemisphere matures significantly later than the right, with fewer neural connections to the limbic system. The left hemisphere has been called the rational side of the brain; its massive powers of analysis, judgment, and planning have made possible the progress that mankind has made in science and society.

In addition to integrating the emotional part of the right hemisphere of our emotions with their rational assessment of the left hemisphere, the prefrontal cortex integrates the various facets or "parts" that make up the personal self, generating a coherent narrative of our self and a continuity of the self in time. Three other structures allow the prefrontal cortex to coordinate the mechanisms of conditioning and neuroplasticity. The hippocampus, located near the amygdala, translates experiences and learning from implicit memory to explicit memory. The hippocampus

greatly enhances our ability to make wise and conscious choices, allowing us to rely on implicit memories of what previously worked to guide us in coping resiliently and adaptively. The significance of these implicit memories, especially from childhood, influences how we react to reality (coping mechanisms) and how we use our resources to respond adaptatively to reality (resilience).

The anterior cingulate cortex allows the brain to focus attention, switching between the right and left hemispheres, allowing for the integration of our thoughts and feelings. The island, a body of cortical tissue that folds into the limbic system, serves as a vital conduit between the upper and lower brain; it allows us to consciously know our body's responses to internal or external signals, interpret the significance of other people's behavior through mirror neurons. These neurons activate in different parts of the cortex when they observe another person's actions and help us learn new behaviors by imitating others. It also helps us understand the intentions of other people's behavior when we see them acting in a certain way. The island then sends these emotional signals to the prefrontal cortex for interpretation.

5. Methods

5.1. Participants

The experimental research was carried out in the period 2022/2023, on a *sample* of 260 adults (130 men and 130 women), non-clinical population from Romania, aged between 22-65 years old, higher education, having the characteristics as shown in Table 1.

Table 1. Descriptive statistics of the research sample

N	Min	Max	Mean	Standard deviation
130	22.00	65.00	29.2077	6.39609
130	22.00	53.00	29.7538	7.17236
260	22.00	65.00	29.4808	6.78771

Regarding the age distribution by age group, we have the following percentages: 22-29 years: 58.5%, 30-39 years: 32.7%, 40-49 years: 7.8%, 50-65 years: 1.2%.

5.2. Instruments

To achieve the proposed goal, we used three instruments: two questionnaires for the assessment of coping (SACS - Behavioral coping questionnaire and CERQ - Cognitive emotional coping questionnaire) and a personality inventory (CPI).

Cognitive-Emotional Coping Questionnaire (CERQ): The test measures the frequency with which the person applies strategies, in general, in negative life situations: self-blame, acceptance, rumination, positive refocus, planning refocus, positive reappraisal, putting into perspective, catastrophizing, blaming others.

Strategic Approach to Coping Scale (SACS): This questionnaire assesses how people react behaviorally when faced with a stressful problem/situation: assertive action, social relationship, seeking social support, cautious action, instinctive action, avoidance, indirect action, antisocial action, aggressive action.

CPI 434: the inventory includes 434 items that reveal information on the evaluated person's perspective in life, on how he perceives himself and compares himself with others, regarding a series of characteristic features that are important in work and everyday life.

6. Results

Considering the first part of the hypothesis, namely the comparison of self-control according to the gender of the person, we note from Table 2 the fact that the average for this dependent variable, between men (1) and women (2) has close values, but is higher in the case of women:

Table 2. Average self-control according to gender

	Gender	N	Mean	Standard deviation	Mean standard deviation
Emotional self-control	1 B	130	30,5846	4,57798	0,40152
	2 F	130	31,9846	3,49969	0,30694

To determine whether the difference between the two means obtained for men and women is statistically significant, we applied the T-test for independent samples (men – women) - Table 3. The results indicate that between women and men there is a difference statistically significant in terms of self-control (t for equality of variance assumed is -2.770, degrees of freedom 258, and the significance threshold is $p < 0.05$), so the difference is statistically significant between women and men.

Table 3. M/F Independent Samples T-Test Values

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Self-control CPI	Equal variances assumed	6,748	0,010	-2,770	258	0,006	-1,40000	0,50540	-2,39523	-0,40477
	Equal variances not assumed			-2,770	241,391	0,006	-1,40000	0,50540	-2,39556	-0,40444

Regarding the second part of the hypothesis, the connection of coping mechanisms with self-control, an average connection between coping and self-control is found both in the case of men and in the case of women, as it results from the analysis of the Pearson correlation coefficients in Table 4.

Table 4. Pearson correlation coefficients for coping – self-control

Gender	Coping	Correlation self-control
Feminine	CERQ Catastrophizing	-0,340**
	SACS Instinctive action	-0,307**
	SACS Independent action	-0,345**
	SACS Aggressivity	-0,353**
Masculine	SACS Antisocial action	-0,380*
	SACS Aggressivity	-0,303**

** $p = 0,0001$

Table 4 shows an average correlation between coping and self-control, so the stronger the person manifests the coping mechanism, the lower the self-control. For women there are both emotional and behavioral coping mechanisms that are related to self-control, and for men there

are only behavioral coping mechanisms that are inversely related to emotional self-control. For women, thinking about how terrible the event was, acting without considering the consequences, manipulative and non-transparent behavior, as well as aggressive, brutal behavior are associated with fragile self-control. In the case of men, aggressive, brutal behavior and focusing only on one's needs, if the consequences of one's actions have negative consequences on others, are associated with fragile self-control.

From the correlation table, it can be seen that there are different coping mechanisms for men and women that are associated with fragile self-control, only one coping mechanism is common to both categories: *aggressive behavior as a behavioral coping mechanism*.

Checking if there is a difference in the manifestation of this common coping behavior between men and women, it results from Table 5 the fact that between men and women there are no differences from a statistical point of view regarding the behavioral coping mechanism aggression, value of $t = 1.022$, degrees of freedom $df = 258$, and the significance threshold $p > 0.05$

Table 5. Independent samples T-test values for behavioral coping AGGRESIVITY by gender

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
Self-control CPI	Equal variances assumed	1,053	0,306	1,022	258	0,308	0,30769	0,30095	-0,28494	0,90032
	Equal variances not assumed			1,022	245,614	0,308	0,30769	0,30095	-0,28508	0,90046

7. Discussion and conclusions

Thoughts produce emotion, and the emotions caused by certain thoughts of fear are felt as worry, anxiety, avoidance or depression, leading to specific coping mechanisms. Worrying thoughts and fears always annoy the mind and trigger anxiety symptoms. The body's response (coping mechanism) to stress caused by anxiety - and anxiety begins in the mind, but continues throughout the body, and its impact varies from person to person, as well as the consequences that arise from it.

Today, the neurobiological effects of psychotherapy can be measured using functional imaging, which is now seen as extremely relevant to neuroscience and psychology, as we can gradually achieve a more accurate identification of the neural circuits associated with the disorders studied. Studies involving neuroimaging and psychotherapy have combined approaches to behavioral therapy, cognitive behavioral therapy, interpersonal therapy, eye movement desensitization, and reprocessing used primarily to treat obsessive-compulsive disorder, major depressive disorder, social / specific phobia, and posttraumatic stress disorder. Neuroimaging studies are based on either a longitudinal approach, in which patients are scanned before and after therapy, or a predictive approach in which patients are scanned before therapy to determine predictors of pre-treatment in the brain of subsequent symptomatic improvement. In contrast, predictive studies aim to provide a basis for stratified treatment based on the likely response, potentially enabling clinicians to tailor therapies more effectively for individual patients (Fu et al., 2013). Research investigating neural correlations of therapy aims to provide a better

understanding of the formation, recovery, and maintenance of symptoms, in addition to supporting the development of improved treatments and personalized medicine based on the likely response that could improve outcomes for psychological recipients. Recent reviews have highlighted the benefits of functional neuroimaging studies in this area for depression and anxiety disorders (Wise et al., 2014).

Given our recent research on coping mechanisms and self-control, as a personality factor, we may conclude that:

- there is a statistically significant difference between men and women in terms of self-control, and the coping mechanisms associated with emotional self-control are different according to gender, therefore the research hypothesis has been confirmed;

- there is an average correlation between coping and self-control, so the stronger the person manifests the coping mechanism, the lower the self-control;

- for women there are both emotional and behavioral coping mechanisms that are related to self-control, and for men there are only behavioral coping mechanisms that are inversely related to emotional self-control.

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