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RESEARCH ARTICLE

# Evidence of Convergent and Discriminant Validity of TAI-State: Influence of Pre-exam Coping Strategies

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**Abstract**

The objective was to find out the degree to which the pre-exam coping strategies (PECS) influence the Test Anxiety (TA) – State (TA-State) in psychology students in order to obtain convergent and discriminating evidence from the TAI-State. The study included 156 psychology students (115 women) from a private university in Metropolitan Lima, ages ranging from 18 to 42 ($M$ = 22.51). The instruments used were: Test Anxiety Inventory-State (TAI-State) and the Coping with Pre-Exam Anxiety and Uncertainty-Brief (COPEAU-B), which evaluates four strategies. A confirmatory factor analysis was used to verify reliability and validity; while structural equation models were used to assess the research model. After the structural regression analysis, the PECSs explain 13.3% of the variance of the TA-State, with *task-oriented* and *search for social support for instrumental reasons* strategies as the most influential ($\beta$ = -.212 and $\beta$ = .320). The theoretical and practical implications of the study are discussed.

**Keywords:**
test anxiety, pre-exam coping, university students, validity, reliability

## Evidencia Convergente y Discriminante del TAI-Estado: Influencia de las Estrategias de Afrontamiento Pre-examen

**Resumen**

El objetivo fue conocer cuánto influyen las estrategias de afrontamiento pre-examen (EAPE) sobre la Ansiedad ante Exámenes - Estado (AE-Estado) en estudiantes de psicología para obtener evidencias convergentes y discriminantes del TAI-Estado. En el estudio participaron 156 estudiantes de psicología (115 mujeres) de una universidad privada de Lima Metropolitana, con edades entre 18 y 42 años ($M$ = 22.51). Los instrumentos usados fueron: el Test Anxiety Inventory – Estado (TAI-Estado) y el Coping with Pre-Exam Anxiety and Uncertainty-Breve (COPEAU-B), que evalúa cuatro estrategias. Fue utilizado un análisis factorial confirmatorio para verificar la confiablidad y validez, y modelos de ecuaciones estructurales para evaluar el modelo de investigación. Luego del análisis de regresión estructural, las EAPE explican el 13.3% de la varianza

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de la AE-Estado, siendo las estrategias orientación a la tarea y búsqueda de apoyo social por razones instrumentales las de mayor influencia ($\beta$ = -.212 y $\beta$ = .320, respectivamente). Se discuten las implicancias teóricas y prácticas del estudio.
**Palabras clave:**
ansiedad ante exámenes, afrontamiento pre-examen, estudiantes universitarios, validez, confiabilidad

## Evidência convergente e discriminante do TAI-Estado: Influência de estratégias de enfrentamento da ansiedade pré-testes

**Resumo**

O objetivo foi conhecer até que ponto influem as estratégias de enfrentamento pré-teste (EEPT) sobre a Ansiedade diante de Exames - Estado (AE-Estado) em estudantes de psicologia para obter evidências convergentes e discriminantes do TAI-Estado. Participaram no estudo 156 estudantes de psicologia (115 mulheres) de uma universidade privada de Lima Metropolitana, com idades de entre 18 e 42 anos (*M* = 22.51). Os instrumentos utilizados foram: o *Test Anxiety Inventory* – Estado (TAI-Estado) e o *Coping with Pre-Exam Anxiety and Uncertainty*-Breve (COPEAU-B), que avalia quatro estratégias. Utilizou-se uma análise fatorial confirmatória para verificar a confiabilidade e validade, e modelos de equações estruturais para avaliar o tipo de pesquisa. Após a análise de regressão estrutural, as EAPE explicam o 13,3% da variância da AE-Estado, onde as estratégias *orientação à tarefa e busca de apoio social por razões instrumentais* são as de maior influência ($\beta$ = -.212 e $\beta$ = .320, respectivamente). Discutem-se as implicações teóricas e práticas do estudo.
**Palavras-chave**:
ansiedade diante de testes, enfrentamento pré-teste, estudantes universitários, validade, confiabilidade

## Introduction

In the context of university higher education, assessments play a preponderant role because they allow the teacher to have an overview of student learning. In addition, there are situations that provoke various reactions in students, one of the most frequent being anxiety.

In this sense, text anxiety (TA) refers to a specific personality trait for exhibiting states of anxiety more intensely and frequently than usual, with concerns that interfere with attention, concentration, and testing (Spielberger, 1980; Spielberger & Vagg, 1995). This definition is based on constant experience, that is, considering TA as a personality trait (TA-Trait) although specific to evaluative situations, but without circumscribing this experience to a specific examination. However, despite its importance, the TA experienced in the exam *itself* (TA-State) has been partially ignored.

TA-State is defined as a period of transient anxiety caused by a specific exam situation (Hong & Karstersson, 2002), and is dynamically influenced by personal (e.g., anxiety as a trait) and situational (e.g., subject-matter) factors (Spielberger & Vagg, 1995), even postulating that TA-Trait is enhanced by different situational factors (Zohar, 1998). Likewise, several studies have associated it inversely with selective attention and concentration (Fernández-Castillo & Caurcel, 2015), working memory (Ikeda, Iwanaga & Seiwa, 1996), and exam performance (Dominguez-Lara, 2017a; Dominguez-Lara, Calderón-De la Cruz, Alarcón-Parco & Navarro-Loli, 2017), given that this facet of TA tends to increase with the proximity of an exam, making its negative relationship with academic self-efficacy stronger (Lotz & Sparfeldt, 2017; Roick & Ringeisen, 2017), so the negative association with performance is expected.

Despite these findings, Spanish-language studies that operationalize the TA-State construct in an instrument are recent. The only antecedent focuses on the adaptation of the Spanish version of the *Test Anxiety Inventory* (TAI) to the examination situation (TAI-State; Dominguez-Lara, 2016a), while in English there is another adapted version of the TAI (Hong, 1988), adjectives (Lotz & Sparfel-

dt, 2017; Roick & Ringeisen, 2017), or focusing the responses in the *State* section of the *Trait-State Anxiety Inventory* (Zohar, 1998), to evaluate the TA-State.

The study of the internal structure of the TAI-State could elucidate some aspects related to the configuration of the instrument. To begin with, the two-factor structure (*concern* and *emotionality*) provided in the model underlying the various versions of the TAI was not supported, resulting in a single factor called TA-State. In addition, the reliability indicators of the scores and construction were high (> .90), as observed in the structural study of the TAI in Peruvian university students (Dominguez-Lara & De la Cruz-Contreras, 2017). Although the evidence obtained regarding the internal structure was favorable, it must be complemented with other sources of validity to consolidate the instrument, especially in relation to the association of the TA-State with related constructs, more recently referred to as *evidence of validity in relation to other variables*, which includes *convergent/discriminating evidence* that refers to the association with other measures that reflect theoretically relevant constructs or *test-criteria relationships*, where the scores of the instrument are linked to a measure of performance (AERA, APA & NCME, 2014).

In this sense, and while the preliminary findings of its relationship with exam performance (Dominguez-Lara, 2017a; Dominguez-Lara et al., 2017) is *evidence regarding one criterion* (AERA, APA & NCME, 2014), it is necessary to associate it with constructs that are relevant to its nomological network (Taras & Kline, 2010). Thus, *pre-exam coping strategies* (PECS) are an appropriate option because of their association with TA-Trait.

PECSs can be defined as a series of strategies used by students days before the exam that could be placed in the *anticipatory phase* of coping (Carver & Scheier, 1994), and include both *task orientation (*TO), *avoidance* (A), and *seeking social support (SSS*), which in turn is divided into SSS *for emotional reasons and* SSS *for instrumental reasons* (Dominguez-Lara & Merino-Soto, 2016).

With respect to joint TA and PECS studies, on the one hand, moderate and positive relations have been found between TA-Trait with the SSS and TO strategies, and low or null with the A strategy (Piemontesi & Heredia, 2011; Stöber, 2004); while another study indicates negative bivariate relationships with TO, and positive with SSS and A, and the results of its multivariate analysis indicate that SSS and A contributed significantly to the variability of TA-Trait (Putwain, Connors, Symes & Douglas-Osborn, 2012).

To date, no studies have been found that analyze the correlational pattern of the PECS and the TA-State, and it is expected that the magnitudes of these correlations will not differ from those found in preliminary studies that evaluate the relationship between PECS and the TA-Trait, reflecting the expected behavioral patterns of the students evaluated. In addition, by establishing a different temporal plane, i.e., that PECS appear before the TA-State, a significant influence of PECS on the anxiety experience during the examination (TA-State) is hypothesized.

Therefore, the objective of this study was to obtain *convergent/discriminating evidence* from the TAI-State by analyzing the influence of the PECS on the TA-State under a structural modeling approach. The study hypotheses were:

- $H_1$: There will be a negative and significant influence of the TO strategy on the TA-State.
- $H_2$: There will be a positive and significant influence of the SSS strategies on the TA-State.
- $H_3$: There will be no significant influence of the A strategy on the TA-State.

These approaches are consistent, since if the person uses strategies that optimize study time (e.g., TO) and relate to academic self-efficacy (Dominguez-Lara, 2018) he or she would feel more confident during the evaluation ($H_1$) than the student who based his or her strategy on asking their classmates for advice on how to approach a particular exam (e.g., SSS) ($H_2$). However, avoiding studying the subjects involved in the exam (A strategy) does not show a consistent relationship with the TA-State, so this research hypothesizes that it does not contribute to the variability of the latter ($H_3$).

These results will serve to understand an unexplored facet of the relationship in the TA-State with the PECS used in the Peruvian context, both for instrumental and empirical purposes. The findings will provide additional evidence of vali-

dity that will allow the TAI-State to be used in the context of higher education, and from the empirical point of view, will help decision making with respect to empowering or modifying those strategies that have a greater impact on the anxiety experience during the exam, due to the relationship of the latter with academic performance.

## Method

### Participants

This instrumental study based on an associative strategy (Ato, López & Benavente, 2013) involved an intentional sample of 156 college students (115 women; 2 did not report the gender) of the fifth (n = 57), seventh (n = 37), and eighth semester (n = 62) of the professional psychology program of a private university located in Metropolitan Lima. The ages ranged between 18 and 42 years (86.8% between 18 and 25 years; 4 did not report age) ($M_{edad}$ = 22.51, $SD_{edad}$ = 3.42), and with moderate differences in favor of men ($t_{[148]}$ = 2.874, $p$ = . 005, $d$ = .53).

### Instruments

***Test Anxiety Inventory - State (TAI-State).*** The TAI-State (Dominguez-Lara, 2016a) evaluates test anxiety as a one-dimensional construct and is composed of 15 items with four alternative responses (*Not at all, Somewhat, Plenty,* and *A lot*). The interpretation of the scores is direct: the higher the score, the more anxiety during the exam. In order to focus the respondent on the examination situation, all statements are preceded by the phrase "*During the examination...*".

***Coping with Pre-Exam Anxiety and Uncertainty-Brief (COPEAU-B).*** The brief version applied to Peruvian university students (Dominguez-Lara & Merino-Soto, 2017) was used, consisting of 12 items with six answer options (from Never to Always). COPEAU-B evaluates each strategy with three items: Homework Orientation and Preparation, Search for Social Support for emotional reasons, Search for Social Support for instrumental reasons, and Avoidance. The interpretation of the scores is direct: the higher the score, the more frequently the strategy evaluated is used.

### Procedure

The students were informed about the objectives of the study, indicating that their participation will be voluntary, that they will not receive any kind of academic or financial reward and that the answers they provide will be confidential. At the end, they were thanked for their collaboration.

The instruments were applied immediately after the final exam by instructing them to respond to the TAI-State based on how they felt during the exam. Likewise, with respect to COPEAU-B, it was indicated that they should respond to it specifically thinking about the subject. This would ensure that the answers given to both questionnaires are related to the same subject.

***Preliminary analysis.*** In view of the impossibility of analyzing the invariance of measurement between men and women due to the sample size of the groups (Dimitrov, 2010), their coefficients $\alpha$ were compared as an approximate indicator of equivalence between these (Merino & Lautenschlager, 2003). For this purpose, the method of Feldt and Kim (2006) was used with the *LittleAlpha* program (Merino-Soto, 2016). In view of the characteristics of the present study, the choice of this method is justified over others because it is oriented to small samples (n < 100) or to instruments with few items (1 < k < 4). Subsequently, the descriptive (mean and standard deviation) and distributional (asymmetry and kurtosis) statistics for each item were reported, as well as the univariate normality (for each dimension) using the Shapiro-Wilk test (SW; 1965; Ghasemi & Zahediasl, 2012).

***Analysis of measurement models.*** Previously, multivariate normality was analyzed by means of the Mardia coefficient, waiting for adequate magnitudes (< 70; Rodríguez & Ruiz, 2008). Subsequently, two models were considered. The first deals with a one-dimensional model (M1), i.e., where all items are simultaneously influenced by a factor. The second model (M2) consists of five oblique factors (four dimensions of COPEAU-B and one of the TAI-State). The estimation method was the maximum robust likelihood with non-normality correction (Satorra & Bentler, 1994), and the matrix used was that of polycoric correlations (Lee, Poon & Bentler, 1995) due to the excess of kurtosis of some items. The models were valued based on

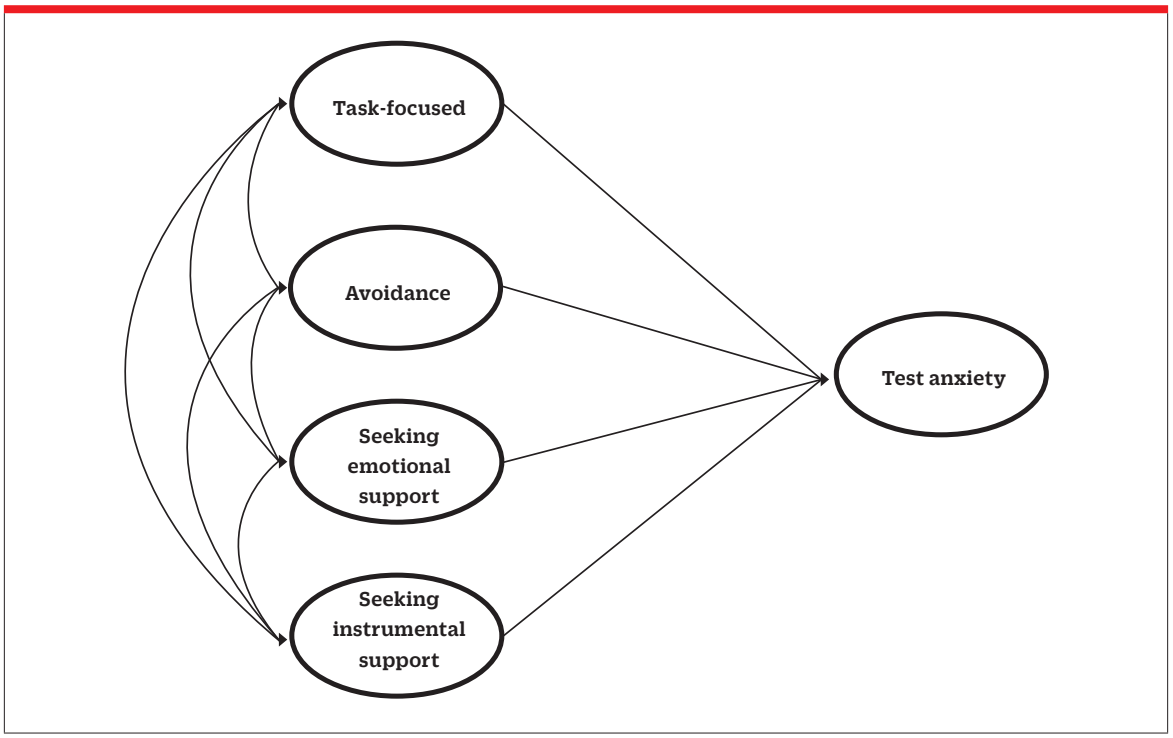


**Figure 1.** *Structural model. Note: Observed variables (items) were omitted to simplify the graph.*

traditional adjustment indices (CFI > .95, RMSEA < .05 and SRMR < .05). In this respect, M1 is expected to have a poor fit, as a baseline, otherwise it would indicate that the five factors analyzed represent facets of a single construct. Consequently, M2 is expected to have significantly better adjustment than M1.

Additionally, factorial loads, average variance extracted by factor (AVE; Fornell & Larcker, 1981) and inter-factorial correlations ($\phi$) were reported *in* order to provide evidence of convergent internal validity. In this sense, AVE magnitudes above .50 and reliability coefficients above .60 (Hair, Black, Babin, Anderson & Tatham, 2010) are indicators of adequate convergent validity. In addition, the factorial determination coefficient ($\phi 2$) and the AVE were compared for the analysis of discriminant internal validity, in the hope that the latter would be of greater magnitude. Finally, two reliability coefficients were reported at the latent variable level: $\omega$ (McDonald, 1999) and *H* (Hancock & Mueller, 2001). All these coefficients were calculated based on the oblique measurement model. The coefficients linked to the scores observed (e.g., $\alpha$) in these analyses were not reported since latent variables were worked with.

***Analysis of the structural model.*** A structural regression model (Kline, 2016) was implemented to analyze the influence of *pre-examination coping strategies* (exogenous variables) on *test anxiety* (endogenous variable) (M3) (Figure 1).

The model was statistically evaluated according to two criteria: sufficiency of the adjustment indices and measures of practical significance or magnitude of the effect (ME). For the first point, the adjustment indices already mentioned in previous paragraphs (CFI, RMSEA, and SRMR) were used. In relation to EM, it was evaluated by means of the determination coefficient (*R2*), that is, the amount of variability of the endogenous variable attributed to the exogenous variables, the influence of each exogenous variable (coefficient $\beta$) and its EM by means of *f2*, when excluding said variable from the model and recalculating *R2 in* order to evaluate if the withdrawal of that exogenous variable substantially affects the explained variance of the model (Cohen, 1988):

$$f^2 = \frac{R^2 \text{incluido} - R^2 \text{excluido}}{1 - R^2 \text{incluido}}$$

As for the assessment of ME measures, *R2* is considered to be significant with a lower limit of its confidence interval (CI; Dominguez-Lara, 2017b) is ≥ .04, and if $\beta$ > .20 (Ferguson, 2009), respectively. Also, as to the importance of each predictor, if *f2* > .02 (Cohen, 1988) in the context of social science research, it would indicate that the influence of each exogenous variable on the endogenous variable is significant. Statistical significance was not considered in view of the fact that its indicators are substantially influenced by sample size, and even in the presence of statistically non-significant results, relevant ME can be found, and vice versa (Kline, 2016).

## Results

***Preliminary descriptive analysis***. The comparison made between the coefficients $\alpha$ of men and women indicates that the difference was not statistically significant except in *BAS-instrumental*, where women presented higher indicators (Table 1).

There is a predominance of lower options in all dimensions, except the *Task Orientation* strategy, where higher responses predominate on the response scale (Table 2). Likewise, some items of the TAI-State present excess asymmetry and kurtosis (e.g., item 10), while the COPEAU-B items remain within acceptable limits (+/- 1.5; Pérez & Medrano, 2010). In general, the executed SW test suggests that the distribution of each variable does not approximate univariate normality ($p$ < .001).

***Analysis of measurement models.*** The Mardia coefficient is above what was considered adequate (91,649), so it was appropriate to include a correction of the estimates in the absence of normality.

Among the models proposed, the one with the worst fit was M1 (Table 3). On the contrary, the measurement model associating the four strategies and test anxiety (M2) obtained a favorable adjustment.

With respect to convergent validity, M2 showed factorial loads of moderate magnitude ($\lambda$ > .50; Table 4), an average extracted variance per acceptable factor (AVE > .50), except for Avoidance (*AVE* < .40), as well as significant inter-factorial correlations (Table 5). Discriminant validity was evaluated by comparing the square of the inter-factorial correlations and the AVE, finding that the factors are empirically differentiated (Table 5). Regarding the reliability of the construct, the magnitude of the coefficients was high in most cases (> .70), except in Avoidance (< .70). Then, based on the evidence shown, it is pertinent to continue with the structural analysis.

**Table 1**
*Comparison of coefficients α between males and females*

| | | α | $\alpha_{adjusted}$ | $W_{Fixed}$ | *gl* | *p* |
|---|---|---|---|---|---|---|
| Test anxiety | Male | .919 | .923 | 1.025 | 94,37 | .480 |
| | Female | .920 | .921 | | | |
| Seeking emotional support | Male | .793 | .804 | 1.436 | 46,33 | .139 |
| | Female | .861 | .863 | | | |
| Avoidance | Male | .350 | .384 | 1.458 | 46,33 | .130 |
| | Female | .570 | .578 | | | |
| Seeking instrumental support | Male | .669 | .686 | 1.773 | 46,33 | .044 |
| | Female | .820 | .823 | | | |
| Task Orientation | Male | .766 | .778 | 1.200 | 46,33 | .294 |
| | Female | .812 | .815 | | | |

**Table 2**
*Descriptive statistics of TAI-State and COPEAU-B items*

| | M | DE | g1 | g2 |
|---|---|---|---|---|
| **Test Anxiety** | | | | |
| **TAI 1** | 2.147 | .708 | .778 | 1.059 |
| **TAI 2** | 2.135 | .828 | .504 | -.117 |
| **TAI 3** | 1.468 | .731 | 1.718 | 2.867 |
| **TAI 4** | 1.712 | .894 | 1.151 | .497 |
| **TAI 5** | 1.705 | .738 | 1.019 | 1.161 |
| **TAI 6** | 2.058 | .781 | .640 | .377 |
| **TAI 7** | 1.538 | .666 | .853 | -.395 |
| **TAI 8** | 1.750 | .678 | .606 | .323 |
| **TAI 9** | 1.910 | .739 | .629 | .438 |
| **TAI 10** | 1.333 | .675 | 2.283 | 5.186 |
| **TAI 11** | 1.263 | .591 | 2.508 | 6.492 |
| **TAI 12** | 1.404 | .660 | 1.519 | 1.555 |
| **TAI 13** | 1.910 | .868 | .835 | .184 |
| **TAI 14** | 1.558 | .772 | 1.379 | 1.471 |
| **TAI 15** | 2.013 | .880 | .723 | -.014 |
| **Seeking emotional support** | | | | |
| **COPEAU1** | 2.551 | 1.271 | .857 | .452 |
| **COPEAU4** | 2.397 | 1.216 | .939 | .853 |
| **COPEAU5** | 2.628 | 1.316 | 1.025 | .635 |
| **Avoidance** | | | | |
| **COPEAU 2** | 2.827 | 1.230 | .779 | .257 |
| **COPEAU 6** | 2.840 | 1.370 | .416 | -.603 |
| **COPEAU 10** | 2.782 | 1.143 | .569 | .385 |
| **Seeking instrumental support** | | | | |
| **COPEAU 3** | 2.314 | 1.353 | .853 | -.223 |
| **COPEAU 7** | 2.564 | 1.359 | .925 | .296 |
| **COPEAU 8** | 3.199 | 1.365 | .174 | -.709 |
| **Task Orientation** | | | | |
| **COPEAU 9** | 3.513 | 1.257 | .158 | -.755 |
| **COPEAU 11** | 4.045 | 1.251 | -.146 | -.904 |
| **COPEAU 12** | 3.474 | 1.236 | .194 | -.562 |

**Note:** *M: Arithmetic mean; SD: Standard deviation; g1: Asymmetry; g2: Kurtosis*

**Table 3**
*Adjustment indices of the measurement models*

| Model | SB-$\chi$2 | g | p | CFI | RMSEA (CI 90%) | SRMR |
|---|---|---|---|---|---|---|
| Measurement Models | | | | | | |
| M1 | 895.252 | 323 | < .001 | .875 | .107 (.098 - .115) | .135 |
| M2 | 433.823 | 314 | < .001 | .974 | .050 (.038 - .060) | .071 |
| Structural regression model | | | | | | |
| M3 | 420.103 | 304 | < .001 | .975 | .050 (.037 - .061) | .071 |

**Note:** *M1: One-dimensional model; M2: Oblique model; M3: Structural model*

**Table 4**
*Factorial loads of the items*

| | TA | ES | AV | IS | TASK |
|---|---|---|---|---|---|
| **TAI 1** | .584 | | | | |
| **TAI 2** | .577 | | | | |
| **TAI 3** | .760 | | | | |
| **TAI 4** | .598 | | | | |
| **TAI 5** | .690 | | | | |
| **TAI 6** | .705 | | | | |
| **TAI 7** | .720 | | | | |
| **TAI 8** | .710 | | | | |
| **TAI 9** | .732 | | | | |
| **TAI 10** | .827 | | | | |
| **TAI 11** | .826 | | | | |
| **TAI 12** | .751 | | | | |
| **TAI 13** | .684 | | | | |
| **TAI 14** | .799 | | | | |
| **TAI 15** | .772 | | | | |
| **COPEAU 1** | | .739 | | | |
| **COPEAU 4** | | .779 | | | |
| **COPEAU 5** | | .843 | | | |
| **COPEAU 2** | | | .592 | | |
| **COPEAU 6** | | | .709 | | |
| **COPEAU 10** | | | .350 | | |
| **COPEAU 3** | | | | .717 | |
| **COPEAU 7** | | | | .882 | |
| **COPEAU 8** | | | | .653 | |
| **COPEAU 9** | | | | | .706 |
| **COPEAU 11** | | | | | .810 |
| **COPEAU 12** | | | | | .706 |

**Note:** *TA: Test anxiety; ES: Search for emotional support; AV: Avoidance; IS: Search for instrumental support; TASK: Task orientation.*

**Table 5**
*Convergent, discriminant, and reliable evidence of the construct*

| | $\omega$ | H | AVE | TA | ES | AV | IS | TASK |
|---|---|---|---|---|---|---|---|---|
| TA | .941 | .947 | .518 | | .077 | .051 | .108 | .023 |
| ES | .830 | .839 | .621 | .277 | | .231 | .684 | .037 |
| AV | .574 | .628 | .325 | .226 | .481 | | .275 | .004 |
| IS | .798 | .841 | .573 | .329 | .827 | .524 | | .030 |
| TASK | .786 | .796 | .551 | -.150 | .193 | -.063 | .172 | |

**Note:** *TA: Test anxiety; ES: Seeking emotional support; AV: Avoidance; IS: Seeking instrumental support; TASK: Task orientation. AVE: average extracted variance.*
*The correlations are placed under the diagonal; above the diagonal is the variance shared among factors.*

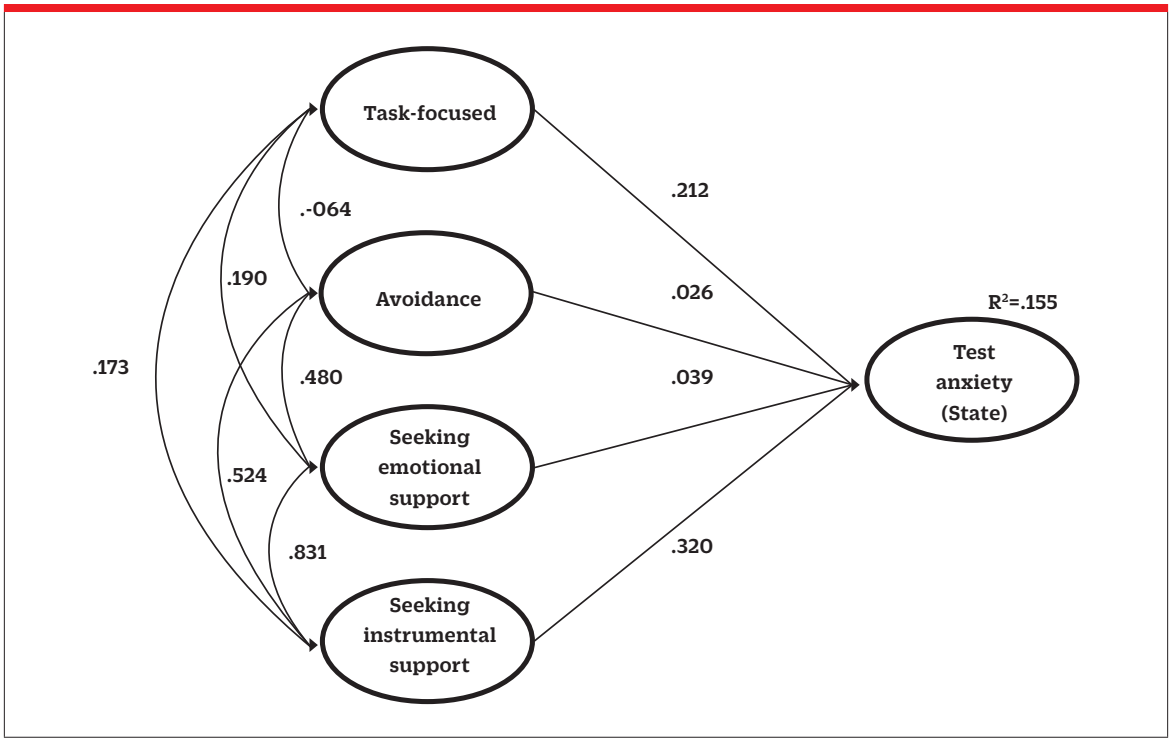


**Figura2.** *Structural model with standardized coefficients.*

***Analysis of the structural model.*** The structural model (Figure 2) showed favorable adjustment indices (Table 3). Similarly, the four pre-examination strategies together explain 15.5% of the variability of test anxiety ($R^2$ = .155; IC95% .053 - .257; Figure 2), after correcting the coefficient based on sample size and number of predictors (Kline, 2016), its magnitude did not decrease noticeably ($R^2$ = .133; IC95% .036 - .230).

Finally, in terms of compliance with the hypotheses, only the coefficients $\beta$ of the *task-oriented* strategies and the *search for instrumental support* are significant (> .20; Ferguson, 2009), showing acceptable measures of ME (f2 > .02), which supports H1 and H2, in full and in part, respectively. In addition, the *avoidance* strategy showed no effect (Table 6), which supports H3.

**Table 6**
*Summary of the test of the research hypotheses*

| | Proposed relationship | Type of effect | $\beta$ | $f^2$ | Decision |
|---|---|---|---|---|---|
| Scenario 1 | TASK (-) TA | Direct Effect | -.212 | .051 | Supported |
| Scenario 2 | ES (+) à TA | Direct Effect | .039 | .021 | Unsupported |
| | IS (+) à TA | Direct Effect | .320 | .043 | Supported |
| Scenario 3 | AV (null) à TA | No effect | .026 | .001 | Supported |

*Note: TA: Test anxiety; ES: Search for emotional support; AV: Avoidance; IS: Search for instrumental support; TASK: Task orientation; $\beta$: standardized beta coefficient; f2: measure of magnitude of effect.*

## Discussion

As it was proposed more than six decades ago (Cronbach & Meehl, 1955), the nomological network to which a given construct belongs is a reliable source for obtaining evidence of validity. Therefore, in addition to studying the internal structure of the TAI-State, it is necessary to analyze whether the construct it evaluates is properly inserted into the network. In this sense, and based on the preliminary studies, the research hypotheses were oriented to the analysis of the influence of the PECS on the experience of the TA-State within the framework of the *evidence of validity in relation to other variables*, obtaining favorable evidence for two of the hypotheses in a complete way, and one in a partial way.

The results obtained are consistent with the previous findings of the association of ASE and EC as a *trait*, especially regarding their relationship with BAS-oriented strategies (Piemontesi & Heredia, 2011; Putwain et al., 2012; Stöber, 2004), although in the present study a more consistent relationship with the BAS-instrumental strategy was observed. This indicates that students who request support from their peers on how to approach the exam (BAS-instrumental) would probably have greater EC, due to the insecurity that a novel situation can cause them and not having the necessary tools to face them efficiently.

On the other hand, previous apparently contradictory evidence regarding the relationship between TO and A strategies with TA (Piemontesi & Heredia, 2011; Putwain et al., 2012; Stöber, 2004) may have been based to a larger extent on the characteristics of the sample (e.g., high-schools students in the Putwain et al. study, and university students in the other two papers) that impacted in some way on the results, or on the lack of clarity regarding whether the responses to the questionnaires were given in general or in relation to a particular subject (Piemontesi & Heredia, 2011; Stöber, 2004), since it is important to consider the influence of perception on the subjects on academic behavior of students (Dominguez-Lara et al., 2017), including the PECS.

Thus, at least with the sample in the present study, those students who focus on the content of the subject leaving aside various distractors before the exam would experience TA to a lesser degree. This makes sense because greater knowledge of the course content would give the student a greater degree of confidence, so the test would not pose a significant threat. However, it is understandable that the influence is not high because even among those who focus on content, they use a variable number of strategies that have different degrees of effectiveness (Hong, Sas & Sas, 2006).

Among the practical implications of the findings we can point out that these will help university tutors to decide which strategies to enhance in students (e.g., *Task Orientation*) due to their negative impact on the TA-State. In addition, the accumulated evidence of validity of the TAI-State makes it possible for it to be included in the student assessment system, in order to detect those students who show greater manifestations of anxiety and, therefore, whose performance is negatively affected. It is necessary to mention that this evaluation must be complemented by a measure of *academic self-regulation* and *postpone-*

*ment of activities*, in order to discern between rational and irrational EC (Dominguez-Lara, 2016d).

With regard to the methodological aspects of the work, the use of a more powerful procedure than the bivariate analyses (Piemontesi & Heredia, 2011; Stöber, 2004) or regression analyses (Putwain et al., 2012) used in advance stands out. However, although interpretations derived from the findings may be questioned because of the apparent weakness of quantitative results, conclusions about the validity of inferences are not based solely on a statistical result, but on a number of considerations, both empirical and theoretical (Furr, 2011).

Firstly, it is difficult to obtain acceptable cut-off points to assess the *R2* measures found (Hair, Ringle & Sarstedt, 2011) as they depend on the amplitude and complexity of the variables studied (Hair, Hult, Ringle & Sarstedt, 2014), so approaches linked to the social sciences (R2 > .04; Ferguson, 2009) were used to allow a realistic and less restrictive assessment of the results found in the field of psychology. This is relevant because sometimes the criteria coming from general statistical texts to assess the ME do not take into account the particularities of each discipline (Gignac & Szodorai, 2016).

Secondly, from a theoretical point of view, because of the complexity of TA and the various factors involved in its genesis and maintenance, a variance explained by the PECS of around 15% is significant in this research context, thus highlighting the role of two of the strategies: TO and SSS-instrumental. It should be noted that due to the simplicity of the model, it was possible to interpret *R2* similarly to a regression analysis (Prima, 2012).

Finally, no re-specifications were made based on modification indices, since the theoretical model based on antecedents is to be contrasted, but not to obtain a *tailor-made model that is* not very interpretable (Medrano & Muñoz-Navarro, 2017), since although the statistical adjustment indices in this analytical framework are important, they do not command the decisions at the moment of concluding on the validity of a model (Dominguez-Lara, 2016b).

With regard to the limitations of the study, the sample size stands out. One of the natural requirements for studies using structural equation models (SEM) is a large sample size (Rusell, Kahn, Spoth & Altmaier, 1998), but it is not uncommon to use small samples in studies under this methodology (Kline, 2016). This requirement seems to be a necessary condition for complex models, with a large number of parameters to be estimated, although in simple models and with highly reliable indicators, adequate estimates could be achieved even with small samples (Hooper, Coughlan & Mullen, 2008; Ullman, 2006), some estimation problems could persist (Hoyle & Gottfredson, 2015); despite this, if there are less than 100 participants, the results obtained from a proposed model would not be reliable (Hu & Bentler, 1995).

Another aspect to consider is the potential difference of the variables studied in relation to sex. In spite of the fact that an equivalence could be found regarding the estimation of the measurement error by means of the comparison of coefficients $\alpha$ that would allow the statistical treatment of the sample in a unitary way, this does not replace an analysis of invariance that would allow knowing in depth the equality of the relations between the constructs and their indicators in each one of the groups. For this reason, the results could vary in terms of the relationship between the dimensions studied between men and women. It should be noted that the male:female ratio (1:3) is not criticized since it is an expected scenario in careers such as psychology, where the majority are female students, and the institution in which the students were evaluated is no exception.

Finally, the magnitudes of the reliability coefficients were moderate in most cases, except for *avoidance*, which obtained low coefficients ($\alpha$, $\omega$ and H) even for accepted research standards (< .70). This could be due to the number of males and the potential fluctuations within that group (n = 39), although the psychometric behavior of said strategy has not varied with respect to what was observed in preliminary research work (Dominguez-Lara, 2018; Dominguez-Lara & Merino-Soto, 2016), so it could be considered something predictable, and not proper to the characteristics of the participating group.

With regard to the recommendations, it is necessary to highlight a few points. It is probable

that the limitation referred to the number of participants does not affect the practical significance of the structural model (PECS à TA) due to the homogeneity of the same (psychology students), the focus on the subjects, and the appropriate reliability indicators in most of the dimensions evaluated. However, it is recommended that these results be replicated with a larger sample size in order to strengthen the conclusions.

Likewise, the characteristics of the sample could limit the capacity of generalization of the findings for the researcher interested in the topic, but the objective of the general project in which the present study is inserted was to know how both constructs are related in a determined group of psychology students, but not in university students in general. For this reason, it is recommended to replicate the analysis in students from other professions in order to enrich the discussion by highlighting the existing differences between students from different professional careers.

On the other hand, it would be convenient to analyze the invariance of the model between men and women, given that it was a pending point and could provide enriching results given that the correlations between the PECS and the TA-Trait in a previous study showed differences according to gender (Stöber, 2004).

To conclude, since validity assessment is a continuous process (AERA, APA & NCME, 2014), the successful implementation of a single strategy (e.g., evidence based on internal structure) is not determinant for fully justifying the use of a particular instrument in a particular context, so it is desirable to obtain more than one evidence of validity (Kline, 2005). In this sense, the results of the present study significantly contribute to the evidence obtained with respect to the internal structure of the TAI-State (Dominguez-Lara, 2016a), as well as the relationships obtained with exam performance (Dominguez-Lara, 2017a; Dominguez-Lara et al., 2017), and consolidate it as an adequate measure of EC during the exam situation.

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