Neurosciences and Emotional States of Latin American University Professors in the Post-Covid-19 Pandemic Stage

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Abstracts

The article aimed to determine the relationship between neuroscience and emotional states in university faculty members from Latin America during the post-pandemic stage of COVID-19. It highlights the importance of understanding emotions from a neuroscientific perspective to develop strategies that enhance emotional management and resilience in the educational context. The descriptive-correlational research included a sample of 318 faculty members from various Latin American countries. The results revealed severe levels of stress (88.4%) and anxiety (92.1%), as well as inadequate (40.9%) or moderate (46.9%) levels of resilience among the faculty members. A strong positive correlation was found between neuroscience and emotional states (rho=0.860), as well as a good positive correlation between neuroscience and resilience (rho=0.739). The study concludes that the knowledge and application of neuroscience principles could contribute to lower levels of stress and anxiety and increase resilience in university faculty members, emphasizing the importance of integrating these disciplines into the understanding and management of emotions in the educational field.

Keywords: Neuroscience, Emotional States, Resilience, University Faculty, Post-Pandemic.

Introduction

Faced with the new reality in the post-pandemic stage of Covid-19 and the new normal, higher education centers in the general context adopted measures that include new forms of academic development; assuming, new methodologies that include the use of new information and communication technologies (NICTs) and other means, such as virtual education platforms.

In this context, universities and different educational centers adopted different forms of teaching based on new information and communication technologies, which allow continuity in the educational process, developing a set of didactic strategies that allow the development of a set of skills and competencies; undoubtedly, this reality generates a situation of stress and anxiety (Trujillo & et al. 2022)

This situation has meant that, in the post-pandemic stage of Covid-19 and the new normal, stress and anxiety levels continue when resuming academic activities; Undoubtedly, these emotional situations have to do with aspects and foundations of neurosciences, since the object of study of neurosciences are the brain functions, emotions and learning processes of the individual. "Neurosciences bring together classic disciplines and novel interdisciplinary fields, with objectives aimed at finding answers about the structure and functioning of the brain with the ultimate goal of understanding in depth the cognitive processes and behavior of the human being" (Barrios-Tao. H. 2016; pp. 395-415)

The emotional situation of university teachers in the post-pandemic stage of Covid-19, in the Latin American context, is a very important issue to take into account in the processes of generating educational quality; It is in this sense, emotional states are related to a set of attitudes and feelings that a person adopts as a result of some event that occurs in their social environment; that is, an emotion is related to a set of feelings and reactions, in this sense emotions are experienced individually. In this regard, Bisquerra Rafael. (2011) states that: an emotion "... It is a complex state of an organism characterized by an excitation or disturbance that predisposes to a certain organized response. Emotions are usually generated in response to an external or internal event" (p. 61).

These aspects and theoretical foundations allowed the present research to be carried out; thus, the research question that has guided the present study was: What is the relationship between Neurosciences and emotional states in Latin American university teachers in the post-pandemic stage of Covid-19?, based on this the objective of the research is determined as follows: To determine the relationship between Neuroscience and emotional states in Latin American university professors in the post-pandemic stage of Covid-19.

In such a way, it allows generating a set of strategies aimed at strengthening and managing stress and anguish levels, to channel emotions in the post-pandemic stage.

The fundamental argument of this study lies in the importance of the relationship between neurosciences and the emotional states of teachers as educational actors in the university context: Latin America case; that allow the development of strategies aimed at the management of emotions in University Professors in the Latin American context.

Emotional self-management is necessary for the effective self-control of situations that may arise from any activity that is carried out within the teaching-learning process and in which the teacher must act in an equanimous manner or show the ability to resolve conflicts that are generated in a media way.

On the other hand, it is important to note that emotions are important to keep the person motivated and interested in what they are participating in or intervening, but that, if they get out

of control and have a duration or intensity above normal, they can become a negative aspect for the achievement of learning goals or results. From the point of view of Frontiñán (2020), emotion is fundamental for cognitive functions such as learning, memory or decision-making, and its control is related to all regions of the limbic system or as some call it, the emotional brain. Therefore, it is inferred that emotions can be decisive in any action carried out by the teacher, so that students acquire their competencies.

It is obvious that emotions play an important role in the teaching-learning outcomes of teachers and students; one of the characteristic elements of the emotional system being motivation, which acts favorably or unfavorably, depending on the presence or not in the subject who teaches or learns. In this sense, Orón (2019) considers that, in order to work on a motivational system, the intentionality, beliefs, cognition, and expectations of the person or student must be taken into account. It also indicates that what motivates a person is to be a person. Similarly, Inglés, Ruiz, & Torregrosa (2019) specify that motivation is the cognitive process that acts through people's thoughts, beliefs, and emotions and guides them towards the achievement of established objectives.

From these ideas, it is inferred that motivation contributes to improving educational processes and emotional self-regulation, with the understanding that, if the teacher uses positive stimulation strategies, based on neuroscience, he achieves not only the interest of the students, but also that they put themselves in a work attitude and want to give the best of each one in favor of the achievement of learning at an individual and of equipment. Meanwhile, Diez (2023) indicates that the human being has an emotional dimension, which implies that it is affective, so an external stimulus results in a neurochemical reaction, which acts on the limbic system and produces an emotion, which contributes to the survival and adaptation of the person, motivating the subjects to perform any action in which they are involved.

From the point of view of Carrión (2015). The manifestation of an emotion requires the functional system to be activated, involving different brain regions and areas, especially the thalamus and the hypothalamus that are responsible for the instinctive and somatic aspects; as well as the cerebral amygdalas that are responsible for behavior and other reactions of the human being. These ideas justify the need for teachers to understand the principles of neuroscience to improve their own work and ensure the learning and academic success of their students; because the application of methods based on neuroscience improves the attention span, concentration and retention of information that students receive.

According to Ariza & Ocampo (2005) "the university is a context that; undoubtedly, it goes beyond the transmission of knowledge and the development of a set of competencies, skills and the management of a set of technologies and is aimed at training professionals with skills to innovate, research and be agents of improvement and social change, through training processes that involve all facets of the human being" (p. 85).

In this context, for the fulfillment of its mission and in the process of a comprehensive education, the university must implement various strategies that adjust to the constant social, political, economic and cultural transformations of its context. These strategies are aimed at the following objectives:

- To facilitate the adaptation and permanence of students to university life, especially during the first semesters of their degree.
- To generate alternatives for the development of general and specific competencies that future professionals must acquire (Cerezo & et al., 2005; p. 105)

The above objectives require a process of planning and implementation of actions, plans and programs, which guarantee higher education with quality and excellence, for which the commitment and role played by each of the actors that make up higher education institutions is essential.

In addressing the issue related to neurosciences and the emotional situation of teachers in the post-pandemic stage of Covid-19 and the new normal, it is very important to understand what "emotion" is and its implications in education and in the context of learning, according to Bisquerra (2003) "Emotion is a complex state of the organism, characterized by an excitation or a disturbance, which predisposes to an organized response. Emotions are generated in response to an internal or external event" (p. 4)

Based on the above; Emotions are related to a set of responses to certain stimuli, these stimuli can be external or internal. The responses generated by the different stimuli are expressed in a set of actions and/or behaviors, which in some way have their repercussions in the social environment where the individual develops. Along these lines, Chóliz (2005) determines that an emotion is related to a "... affective experience to a certain extent pleasant or unpleasant, which supposes a phenomenological quality, a characteristic that involves three response systems: cognitive - subjective, behavioral - expressive, and physiological adaptive" (p. 4)

On the other hand, Revee (2010) states that: "Emotions are subjective, physiological, functional, and expressive phenomena of short duration that prepare us to react adaptively to important events in our lives" (p. 7). Along these lines, Gondim and Estramiana (2010) state that: "emotions are the reflection of affective, personal and collective states, they influence interpersonal and group relationships and express reactions to values, customs and social norms, which account for social differences" (p. 33)

So, based on the aforementioned considerations, it is possible to determine that emotions, such as stress, anguish, as a set of psychophysiological reactions, which represent modes of adaptation, as forms of responses to certain stimuli, whether internal or external. Emotions are related to what we feel, when we perceive a certain situation.

Undoubtedly, emotions from an experiential perspective are sudden alterations, which we experience from our moods; however, these alterations or changes occur as a function of certain stimuli, whether external or internal, they have a direct influence on our forms of conduct, behavior in the face of a certain reality; Thus, the levels of stress and anguish in university teachers in the post-pandemic stage is a current issue, since it is directly linked to emotions, ways of thinking and ways of processing experiences and learning.

So, emotions are complex responses of the brain to external stimuli and internal stimuli, and their study has been and is a topic of interest for neurosciences. Neuroscience is a branch of science that studies the nervous system and its relationship with behavior and emotions.

Much of the research in neuroscience has revealed that emotions are associated with the activity of different regions of the brain, such as the limbic system, the prefrontal cortex, and the hypothalamus; In addition, emotions have been shown to have an impact on the release of neurotransmitters and hormones, which influences mood, pain perception, decision-making, and memory.

Advances in the field of neuroscience have shown the indisputable link between emotions and cognition, emotions and learning (Immordino-Yang, 2011. Meltzoff et al, 2009), emotions and moral decisions (Han et al, 2016, Pletti et al, 2017); Likewise, it has been shown that emotions play a preponderant role in rational thinking and decision-making (Fuster, 2023. Prada & Gonzales, 2014. Torres et al, 2013).

The study of emotions from a neuroscientific perspective has also allowed a better understanding of emotional disorders such as depression, anxiety and post-traumatic stress disorder, which has led to the development of new therapies and treatments.

In this line, of the relationship between neurosciences and emotions, it is important to note that, when emotional development acquires a relevant role within the learning and teaching processes, it is easier for students to make free, responsible and autonomous decisions, taking into account the consequences of their decisions on life and others (ethical dimension); he is able to transcend beyond his existence to come into contact with the existence of others (spiritual dimension); is able to understand and creatively apply knowledge by making critical and innovative reflections (cognitive dimension); is able to relate positively to themselves and to others, based on emotional management (affective dimension); is able to use verbal and non-verbal language to transmit and understand messages with meaning and meaning (communicative dimension); he is able to creatively express his sensitivity and appreciate and transform the environment (aesthetic dimension); and is capable of assuming a commitment of solidarity in the construction of a fairer society (socio-political dimension); that is, there is an interconnection and a very close relationship between neuroscience and emotions.

Neurosciences refer to a "discipline that includes many sciences that are concerned with studying, from the inter, multi and transdisciplinary point of view, the structure and functional organization of the Nervous System, particularly the brain." (Gudiño 2009).

In this sense; according to Tapia & et al (2017). The term neuroscience is made up of two important elements: neuro which means nerve and knowledge science, therefore, neuroscience applied to human beings studies the nervous system and the interaction of its different elements which give rise to the biological bases of behavior... (pp. 61-74).

"The fundamental contribution of Neuroscience lies in making all teachers see that the gateway to knowledge is emotion. And that it is with emotion that curiosity is awakened that the automatic opening of the windows of attention is followed, which activates the neural mechanisms of learning and memory." (Mora 2014; p. 47).

In the current context, neurosciences contribute significantly to the generation of critical thinking and the generation of emotions, these elements can also be applied at different levels of

educational environments to make this activity more dynamic and entertaining for educational actors; that is, teachers and students.

Based on the above, in the process of studying the emotional states of university professors, it is important to note that the study of emotions from neurosciences is directed from affective and emotional neurosciences and social neurosciences, whose development has been favored; based on a set of investigations in recent years. The study with people with neuropsychiatric and neurological conditions has also made it possible to approach the neural bases that underlie the affective, emotional and social processes in the learning and teaching processes.

Some elements that neurosciences consider to achieve educational processes, where the participation of students and teachers is important; To this end, neurosciences deal with:

- To learn more about the functioning of the human brain.
- Value the importance of contact with nature and the social environment.
- Motivate curiosity, pure attention, for the explanation of the phenomena being studied.
- Understand that motivation is the "mental fuel" for learners to generate meaningful learning.
- Diversify the way in which balanced and positive emotional states are taught and cultivated.
- Recognize learning and neuropsychological functioning problems early to help students.
- Teach self-control and the management of altruistic emotions, as well as assess the different types of skills and abilities of students.

In any case, the study of neuroscience considers "training the brain to change our lives", as we know experience models the brain to what is called neuroplasticity. It is the attentive mind that places itself in the present with an attitude of acceptance, sheds worries, fears and anxiety and creates the basis of a virtuous circle that includes acceptance, patience, equanimity.

The relationship between neurosciences and the emotional states of university professors in the Latin American context is a fascinating topic that has been explored through various approaches, including affective and emotional neurosciences, as well as social neurosciences. These approaches have been made possible by advances in technologies to study the brain in action, as well as methodologies such as neuroimaging techniques and laboratory studies with non-human animals.

The study of the neural bases underlying affective, emotional, and social processes has allowed for a deeper understanding of how these aspects influence teaching and learning. It has been observed that emotional development can facilitate free, responsible and autonomous decision-making in students, as well as their ability to relate positively to themselves and others.

In addition, it has been found that emotional development can contribute to students' ability to creatively apply knowledge, communicate effectively, express their sensitivity creatively, and assume a commitment to solidarity in the construction of a more just society.

The study of neurosciences in relation to the emotional states of teachers offers valuable perspectives on how these aspects influence the learning and teaching processes and the integral development of individuals.

Materials and Method

This research work is of the Applied type. Sánchez and Reyes (2015) state that applied research, also called constructive or utilitarian, is characterized by its interest in the application of theoretical knowledge to a specific situation and the practical consequences that derive from it.

The design is descriptive correlational because this type of study aims to measure the degree of relationship that exists between two or more variables (in a particular context). According to Hernández et al. (2018), descriptive studies measure, evaluate, or collect data on various concepts (variables), aspects, dimensions, or components of the phenomenon to be investigated, and correlational studies measure each presumably related variable and then measure and analyze the correlation.

The population was made up of 318 professors from different universities in Latin America (Peru, Bolivia, Dominican Republic, Venezuela, Colombia, and Mexico), the sample was census-based, which means that the entire target population was included in the study, according to the conceptualization of Ramírez (1997).

The technique used for data collection was the survey and the instrument used has been the questionnaire, the collection of field information, a Google Forms questionnaire was applied, which was socialized using the different social networks and virtual platforms to university professors in the Latin American context. In this case, two questionnaires were structured, with general sociodemographic questions and formulations of questions of the two variables: Neurosciences and Emotional States.

The questionnaire was composed of 30 items, the variable Neurosciences organized into the following dimensions: Adaptation to teaching strategies, Emotional and motivational factors and Knowledge of plasticity and brain change. dimension of neurosciences and the dimension of emotional states, the variable Emotional states with the following dimensions: Stress, Anxiety and Resilience.

To check the reliability of the instruments, Cronbach's alpha was calculated, for the Neurosciences variable a value of $\alpha = 0.935$ was obtained and for the Emotional States variable a value of $\alpha = 0.776$ was obtained; This indicates that the reliability of both instruments is good. For the validity process, exploratory factor analysis was applied using the SPSS V - 29 statistical package. Where it can be observed that the values for the first instrument give us a value of KMO = 0.952 and for the second instrument the KMO = 0.813, as can be seen both values are high. And with respect to Bartlett's Sphericity Test, for both we are given a value of $p<0.05$, so we reject the null hypothesis in both cases. Therefore, it can be stated that the measurement instrument presents one-dimensionality in each of its dimensions and that each of the items of these dimensions seek the measurement of a single dimension, that is, that there is uniqueness of the items.

Regarding Data Processing and Analysis, the SPSS version 29 software was used, using both descriptive and inferential statistics. Spearman's Rho correlation test was included in order to examine the relationship between the variables studied.

In terms of ethical aspects, the rights of the participants were secured, protecting the confidentiality of their identity and the answers provided. Thus, the essential bioethical principles of autonomy, beneficence, non-maleficence, and justice were respected throughout the research process. (Miranda & Villasis, 2019)

Results

The study included a total of 318 participants, distributed in four age groups. The majority of participants, 42.1%, were aged between 56 and 70 years, followed by 39.9% who were between 41 and 55 years old, 15.7% between 25 and 40 years old and 2.2% who were in the age group of 71 to 85 years, thus completing 100% of the sample. The group was composed of 45% male participants and 55% female participants, reflecting a slight predominance of the female gender in the sample. Regarding marital status, it can be stated that 61% of the participants are married, 29.9% are single and the rest of the percentage with other marital status conditions. As for the Area of Knowledge, it was divided into three groups. The highest percentage (83.3%) are from the Social Sciences and Humanities, 9.7% from Health Sciences and 6.6% from Engineering. The years of service of the teachers were also taken into account and it was divided into four groups. The highest percentage, 43.4%, has between 1 and 12 years of service at the university, 27.0% has between 13 and 23 years of service, 23.3% of teachers have between 24 and 34 years of service and 6.3% have between 35 and 45 years of service. University professors from different Latin American countries participated in the study, including Peru with 48.4%, Bolivia with 22.6%, the Dominican Republic with 19.2%, Venezuela with 4.4%, Colombia with 2.8% and Mexico with 2.5%.

Table 1 provides detailed information on the variable Neurosciences in a sample of 318 university professors, which is broken down into three dimensions: Adaptation to teaching strategies, Emotional and motivational factors, and Knowledge of plasticity and brain change. The results indicate that 62.9% of the teachers have an Adequate knowledge and management of Adaptation to teaching strategies and 36.5% have a Medium or Regular knowledge. Regarding emotional and motivational factors, 66% have an adequate understanding and understanding in this regard and 33.33% of the teachers have a medium or regular understanding and understanding. Regarding the knowledge of plasticity and brain change, 80.2% of the teachers have an adequate knowledge of it and 19.2% have a medium or regular knowledge.

Table 1. Variable 1. Neuroscience

V1: Neurosciences		Frequency	%
D1: Adaptation to teaching strategies	Inadequate	02	0,6
	Medium or fair	116	36,5
	Adequate	200	62,9
	Total	318	100
D2: Emotional and motivational factors	Inadequate	02	0,6
	Medium or fair	106	33,3

	Adequate	210	66,0
	Total	318	100
D3: Knowledge of plasticity and brain change	Inadequate	02	0,6
	Medium or fair	61	19,2
	Adequate	255	80,2
	Total	318	100

Table 2 provides detailed information on the variable Emotional states of university teachers, which is broken down into three dimensions: Stress, Anxiety and Resilience. The results indicate that 88.4% of teachers have Severe Stress, 11% Moderate Stress and only 0.6% of teachers have Mild Stress. Regarding Anxiety, 92.1% of teachers have Severe Anxiety, 6.9% have Moderate Anxiety and only 0.9% of teachers have Mild Anxiety. Regarding Resilience, 40.9% of teachers manifest Inadequate Resilience, 46.9% manifest Medium or Regular Resilience and only 12.3% have Adequate Resilience

Table 2. Variable 2. Emotional states

V1: Neurosciences		Frequency	%
D1: Stress	Severe	281	88,4
	Moderate	35	11,0
	Slight	02	0,6
	Total	318	100
D2: Anxiety	Severe	293	92,1
	Moderate	22	6,9
	Slight	03	0,9
	Total	318	100
D3: Resilience	Inadequate	130	40,9
	Medium or fair	149	46,9
	Adequate	39	12,3
	Total	318	100

Table 3 presents a cross-table that relates Age with emotional states in a sample of 318 university professors, offering an integrated view of how these two variables interact. The distribution shows that of the individuals classified in the age group of 20 to 36 years (35 teachers, 11.0% of the total), 10 teachers (3.1% of the total) have an Inadequate emotional state, 20 teachers (6.3% of the total) have a Medium or Fair emotional state, and 5 teachers (1.6% of the total) have an Adequate emotional state. In the age group of 37 to 52 years (113 teachers, 35.5% of the total), 33 teachers (10.4% of the total) have an Inadequate emotional state, 59 teachers (18.6% of the total) have a Medium or Fair state, and 21 teachers (6.6% of the total) have an Inadequate emotional state. On the other hand, the age group of 53 to 68 years (158 teachers, 49.7% of the total), 55 teachers (17.3% of the total) have an inadequate emotional state, 88 teachers (27.7% of the total) have a medium or fair emotional state and 15 teachers (4.7% of the total) have an adequate emotional state. Finally, the age group of 69 to 84 years (12 teachers, 3.8%), 5 teachers (1.6% of the total) have an inadequate emotional state and 7 teachers (2.2% of the total) have a medium or fair emotional state.

Table 3. Cross-table of Age and Emotional States

			Emotional States Inadequate	Medium or fair	Adequate	Total
Age	20 - 36	Recount	10	20	5	35
		% of total	3,1%	6,3%	1,6%	11,0%
	37 - 52	Recount	33	59	21	113
		% of total	10,4%	18,6%	6,6%	35,5%
	53 - 68	Recount	55	88	15	158
		% of total	17,3%	27,7%	4,7%	49,7%
	69 - 84	Recount	5	7	0	12
		% of total	1,6%	2,2%	0,0%	3,8%
Total		Recount	103	174	41	318
		% of total	32,4%	54,7%	12,9%	100,0%

Table 4 presents a cross-table that relates the Areas of Knowledge with the Emotional States in a sample of 318 university professors. The distribution shows that of the teachers in the Area of Social Sciences and Humanities (266 teachers, 83.6% of the total), 89 teachers (28.0% of the total) show an Inadequate emotional state, 143 teachers (45% of the total) show a Medium or Fair emotional state and 34 teachers (10.7% of the total) show an Inadequate emotional state. Regarding the area of health sciences (31 teachers, 9.7% of the total), 11 teachers (3.5% of the total) manifest an inadequate emotional state, 16 teachers (5.0% of the total) have a Fair or medium emotional state and 4 teachers (1.3% of the total) have an adequate emotional state. And as for the Engineering Area (21 teachers, 6.6% of the total), 3 teachers (0.9% of the total) manifest an inadequate emotional state, 15 teachers (4.7% of the total) have a Medium or Fair emotional state and 3 teachers (0.9% of the total) manifest an Adequate emotional state.

Table 4. Cross-Table of Area of Knowledge and Emotional States

			Emotional States Inadequate	Medium or fair	Adequate	Total
Area of knowledge	Social Sciences and Humanities	Recount	89	143	34	266
		% of total	28,0%	45,0%	10,7%	83,6%
	Health Sciences	Recount	11	16	4	31
		% of total	3,5%	5,0%	1,3%	9,7%
	Engineering	Recount	3	15	3	21
		% of total	0,9%	4,7%	0,9%	6,6%
Total		Recount	103	174	41	318
		% of total	32,4%	54,7%	12,9%	100,0%

Table 5 presents the results of a Spearman Rho correlation analysis between the variables Neurosciences and Emotional States of university professors in a sample of 318 individuals. The correlation coefficient between these two variables is 0.860, indicating a strong positive correlation. This result is statistically significant at a level of 0.01 (bilateral), with a value of $p < 0.001$, which demonstrates a reliable association between the variables Neurosciences and emotional states of teachers.

Table 5. Correlation of Neurosciences and Emotional States

			Neuroscience	States Emotional
Spearman's Rho	Neuroscience	Correlation coefficient	1,000	,860**
		Sig. (bilateral)	.	<,001
		N	318	318
	States Emotional	Correlation coefficient	,860**	1,000
		Sig. (bilateral)	<,001	.
		N	318	318

**. The correlation is significant at the 0.01 level (bilateral).

Table 6 presents the results of a Sperman Rho correlation analysis between the Neurosciences variables and the Stress dimension of university professors in a sample of 318 individuals. The correlation coefficient between these two variables is 0.238, indicating a weak positive correlation. This result is statistically significant at a level of 0.01 (bilateral), with a p-value < 0.001, which demonstrates a reliable association between the Neuroscience variables and the Teacher Stress dimension.

Table 6. Correlation of Neurosciences and Stress

			Neuroscience	Stress
Spearman's Rho	Neuroscience	Correlation coefficient	1,000	,238**
		Sig. (bilateral)	.	<,001
		N	318	318
	Stress	Correlation coefficient	,238**	1,000
		Sig. (bilateral)	<,001	.
		N	318	318

**. The correlation is significant at the 0.01 level (bilateral).

Table 7 presents the results of a Sperman Rho correlation analysis between the Neurosciences variables and the Anxiety dimension of university professors in a sample of 318 individuals. The correlation coefficient between these two variables is 0.192, which indicates a weak positive correlation. This result is statistically significant at a level of 0.01 (bilateral), with a p-value < 0.001, which demonstrates a reliable association between the Neuroscience variables and the Teacher Anxiety dimension.

Table 7. Correlation of Neuroscience and Anxiety

			Neuroscience	Anxiety
Spearman's Rho	Neuroscience	Correlation coefficient	1,000	,192**
		Sig. (bilateral)	.	<,001
		N	318	318
	Anxiety	Correlation coefficient	,192**	1,000
		Sig. (bilateral)	<,001	.
		N	318	318

**. The correlation is significant at the 0.01 level (bilateral).

Table 8 presents the results of a Sperman Rho correlation analysis between the Neurosciences variables and the Resilience dimension of university professors in a sample of 318 individuals. The correlation coefficient between these two variables is 0.739, indicating a good positive correlation. This result is statistically significant at a level of 0.01 (bilateral), with a value of p <

0.000, which demonstrates a reliable association between the Neuroscience variables and the Teacher Resilience dimension.

Table 8. Correlation of Neurosciences and Resilience

			Neuroscience	Resilience
Spearman's Rho	Neuroscience	Correlation coefficient	1,000	,739**
		Sig. (bilateral)	.	,000
		N	318	318
	Resilience	Correlation coefficient	,739**	1,000
		Sig. (bilateral)	,000	.
		N	318	318

**. The correlation is significant at the 0.01 level (bilateral).

Discussion

Research in the field of neuroscience and emotional states is essential because of the complex interrelationship between the brain and emotions, which plays a vital role in our daily lives, influencing decision-making, social behavior, memory, and cognition. Understanding how this system works will allow us to create strategies to improve emotional well-being, mental health, and treat various emotional disorders such as depression, post-traumatic stress disorder, and anxiety. Likewise, emotional neuroscience offers us a better understanding of interpersonal relationships, decision-making and social behavior in general. With greater knowledge about how emotions work, it is possible to develop tools that improve communication, empathy, and collaboration.

Studies in recent years agree with our perspective that the changes experienced during these difficult times have had not only a physical, but also a psychological and emotional impact on the population (Stankovska et al., 2020; Johnson et al., 2020; Ipsos, 2020). In this context, an increase in the levels of stress, anxiety and anguish among people is observed. Faced with this situation, interest arises in evaluating the resilience capacity of university teachers to face this reality. Lozano (2020) points out that "the pandemic poses the challenge of taking care of the mental health of health personnel as well as that of the general population" (p.51).

From the results of our research work, regarding the Stress dimension of university teachers, they show us that the vast majority (88.4%) have severe Stress. These results coincide with the work of Cantero et al. (2022), in their research entitled, Personal and teaching factors related to the stress perceived by university teachers in the face of COVID-19, states that, although in both the group of women and men the comparison in the level of stress between those who had children and those who did not was significant (χ^2=7.92, p=0.02; χ^2=33.91, p<.001, respectively), it should be noted that the differences are especially observed in the high levels of stress in the respondents.

According to the results found, in the dimension of Anxiety, the vast majority of university professors (92.1%) have Severe Anxiety. These results disagree with the results of Said et al. (2021), in their research work entitled Academic anxiety in teachers and covid-19. This is the case of higher education institutions in Latin America, in which, in the responses obtained from the 251 participants in the survey, the mean ($\bar{x}$) level of academic anxiety experienced during

the weeks of confinement experienced by the surveyed professors was 4.55/10 maximum points. Based on this result, it can be seen how, at least during the first weeks of confinement, the level of anxiety observed by most was medium/low. In this regard, it should be noted that the observed standard deviation (σ=3.053) denotes a context of high dispersion in the set of assessments made in this regard by the participants in this study, and therefore an asymmetric distribution in the assessment of this variable. In other words, although the average of the sample considered having medium/low levels of academic anxiety during the first weeks of confinement, most of the answers given show a polarized scenario around this issue.

With regard to the Resilience dimension, we highlight that the vast majority of teachers (46.9%) manifest a Medium or Regular Resilience. These results coincide with Castagnola (2021), in his research work entitled Resilience as a fundamental factor in times of Covid-19, where it can be observed that a level of resilience was obtained after Covid are normal, that is, that their level of strength to overcome the obstacles that are expected in the future is very optimal and favorable being in a situation of normality.

From the results obtained from this research work, we can mention that there is a strong and positive relationship between the variables Neurosciences and emotional states of university teachers, these results coincide with the research work carried out by Barrios and Gutiérrez (2020), who among their conclusions mentions the need to include emotions as a fundamental part in comprehensive education and offer bases to understand the development and limitations of neural aspects in educational processes.

In our research, the correlation between the Neurosciences variables and the Resilience dimension of university teachers was carried out in a sample of 318 individuals. Spearman's Rho correlation coefficient between these two variables is 0.739, indicating a good positive correlation. This result is statistically significant at a level of 0.01 (bilateral), with a value of $p < 0.000$, which demonstrates a reliable association between the Neuroscience variables and the Teacher Resilience dimension. Our results coincide with the research carried out by Román et al. (2020), called Resilience of teachers in mandatory preventive social distancing during the COVID-19 pandemic, who states that, when reviewing the results of the study, there is evidence of a positive and significant association between the "High Resilience" of teachers and relevant factors during social distancing such as the perception of the disruptive event of the pandemic as an opportunity, the perception of the emotional support provided, physical activity, the need for training in neuroeducation, the use of online education tools, socio-emotional skills to face changes, experiences of positive valence emotions and the implementation of lifestyle changes during the pandemic.

Conclusions

The results found in this research work seek to highlight the relevance of integrating the knowledge of neurosciences in the understanding of emotions and emotional well-being of university teachers in the post-pandemic context, as well as the importance of strengthening resilience as a tool to face current challenges in higher education. Based on the results found, the following conclusions can be drawn:

- Most university professors reported severe levels of stress (88.4%) and anxiety (92.1%), as well as inadequate (40.9%) or medium/regular (46.9%) levels of resilience. These results reflect the emotional impact that COVID-19 has had on university teachers in Latin America.

- Differences were found in the emotional states of the teachers according to age and area of knowledge. Older teachers and those in the area of Social Sciences and Humanities tended to report less favorable emotional states compared to younger teachers and teachers from other areas of knowledge.

- A weak but statistically significant positive correlation was found between the Neurosciences variable and the dimensions Stress (rho = 0.238; $p < 0.001$) and Anxiety (rho = 0.192; $p < 0.001$) of university professors. This indicates that greater knowledge of neuroscience could contribute to lower levels of stress and anxiety in teachers.

- On the other hand, a good positive correlation was found between the Neurosciences variable and the Resilience dimension (rho = 0.739; $p < 0.000$), suggesting that teachers with greater knowledge of neurosciences tend to show higher levels of resilience.

- There is a positive, strong and statistically significant correlation between the variable Neurosciences and the variable Emotional States in university teachers (Spearman's correlation coefficient = 0.860; $p < 0.001$). This suggests that, the greater the knowledge and application of neuroscience principles, the more favorable emotional states teachers tend to have, and vice versa.

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