

## Confirmatory Factor Analysis and Gender Invariance of the Coping Strategies Inventory in Academic University Stress

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### ABSTRACT

**Background:** Though the Spanish version of the Coping Strategies Inventory (CSI) is frequently used, it has not been subjected to any significant re-evaluation from a psychometric perspective. **Method:** We analysed CSI data that was focused on an academic stress situation, using a university sample of 874 participants, 50% of each gender. We conducted reliability, confirmatory factor, and factorial invariance across gender analyses. **Results:** The first-order factorial structure was confirmed, showing an adequate fit for the eight-factor coping strategies model with good reliability indices. Neither the second-order (problem-centred vs. emotion-centred) nor third-order (engagement vs. disengagement) strategies showed an adequate fit. Factorial invariance for gender was confirmed. **Conclusions:** The theoretical and applied implications of the results are discussed.

### Análisis factorial confirmatorio e invarianza de género del Inventario de Estrategias de Afrontamiento (CSI) en estrés académico universitario

### RESUMEN

**Antecedentes:** Aunque la versión española del del Inventario de Estrategias de Afrontamiento (CSI) se usa frecuentemente, no se ha sometido a reevaluación psicométrica. **Método:** Analizamos datos del CSI aplicados a situaciones de estrés académico utilizando una muestra universitaria de 874 participantes, 50% de cada género. Llevamos a cabo análisis de fiabilidad, confirmatorios y de invarianza factorial por género. **Resultados:** Se confirmó la estructura factorial de primer orden, mostrando un ajuste adecuado el modelo de 8 estrategias de afrontamiento, con buenos índices de fiabilidad. No mostraron un ajuste adecuado las factorizaciones de segundo orden (centrado en el problema o en la emoción) ni de tercer orden (compromiso o retirada). Se confirmó la invarianza factorial por género. **Conclusiones:** Se discuten las implicaciones teóricas y aplicadas de los resultados.

Due to the cognitive revolution in psychology, the scientific view of stress shifted from dispositional or situational to contextual. Stress came to be conceived as an individual process of appraisal and coping with situations (Lazarus & Folkman, 1984), and later as part of our personal constructs of meanings (Lazarus, 1999). From this perspective, coping strategies are understood as tools that can potentially be used by any individual depending on the characteristics of the situation (Folkman & Moskowitz, 2004), regardless of whether or not styles – that is, stable and consistent ways of coping with stress – can be developed (Moos & Holahan, 2003). Coping, defined as the effort to manage stressors (Lazarus, 1999; Lazarus & Folkman, 1984), can have an immense impact on an individual's personal and social functioning as well as their health (Budimir et al., 2021; Liao, 2014;

Nechvatal & Lyons, 2013), and therefore it is important to be able to measure it adequately.

The structure of coping remains unresolved. Up to 400 forms of coping have been identified, which is why several classifications have been proposed, such as problem-centred vs. emotion-centred, engagement vs. disengagement, approach vs. avoidance/scape, primary vs. secondary, behavioural vs. cognitive, reactive vs. proactive, etc. (Skinner et al., 2003). Recent proposals have attempted to overcome the dichotomous nature of these dimensions. For example, Stanisławski (2019) advocates a circumplex model with two bipolar dimensions, which result in eight types of coping, four of which are purely emotion- or problem-centred, and another four that combine problem and emotion.

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In terms of efficacy, a distinction between adaptive and maladaptive was proposed from the start. For example, avoidant, passive, or emotion-centred ways of coping were posited as maladaptive (Frydenberg, 2014). However, the poor reputation of emotion-centred coping is more a product of stereotypes or biases in the measurement instruments that can allow coping items to be confounded with distress or self-loathing (Austenfeld & Stanton, 2004). Similarly, approach coping has generally not been observed to be superior to avoidant coping (Suls & Fletcher, 1985).

Two stages have been described in the assessment of coping (Folkman & Moskowitz, 2004). The first stage involves a quantitative assessment, checklists, rating scales, questionnaires, and inventories. During the second stage, complementary to the first, qualitative procedures such as narrative analysis are incorporated in order to delve into the individual meaning of the situation, clarify the stressor the person is facing, or discover new forms of coping that had not been anticipated in the questionnaires. The Coping Strategies Inventory (CSI) (Tobin et al., 1989) is an instrument that allows both types of information to be collected and has been in use for over three decades. The CSI collects qualitative information (a person's description of the stressful situation) as well as quantitative information (the frequency with which certain coping strategies are used according to a Likert-type scale, as well as the degree of perceived efficacy in coping).

The CSI is used frequently due to its versatility, as it yields both narratives and scores (Kato, 2015). With the CSI, a situation can be recalled, analysed in the present or even contemplated in the future. The tool provides explanations for a specific situation or generalisations about a whole context of stressful situations. It also allows new meanings of stress and new coping strategies to be verified and/or discovered, and it differentiates perfectly between the use of strategies and their outcomes. The CSI has been used to assess virtually any stressor in any setting, with 1,497 citations of studies employing the tool (Google Scholar, 2022a).

The CSI is partially based on the Ways of Coping Scale (Folkman & Lazarus, 1980), though the authors generated more than half of the items using structured interviews, open-ended interviews and brainstorming sessions. The initial pool of 109 items was subjected to a hierarchical factor analysis that resulted in a three-level structure: engagement vs. disengagement, problem-centred vs. emotion-centred, and primary coping strategies. Validated with a sample of 398 university students, the final instrument consisted of the best 72 items (nine for each of the eight primary scales). The first-order structure provided an explanation for 47% of the total variance and the Cronbach's alpha reliability coefficients ranged from .72 to .94. Problem solving and cognitive restructuring were the primary active problem-centred strategies (engagement); emotional expression and social support were the primary active emotion-centred strategies; problem avoidance and wishful thinking were the primary passive problem-centred strategies (disengagement); and self-criticism and social withdrawal were the primary passive emotion-centred strategies (Tobin et al., 1989).

The CSI was adapted in Spain in an abbreviated 40-item version (Cano-García et al., 2007), with an incidental sample of 337 adults from the general population. An exploratory factor analysis of the principal components yielded an identical first-order factor structure and good psychometric properties (61% of explained variance; Cronbach's alpha reliabilities between .63 and .89). However, neither the second- nor third-order structure could be replicated. This Spanish version has also been widely used, with 630 citations appearing (Google Scholar, 2022b).

Only four previous studies have addressed the Spanish version of the CSI (Nava Quiroz et al., 2010; Rodríguez-Díaz et al., 2014; Rubio et al., 2016; Schetsche et al., 2022). Exploratory factor analyses conducted with a sample of 217 people from the general Mexican population (Nava Quiroz et al., 2010) and a sample of 261 Mexican inmates (Rodríguez-Díaz et al., 2014) obtained an identical structure. Rubio et al.

(2016) conducted a confirmatory factor analysis using an incidental community sample of 243 Spanish seniors. That analysis confirmed the original three-level hierarchical structure, although the authors proposed eliminating two items from the problem avoidance scale to increase its reliability. In the fourth study, Schetsche et al. (2022) carried out validation with a sample of 762 Argentine adults, using an exploratory factor analysis for half of the sample and a confirmatory factor analysis for the other half. These authors reported that the fit indices of the 40-item version were not adequate. Fit indices of the abbreviated 24-item version performed somewhat better and also confirmed the factorial invariance for gender in men. This abbreviated version did not achieve adequate fit indices for the second- and third-order structures.

A confirmation of the hierarchical structure of the Spanish version of the CSI would support the idea that coping strategies can be either active or passive, and as problem-centred or emotion-centred (Rubio et al., 2016). If the hierarchical structure of the Spanish version were not confirmed, the opposite would hold true, that is, that coping strategies cannot be classified as active or passive, nor as problem-versus emotion-centred (Cano-García et al., 2007; Nava Quiroz et al., 2010; Rodríguez-Díaz et al., 2014; Schetsche et al., 2022).

A simple search for scoping, systematic, meta-analysis or even narrative review studies reveals that most studies on coping strategies focus on health, particularly physical health, while fewer examine mental health. To our knowledge, there have been no studies on coping with academic stress, though some authors have noted the need for such studies. For example, a recent meta-analysis revealed an estimated burnout prevalence of nearly one-third of university students in low- and middle-income countries (Kaggwa et al., 2021), a percentage like that of university students who consume alcohol and other drugs to cope with the stress of university life (Andrade et al., 2021). University academic stress may even be associated with suicidal ideation (Okechukwu et al., 2022). Socio-demographic, situational, and academic factors have all been identified in the stress experienced by university students worldwide (Balanza Galindo et al., 2009; Sharp & Theiler, 2018).

There is evidence of gender differences in the ways people cope with stress: women use more verbal coping strategies, such as seeking social support, emotional expression, wishful thinking or inner speech (Graves et al., 2021; Helgeson, 2011; Tamres et al., 2002). However, only one study has addressed the factorial invariance of gender in the Spanish version of the CSI, and it used an abbreviated version (Schetsche et al., 2022). Hence, there is a need to confirm that its structure is valid for both men and women and captures potential gender differences without any instrument or item adaptation bias. Therefore, this study aimed to confirm the factor structure of the Spanish version of the CSI and the factorial invariance of gender in a context of university academic stress.

## Method

### Participants

A total of 874 records provided by psychology students from the University of Seville (Spain) were analysed, 50% from men and 50% from women ( $n = 437$ ), with a mean age of 20.30 years old, 20.51 for men and 20.08 for women ( $SD = 3.85, 4.39$  for men and 3.22 for women). The sample of women was randomly selected from a larger sample ( $N = 1,682$ ) to obtain a constant sample size.

### Instruments

As indicated in the introduction, the Spanish *Inventario de Estrategias de Afrontamiento* (Cano-García et al., 2007) is an abbreviated adaptation of the English-language Coping Strategies

Inventory (Tobin et al., 1989). It contains a blank space for the respondent to describe a stressful situation with as much detail as possible. This is followed by 40 items, which reflect the thoughts, attitudes, feelings, and coping behaviours linked to the situation described. These are scored on a Likert-type five-point scale, where 0 = *not at all* and 4 = *totally*. The 40 items are divided into eight subscales, each with five items, so the range of direct scores for each is from 0 to 20. The following items all obtained good reliability indices in the initial validation of the inventory in Spanish (Cano-García et al., 2007): problem solving (PS), understood as cognitive and behavioural strategies aimed at eliminating stress by modifying the situation which produces it (e.g., “I struggled to resolve the problem”) ( $\alpha = .86$ ); cognitive restructuring (CR), understood as cognitive strategies that modify the meaning of the stressful situation (e.g., “I went over the problem again and again in my mind and finally saw things in a different light”) ( $\alpha = .80$ ); social support (SS), understood as strategies referring to the search for emotional support (e.g., “I found somebody who was a good listener”) ( $\alpha = .80$ ); emotional expression (EE), defined as strategies aimed at releasing the emotions that arise during the stressful process (e.g., “I let out my feelings to reduce the stress”) ( $\alpha = .84$ ); problem avoidance (PA), understood as strategies that include denial and avoidance of thoughts or acts related to the stressful event (e.g., “I didn’t let it get to me”; “I refused to think about it too much”) ( $\alpha = .63$ ); wishful thinking (WT), understood as cognitive strategies that reflect the wish that reality were not stressful (e.g., “I wished that the situation had never started”) ( $\alpha = .78$ ); social withdrawal (SW), defined as the act of withdrawing from friends, family, peers, and significant others associated with the emotional reaction to the stressful process (e.g., “I spent some time by myself”) ( $\alpha = .65$ ); and self-criticism (SC), understood as strategies based on self-blame and self-criticism due to the occurrence or inadequate handling of the stressful situation (e.g., “I blamed myself”) ( $\alpha = .89$ ). Finally, it includes an item in which the person must score his/her perceived efficacy in coping (“I consider that I can cope with the situation”) using the same scoring system.

## Procedure

In the first semester of each cohort since the 2010-2011 academic year, students of Personality Psychology in the second year of the Psychology degree program at the University of Seville (Spain) have completed a test battery related to the contents of that subject. The battery, which is completed over several sessions, takes an estimated three hours, and includes the CSI (approximately 20 minutes). The work is done anonymously at the university under the supervision of the teaching staff, with participants indicating socio-demographic data such as age and gender. Participants are asked to write about a stressful academic situation they experienced during their university studies. They then score the inventory’s 40 items, plus the item related to perceived coping efficacy.

This research has been carried out in accordance with the Declaration of Helsinki and informed consent was obtained in writing from each participant. Data processing complies with all current laws: firstly, with the Spanish Personal Data Protection Act of 1999 and, secondly, with the Spanish Data Protection Rule (GDPR) of 2016, which guarantees the anonymity and security of the information. As the subjects are university students, the following requirements were established: all were recruited by faculty members with whom they have had no academic involvement; the activity was voluntary, without incentives of any kind; and the activity was conducted outside of class time.

## Data Analysis

Cronbach’s alpha, McDonald’s omega and mean inter-item correlation indices were estimated to study the internal consistency of

each dimension for all the models tested. The omega index, which is based on factor loadings (Gerbing & Anderson, 1988) and does not depend on the number of items (McDonald, 2013) was considered more stable than alpha, and thus more suitable. Internal consistency was considered adequate if such indices were above .70 (Nunnally, 1970).

The dimensionality of the Spanish version of the Coping Strategies Inventory (Cano-García et al., 2007) was studied using a confirmatory factor analysis (CFA). Three different models were tested according to the latent variables proposed by Tobin et al. (1989): a) a two-factor model with 20 items in each factor corresponding to engagement (PS, CR, EE, and SS) and disengagement (PA, WT, SC, and SW); b) a four-factor model, with ten items in each factor: problem engagement (PS and CR), emotional engagement (EE and SS), problem disengagement (PA and WT), and emotional disengagement (SC and SW); and c) an eight-factor model, with five items in each factor. Although multivariate normality could not be assumed and the item scoring format is a Likert-type scale, we used the maximum likelihood (ML) estimation method but calculated it using the Satorra-Bentler Scaled  $\chi^2$  (Satorra & Bentler, 2010). It was assumed there could be a correlation among factors because people can use different coping strategies at the same time. We considered values of the comparative fit index (CFI) and Tucker-Lewis index (TLI) above .95 as a good fit and values between .90 and .95 as an acceptable fit (e.g., Browne, M. W. & Cudeck, 1993; Hu & Bentler, 1999). Root mean square error of approximation (RMSEA) values of  $\leq .05$ , between .05 and .08, and  $\geq .10$  were considered indicative of good fit, reasonable fit and poor fit, respectively (Browne & Cudeck, 1993). Finally, standardised root mean square residual (SRMR) values of  $\leq .08$  were required for consideration as a good fit (Hu & Bentler, 1999).

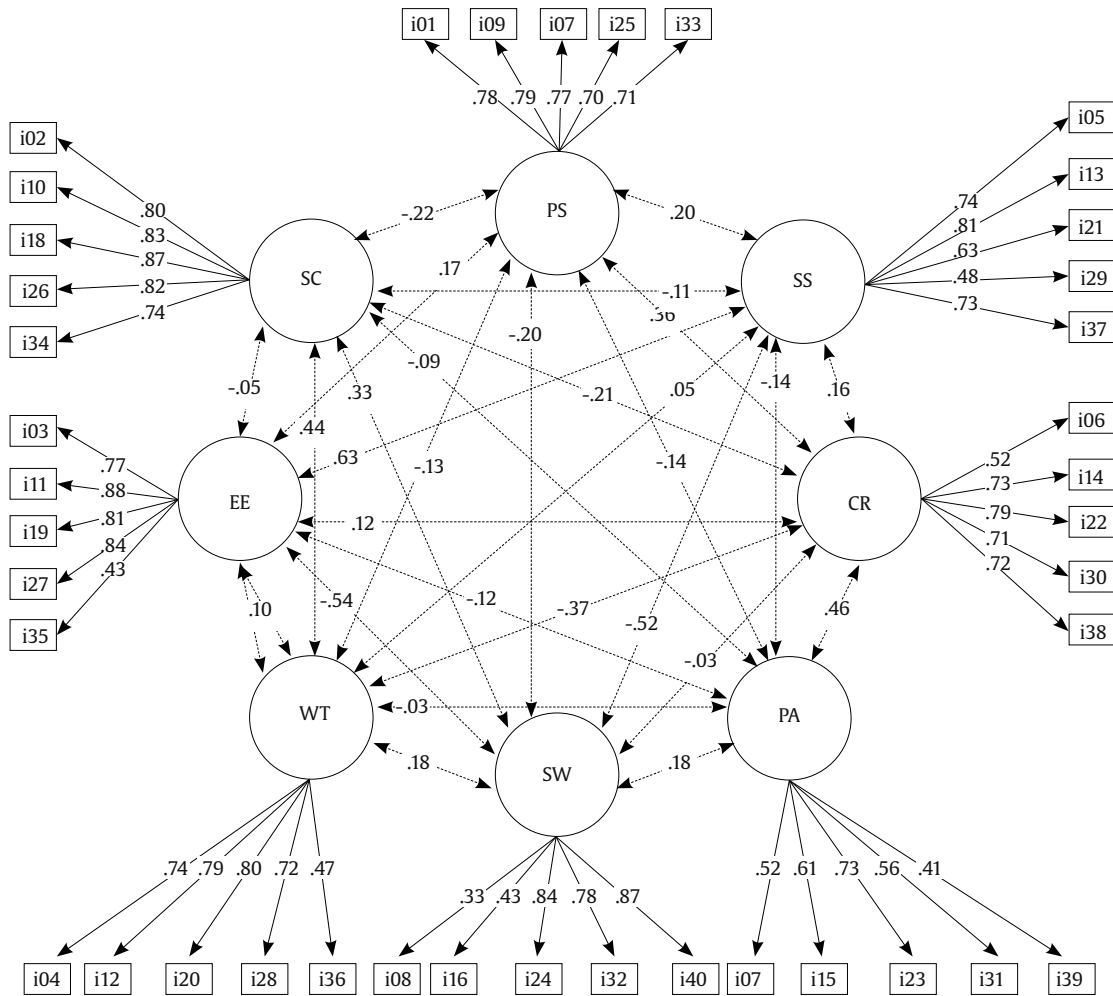
To analyse the differences between men and women in each of the factors, Snedecor’s or Welch’s *F* was used depending on the assumption of heteroscedasticity. This assumption was met in all factors except SW, Levene’s  $F(1, 872) = 10.35, p = .001$ . We used  $R^2$  jointly, considering values of .01, .06, and .14 as references for a small, medium, and large effect size, respectively. We then tested the configural, metric, and scalar invariance across gender.

The association between perceived coping efficacy and the eight coping strategies was analysed with a multiple linear regression model, controlling for gender (0 = men, 1 = women).  $\Delta R^2$  was used as the effect-size index for each independent predictor, where a value of .01 was considered a small effect size, .06 medium, and .14 large. The assumption of non-collinearity was evaluated by means of tolerance and variance inflation factor indices.

SPSS 26.1 for ANOVA and multiple linear regression models were the statistical packages used, along with AMOS 26.0 and structural equation models (SEM) in JASP for the CFA and for testing configural, metric, and scalar gender invariance. Age invariance was not tested due to the age homogeneity of the sample.

## Results

Of the 874 records, 685 included a description of a stressful academic situation. These were coded by one of the authors of the study (MMAG), taking inspiration from an empirical categorisation proposed by Vollrath and Torgersen (2000) on the daily hassles students face. The stressful situations were classified as follows: 36.2% were related to academic capabilities (insecurity about one’s own academic abilities), 25.4%, to time (perceived lack of time to meet all their academic obligations), 13.1%, to peers (relational difficulties with peers), 11%, to study prospects (dissatisfaction with degree program), and 6.4%, to teachers (problems with faculty). Three new categories also needed to be incorporated: 3.6% referred to bureaucratic problems, 3.5%, to fear of speaking in class, and 0.9%, to academic stress associated with COVID-19. There were no gender differences in the type of situation:  $\chi^2(7, N = 685) = 4.61, p = .707$ .



**Figure 1.** Path Diagram with Standardised Factor Loadings for the Eight-factor CSI Model ( $N = 874$ ).

PS = problem solving; CR = cognitive restructuring; EE = emotional expression; SS = social support; PA = problem avoidance; WT = wishful thinking; SC = self-criticism; SW = social withdrawal.

**Table 1.** Reliability Indices of Internal Consistency: Cronbach's  $\alpha$  and McDonald's  $\omega$  and Average Inter-item Correlation

Model	Dimensions	$\omega$	$\alpha$	Average Inter-item Correlation [ $CI_{95}$ ]
a) 2-factor	Engagement (e)	.81	.85	.22 [.20, .24]
	Disengagement (d)	.80	.82	.18 [.16, .20]
b) 4-factor	Problem (e)	.81	.83	.34 [.31, .37]
	Emotion (e)	.86	.87	.40 [.37, .42]
	Problem (d)	.69	.70	.18 [.16, .21]
	Emotion (d)	.86	.85	.36 [.33, .39]
c) 8-factor	PS	.86	.86	.56 [.53, .60]
	CR	.82	.82	.48 [.45, .51]
	EE	.87	.86	.55 [.52, .58]
	SS	.82	.81	.46 [.43, .49]
	PA	.71	.70	.32 [.28, .36]
	WT	.85	.93	.49 [.46, .53]
	SC	.91	.91	.66 [.63, .69]
	SW	.78	.78	.44 [.39, .48]

Note. PS = problem solving; CR = cognitive restructuring; EE = emotional expression; SS = social support; PA = problem avoidance; WT = wishful thinking; SC = self-criticism; SW = social withdrawal.

**Item Analysis**

Item means ranged from 0.55 to 2.90 ( $M = 1.84, SD = 0.71$ ), and their standard deviations ranged from 0.88 to 1.46 ( $M = 1.19, SD =$

1.13). Skewness ranged from -0.75 to 1.85 ( $M = 0.28, SD = 0.74$ ), and kurtosis ranged from -1.37 to 3.37 ( $M = -0.30, SD = 1.13$ ). Mahalanobis distances ranged from 13.21 to 143.11 ( $M = 40.72, SD = 17.48$ ); 4.92% of the data were greater than chi-square ( $df = 40, \alpha = .001$ ) = 73.40. Mardia's coefficients (c) of skewness and kurtosis were significant,  $c = 135.34, \chi^2(11480) = 19714.36, p < .001$ , and  $c = 1872.11, z = 48.99, p < .001$ , respectively.

**Reliability Analysis**

The calculation of reliability indices for each dimension considering the three models to be tested showed adequate to good levels of internal consistency in models a and c (see Table 1). According to the omega indices, internal consistency was good for the two-factor model and ranged from poor ( $\omega_{\text{problem disengagement}} = .69$ ) to good ( $\omega_{\text{emotional engagement}} = .86$ ) for the four-factor model. The eight-factor model ranged from adequate ( $\omega_{\text{PA}} = .71$ ) to excellent ( $\omega_{\text{SC}} = .91$ ) internal consistency indices, with this structure having the highest average inter-item correlations within each dimension.

**Analysis of Scale Dimensionality**

The goodness-of-fit indices of the different models tested (see Table 2) revealed a poor fit for models with only two or four factors. Comparatively, the eight-factor model fit best, with CFI and

TLI close to the minimum level of .90 required for an acceptable fit of the model, while RMSEA and RMSR indicate a good fit. The modification indices were inspected to examine possible sources of misfit. The model fitting could be improved by estimating some covariances between residuals, especially between items 8 and 16 (SW), and among item 35 (EE) with the factors SC and WT. However, a decision was made not to test other models as there were no theoretical justifications for doing so. For the model with the best fit (Model c), all factor loadings were statistically significant and ranged from .33 for item 8 to .88 for item 11 (see Figure 1).

**Association between Coping Strategies and Self-perceived Efficacy**

To test whether some strategies were perceived as effective (adaptive) compared with others (maladaptive), a predictive model of perceived coping efficacy was included, which is the final and additional item on the CSI.

**Table 2.** Fit Indices of the Different Models Tested

Model	SBS $\chi^2$	df	CFI	TLI	RMSEA [CI <sub>90</sub> ]	RMSR
a) 2-factor	9353.68	739	.42	.39	.12 [.12, .12]	.15
b) 4-factor	6276.68	734	.62	.60	.10 [.09, .10]	.12
c) 8-factor	2351.27	712	.89	.88	.06 [.05, .06]	.07

Note. SBS $\chi^2$  = Satorra-Bentler's scaled  $\chi^2$ ; CFI = comparative fit index; TLI = Tucker-Lewis and Lewis index; RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual. All chi-squares were statistically significant at  $p < .001$ .

Table 3 shows the results of a multiple linear regression model with perceived coping efficacy, with the eight coping strategies and gender (0 = men, 1 = women) as predictors. As can be observed, all coping strategies were statistically related to the perceived efficacy, except for social support; however, only the association with problem solving achieved a medium effect size. The higher the score in problem solving, the higher the perceived efficacy. No collinearity problems were detected with the tolerance indices, all of which were above .20, or variance factor inflation, all below 10.

**Gender Differences and Factorial Invariance across Gender**

Table 4 shows the differences in means by gender for each factor. Six of the differences tested were significant, but only one achieved

a medium effect size, the difference in emotional expression: the mean of women in this dimension was higher than that of men. The remaining five differences may be statistical artefacts due to excessive statistical power, calculated using G\*Power 3.1 (Faul et al., 2007),  $\beta = .99$ , for small effect size,  $\alpha = .05$ ,  $N = 1,682$ , and two groups. Even so, it is worth analysing whether the significant difference found between men and women (with a medium effect size) can in fact be attributed to gender or to a possible gender bias in the instrument. For this reason, we discuss the gender invariance of the instrument below.

**Table 3.** Results of the Multiple Linear Regression Model with Perceived Coping Efficacy as the Dependent Variable and the Coping Strategies and Gender as Predictors

df = 863	$\beta$	SE	t	p	$\Delta R^2$	Tolerance	VIF
Gender	-.18	.06	-2.88	.004	.01	.91	1.09
PS	.09	.01	12.51	<.000	.11	.80	1.25
CR	.07	.01	8.72	<.000	.05	.67	1.49
EE	-.02	.01	-2.29	.022	<.00	.67	1.48
SS	.01	.01	1.53	.126	<.00	.63	1.59
PA	.03	.01	3.10	.002	.01	.80	1.24
WT	-.02	.01	-3.07	.002	.01	.72	1.38
SC	-.02	.01	-3.42	.001	.01	.74	1.35
SW	-.03	.01	-3.34	.001	.01	.69	1.45

Note. PS = problem solving; CR = cognitive restructuring; EE = emotional expression; SS = social support; PA = problem avoidance; WT = wishful thinking; SC = self-criticism; SW = social withdrawal;  $\beta$  = partial regression coefficient; SE = standard error; VIF = variance inflation factor.

The factorial invariance analyses showing the gender invariance of the CSI considered the eight-factor model (c). Table 5 shows the main results for the three steps of the analysis. In the first step, the configural invariance was tested. The resulting model shows an acceptable data fit. The second step consisted of testing for metric variance to test that the factor loadings are equal between groups. The comparison of the metric invariance to the configural variance showed no significant differences between the two models ( $\Delta SB\chi^2 = 24.97$ ,  $p = .807$ ), and  $\Delta CFI < -.01$ . The third step included testing for scalar invariance to assess equivalence of item intercepts for metric invariant items. Scalar invariance also showed acceptable goodness-of-fit indices, while there were no significant differences with respect to the previous models ( $\Delta SB\chi^2 = 0.00$ ,  $p > .999$ ). The change in CFI did not reach the threshold of  $-.01$ . Since the gender

**Table 4.** Results of the ANOVA for Each Factor by Gender and Descriptive Statistics for Men and Women

Factor	Gender	M	SD	F <sup>1</sup>	df	p	R <sup>2</sup>
Problem solving	Men	13.98	4.55	0.02	1, 872	.877	< .01
	Women	13.93	4.17				
Cognitive restructuring	Men	10.33	4.56	7.43	1, 872	.007	.01
	Women	9.49	4.62				
Emotional expression	Men	7.69	4.50	56.01	1, 872	< .001	.06
	Women	10.01	4.68				
Social support	Men	11.31	4.92	22.28	1, 872	< .001	.02
	Women	12.83	4.59				
Problem avoidance	Men	5.06	3.74	11.30	1, 872	.001	.01
	Women	4.24	3.48				
Wishful thinking	Men	11.64	5.33	10.99	1, 872	.001	.01
	Women	12.79	4.96				
Self-criticism	Men	7.85	5.59	2.22	1, 872	.790	< .00
	Women	7.75	5.58				
Social withdrawal	Men	4.68	4.05	18.60	1, 848.92	< .001	.02
	Women	3.59	3.43				

Note. <sup>1</sup>Welch's heteroscedastic F test for social withdrawal.

**Table 5.** Fit Indices for the Different Steps of the Factorial Invariance across Gender Analysis

Invariance	SB S $\chi^2/df$	$\Delta\chi^2$	<i>p</i>	CFI	$\Delta$ CFI	TLI	RMSA [IC 95%]	SRMS
Configural	2.33			.89		.87	.06 [.05, .06]	.08
Metric	2.29	24.97	.807	.89	-.00	.88	.05 [.05, .06]	.08
Scalar	2.23	0.00	> .999	.89	-.00	.88	.05 [.05, .06]	.08

Note. SB S  $\chi^2$  = Satorra-Bentler Scaled  $\chi^2$ ; CFI = comparative fit index;  $\Delta\chi^2$  = increase in  $\chi^2$ ;  $\Delta$ CFI = increase in CFI; TLI = Tucker-Lewis index; RMSA = root mean squared error; SRMR = standardised root mean squared residual.

differences found were not due to bias in the instrument, we developed a gender-disaggregated scale of the Spanish version of the CSI for university.

## Discussion

The purpose of the study was to confirm the factorial structure and gender invariance of the Spanish version of the CSI in an environment of university academic stress. Although the results confirmed the first-order structure, with eight subscales corresponding to primary coping strategies, they did not confirm the three-level hierarchical structure. The fit was not adequate for a second-order model with problem-or emotion-centred strategies, nor was it adequate for a third-order model that also combined active or passive styles of strategies. The fit could have been improved by estimating some co-variances between residuals, particularly in items 8, "I spent some time alone," 16 "I avoided being with people," and 35, "I was so overwhelmed by my feelings that I exploded," the first two of which belong to the social withdrawal scale, while the third relates to emotional expression. However, we opted not to modify the instrument, since the fit was sufficient and the internal consistency of the subscales ranged from adequate to excellent, in line or above what had been obtained in previous studies (Cano-García et al., 2007; Nava Quiroz et al., 2010; Rodríguez-Díaz et al., 2014; Rubio et al., 2016; Schetsche et al., 2022). In contrast, Rubio et al. (2016) eliminated two items from the problem avoidance factor in order to solve the reliability deficit, specifically, item 7, "I did not let it affect me; I avoided thinking or doing anything," and item 39, "I avoided thinking or doing anything."

Taking only those previous studies that performed confirmatory analyses into consideration, our results confirmed only the first-order structure, just as in Schetsche et al. (2022). In contrast, the study by Rubio et al. (2016) did confirm the three-level hierarchical structure of Tobin et al. (1989). One of the reasons for the discrepancy between the studies could be the difference in the gender distribution of the samples. While women are overrepresented in the study of Rubio et al. (2016), men represented a higher percentage of the sample in the other studies (Cano-García et al., 2007; Rodríguez-Díaz et al., 2014). However, our results, which are in line with previous studies (Nava Quiroz et al., 2010; Schetsche et al., 2022), suggest that gender does not influence the results confirming a first-order hierarchical structure.

The fact that this study was unable to confirm the hierarchical structure of the original CSI aligns with the recommendation to increase coping structure options in the Coping Circumplex Model (Stanislawski, 2019). Here the author suggests expanding the coping structure to four bipolar dimensions that conform a circumplex gradient: problem solving (vs. problem avoidance), efficiency (vs. helplessness), positive emotional coping (vs. negative emotional coping), and hedonic disengagement (vs. preoccupation with the problem). The model is certainly thought-provoking, though empirical verification is clearly needed. As for perceived efficacy in coping, it was only possible to predict perceived efficacy from one of the eight coping strategies: problem solving. On the other hand, this is logical since the strategy aims to change the stressful situation. This supports the view that neither passive nor emotion-centred strategies are intrinsically maladaptive (Austenfeld & Stanton, 2004; Suls & Fletcher, 1985).

The second objective of the study was to confirm the factorial invariance for gender. Our findings confirmed invariance, supporting the conclusions of Schetsche et al. (2022), though that study used an abbreviated version of 24 items, and demonstrated the instrument was valid for both genders. The unique characteristic of our sample, university students of the highest academic level who, furthermore, were responding to the same type of stress (academic), likely minimised any gender differences, as already noted. Even so, women made more use of emotional expression than men. This strategy is considered an active one but is clearly emotion-centred. This could be attributed to the different social expectations men and women face in terms of fulfilling gender stereotypes and roles. While women are expected to be emotionally expressive, dependent and willing to subordinate their own needs, the traditional traits associated with men are independence, assertiveness, and unwillingness to express emotion (which could reveal fear or incompetence) (Matud, 2004). It would be worthwhile for future studies to examine possible differences in the strategies women and men use depending on the specific stress situation they face in an academic context.

One core strength of this study was its confirmation of the factorial structure of the Spanish version of the CSI in a large sample of university students facing academic stress. Then, it is the first study to analyse the gender invariance of the complete version of this instrument. Nevertheless, the study has some limitations. In addition to the disadvantages of self-administered surveys, the sample is not representative of the general population, or even of university students. Undergraduate psychology students were chosen because of convenience and availability. Psychology majors are known for their high levels of neuroticism and open-mindedness (Vedel, 2016). Neuroticism in particular correlates negatively with wishful thinking and with cognitive restructuring (Connor-Smith & Flachsbart, 2007). In addition, the sample is not representative of the enormous variety of stressors that a person may face, and which may prove key (Andrade et al., 2021; Kaggwa et al., 2021; Sharp & Theiler, 2018). Therefore, future lines of research include, on the one hand, the diversification of the study to other stress environments, the detailed analysis of the stress situations described, and their relationship with individual and gender differences. On the other hand, it is important to continue verifying factorial invariance, not only by academic level, but also by age and culture (Kuo, 2011), given the number and variety of Spanish-speaking countries.

In conclusion, the Spanish version of the CSI has proven to be a valid and reliable instrument to measure coping with academic stress in university students of both genders, which makes it an interesting tool for the management of this particular type of stress.

## Conflict of Interest

The authors of this article declare no conflict of interest.

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