

## Unpleasant past experience as a determinant of cognitive, behavioral and physiological responses to academic stress in professional examination candidates

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**Título:** La experiencia desagradable como determinante de las respuestas cognitivas, conductuales y fisiológicas de estrés académico en universitarios opositores.

**Resumen:** Esta investigación estableció las relaciones de interdependencia y predicción entre experiencia desagradable previa y creencias irracionales, ansiedad evaluativa, autorregulación en el estudio y estrés académico, variables de la competencia para rendir en contextos de alta exigencia. Participaron 221 aspirantes de academias preparatorias a la función pública del cuerpo de Maestros. Las variables fueron medidas mediante autoinformes validados. El diseño fue ex post-facto lineal, con análisis inferenciales y estructurales. Los resultados mostraron relaciones significativas positivas de interdependencia de la experiencia desagradable con las creencias irracionales y respuestas fisiológicas de estrés, así como negativas con la autorregulación en el estudio. Además, apareció una relación estructural predictiva significativa entre experiencia desagradable y respuestas cognitivas, conductuales y fisiológicas de estrés. Estos resultados validan parcialmente las relaciones del modelo CAERE, explicando el aprendizaje en contextos estresantes, y evidencian la necesidad de entrenar a los estudiantes ante estas situaciones.

**Palabras clave:** modelo CAERE; creencias irracionales; ansiedad evaluativa; autorregulación en el estudio; estrés académico.

**Abstract:** This investigation established *unpleasant past experience* in interdependent and predictive relations with irrational beliefs, test anxiety, self-regulated study and academic stress, variables belonging to the competency for performing in highly demanding contexts. Participants were 221 candidates enrolled in preparatory academies, where they were preparing for competitive exams for posts as public elementary school teachers. The variables were measured using validated self-reports. A linear, ex post-facto design was used, with inferential and structural analyses. Unpleasant experience was shown to have significant, positive, interdependent relations with irrational beliefs and physiological stress responses, as well as negative relations with self-regulated study. Significant, predictive, structural relations were found between unpleasant experience and cognitive, behavioral, and physiological stress responses. These results partially validate the relationships shown in the SLPS Competency model, which explains learning in stressful contexts; and offer evidence of the need to train students for these situations.

**Keywords:** SLPS Competency model; irrational beliefs; test anxiety; self-regulated study; academic stress.

### Introduction

In many countries, public employment is attained through selective examinations. This implies preparing for and taking one or several tests in competition with hundreds of thousands of aspirants. In present-day Spain, to become a public school teacher, one must complete written exams that measure technical knowledge, and oral exams, where job-related skills and aptitudes are assessed. Preparation for this type of test requires sustained, high productivity; it is a complex task that involves persistent, self-regulated use of different competencies (Koivuniemi, Panadero, Malmberg & Järvelä, 2017). Some of these competencies relate to the nature of the tests themselves, while others have to do with controlling emotions and one's own learning process in this type of context (Gómez & Gundín, 2016).

### The SLPS Competency Model, for Studying, Learning, and Performing under Stress (de la Fuente, 2015; de la Fuente et al., 2014), as a research heuristic

This model explains learning in highly demanding contexts and establishes three dimensions of this competency: *knowing* (facts, concepts and principles), *know-how* (study skills and meta-skills, instrumental skills, self-regulation strategies and coping strategies) and finally, *mindset* (attitudes, values and habits related to studying and to the selection process). These dimensions and the variables that form them are related to each other in multiple ways. Moreover, they interact with other variables that appear previously or later on. These variables are shown in Figure 1, organized according to Biggs' 3P Model of Presage, Process, Product (Biggs, 2001); the 3P model has been confirmed in many research studies (Barattucci, Pagliaro, Cafagna & Bosetto, 2017). The SLPS Competency Model has appeared in recent Educational Psychology research (Contreras, 2015), although it requires further empirical validation. This model is founded on more than a decade of prior evidence of the interference between stress and cognitive and motivational processes during learning and study (Serlachius, Hamer & Wardle, 2007), and of the influence of aspects such as test anxiety and irrational beliefs on stress, thereby contributing to demotivation in the learning process (Largo-Wight, Peterson & Chen, 2005). Based on a definition of the stress response during learning

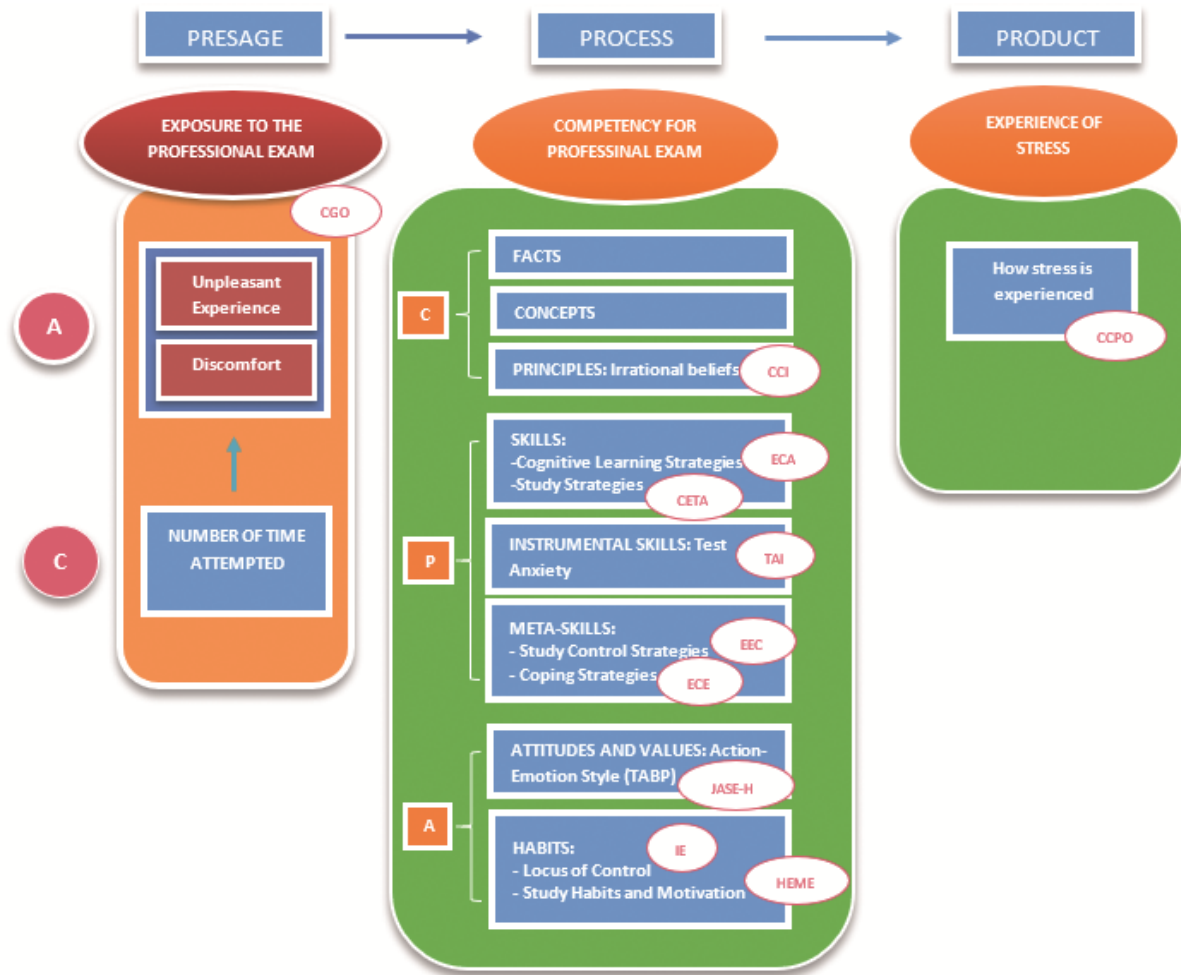
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as a complex, multidimensional process, with cognitive, physiological, emotional and behavioral indicators (Arsenio & Loria, 2014; de la Fuente et al., 2014; Romero, Master,

Paunesku, Dweck, & Gross, 2014), this model seeks to incorporate all these aspects in order to evaluate their impact on academic stress.



**Figure 1.** *The SLPS Competency Model* (de la Fuente, 2015) with variables and some of the instruments used. Initials shown in red refer to the abbreviated names of the instruments used for measuring the adjacent variable; each of these are defined above in the corresponding section on instruments used.

### Unpleasant experience as a presage variable

This variable is understood as the student's negative assessment of his/her past experience with professional exams, as well as his or her present situation and future outlook. The influence of prior experience on performance has already been studied in other spheres (Alanzi, 2015).

### Irrational beliefs as a process variable

Irrational beliefs are explanatory, cognitive elaborations about real events, that (1) lack evidence to support them, and (2) make no contribution to problem solving (Malhotra & Kaur, 2016). Subjects who are prone to irrational beliefs usually persevere in them rigidly even when they know that their beliefs are irrational and negative (Wessler, Hankin, & Stern,

2016). These beliefs may have a good deal of influence on the learning process and on academic stress, as recent studies indicate (Keshu, Thomas & Dey, 2016).

### Test anxiety as a process variable

Test anxiety has been thoroughly researched in past decades and is consistently associated with problems in learning and performance, since it involves a substantial loss in cognitive resources (Putwain, Daly, Chamberlain & Sadreddini, 2015). Studies indicate that there are sizable student populations whose levels of anxiety are cause for concern (Álvarez, Aguilar & Lorenzo, 2012). This anxiety has two components: worry and emotionality (Burdwood et al., 2016), referring to cognitive aspects and to emotional manifestations, respectively (Pekrun & Stephens, 2012).

### Self-regulated study as a process variable

This refers to meta-skills that the student uses to control and direct his or her own learning process (Bembenutty, Cleary & Kitsantas, 2014). Research has shown that students who practice self-regulated learning are more motivated to keep up their effort in learning, an essential aspect of preparing for job placement exams, and that the variable of self-regulation predicts performance (Zimmerman & Kitsantas, 2014). Furthermore, other studies have associated self-regulation strategies with variables like anxiety and stress (Zhang, 2013).

### Academic stress as a product variable: cognitive and physiological correlates

Unlike in the clinical sphere (Costarelli & Patsai, 2012), educational research has not given proper attention to the stress response, although more articles are appearing in recent years (Mehmet & Watson, 2017). While stress in general is defined as an adaptive response when facing a threat, academic stress fundamentally pertains to perceived aspects such as loss of control over outcomes, arbitrariness of the grading system, demands of the situation and a lack of competence for studying and learning in stressful contexts (de la Fuente et al., 2014). Notwithstanding, academic stress has been shown to have substantial influence in certain cognitive processes, like memory and attention, and in motivational aspects (Serlachius, Hamer & Wardle, 2007). On the other hand, anxiety associated with stress can also increase thoughts of worry and negative emotionality, considerably expanding negative thoughts and irrational beliefs, and diminishing motivation (Karaman & Watson, 2017). De la Fuente et al. (2014) proposes that anxiety be assessed based on the correlates of stress, both cognitive (interfering thoughts) and physiological (level of activation). These correlates are considered product variables in the present research.

### Objectives and hypotheses

The aim of this investigation is to add to the scientific evidence that helps us understand the complex relations involved in preparing for these tests, and to equip professionals with tools for intervention. The *general objective* was to describe the interdependent and predictive relationships that were most significant and important among the variables evaluated (identified above). In accordance with the scientific basis for these variables, the *hypotheses* were formulated as follows:

- 1) The variable *unpleasant experience* (presage) will demonstrate interdependence relationships with the variables *irrational beliefs*, *test anxiety* and *self-regulated study strategies* (process).
- 2) The variables *irrational beliefs*, *test anxiety* and *self-regulated study strategies* (process) will be interdependent with each

another.

- 3) The variable *unpleasant experience* (presage), as well as the variables *irrational beliefs*, *test anxiety* and *self-regulated study strategies* (process), will demonstrate interdependence relationships with the cognitive and physiological correlates of academic stress (product).
- 4) The variable *unpleasant experience* (presage) will jointly and significantly predict: (1) positively, *cognitive* variables of irrational beliefs and interfering thoughts; (2) negatively, the *behavioral* variable of self-regulated study; and (3) positively, the *emotional* variable of test anxiety and physiological stress.

## Method

### Participants

A total of 221 professional examination candidates participated. All of them were enrolled in preparatory academies to prepare the exams for Primary School Teacher in Almería province (Spain). The selection method was random and nonprobabilistic; first, five preparatory academies in the province were selected, then the groups within each academy were also randomly selected and finally the participating subjects. No further inclusion or exclusion criteria were applied when forming our sample. Experimental mortality was less than 5% over the duration, and for reasons outside the scope of the research study, such as dropping out of the academy during the research process. We must note that not all subjects were able to answer all the questionnaires, since they were administered in different class sessions, and not all subjects were in attendance at every session. Cases with incomplete data were eliminated from the study. Given the characteristics of the population that usually prepares for these exams, the sample was mostly female ( $n = 161$ ). Ages ranged from 21-45 years ( $M = 24.02$ ;  $SD = 4.99$ ). All participants had completed the undergraduate university degree in Primary Education, and approximately 20% had also completed a Master's program. Most participants were in their first year of exam preparation ( $n = 133$ ), while very few had exceeded five years in preparation ( $n = 12$ ). All subjects had Spanish nationality, and most of them had completed their degree at University of Almería.

### Instruments

*Cuestionario General del Opositor, CGO [General Questionnaire for the Exam Candidate]* (de la Fuente et al., 2014)

This was used to measure the presage variable: Unpleasant experience. It contains 7 items on a 4-point response scale, and assesses not only past experiences with professional examinations, but also perception of the current and future situation, and the resulting degree of affectedness. After being subjected to confirmatory factor analysis, the structure of the instrument contained two factors: Factor 1, *past experi-*

ence, comprising a total of 5 items; and Factor 2, *present-future experience*, composed of 2 items. Construct validity is acceptable (Chi-squared = 80.051,  $df = 13$ , NFI Delta 1 = 0.931, RFI = 0.911, IFI = 0.941, TLI = 0.912, CFI = 0.941, RMSEA = 0.087), with acceptable indicators in relation to adequate sample size (HOELTER .05 = 152, HOELTER .01 = 189). Total questionnaire reliability is also acceptable ( $\alpha = .738$ ).

*Cuestionario de Creencias Irracionales, CCI [Irrational Beliefs questionnaire] (de la Fuente et al., 2014)*

This was used to measure the process variable by the same name. It is composed of 20 items which represent typical statements about the professional examination, where the candidate must score his or her level of agreement on a scale of 0 to 4. These statements refer to the most common irrational beliefs, according to the specialists: *Oughts* (e.g. "I ought to have passed these examinations a long time ago"), *Catastrophizing* (e.g. "If I fail it would be so awful for me"), and *overgeneralizations* (e.g. "Almost all the panels of judges are unfair"). After being submitted to confirmatory factor analysis, the structure of the instrument is composed of two factors and twelve items, given that the remaining items were not sufficiently consistent: Factor 1, *anticipation of failure*, comprising a total of 4 items; and Factor 2, *negative general assessments*, composed of 8 items. Construct validity is acceptable (Chi-squared = 148.071,  $df = 53$ , NFI Delta 1 = 0.909, RFI = 0.924, IFI = 0.908, TLI = 0.914, CFI = 0.914), and high according to some indicators (RMSEA = 0.057, HOELTER .05 = 261, HOELTER .01 = 294). Total questionnaire reliability is also adequate ( $\alpha = .782$ ).

*TAI-80 (Sarason, 1980)*

The TAI-80 was used to measure test anxiety, considered a process variable. The inventory contains 20 Likert-type items on a four-point response scale, with expressions commonly used to describe oneself; the subject must answer according to how frequently he or she identifies with these expressions. Confirmatory factor analysis showed a structure comprising two factors and 20 items: Factor 1, *worry*, comprising a total of 10 items; and Factor 2, *emotionality*, composed of another 10 items. Construct validity is acceptable (Chi-squared = 524.674,  $df = 169$ , NFI Delta 1 = 0.917, RFI = 0.910, IFI = 0.929, TLI = 0.913, CFI = 0.915, RMSEA = 0.062, HOELTER .05 = 208, HOELTER .01 = 223). Total questionnaire reliability is also very high ( $\alpha = .917$ ). These data are similar to what other authors have found using different procedures (de la Fuente, Sander et al., 2017), given that this questionnaire has been widely used in Educational Psychology research.

*Inventario de Estrategias de Control Durante el Estudio, ECE (Hernández & García, 1995) [Inventory of control strategies during study]*

This was used to measure self-regulated study strategies, considered a process variable. It is composed of 17 items, in 3 categories according to the time when each strategy is used (at the start of study, during study and at the end of study), and has a five-point response scale. After being submitted to confirmatory factor analysis, the structure of the instrument contains two factors and 14 items, given that the remaining items were not sufficiently consistent: Factor 1, *study planning*, comprising a total of 7 items; and Factor 2, *study process/review*, composed of 8 items. Construct validity is adequate (Chi-squared = 220.312,  $df = 76$ , NFI Delta 1 = 0.911, RFI = 0.931, IFI = 0.927, TLI = 0.912, CFI = 0.914, RMSEA = 0.059, HOELTER .05 = 241, HOELTER .01 = 266). Total questionnaire reliability is also adequate ( $\alpha = .856$ ).

*Cuestionario de Pensamientos Interferentes sobre la Oposición, CCPO (de la Fuente et al., 2014) [Questionnaire on Interfering Thoughts about the Professional Exam]*

This questionnaire was used to measure the cognitive correlate of academic stress, one of the indicators into which the product variable was divided, for study purposes. It contains 10 items representing common thoughts; the subject must indicate how often he or she experiences them, their intensity, duration, degree of interference and the situation in which they occur. All of these were answered on a four-point scale, except "situation", which required a dichotomous answer (during study or in many situations). Confirmatory factor analysis showed a structure comprising two factors and 10 items: Factor 1, *thoughts about maladaptive emotions*, comprising a total of 5 items; and Factor 2, *thoughts about negative outcomes*, composed of another 5 items. Construct validity is consistent (Chi-squared = 90.718,  $df = 34$ , NFI Delta 1 = 0.902, RFI = 0.928, IFI = 0.905, TLI = 0.914, CFI = 0.915, RMSEA = 0.055, HOELTER .05 = 292, HOELTER .01 = 337). Total questionnaire reliability is also good ( $\alpha = .820$ ).

*Inventario de Vivencias de Tensión y Ansiedad, IVTAO (de la Fuente et al., 2014) [Inventory of tension and anxiety experiences]*

This was used to measure the physiological correlate of academic stress, another indicator of the product variable. It has 20 items, representing different physiological responses during study; responses were on a four-point scale according to the degree of intensity with which the subject experienced them. Confirmatory factor analysis revealed a structure comprising six factors and 20 items: Factor 1, *tension*, comprising a total of 6 items; Factor 2, *sweating*, composed of 2 items; Factor 3, *trembling*, composed of 3 items; Factor 4, *nausea*, composed of 2 items; Factor 5, *movements*, composed of 4 items; and finally, Factor 6, *rapid heartbeat*, composed of 3

items. Construct validity is acceptable (Chi-squared = 339.256,  $df = 163$ , NFI Delta 1 = 0.880, RFI = 0.913, IFI = 0.940, TLI = 0.917, CFI = 0.902, RMSEA = 0.045, HOELTER .05 = 311, HOELTER .01 = 334). Total questionnaire reliability is also acceptable ( $\alpha = .732$ ).

### Procedure

The instruments were used in written format. Although the time interval for test administration was reduced as much as possible, several weeks were required, given the number of instruments, frequency of class sessions at the academies, and limitations of the research itself, thus resulting in a certain amount of experimental mortality during the investigation. In order to minimize contaminating external factors, questionnaires were administered in a normal class situation; the usual teacher explained the study objectives and their importance, without going into details or hypotheses. Participants were guaranteed confidentiality at all times and were asked to answer truthfully and individually. At the end of the investigation, participating subjects were given feedback from the overall study as well as individualized feedback, and were thanked for their participation.

Data was compiled and processed on a voluntary basis, with the informed consent of the students. The Ethical and Deontological Principles of Psychology were accepted. Data were processed in an anonymous format and as a group, and stored in a protected database at the university. The Bioethics Committee approved the Project and the instruments.

### Data analyses

An ex post facto design was used for this research study, given that the groups formed from the sample for independent

variables were not intentionally selected, but rather formed according to the score obtained in these variables after the questionnaires were administered. At Time 1, inferential analyses (ANOVA) were carried out. The level  $p < .05$  was considered for significant effects. Low-medium-high levels were previously established according to scores on different variables, using k-means clustering analysis. Post hoc tests were performed using the Sheffe index. These analyses and the validity and reliability indicators (Cronbach alpha) were carried out using SPSS v.22. The AMOS program (v.22) was also used for SEM analyses and to analyze instrument structure through confirmatory factor analysis.

## Results

### Interdependence relations between presage and process variables

The low-medium-high level of IV *unpleasant experience* determined a significant main effect on the dependent variable *negative general assessments*, one of the two factors of the *irrational beliefs* variable [ $F(2, 51) = 3.278, p < .05, \eta^2 = .114$ , observed power = .598; Post hoc:  $1 < 3, p < .05$ ]. A significant main effect was also found on the variable *self-regulated study strategies* [ $F(2, 115) = 4.093, p < .01, \eta^2 = .066$ , observed power = .716; Post hoc:  $1 > 3, p < .05$ ]; and its two factors, *study planning* [ $F(2, 218) = 3.206, p < .05, \eta^2 = .029$ , observed power = .608] and *study process/review* [ $F(2, 140) = 4.239, p < .01, \eta^2 = .057$ , observed power = .734; Post hoc:  $1 > 2, 3, p < .05$ ]. See Table 1.

**Table 1.** Interdependence relations between presage and process variables.

	Unpleasant experience		
	Low (1) <i>n</i> = 67	Medium (2) <i>n</i> = 97	High (3) <i>n</i> = 57
Negative general assessments ( <i>n. irrational beliefs</i> , F2)	2.05 (.71)	2.25 (.65)	2.63 (.69)
Self-regulated study strategies ( <i>total variable</i> )	4.05 (.55)	3.78 (.50)	3.70 (.60)
Study planning ( <i>n. self-regulated study strategies</i> , F1)	3.92 (.62)	3.70 (.56)	3.70 (.60)
Study Process/Review ( <i>n. self-regulated study strategies</i> , F2)	3.94 (.60)	3.62 (.62)	3.59 (.68)

Note: Interdependence relationships between some process variables and their factors (DV) and the level of unpleasant experience (IV). Mean and standard deviation are indicated for each group; only the variables or factors with significant effects are shown ( $p < .05$ ).

### Interdependence relations between process variables

The low-medium-high level of IV *irrational beliefs* produced a significant main effect on the dependent variable *test anxiety* [ $F(2, 55) = 2.990, p < .05, \eta^2 = .098$ , observed power = .558]; and its two factors, *worry* [ $F(2, 63) = 3.981, p < .05, \eta^2 = .112$ , observed power = .693; Post hoc:  $1 < 3, p < .05$ ] and *emotionality* [ $F(2, 60) = 3.372, p < .05, \eta^2 = .101$ , observed power = .615; Post hoc:  $1 < 3, p < .05$ ]. See Table 2.

When the low-medium-high levels of *test anxiety* were

taken as an independent variable, there was a significant main effect on the dependent variable *negative general assessments*, one of the two factors of the *irrational beliefs* variable [ $F(2, 56) = 9.984, p < .001, \eta^2 = .263$ , observed power = .980; Post hoc:  $1 < 3, p < .001; 2 < 3, p < .05$ ]. Similarly, the independent variable *test anxiety* was observed in an interdependence relation with the dependent variable *self-regulated study strategies* [ $F(26, 0) = 3.760, p < .05, \eta^2 = .111$ , observed power = .665; Post hoc:  $1 > 2, p < .05$ ], as well as with the *study planning* factor [ $F(2, 61) = 4.550, p < .05, \eta^2 = .130$ , observed power = .754; Post hoc:  $1 > 2, p < .05; 2 < 3, p < .05$ ]. See

Table 2.

**Table 2.** Interdependence relations between process variables.

	Irrational beliefs		
	Low (1) <i>n</i> = 27	Medium (2) <i>n</i> = 33	High (3) <i>n</i> = 10
Test anxiety ( <i>total variable</i> )	2.19 (.72)	2.43 (.57)	2.85 (.66)
Worry ( <i>v. test anxiety</i> , <i>F1</i> )	1.94 (.65)	2.22 (.57)	2.63 (.55)
Emotionality ( <i>v. test anxiety</i> , <i>F2</i> )	2.38 (.77)	2.58 (.60)	3.11 (.74)
	Test anxiety		
	Low (1) <i>n</i> = 26	Medium (2) <i>n</i> = 16	High (3) <i>n</i> = 25
Negative general assessments ( <i>v. irrational beliefs</i> , <i>F2</i> )	1.95 (.55)	2.15 (.47)	2.74 (.72)
Self-regulated study strategies ( <i>total variable</i> )	3.98 (.62)	3.43 (.68)	3.94 (.59)
Study planning ( <i>v. self-regulated study strategies</i> , <i>F1</i> )	4.04 (.76)	3.34 (.77)	3.98 (.64)

Note: Interdependence relationships between some process variables and their factors (DV) and the level of irrational beliefs and test anxiety (IV). Mean and standard deviation are indicated for each group; only the variables or factors with significant effects are shown ( $p < .05$ ).

**Interdependence relations between the presage-process variables and the product variable**

The low-medium-high level of IV *Unpleasant experience*, showed a significant main effect on the dependent variable *maladaptive thoughts*, one of the two factors of the cognitive correlates of academic stress [ $F(2,33) = 3.363, p < .05, \eta^2 = .169$ , observed power = .594; Post hoc:  $1 < 3, p < .05$ ]. See Table 3.

On the other hand, when low-medium-high levels of *irrational beliefs* were taken as an independent variable, a significant effect was observed on the dependent variable *academic stress-cognitive correlates* [ $F(2,21) = 3.379, p < .05, \eta^2 = .243$ , observed power = .573], and on its factor *thoughts about negative outcomes* [ $F(2,26) = 3.712, p < .05, \eta^2 = .222$ , observed power = .628]. Likewise, this independent variable was observed to have a significant effect on the dependent variable *academic stress-physiological correlates* [ $F(2,24) = 5.218, p < .05, \eta^2 = .303$ , observed power = .780; Post hoc:  $1 < 3, p < .01; 2 < 3, p < .05$ ], and on its factors *sweating* [ $F(2,43) = 6.982, p < .01, \eta^2 = .245$ , observed power = .908; Post hoc:  $1, 2 < 3, p < .01$ ], *trembling* [ $F(2,40) = 3.728, p < .05, \eta^2 = .157$ , observed power = .650; Post hoc:  $1 < 3, p < .05$ ] and *movements* [ $F(2,$

$30) = 4.578, p < .01, \eta^2 = .234$ , observed power = .733; Post hoc:  $1 < 3, p < .05$ ]. See Table 3.

On the other hand, when taking low-medium-high levels of *test anxiety* as independent variable, a significant effect was observed on the dependent variable *academic stress-cognitive correlates* [ $F(2,27) = 5.341, p < .01, \eta^2 = .283$ , observed power = .796; Post hoc:  $1 < 2, 3, p < .05$ ], and on its factors *thoughts about maladaptive emotions* [ $F(2,29) = 6.880, p < .01, \eta^2 = .322$ , observed power = .893; Post hoc:  $1 < 2, 3, p < .01$ ] and *thoughts about negative outcomes* [ $F(2,38) = 3.074, p < .05, \eta^2 = .139$ , observed power = .559]. Likewise, this independent variable was observed to have a significant effect on the dependent variable *rapid heartbeat*, one of the factors of the variable *academic stress-physiological correlates* [ $F(2,39) = 6.287, p < .01, \eta^2 = .244$ , observed power = .873; Post hoc:  $1 < 3, p < .01; 2 < 3, p < .05$ ]. See Table 3.

Finally, when taking low-medium-high levels of self-regulated study strategies as independent variable, a significant effect was observed on the dependent variable *nausea*, one of the factors of the variable *academic stress-physiological correlates* [ $F(2,40) = 3.423, p < .05, \eta^2 = .146$ , observed power = .610; Post hoc:  $1 > 2, p < .05$ ]. See Table 3.

**Table 3.** Interdependence relations between presage-process variables and product variables.

	Unpleasant experience		
	Low (1) <i>n</i> = 10	Medium (2) <i>n</i> = 10	High (3) <i>n</i> = 18
Maladaptive emotions/thoughts ( <i>v. academic stress: cognitive corr.</i> , <i>F1</i> )	2.03 (.51)	2.32 (.38)	2.48 (.42)
	Irrational beliefs		
	Low (1) <i>n</i> = 21	Medium (2) <i>n</i> = 17	High (3) <i>n</i> = 10
Academic stress: cognitive corr. ( <i>total variable</i> )	2.03 (.32)	2.42 (.38)	2.56 (.54)
Thoughts about negative outcomes ( <i>v. academic stress: cognitive corr.</i> , <i>F2</i> )	2.17 (.43)	2.57 (.42)	2.73 (.50)
Academic stress: physiological corr. ( <i>total variable</i> )	1.34 (.36)	1.45 (.24)	1.89 (.21)
Sweating ( <i>v. academic stress: physiological corr.</i> , <i>F2</i> )	1.21 (.40)	1.18 (.30)	1.75 (.46)
Trembling ( <i>v. academic stress: physiological corr.</i> , <i>F3</i> )	1.14 (.30)	1.31 (.41)	1.75 (1.00)
Movements ( <i>v. academic stress: physiological corr.</i> , <i>F5</i> )	1.48 (.39)	1.68 (.53)	2.25 (.50)

	Test anxiety		
	Low (1) n = 17	Medium (2) n = 10	High (3) n = 19
Academic stress: cognitive corr. ( <i>total variable</i> )	2.02 (.46)	2.57 (.18)	2.46 (.38)
Thoughts about maladaptive emotions ( <i>v. academic stress: cognitive corr., F1</i> )	1.82 (.51)	2.49 (.20)	2.36 (.42)
Thoughts about negative outcomes ( <i>v. academic stress: cognitive corr., F2</i> )	2.21 (.49)	2.52 (.35)	2.58 (.43)
Rapid heartbeat ( <i>v. academic stress: physiological corr., F6</i> )	1.23 (.39)	1.20 (.36)	1.93 (.91)
	Self-regulated study strategies		
	Low (1) n = 10	Medium (2) n = 14	High (3) n = 19
Nausea ( <i>v. academic stress: physiological corr., F4</i> )	1.70 (.59)	1.14 (.31)	1.39 (.59)

Note: Interdependence relationships between the product variable and its factors (DV) and the level of unpleasant experience, irrational beliefs, test anxiety and self-regulated study strategies (IV). Mean and standard deviation are indicated for each group; only the variables or factors with significant effects are shown (p<.05).

**Structural linear relations (SEM)**

The results of structural analysis or path analysis (SEM) showed an acceptable model of variable relations. Values for the models tested are presented below. See Table 4.

*Standardized direct effects.* The predictive linear model establishes that the latent variable *unpleasant experience* (F1) was a significant positive predictor (.708) of the latent cognitive variable *irrational beliefs* (F2). Moreover, the *irrational beliefs* varia-

ble (F2) was a positive predictor (.896) of the latent variable *academic stress-cognitive correlates* (F5). In the same way, the latent variable *unpleasant experience* (F1) was a significant negative predictor (-.220) of the latent behavioral variable *self-regulated study strategies* (F4). At the same time, the latent variable *unpleasant experience* (F1) was a positive predictor (.53) of *test anxiety* (F3), and *test anxiety* (F3) appeared in a significant, positive predictive relationship (.456) with the latent variable *academic stress-physiological correlates* (F6). See Table 5.

**Table 4.** Structural linear relations models.

	Chi2	FG	p <	NFI	RFI	IFI	TLI	CFI	HOELTER	RMSEA
Model	544.804	(299-81): 218	.000	.806	.709	.876	.869	.873	.444	.078
Model	112.931	(119-46): 73	.002	.903	.916	.920	.917	.915	.502	.032

**Table 5.** Standardized direct effects.

	F1	F2	F3	F4	F5	F6
F2	.708					
F3	.534					
F4	-.220					
F5		.896				
F6			.456			
CGOFACTOR1	.647					
CGOFACTOR2	.573					
CCID1		.537				
CCID2		.848				
TAIPREOC			.860			
TAIEMOC			.954			
ECEPLANI				.648		
ECEDESARRO				.904		
CCPOD1					.631	
CCPOD2					.814	
TENSION						.702
RAPID HEARTBEAT						.374
SWEATING						.881
TREMBLING						.493
NAUSEA						.572
MOVEMENTS						.402

Note: F1= Unpleasant experience; F2= irrational beliefs; F3=Test anxiety; F4=Self-regulated study; F5= academic stress-cognitive correlates; F6= academic stress-physiological correlates

*Standardized indirect effects.* The model also showed multiple indirect predictions between variables. The predictive linear

model established that the latent variable *unpleasant experience* (F1) was a significant positive predictor (.634) of the latent

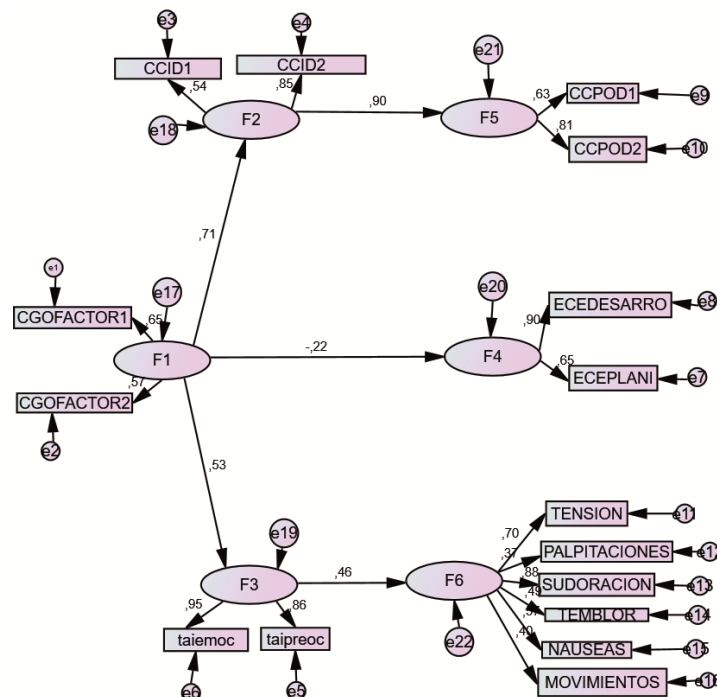
variable *academic stress-cognitive correlates* (F5), and a positive predictor (.224) of the latent variable *academic stress-physiological correlates* (F6). Additionally, the latent variable *unpleasant experience* (F1) held a positive, indirect predictive relationship with the components of *test anxiety* (F3), *academic stress-cognitive*

*lates* (F5) and *academic stress-physiological correlates* (F6). However, it had an indirect, negative effect on the latent variable *self-regulated study strategies* (F4). See Table 6. See the graphic representation of the model in Figure 2.

**Table 6.** Standardized indirect effects.

	F1	F2	F3	F4	F5	F6
F2						
F3						
F4						
F5	.634					
F6	.244					
CGOFACTOR1						
CGOFACTOR2						
CCID1						
CCID2						
TAIPREOC	.459					
TAIEMOC		.509				
ECEPLANI	-.142					
ECEDESARRO	-.199					
CCPOD1			.400	.729		
CCPOD2			.516	.565		
TENSION		.171		.320		
RAPID HEARTBEAT	.091		.171			
SWEATING	.215		.402			
TREMBLING		.120		.225		
NAUSEA		.139		.261		
MOVEMENTS	.098		.184			

Note: F1= unpleasant experience; F2= irrational beliefs; F3=test anxiety; F4=self-regulated study; F5= academic stress-cognitive correlates; F6= academic stress-physiological correlates



**Figure 2.** Graphic representation of the structural model.

F1= Unpleasant experience; F2= irrational beliefs; F3=Test anxiety; F4=Self-regulated study; F5= academic stress-cognitive correlates; F6= academic stress-physiological correlates. PALPITACIONES: rapid heartbeat. SUDORACION: sweating. TEMBLOR: trembling. NAUSEAS: nausea. MOVIMIENTOS: movements.



## Discussion and Conclusions

The results indicated that there were significant interdependence and structural prediction relationships among the research variables, partially validating the relationships proposed in the SLPS Competency model for predicting study behavior in stressful situations.

In more detail, *Hypothesis 1* was partially fulfilled, providing evidence that previous experience determines different process variables and factors in the system, and therefore constitutes an important factor to be considered in preparing for these exams. Nonetheless, in the case of irrational beliefs, this relationship was only observed in one of its factors, and with respect to the test anxiety variable, no interdependence relationship was observed at all. As for its important relationship to self-regulation strategies and its two factors, unpleasant experience probably acts by reducing tolerance to frustration, leading subjects to exercise fewer strategies, or less-developed strategies (Akfirat, Gül & Yetim, 2016). This would explain why the effect between the variables *unpleasant experience* and *self-regulation strategies* is less intense in the final period of study (review) than it was initially (planning), thereby giving rise to new hypotheses which can be empirically tested.

*Hypothesis 2* was also partially validated. While *irrational beliefs* and *test anxiety* are strongly interdependent, and *test anxiety* is also interdependent with *self-regulated study strategies*, no such relationship is appreciable between the *irrational beliefs* variable and *self-regulated study strategies*, something which must be examined in greater depth (Cheng & Liao, 2016). The relationship between irrational beliefs and anxiety is sufficiently well understood, it is not for naught that anxiety has an important cognitive component (Pedroza, 2015). Yet to be verified is its relationship to other external variables that recent research has identified, such as locus of control, which might actively contribute to the origin and maintenance of many irrational beliefs and of test anxiety (Senler, 2016).

Regarding *Hypothesis 3*, it was also partially validated. While interdependence relations between *presage/process* variables and academic stress can be observed, on several occasions this only occurred when considering the cognitive correlates of academic stress, and not its physiological correlates. Along this line, results indicate that physiological correlates of stress depend to a greater degree on the level of irrational beliefs than on the level of test anxiety, despite an *a priori* inclination to attribute a greater component of physiological activation to test anxiety (Leung, Yeung & Wong, 2010).

Finally, *Hypothesis 4*, referring to structural relations, is consistently validated. A relationship structure consistent with the role of *unpleasant experience* was confirmed; there was a clear, three-fold effect -- cognitive, behavioral and physiological -- on how professional examination candidates study. These results are consistent with prior evidence that show the importance of initial experiences for continuing universi-

ty-level studies, when diverse variables are considered (García, Gutiérrez & Rodríguez-Muñiz, 2016).

As for general *limitations* of this study, in addition to those mentioned above, there is a need to study the role of *gender*. Because of limitations in the present sample, it would be desirable to replicate this study with a greater number of participants and better representation of both genders; test results cannot be extrapolated to the general population, since they may be influenced by the clearly higher number of women than men. Regarding gender influence, earlier research shows significant differences between the sexes in test-related stress and in anxiety (Kosmala-Anderson & Wallace, 2007). Regarding sample representativeness, we should note that all the subjects in this study were preparing for the exams at an academy; this same research could also have included candidates who prepare on their own, and so compare the two groups and verify whether there were significant differences between them.

## Implications in Educational Psychology

The most important implication of these results is the need to take greater interest and intervene preventively in the explanations that subjects make when they interpret their experiences with preparing this type of selective examination. In this way, the subject can come to attribute more realistic meanings and avoid simplistic explanations that trigger states of anxiety or stress, which in the end make it more difficult to reach the final objective of obtaining a post. This area of interest could be incorporated into the exam preparatory process itself, making it a process of wholistic educational care for the candidate, not merely intellectual or test preparation. Lastly, it could be embodied as a specific program for preventing academic stress, such as is proposed in the *SLPS Competency Model* (de la Fuente, 2015). Recent studies, also carried out with samples of university students pursuing the Primary Education degree, show that there are effective techniques for easing levels of academic stress and test anxiety (Gallego, Aguilar-Parra, Cangas, Rosado & Länger, 2016). In addition, certain tools of interest have incorporated a clear component of ICT innovation, and are available for coping with stress in relation to highly demanding tests (de la Fuente, 2015).

## Future lines for research

Given that there is limited research on this topic in Educational Psychology, and in light of the potential of the underlying theoretical model used in this investigation, the possibilities for future studies are numerous and diverse. One could look for relations with other model variables that have not been analyzed in this investigation, such as instrumental skills involved in the tests, or motivational strategies (Busari, 2017), and also include stronger evidence on the possible causal relationships that may exist between the variables

studied, in line with other recent reports (de la Fuente, Fernández-Cabezas et al., 2017).

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