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STATE OF THE ART ON THE RELATION OF ACADEMIC STRESS AND ACHIEVEMENT IN UNIVERSITY STUDENTS, WITH THE MEDIATION OF TWO VARIABLES

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Abstract. Meaning is attributed to the review of the antecedents to identify trends in the generation of knowledge from an epistemic and methodological position, which allows to direct the research in process. In this case, a review of primary sources (articles and doctoral thesis) was carried out from a positivist position of inquiry and measurement of scientific production. Of the 46 studies reviewed, 37 are international and nine are national, published from 1999 to 2019, which talk about stress in academic contexts, achievement, academic goals, and learning strategies. Depending on the type and design, theoretical-conceptual studies were reviewed, correlational-causal with pre and quasi-experimental design, descriptive-correlational-causal with non-experimental and cross-sectional design; and others that confirm the structure and reliability of measurement instruments. This review implied a critical reading as an hermeneutical exercise to approach the understanding of the texts in the context of research, most in Spain and some in Latin America, which appears to identify five vestiges that guide the theoretical-methodological position of the doctoral thesis in process. The object of study is the binding relationship between stress and academic performance at university, mediated by two variables, academic goals and learning strategies with the intention of testing this relationship in a context located in Mexico.

Keywords: Academic Stress, achievement, academic goals, learning strategies, university students.

ESTADO DEL ARTE SOBRE LA RELACIÓN DEL ESTRÉS ACADÉMICO Y EL RENDIMIENTO EN ESTUDIANTES UNIVERSITARIOS, CON LA MEDIACIÓN DE DOS VARIABLES

Resumen. Se atribuye sentido a la revisión de los antecedentes para identificar las tendencias en la generación del conocimiento desde una postura epistémica y metodológica que permita direccionar la investigación en proceso. En este caso, se llevó a cabo una revisión de fuentes primarias (artículos y tesis doctorales) desde una postura positivista de indagación y medición de la producción científica. De los 46

estudios revisados, 37 son internacionales y nueve nacionales, publicados de 1999 a 2019, que versan sobre estrés en contextos académicos, rendimiento, metas académicas y estrategias de aprendizaje. En función del tipo y diseño, se revisaron estudios teórico-conceptuales, correlacionales-causales con diseño pre y cuasiexperimental, descriptivos-correlacionales-causales con diseño no experimental y transversal; y otros que confirman la estructura y fiabilidad de instrumentos de medición. Esta revisión implicó una lectura crítica como ejercicio hermenéutico para aproximarnos a la comprensión de los textos en el contexto de investigación, la mayoría en España y algunos en Latinoamérica, lo cual permitió identificar cinco vestigios que orientan la postura teórico-metodológica de la tesis doctoral en proceso. El objeto de estudio es la relación vinculante entre el estrés y el rendimiento académico en la universidad, mediado por dos variables, las metas académicas y las estrategias de aprendizaje con la intención de poner a prueba esta relación en un contexto situado en México.

Palabras clave: Estrés académico, rendimiento, metas académicas, estrategias de aprendizaje, estudiantes universitarios.

Introduction

From the conception of the student in higher education able to adapt and self-regulate in the university environment with high demands and requirements, educational research provides evidence in relation to their ability to cope with stress, the choice of multiple academic goals, and the use of learning strategies, as well as their association with academic performance. This article summarizes the state of the art of a doctoral thesis in progress, which addresses the study of the relationship between stress (independent variable) and academic performance (dependent variable), mediated by two variables, academic goals and learning strategies. It is known that a mediating variable is an integral part of a cause and effect relationship because it helps to explain how the independent variable is influencing the dependent variable (Rodríguez & Pueyo, 2010).

Within the framework of a constructivist conception of the teaching and learning process at university (Coll, 1999; Díaz Barriga, 2006; Hernández, 2012) and in view of the requirements of the competence-based educational approach (Pimienta, 2008; Pozo and Pérez, 2009; Tobón, 2010; Villa and Poblete, 2010; Zabalza, 2013), the student is given a central role as an active, critical, and reflective subject, capable of adapting, choosing, and using the necessary learning strategies, with the mediation of the teacher. This conception shapes the spirit of the reform of teaching and learning processes in universities in the 21st century, within the framework of the European Higher Education Area (EHEA), starting with the *Tuning* project (2004) and in the university context in Latin American countries, the *Alfatuning* project (2007).

In this sense, the concern of universities to study the variables involved in student self-regulation is current. The schooling process summons them to comply with institutional academic norms for the accreditation of learning and their permanence in the system and also demands evidence of their participation in the teaching and learning processes of each subject. In this sense, the student moves between different scenarios in regard to what he/she wants, can, and decides in order to accredit, learn, and remain in the system.

The university student carries out a process of assessment to self-regulate and cope with the stress perceived from the demands of the university environment. They constantly make decisions in the face of the demands and can achieve self-regulation progressively, although they require help in the course of their education (Valle et al., 1999; Rosário et al., 2007). Self-regulation mobilizes their cognitive processes and also activates their emotional nature because it implies that they carry out an assessment to decide how to interact in the environment, according to their resources, to confront stress, to choose goals and strategies for learning (Cabanach et al., 2007). Goals constitute the reasons or motives that move him to action according to the demands of the school system (Dweck, 1986, cited by Porcar, 2010; Valle et al., 2009); when he chooses, he assumes a position according to the value he attributes to the required activities and his expectation of achievement. On the other hand, learning strategies constitute conscious and intentional activities that guide their action towards the achievement of goals (Roces et al., 1995; Valle et al., 1999; Beltrán, 2003; Porcar, 2010).

Method

According to George (2019), although there is no methodological consensus that distinguishes the strategies to develop a state of the art, the literature on the subject shows a coincidence in relation to the purpose of doing it. The aim is to identify trends in the generation of knowledge with its epistemic and methodological alternatives in order to direct the research. To do so, it suggests establishing an epistemic-methodological stance to approach the object of study, delimit the temporal space and articulate the axes of analysis based on the types of research. In this case, a review of primary sources was carried out from a positivist stance for the investigation and measurement of the scientific production of articles and theses in relation to the variables under study from 1999 to date, distinguishing the type of research and its methodological design, as shown in Table 1.

Table 1
Studies reviewed by type and methodological design according to the main variable

Type of study and methodological design	Quantity	Percentage
Theoretical-conceptual E (3), R (1), MA (1), EA (2)	7	15.2%
Correlational / Causal, with pre-experimental / quasi-experimental, pretest-posttest design (includes a doctoral thesis). E (1), MA (1), EA (2)	4	8.7%
Descriptive / Correlational-causal, with non-experimental, cross- sectional design (includes three doctoral theses). E (12), R (6), MA (9)	27	58.7%
To confirm the structure and reliability of a measuring instrument E (5), MA (2), EA (1)	8	17.4%
Total	46	100%

Note. Acronyms of the variables: E (Stress), R (Performance), MA (Academic Goals), EA (Learning Strategies). The number of studies reviewed by variable is indicated in parentheses.

Of the 46 studies reviewed, 37 are international and nine are national. Twenty-one were reviewed on stress in academic contexts (eight in Mexico), seven on performance, 12 on academic goals (one in Mexico), and five on learning strategies. This review was carried out based on a critical reading as a hermeneutic exercise to approach the understanding of the texts in the research context, most in Spain and some in Latin America, which allowed us to identify five vestiges that guide the theoretical-methodological position in the doctoral thesis in process to test the relationship of variables in the national context. In this sense, a line in time was elaborated with the support of a graphic representation that facilitates to locate the temporal and spatial limits in the reviewed scientific production (see Figure 1).

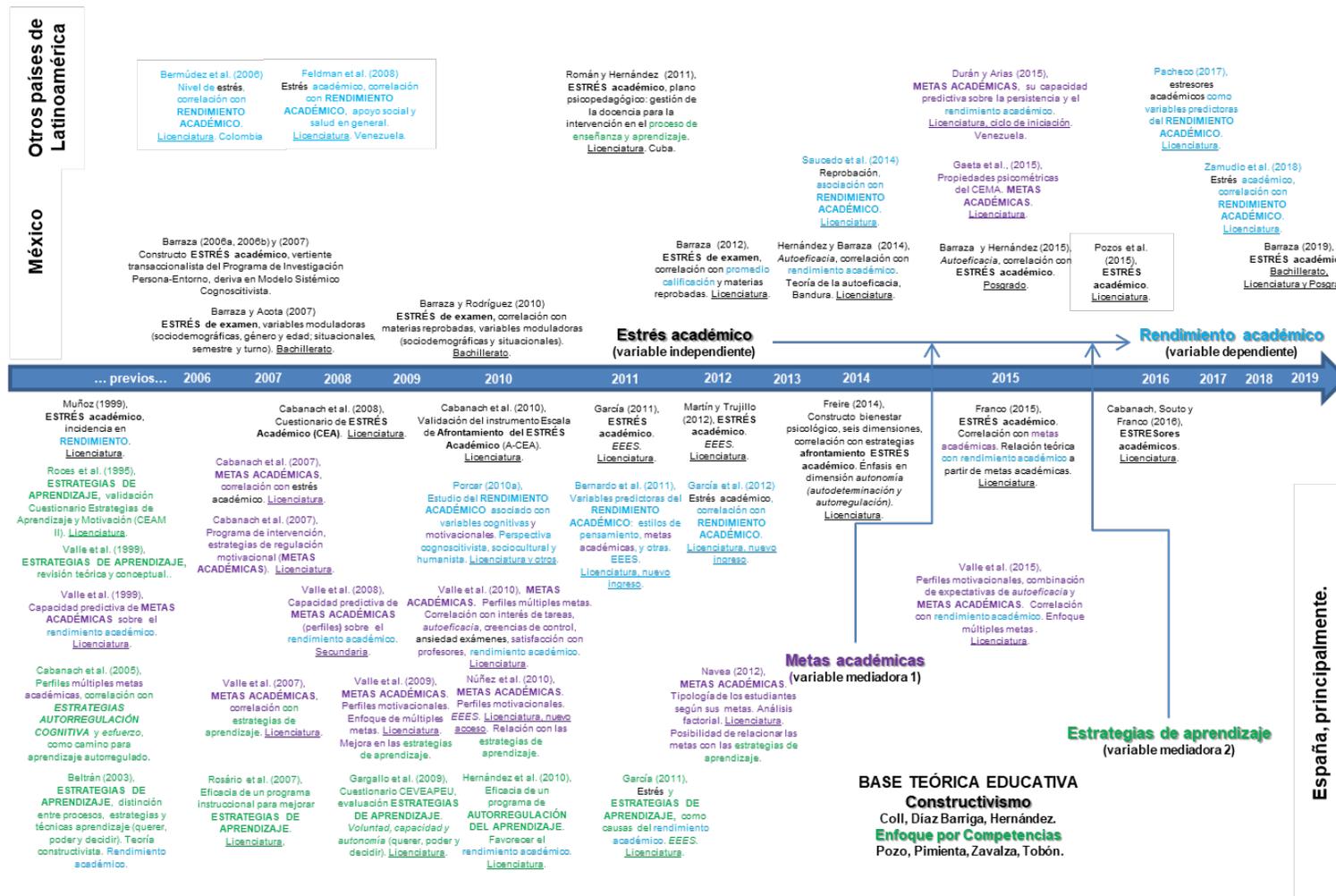


Figure 1. Timeline of the study of the variables

Results

The studies reviewed coincide in the proposition that the teaching model in the university context of the EHEA, as well as in Latin American countries, represents high demands and requirements for students, confirming its influence on their well-being during their time at university. They indicate that they may perceive, even temporarily, a lack of control over the new environment, particularly in the initial cycle, providing evidence that the context is a potential generator of stress and mobilizer of their cognitive and motivational self-regulation, with an impact on their performance. The synthesis of the review has been organized distinguishing the findings at the international and national levels and indicating five vestiges.

Findings that shape the timeline at the international level. First vestige

Several researches consulted provide evidence of the relationship between stress and academic performance. According to the doctoral thesis of Muñoz (1999), a double design study, pre-experimental pretest-posttest of a single group, and quasi-experimental control group with posttest only in which 249 Psychology students from the University of Seville participated. The author confirms that students presented a greater deterioration of their health and emotional state during final exams (potent stressor). Although the difference in the pretest-posttest measurement is not significant, it is confirmed that the teaching methodology applied in the experimental group (less role ambiguity of the teacher and greater control of the subjects over their academic environment) did have positive effects on the organizational behavior of the students and, therefore, on their possibility of obtaining better results. It suggests including in the study of stress in the academic context the incidence of modulating variables of a psycho-pedagogical nature.

Bermúdez et al. (2006) conducted a study on stress involving 64 medical students from the University of Manizales, Colombia, measured on the basis of the Stress Questionnaire of the Ministry of Labor and Social Security. Academic performance was measured based on grade point average. They conducted a regression analysis, whose model includes the variables of stress level, depression, family dysfunction, and alcohol consumption; this model was able to explain only 4.7% of the variance of academic performance ($R^2 = 0.497$). The results confirm a significant correlation between stress level and depression, family dysfunction, and alcohol consumption. The relationship between performance and the rest of the variables is differential among the eleven semesters, the stress level is oscillating, it increases and decreases, registering its highest value in the seventh semester while performance registers the highest value in the eleventh semester. It is likely that the high academic demands of the medical curriculum may be perceived as more stressful in some semesters depending on the learning environments generated by teachers.

Another study is that of Feldman et al. (2008), conducted at the Universidad Simón Bolívar, Venezuela, with 442 students enrolled in exact sciences to whom the Academic Stress Questionnaire was applied before the end of the current term when students must make the decision to continue or withdraw in order to avoid failing the

corresponding subject(s) (De Pablo et al., 2002). To explain academic performance (grade point average), they included in the regression model the level of stress, current trimester, age, and perception of social support; the model explains 13% of the variance of performance ($F= 4.41$, $p< 0.001$); a significant positive correlation is reported: the higher the intensity of stress, the higher the performance; and an inverse correlation, the higher the stress, the younger the student's age and the lower the perception of support. Three stressors stand out in the analysis: exams, time distribution, and amount of material to study.

In this same line, García et al. (2012), in a research with 199 new students entering the University of Valencia, carried out the measurement of stress through the application of the Academic Stress Questionnaire at the University and its relationship with academic performance (number of credits passed). They report that academic stressors explain only 5% of their variance ($F= 2.71$, $p< .05$). Of the stressors analyzed, lack of time to complete activities, academic overload, and the exposure of class work stand out, with significant correlations; those who perceive more stress manage to pass a greater number of credits.

For their part, Cabanach et al. (2016), carried out an investigation to confirm the structure and reliability of the Academic Stress Questionnaire Stress Scale (E-CEA), in the context of the EHEA in which 1,196 students from various universities in Spain participated, configured on the basis of the transactional model of coping of Lazarus and Folkman (1986). The CEA had been previously validated in university contexts (Cabanach et al., 2008). The results confirm the structure of eight factors, three of which are the most potent stressors: Teacher methodological deficiencies, exams, and public speaking. For their part, Martín and Trujillo (2012) had applied the CEA Questionnaire to 492 students of the Polytechnic School of the University of Malaga and confirm that the teaching model affects high levels of stress, with significant correlation in the comparison by sex (higher in women). For their part, (Cabanach et al., 2010), conducted a confirmatory study of the structure and reliability of the CEA Questionnaire Coping Scale, with 835 students of the University of La Coruña of health sciences and education; the structure and reliability of three factors are confirmed: Positive reappraisal, Search for support, and Planning.

Also on the relationship of stress with academic performance, the doctoral thesis of Pacheco (2017) was reviewed in which 229 students from a University of Puerto Rico participated. The CEA questionnaire was applied to measure stress and reports that the subscales of stressors and stress responses correlate inversely and significantly with academic performance (attempted-passed credit rate and GPA). This implies that the higher the perception of stress and the more symptoms affecting students' well-being, the lower their academic performance. The regression analysis indicates that stressors explain 27% of the variance in performance ($F= 9.14$, $p< .001$); specifically, poor social relationships in the academic context, lack of control over one's own performance and exams.

Given the diversity of instruments for measuring stress, both in the Spanish context and in Latin American countries, the *first vestige* is identified, studying the

relationship of stress and performance in university students in Mexico, having a validated instrument for this context: Inventory SISCO-SV-21 (Barraza, 2018).

Second vestige

In relation to research on academic stress and its relationship with academic goals, the doctoral thesis of Franco (2015) was consulted. The CEA questionnaire was applied to 458 students at the University of La Coruña, as well as Skaalvik's Goal Orientation Scale (1997). It reports as the most powerful stressors the methodological deficiencies of the teaching staff, academic overload, and exams. Two aspects of the discussion presented are noteworthy: one is the author's affirmation of the strength of exams as a stressor and its incidence on performance; the second aspect is that motivational orientations to academic goals can act as a modulating factor of the influence of stress on students.

In this vein, another research by Cabanach et al. (2007), addresses the assessment of academic goals and vulnerability to stress with the participation of 258 students enrolled in degrees in the area of health at the University of La Coruña. The CEA questionnaire and Skaalvik's Goal Orientation Scale (1997) were applied. The authors affirm that academic goals model the student's sensitivity in the perception of the demands of the university context; when he/she clarifies his/her commitments, he/she can discern with greater probability which are the interactions that violate his/her well-being (he/she perceives them as a challenge or threat) and can discern how to face them. The conceptualization of academic goals in the study is broken down into: Type 1, mastery or task approximation goals, which refer to interest in learning and developing skills; Type 2, work or task avoidance goals, referring to avoiding effort; Type 3, performance approximation or self improvement goals, whose interest is to demonstrate superior ability and performance to others; Type 4, performance avoidance or self defense goals, aimed at avoiding appearing less than competent and avoiding negative judgments. It is concluded that students with Type 1 goals who did not register symptoms of distress, seek to use problem-focused active coping strategies. In contrast, students with type 4 goals, with manifestation of perceived stress and with feelings of physical and psychological discomfort, resort more to emotion-focused strategies.

In the same line of research, the doctoral thesis of Freire (2014) on the psychological well-being of 1,072 students of the University of La Coruña, of various degrees, was consulted. The Coping Scale of the CEA Questionnaire was applied. The results confirm a significant causal relationship between students' psychological well-being (independent variable) and coping strategies (dependent variable). This relationship was found in the six dimensions of well-being: self-acceptance, positive relationships with other people, autonomy, mastery of the environment, purpose in life, and personal growth. In particular, the higher the value of self-acceptance, the greater the use of the three coping strategies (Positive reappraisal, Seeking support, and Planning). The author affirms that self-efficacy becomes relevant in the study of students' self-regulation.

In this respect, the findings of the research by Valle et al. (1999) shed light on the determinant variables of academic performance of 614 students of different degrees at the

University of La Coruña. They propose a model constituted by the following independent variables (exogenous): Previous performance, Incremental conception of intelligence, Perceived ability, Perception of evaluation criteria, Analysis of task characteristics, Perception of teaching style, Perception of the type of subject; and dependent variables (endogenous) are: Causal attributions, Academic self-concept, Academic goals, Learning strategies, Academic performance. Based on a structural equation analysis, it is reported that the set of causal relationships in the model explain about 50% of the variance of achievement; in the specific relationship with each dependent variable, the model explains 15.9% of the variance of causal attributions, 26.1% of the variance of self-concept, 22.1% in the case of learning goals, 8.7% in relation to achievement goals, only 15.8% of the variance of learning strategies, and 40% of academic achievement. In summary, the model indicates that student performance is influenced by the way in which they self-perceive and regulate themselves in motivational terms and if they use strategies that favor their cognitive self-regulation and meaningful learning. This research set the standard for incorporating variables of a motivational and self-regulatory nature in the study of how students learn and what results they achieve.

In this regard, Valle et al. (2007) publish the results of a study on the relationship between academic goals and learning strategies with 632 students from different degrees at a Spanish university. They use the Questionnaire for the Evaluation of Academic Goals (CEMA-II), by Núñez et al. (1997). They consider five learning strategies: repetition, organization, elaboration, critical thinking, and metacognitive self-regulation. The results show a significant correlation between higher levels of learning goals and a greater use of the five learning strategies. On the other hand, there is a significant and inverse correlation between higher levels of academic work avoidance goals and a lower use of strategies, particularly the last two. A correlation is also confirmed between performance approach goals and the use of the last two learning strategies. This diversity allows us to affirm that when the student shows a clear tendency in his or her purpose of learning and accreditation, it is more frequent that he or she uses all the strategies to achieve it. This research set a guideline for assessing learning strategies from the perspective of multiple goals.

Following the footprint of the study of academic goals and learning strategies, we consulted the research of Núñez et al. (2010) in which 559 new students of the University of Oviedo participated. They applied the CEMA-II questionnaire. The authors state that goals set the tone for the learning strategies used by students, as they determine their effort, persistence, and self-regulation. The findings emphasize that students more frequently choose learning-oriented goals, a choice associated with greater time and effort for academic activities, as well as with the use of strategies for self-regulation of learning with a positive effect on performance. The results confirm a significant difference between learning-oriented goals and the rest of the goals. Students are "sometimes" motivated to engage in activities by pursuing reward-oriented goals (obtaining a worthy future job) and social valuation. In contrast, incoming students "rarely" choose goals that are "self" oriented, related to defending their image or trying to stand out from others. The authors propose to increase studies from the multiple goals approach.

In the same sense, Valle et al. (2009), carried out a theoretical-conceptual review, a historical analysis of the theory of achievement goals, whose starting point is the two-dimensional approach, which distinguishes between learning and performance goals, passing through the three-dimensional approach, which distinguishes in performance goals the tendencies of approximation and avoidance to the two by two model, differentiating these tendencies in both performance and learning goals. They conclude with the affirmation that this approach marks a line of research that is closer to and more representative of the functioning of the emotional nature that mobilizes the university student in the choice of goals. From this perspective, Valle et al. (2010) conducted a study involving 1,925 students from 16 degrees from five universities representative of the Spanish territory; they applied the Academic Goals Questionnaire proposed by Skaalvik (1997) and assessed its relationship with motivational variables for learning: interest in tasks, perceived self-efficacy, control beliefs, test anxiety, satisfaction with teachers, performance (current performance, performance expectations, and perceived level of knowledge). They provide evidence on the existence of six motivational profiles or groups, based on a cluster analysis: low generalized motivation, with a predominance of performance avoidance goals; with a predominance of learning goals; with a predominance of learning and performance avoidance goals; with a predominance of learning and performance approach goals; and high generalized motivation.

Among the main findings, the sixth group stands out with the highest scores in perceived achievement and level of knowledge, as well as high scores in the rest of the variables analyzed, except for satisfaction with teachers. On the other hand, the first group presents low scores in all variables, except in test anxiety. In between, the third group had the highest scores on task value, control beliefs, and satisfaction with teachers; high scores on perceived academic performance, knowledge level, and self-efficacy beliefs; and low scores on test anxiety. The authors suggest that, given the importance of the motivational component for cognitive work, teachers should have information about the motivational profile of their students, so that they can make the required curricular adaptation according to the motivational needs of the students; in this sense, they propose the notion of the zone of motivational proximal development.

The findings, provided by the research led by Valle and Cabanach, allow us to outline the relationship between the variables under study in the doctoral thesis: the motivational profile of the student as a modulating factor in the causal relationship between stress and academic performance. This is the *second vestige*, the intention to study this relationship of variables in a context of higher education in Mexico.

Third and fourth vestige

Continuing with the review of research, Valle et al. (2008) conducted a study in which 447 high school adolescents participated. The authors state that the predictive capacity of academic goals on achievement is scarce, giving it a more indirect than direct role and of great value in explaining student achievement. They applied the CEMA-II Questionnaire. Based on the findings, they suggest expanding the number of variables in the regression model for future research on the prediction of achievement, including

learning strategies as self-regulatory. They also make a distinction in relation to performance goals, stating that they could be more effective when they are assessed in a more competitive context such as in higher education, a scenario that could move more strongly their intentionality for higher grades (Valle et al., 2009).

This is the *third vestige*, the relationship of learning strategies as a mediating variable between stress and academic performance linked to academic goals. In this order of ideas, Rosário et al. (2007) conducted a study with a pretest-posttest quasi-experimental design with a control group. They applied an instructional program to improve the learning processes and strategies of 66 students at the University of Oviedo, the experimental group, and 42 more formed the control group. They used the Questionnaire of Knowledge of Learning Strategies (CEA), Inventory of Study Processes for Undergraduates (IPE, Rosário et al., 2006), Inventory of Self-Regulation of Learning Processes (Rosário et al., 2006; Zimmerman, 2000; 2002), and Questionnaire of Perceived Instrumentality to Self-Regulate Learning. The results show evidence of the effectiveness of the program with the experimental group; a relevant result is in relation to the knowledge of learning strategies. The experimental group recorded significant pretest-posttest differences ($M_{dif.} = -.545$; $t_{65} = -3.717$; $p = .000$), while the control group did not record significant differences. It can be said that students in the experimental group improved significantly in the domain of declarative knowledge about learning strategies, decreased the use of a superficial study approach, and improved in the application of these skills in different and new tasks for them (transfer).

Coinciding with this intervention, Cabanach et al. (2007) also carried out a study to assess the effectiveness of a program for the management of motivational resources in which 258 students from various degrees at the University of La Coruña participated. The aim was to improve their awareness of how they manage their academic goals according to the demands of the context. A single-group pretest-posttest pre-experimental design was applied. The Learning Strategies and Motivation Questionnaire was applied. The results show evidence of the effectiveness of the program in relation to the use of cognitive self-regulation strategies ($F = 8.177$, $p < .000$) and in the regulation of effort ($F = 2.808$, $p < .040$) and register a significant difference in the comparison of means of the four groups of academic goals. The authors emphasize the relevance of self-efficacy beliefs that affect the student's self-regulation; it is important that the student perceives him/herself as capable of getting involved in the tasks, managing techniques and skills and overcoming obstacles in his/her interactions in the context.

The doctoral thesis of García (2011) on learning strategies and their relationship with stress and performance of 209 incoming students at the University of Málaga was consulted. The Cognitive Learning and Study Strategies Questionnaire (Valle et al., 2006) was used, which includes four strategies: selection, organization, memorization, and elaboration. To measure performance, a rate was constructed based on the number of credits passed in relation to the number of credits enrolled and the average grade. It affirms that performance is an indicator of efficiency and quality within the framework of the demands and requirements of the EHEA. He conceptualizes learning strategies

from the contributions of Beltrán (2003) and others, associating cognitive strategies with information processing; and warns that he did not include in the study those of an affective-motivational and supportive nature, nor metacognitive ones. Among the main results, it stands out that new students use the four cognitive strategies intensively, without registering a significant correlation with performance; in turn, the memorization strategy maintains a significant correlation with stress; and stress correlates inversely with performance: the higher the stress, the lower the performance.

In the Latin American context, the research of Durán and Arias (2015) on academic goal orientation, persistence, and performance of 205 new students entering the initial cycle of higher education at the Universidad Simón Bolívar, Venezuela was consulted. The results of the multiple regression analysis show that goals manage to explain 23% of the variance of academic performance ($r = .153$); a positive correlation is also confirmed between extrinsic goals (results), persistence, and performance, a possible scenario given the institutional regulations that condition permanence according to a minimum grade point average, which places academic performance as an indicator of efficiency and quality within the framework of the demands of the university system.

The research by Gargallo et al. (2009) was also consulted on the use of learning strategies. In our opinion, it is a fundamental reference because it presents a theoretical and methodological review of previous measurement instruments to validate the structure and reliability of their proposal: the Questionnaire for the Evaluation of Learning Strategies in University Students (CEVEAPEU); 1,127 students from two public institutions in Valencia participated. It assesses two scales, six subscales and 25 strategies. The scales and subscales are the following: Affective, support, and control or self-management strategies (motivational, affective components, metacognitive, context control, social interaction, and resource management), and strategies related to information processing (information search and selection, information processing and use).

Some antecedents cited by Gargallo et al. (2009) were reviewed to confirm their theoretical and empirical basis (Beltrán, 2003; Cabanach et al., 2005; Pozo & Pérez, 2009; Gargallo & Suárez, 2014). In this review, we were able to identify the psycho-pedagogical principles that support another instrument of our interest for the evaluation of goals (CEMA-II), which has already been validated in its Mexican version (Gaeta et al., 2015). Both instruments allow us to evaluate academic and social situations from an interactionist perspective of educational psychology, congruent with the constructivist postulates that place the student at the center as an active subject in his or her learning, capable of self-regulation, with the mediation of the teacher.

This is the *fourth vestige*, to verify if the instrument is available to measure the two mediating variables in the relationship between stress and performance. It is found that the CEMA-II has already been validated for the university context in Mexico but not for the CEVEAPEU.

Findings that shape the timeline at the national level. Fifth vestige

In relation to the review of antecedents at the national level, it was carried out to complete the vestiges identified at the international level, particularly the instrument for measuring stress. Of the scientific production in Mexico, eight researches on academic stress were consulted, four of them assess its relationship with performance. Barraza's research was consulted for the conceptualization of academic stress (2006a), understood as a systemic process of an adaptive and essentially psychological nature, which is presented in a descriptive manner in three moments: 1) the student is subjected, in university contexts, to a series of demands that can be valued as stressors; 2) those stressors provoke a systemic imbalance when the situation is perceived as stressful, which the student manifests in a series of symptoms or indicators of imbalance; 3) that imbalance forces the student to perform coping actions to restore the systemic balance. In two more of his investigations, Barraza (2006b; 2007) describes the theoretical support of such conceptualization based on the transactional model of stress coping (Lazarus and Folkman, 1986), affirming that it is ascribed to the research program from which it is assumed that stress is the result of a dynamic relationship between the person and the environment. The author suggests enriching the analysis of academic stress by including modulating variables for a better understanding of the vulnerability and resilience of students to stress.

In 2007, the author publishes the instrument for measuring academic stress; a decade later he publishes the second version, the SISCO SV-21 Inventory, confirming its structure and reliability, with three resulting factors or dimensions: stressors, symptoms, coping strategies (Barraza, 2018).

Two more of the studies consulted studied exam stress in upper secondary education (Barraza and Acosta, 2007; Barraza and Hernández, 2010), with the participation of 1,875 students from a public high school and 343 from a private high school. The results in both studies coincide in that more than 80 percent of the students perceive a medium-high level of stress during the exam period. The most frequent stressors are: grade that could be obtained, type of questions, exercises or problems that are included. Regarding the variable of failed subjects, a self-reported indicator of academic performance, Barraza and Hernández (2010) report that it correlates significantly with 16 of the 27 indicators of exam stress, as well as with the stressors and symptoms components and with the frequency with which it occurs. In a later research on stressors and their relationship with grade point average and failed subjects in which 168 students from the Pedagogical University of Durango participated, Barraza (2012) reports that there is a significant and positive correlation between the record of failed subjects and the frequency of stressors; and inversely with grade point average, the lower the average, the higher the frequency of stress; the latter correlation is confirmed by Zamudio et al. (2018) in a study on the relationship between both variables.

Other research consulted provides evidence on the correlation between academic performance and self-efficacy perceived by students (Hernández & Barraza, 2014; Barraza & Hernández, 2015); they are of interest because self-efficacy beliefs are a

decisive factor in the achievement of goals and in the realization of academic activities. Another study conducted by Barraza (2019) in which 250 students participated, high school (110), undergraduate (84), and master's (56), confirms that the manifestation of academic stress is equivalent in the three educational levels, with high presence and medium-high intensity, without registering significant differences between levels.

We also reviewed the research of Román and Hernández (2011) who propose to adapt the classic concept of stress to the psycho-pedagogical level as a guide for its study in university contexts. In our opinion, it complements the conceptualization proposed by Barraza in two areas: 1) *the subject of action*: enriching the conception of the student as an active, critical, and reflective subject, capable of adapting and self-regulating; and, 2) *the student's experience of stress as a process*: assessing the student's perception in the teaching and learning process with the mediation of the teacher.

Conclusions

The background review provides empirical evidence at the international and national level in relation to vestiges that theoretically and methodologically guide the doctoral thesis in process. In particular, it is important to include in the study of the causal relationship between stress and academic performance the incidence of mediating variables: academic goals and learning strategies, both with the purpose of mobilizing the student towards self-regulation, a relationship located in a university context in Mexico for its measurement and assessment. The basis is the conceptualization of stress proposed by the Mexican author Barraza (2006a; 2007), coinciding with the theoretical basis that supports various investigations consulted in the international plan and that refer to the coping model formulated by Lazarus and Folkman (1986); complemented with psycho-pedagogical principles proposed by Román and Hernández (2011).

Academic stress is understood as a process that the student experiences in their interactions in the university context, in three moments: First, he is subjected to a series of demands; second, when the situation is perceived by the student as stressful, it causes a systemic imbalance that manifests itself in stress indicators; third, this imbalance forces him to perform actions to restore the systemic balance, for which he resorts to the use of both stress coping strategies and strategies for his cognitive, emotional, and metacognitive self-regulation with the guidance of the teacher, seeking to learn, accredit, and remain in the system.

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