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Psychometric properties and validation of the EQ-I:S five factor questionary of emotional intelligence (Baron-On, 2002) in Spanish university students

Propiedades psicométricas y validación del cuestionario de cinco factores EQ-I:S de inteligencia emocional (Bar-On, 2002) en estudiantes universitarios españoles

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Resumen

Se realizó una investigación para adaptar el cuestionario EQ-i:S_5 (Bar-On, 2002) a estudiantes universitarios españoles, incorporando el factor estado de ánimo y se evaluó su utilidad. *Método:* la muestra incluyó 799 estudiantes. Se realizaron análisis factoriales exploratorios y confirmatorios para determinar su estructura y evaluar la invarianza de la medida. También se analizó su fiabilidad y se examinaron diferencias según sexo y curso académico. *Resultados:* se confirmó la estructura del EQ-i:S_5. De los 45 ítems originales, 25 mostraron propiedades psicométricas adecuadas, conformando la versión revisada EQ-I: S_5.S_U. La fiabilidad fue alta. La invarianza factorial se mantuvo estable por sexo. Se encontraron diferencias significativas según sexo y curso, y se comprobó que las 5 dimensiones del cuestionario eran necesarias para evaluar estas diferencias. Se comprobó que una medida global de inteligencia emocional es útil para situar a un sujeto en un continuo, pero no permite captar sus particularidades. *Discusión y Conclusiones:* el EQ-I: S_5.S_U es un instrumento psicométricamente sólido para evaluar la inteligencia emocional en universitarios españoles. Su validez y fiabilidad determinan que es útil para la investigación y la intervención. Se recomienda realizar estudios longitudinales para evaluar su estabilidad y su impacto en el rendimiento académico y el bienestar psicológico.

Palabras clave

Inteligencia Emocional, EQ-i:S_5, EQ-I:S_5.S_U, Adaptación y Validación

Abstract

A study was conducted to adapt the EQ-i:S_5 questionnaire (Bar-On, 2002) for Spanish university students, incorporating the mood factor and assessing its usefulness. *Method:* The sample included 799 students. Exploratory and confirmatory factor analyses were performed to determine its structure and assess measurement invariance. Reliability was also analyzed, and differences were examined based on gender and academic year. *Results:* The structure of the EQ-i:S_5

was confirmed. Of the original 45 items, 25 showed adequate psychometric properties, forming the revised version EQ-I: S_5-S_U. Reliability was high, and factorial invariance remained stable across genders. Significant differences were found based on gender and academic year, and all five questionnaire dimensions were necessary to evaluate these differences. A global measure of emotional intelligence was found to be useful for situating an individual on a continuum but did not capture specific individual characteristics. *Discussion and Conclusions:* The EQ-I:S_5-S_U is a psychometrically solid instrument for assessing emotional intelligence in Spanish university students. Its validity and reliability support its usefulness for research and intervention. Longitudinal studies are recommended to evaluate their stability and its impact on academic performance and psychological well-being.

Key Words

Emotional Intelligence, EQ-i:S_5, EQ-I:S_5-S_U, Adaptation and Validation

1. INTRODUCTION

One of the most significant milestones in understanding human intelligence was the recognition of forms of intelligence beyond cognitive abilities (Gardner, 1983). This challenged the notion that only individuals with high IQ scores were considered intelligent. While cognitive skills remained essential, contemporary perspectives emphasized that general intelligence alone was insufficient for predicting success compared to the importance attributed to emotional skills and emotional intelligence (Goleman, 1995). Emotional intelligence was understood as a non-cognitive type of intelligence encompassing the ability to perceive, express, understand, and effectively manage one's emotions and those of others (Mayer & Salovey, 1997).

In recent decades, research on the impact of emotional intelligence on various aspects of life increased (Bar-On, 2006; Mayer & Goleman, 1995; Salovey, 1997). These studies highlighted emotional intelligence as a crucial adaptive resource for individuals, positively influencing resilience, emotional well-being, and healthy interpersonal relationships. Individuals with high emotional intelligence proved to be more adept at managing their daily lives, as they were better able to regulate their emotions and understand those of others. For instance, the ability to manage stress, a key component of emotional intelligence, directly impacted on personal benefits such as improved physical health and overall well-being. Emotional intelligence also correlated positively with mental health, showing lower rates of mental health issues such as depression and anxiety. Moreover, it enhanced resilience, allowing individuals to navigate adverse life conditions with less trauma (Edara, 2021). Notably, emotional intelligence improved decision-making and problem-solving skills. Individuals with high emotional intelligence demonstrated a greater capacity to analyze complex situations and make decisions based on sound criteria to achieve their objectives (Brackett et al., 2011).

In the workplace, emotional skills were increasingly regarded as stronger predictors of professional success than classic variables such as IQ or technical knowledge (Cherniss & Adler, 2000; Johennesse & Pressley, 2022). While academic and cognitive achievements initially played a role in hiring decisions, long-term success in a job was largely influenced by "soft skills," with emotional intelligence being a prominent factor. Consequently, a growing belief emerged that while cognitive intelligence might secure

an individual's entry into a company, a lack of emotional intelligence often led to their departure.

The role of emotional intelligence proved crucial not only in leadership but also in individual work performance and the achievement of a healthy work-life balance. Leaders with high emotional intelligence were better equipped to understand the needs of their teams and establish more effective relationships with them (Nabih et al., 2023). This, in turn, led to increased motivation, commitment, and productivity among team members (Goleman, 2011).

Within the realm of education, research indicated that students with high emotional intelligence exhibited superior abilities in regulating their emotions, resulting in improved academic performance. Furthermore, they demonstrated a greater ability to establish positive relationships with peers and teachers, which subsequently enhanced their interest in learning and acquiring knowledge (Joyce et al., 2021; Puertas-Molero et al., 2020). The benefits of emotional intelligence extended beyond practical matters, playing a significant role in overall happiness and success across various aspects of life.

Unlike cognitive intelligence or personality traits, emotional intelligence had the advantage of being trainable through learning and practice. Various studies confirmed this in contexts such as family, work, and education (Dowling & Barry, 2020; Edara, 2021; Mattingly & Kraiger, 2019; Storey-Hurtubise et al., 2021). To facilitate this, rigorous assessment tools were necessary to provide valid and reliable information about emotional intelligence, both overall and in its various components.

Currently, different measurement tools exist based on various models of emotional intelligence. These models could be divided into two categories: ability models, such as that proposed by Mayer & Salovey (1997), and trait models, such as Goleman's interpersonal and intrapersonal interaction model (Goleman, 1995) and Bar-On's mixed model of Emotional-Social Intelligence (ESI) (Bar-On, 1997). While each model had its distinct characteristics, they shared core elements such as the ability to recognize and differentiate one's own emotions and those of others, the capacity to manage and regulate emotions, and the use of emotions as tools for navigating daily life challenges (Mayer & Salovey, 1997).

For this study, Bar-On's model (1997) was chosen because it was the first to interrelate social and emotional competencies as determinants of emotional intelligence. Bar-On (1997) specifically referred to "social and emotional intelligence," defining it as "a multifactorial set of interrelated emotional, personal, and social skills that influence a person's overall ability to cope with daily demands and pressures."

To develop his model, Bar-On created the Emotional Quotient Inventory (EQ-i) (1997), a self-report test that, in its original version, consisted of 144 items grouped into five factors: Stress Management, Adaptability, General Mood, Interpersonal, and Adaptability. Later, Bar-On (2002) developed the Emotional Quotient Inventory Short (EQ-i:S), a condensed version intended to be easier to complete and use. This version contained 51 items structured into two sections: the first included 45 items divided into five factors—Intrapersonal (10 items), Interpersonal (10 items), Stress Management (8 items), Adaptability (7 items), and Mood (10 items) while the second section included six items measuring positive impressions related to social desirability.

The reliability and validity of the EQ-i:S were confirmed in different studies (Bar-On, 2002; Parker et al., 2011), and the test was adapted for different populations (Ruvalcaba-Romero et al., 2020). In Spain, the adaptation was conducted by with

university students. However, in this study, they only selected four dimensions of the original EQ-i:S, eliminating the 10 items related to mood, arguing that "*Puesto que el análisis de Parker et al. (2011) parte de 35 ítems que son los que mejores propiedades psicométricas muestran, en este estudio partimos de esta validación*". (López-Zafra et al., 2014, p.26). As a result, no known studies have been conducted with a Spanish sample that assess the reliability and validity of the original EQ-i:S, including the mood factor (Bar-On, 2002).

Nonetheless, researchers in the field agreed on the close relationship between mood and emotional intelligence (Cabras et al., 2020; Dong et al., 2021; Di Fabio & Saklofske, 2021; Edara, 2021; Gavín-Chocano et al., 2020; Jordan et al., 2002; Koçak, 2021; Sfetcu, 2020).

For this reason, in this research we propose three objectives. One. To adapt the EQ-i:S_5 (Bar-On, 2002) questionnaire to the population of Spanish University students and to study its psychometric properties (Bar-On named it EQ-i:S. In this research, to differentiate it from other versions that only contain 4 factors, we call the original questionnaire EQ-i:S_5). This is to determine its dimensionality, test the hypothesis of factorial invariance as a function of gender, study the measure's reliability, and examine evidence of validity. Two, to examine the differences in Emotional Intelligence based on the measurement of each subscale. Three, to evaluate the power of the adapted questionnaire's full measure of Emotional Intelligence (EI) to classify the sample participants into different categories.

To respond to the stated objectives, a non-experimental cross-sectional investigation was carried out. The first objective was answered by performing an instrumental study conducted following the standards required for the construction, adaptation, and development of tests (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 2014). The second and third objectives were answered by conducting a causal-comparative study using inferential techniques and an exploratory study using classification techniques.

2. METHOD

2.1. Participants

A total of 799 students from the University of Oviedo participated in the study, of whom 61,5% (N = 491) were women and 38,5% (N = 308) were men. Regarding academic year distribution, 51,6% of the participants were enrolled in the first and second years in nearly equal proportions (25,2% and 26,4%, respectively). The remaining 48,4% were unevenly distributed between the third (13%) and fourth (35,4%) years.

In terms of academic disciplines, 11,88% (N = 95) were enrolled in Arts and Humanities, 8,76% (N = 70) in Social and Legal Sciences, 58,9% (N = 471) in Sciences, 7,75% (N = 62) in Engineering, and 12,64% (N = 101) in Health Sciences. The age variable exhibited a non-normal distribution. The mean age (M) was 20,78 years, with a standard deviation (SD) of 3,03, a median of 20, an interquartile range of 3, and 25th and 75th percentiles of 19 and 22, respectively.

To meet the previously established objectives, data from four participants were excluded from the analysis. Two of them had only completed half of the items, while the other two provided identical responses to all items. Given that these exclusions represented only 0,50% of the dataset, their removal did not impact on the overall results of the analysis.

With respect to justification for the Collection of Personal Data, in the context of this research, no personal data has been collected as defined in Article 2 of the Personal Data Protection Regulations of the University of Oviedo, approved by the Governing Council Agreement on March 5, 2020. The information obtained is entirely anonymous and does not allow for the direct or indirect identification of participants.

Data collection was conducted during regular class hours within the university premises, with prior authorization from the faculty responsible for the respective courses. Student participation was entirely voluntary, ensuring that they could withdraw at any time without any consequences should they choose not to take part. Additionally, all participants were verified to be of legal age, and their responses were provided freely and anonymously, with no identifying information being recorded.

Since this study does not pose any risk to participants, does not involve the processing of sensitive data, and guarantees complete anonymity, it is considered unnecessary to seek approval from the Research Ethics Committee of the University of Oviedo, in accordance with the applicable regulations.

2.2. Measures

As assessment tools, a questionnaire consisting of two parts was utilized:

A section collecting socio-demographic and academic data, including age, gender, academic year, and field of study. These variables are described in detail in Section 2.1. Participants.

A section containing the EQ-I: $Short_5$-S_U, the questionnaire under validation. This self-report test is an adaptation of the EQ-i:S (Bar-On, 2002), excluding 6 items related to the Social Desirability scale. The final questionnaire consisted of 45 items grouped into five subscales: Intrapersonal (10 items), Interpersonal (10 items), Stress Management (10 items), Adaptability (7 items), and Mood (8 items). The response scale was a 5-point Likert scale (1 = Never, 5 = Always).

The questionnaire provides a measure for each of the five dimensions and a measure of overall EI. Scoring is done by algebraically summing the items within each dimension and across all dimensions. The higher the scores, the better the ability to handle everyday demands and challenges, whereas low scores indicate a higher likelihood of experiencing emotional, social, and/or behavioral problems.

As for the reliability of the questionnaire, internal consistency levels range from ,86 to ,97, and test-retest reliability over a 3-month period ranges from ,70 to ,82 (Bar-On, 2002). Similar results have been found by the researchers referenced in the introduction section. Additionally, all authors have provided support for the validity of the questionnaire.

2.3. Procedure

Faculty directors and professors at the University of Oviedo were contacted to seek their support and authorization for administering the questionnaire. Once approval was obtained, specific dates and times were arranged for visiting classrooms where participating students were present. Upon arrival, the purpose of the study was explained to the students, and their voluntary participation was requested, ensuring complete anonymity. Trained volunteer interviewers conducted the data collection.

The study followed all the mandatory ethical criteria and necessary bureaucratic procedures for this type of research.

2.4. Data analysis

Data analysis was performed in three phases.

First phase. The process of assessing the dimensionality structure of the EQ-i:S_5 began by assessing whether the 5-factor model in a 45-item questionnaire is valid for the sample of Spanish university students. This was done in two ways, by a Semi confirmatory Factor Analysis (sCFA) using Procrustean rotations against a target matrix (Ferrando & Lorenzo-Seva, 2014) and by the Confirmatory Factor Analysis (CFA). Both methods converged that the original model does not fit the data.

Following the required procedure for cross-validation, the sample was randomly divided into two halves. With the calibration sample (n=392), successive Exploratory Factor Analysis (EFA) were performed. The model best fitted by EFA (model M2) has 25 items and is sized on the same five factors as Bar-On's EQ-i:S_5 questionnaire (2002). Model M2 was tested by confirmatory factor analysis (CFA) with the validation sample (n=403). Parker et al. (2011) examined to what extent the moderately correlated 4-factor model fitted better than a one-dimensional model (M4, in this case) and a higher-order model (M3, in this case). We perform this same test. Once the good fit of the M2 model was verified, factorial invariance was examined as a function of sex.

The descriptive study of the items was carried out using IBM SPSS 25. The sCFA was performed using the FACTOR program (V.11.04.02) (Lorenzo-Seva & Ferrando, 2006), which examines the model fit based on the RMSD. If RMSD<0,05, the misfit is trivial, between 0,05 and 0,10, it is moderate, and if RMSD>,10, the misfit is substantial.

Both the EFA and CFA were done with JASP (V.0.14.1.0). For all EFA, the estimation procedure was Minimum Residuals (Jöreskog, 2003), the number of factors was determined by considering eigenvalues above 1 and the Scree Test, and oblimin rotation was used. The model was evaluated with RMSEA, TLI, and BIC. Satisfactory reference values are RMSEA≤,06, TLI≥,95 (Hair et al., 2006), and the lower the BIC.

In the CFA, the Diagonally Weighted Least Squares (DWLS) (DiStefano & Morgan, 2014) estimation method was used. Based on the modification indices, the correlation between some errors was left free. Model fit was examined using the RMSEA, SRMR, and CFI indices, and by the χ^2/gl ratio. Satisfactory reference values of the latter three indices were SRMR <,08, CFI≥,95, and χ^2/gl<3 (Schermelleh-Engel et al., 2003). Next, the multi-group CFA according to sex was performed. The deviation of the metric, scalar, and strict invariance models from the configurational invariance model was

examined based on the increase in CFI, RMSR, and RMSEA (Jak & Jorgensen, 2017). If the differences are ,01 or less, indicate equivalent fit.

The reliability of the measure of the resulting scale, EQ-i:S_5-S_U, was then estimated by analyzing internal consistency using Cronbach's standardized alpha and McDonald's ordinal omega. Values greater than ,70 were considered acceptable (Hair et al., 2006).

Finally, once it has been verified that the dimensional structure of the scale adapted for the sample university students is the same as that contained in the original Baron scale, but in which 20 items have been dispensed, it was evaluated to what extent the EQ-i:S_5-S_U questionnaire measures the same construct as the original EQ-i:S_5 questionnaire. In the same way as Bar-On (2002) did, this examination of the evidence of concurrent validity was examined through the correlational analysis between the empirical measures of the factors and of the total scale of both versions, using the correction proposed by Levi (1967). Values of r≥ ,20, r≥ ,50, and r≥ ,80 express a weak, moderate, and strong correlation, respectively.

Second and third phases. The data analysis of the objectives pursued in the second and third phases was performed using IBM SPSS 27. First, the analysis of a two-way (Sex x Course) multivariate factorial layout was performed to examine the differences in EI between both sexes, whether EI undergoes any variation as university students progress in the academic year, and whether there is an interaction between both variables. Because the covariance matrices were heterogeneous (Box's M= 181,66; p=<,001), resampling was used to estimate the parameters, and the result was examined using the Wilks Lambda statistic. The analysis was completed by performing a stepwise discriminant analysis (Enders, 2003) to examine which combination of dependent variables is stronger in differentiating between groups of assigned independent variables (Sex and Course), paying special attention to the standardized coefficients and the magnitude and sign of the centroids. The level of significance was α=,05, and the reference values 1-β>,80, and partial eta squared (η^2)**,** ,01**,** ,06 and ,14, small, medium, and large respectively (Ellis, 2010).

Next, a two-stage cluster analysis was performed to assess the strength of the global measure of EI calculated using (EQ-i:S-SU) for identifying participants with different levels of EI. The quality of the clusters was considered Poor, Sufficient, or Good based on the work carried out by Kaufman & Rousseeuw (1990).

Both classification analyses, the discriminant analysis, and the two-stage cluster analysis were performed on a training sample (approx. 50%; n=432), and the result was verified in the verification sample (approx. 50%; n=367).

3. RESULTS

Evidence of validity based on the internal structure and reliability of the scale score. The results are shown in Tables 1, 2, and 3.

The model found by Bar-On (2002) of 45 items and five factors, Model EQ-I:S_5, does not fit the data from the sample of Spanish university participants. Both methods, sCFA and CFA, allow us to conclude with the same result. On the sCFA, the RMSD values were ,107**,** ,111**,** ,145**,** ,089 and ,105 for the Intrapersonal, Interpersonal, Stress, Adaptability, and Mood factors, respectively, indicating a moderate mismatch of the Adaptability factor, and a substantial mismatch in the remaining four factors, with the total mean mismatch being .112. The initial CFA showed an unsatisfactory fit only in

χ^2/df and in CFI (see Table 2), and although all standardized factor loadings were statistically significant, the item loadings 33, and 39 were very low, ,243 and ,302. The internal consistency examined by Cronbach's Alpha of the factors in the previous order was ,732**,** ,831**,** ,840**,** ,796 and ,850.

A modeling process was then initiated with the calibration sample (n=392) through successive exploratory factor analyses. The adequacy of the data examined using the KMO sphericity test and Bartlett's test was always satisfactory. Based on the descriptive statistics of the items 3 items (items 33, 39 and 17) were eliminated (Model M1). Next, 17 items were successively eliminated, concluding in Model M2. A total of 20 items were eliminated. The EFA concluded that Model M2, sized with five moderately correlated factors consisting of a total of 25 items, is the simplest model and best adjusted. Table 2 shows the change experienced by the fit indices in Models M1 and M2 with respect to Model M0. The CFA with the validation sample (n=403) corroborated a satisfactory fit of the M2 Model [χ^2/df=1,007; ECVI=,970; TLI=,999; SRMR=,053 and RMSEA=,004. The covariance between the residuals of three pairs of items has been restricted (see Kline, 2015). In the same way that Parker et al. (2011) found, the M2 model fitted slightly better than the M3 Model (higher order model) and notably better than the M4 One-Dimensional Model (see Table 2). Table 1 presents the items that comprise the 5 Factors, their descriptive statistics, and the factor loadings of both EFA and CFA in the M2 Model.

	Descriptive statistics					Factor loads; K=25		HIc; K=25	
	M	SD	Asy.	Kur.	$^{K=45:T}$HIc	^{C}EFA M2	^{V}CFA M2	$^{K=25:F}$HIc	$^{K=25:T}$HIc
Intrapersonal (M_{B-O} k=10; M_{SU} k=5)									
^{A}*3. Soy incapaz de expresar mis ideas a los demás	3,66	,95	-,30	-,27	,383	,432	,406	,352	,343
*13. Me cuesta entender cómo me siento	3,53	,96	-,35	-,11	,459	,512	,633	,406	,357
*18. En los últimos años, he logrado poco	3,79	1,02	-,82	,16	,406	,420	,588	,323	,382
*28. Me cuesta expresar mis sentimientos íntimos	3,04	1,10	-,06	-,60	,284	,625	,549	,466	,221
*42. Me cuesta describir mis sentimientos	3,14	1,09	-,16	-,53	,392	,761	,645	,583	,358
Interpersonal (M_{B-O} k=10; M_{SU} k=7)									
2. Me gusta ayudar a la gente	4,23	,82	-1,29	2,37	,446	,642	,565	,551	,433
*7. Soy incapaz de entender cómo se sienten los demás	4,01	1,02	-1,17	1,09	,366	,566	,520	,507	,435
12. Soy bueno para comprender cómo se sienten los demás	3,97	,85	-,83	,78	,388	,674	,546	,586	,430
21. Me importa lo que les pasa a los demás	4,11	,84	-,91	,91	,425	,778	,649	,677	,432
27. Mis relaciones cercanas significan mucho para mí	4,07	,93	-1,06	1,00	,333	,647	,520	,409	,289
32. Soy capaz de respetar a los demás	4,28	1,01	-1,83	3,18	,343	,493	,501	,437	,386
37. Tengo buenas relaciones con los demás	3,90	,92	-,79	,48	,337	,671	,630	,591	,402
Manejo del estrés (M_{B-O} k=8; M_{SU} k=5)									
*4. Es un problema controlar mi ira	3,73	1,07	-,65	-,09	,420	,762	,783	,690	,436
*9. Mi impulsibidad crea problemas	3,56	1,14	-,49	-,45	,382	,756	,692	,684	,446
*19. Tiendo a explotar de ira fácilmente	3,75	1,14	-,72	-,23	,465	,787	,933	,713	,471
*24 Tengo fuertes impulsos que son difíciles de controlar	3,72	1,07	-,63	-,21	,500	,748	,862	,672	,535
*29. Soy impulsivo	3,16	1,16	-,16	-,66	,271	,630	,593	,587	,338
Adaptabilidad (M_{B-O} k=7; M_{SU} k=5)									
5. Mi enfoque para superar las dificultades es avanzar paso a paso	3,53	,85	-,26	,10	,369	,494	,406	,430	,442
15. Cuando me enfrento a una situación difícil me gusta recopilar toda la información que pueda al respecto	3,67	,93	-,42	-,14	,388	,616	,633	,537	,347
20. Me gusta tener una visión general de un problema antes de intentar resolverlo	3,85	,85	-,69	,65	,452	,728	,588	,638	,451
30. Cuando me enfrento a un problema, miro cada posibilidad y luego decido la mejor manera	3,59	,83	-,21	-,09	,411	,713	,549	,606	,405
35. Al manejar las situaciones que surgen, trato de pensar en tantos enfoques como pueda	3,64	,86	-,29	-,11	,493	,734	,645	,618	,520
Estado de Anímo M_{B-O} k=10; M_{SU} k=3									
16. Soy optimista sobre la mayoría de las cosas que hago	3,59	,97	-,45	-,20	,463	,821	,536	,643	,391
26. Estoy satisfecho con mi vida	3,99	,91	-,88	,67	,532	,584	,597	,451	,473
36. Generalmente espero que las cosas salgan bien, a pesar de los contratiempos de vez en cuando	3,67	,93	-,54	,00	,371	,721	,442	,601	,325

Legend. ^{A} = numbering of the items in EQ-I: S_5 (Bar-On, 2002) * = inverse item; M, SD, Asy. and Kur. = Mean, standard deviation, Asymmetry, Kurtosis; $^{K=45:T}$HIc= corrected homogeneity index respectively; $^{T, F}$=HIc in the total scale, and HIc in each factor; $^{K=45, K=25}$= on the 45-item scale (EQ-I: S_5, in Bar-On, 2002) and on the 25-item scale (EQ-I: S_5-S_U, best-adjusted model in the sample of Spanish university students); ^{C}= calibration sample (50% approx. n = 392); ^{V}= validation sample (50% approx. n = 403); EFA M2 and CFA M2= Factorial loadings of M2 in EFA, and Standardized factorial loadings of M2 in CFA, respectively; K= number of items in the tested model; k= number of items in the factor. M_{B-O}, M_{SU}= EQ-I: S_5, Bar-On (2002), and EQ-I: S_5.S_U, respectively.

Table 1. Descriptive statistics of the items of the Bar-On Emotional Quotient Short Form (EQ-I: S_5; Bar-On, 2002) that make up the questionnaire adapted to the population of Spanish university students, EQ-I: S_5-S_U, and factor loadings of the Model M2 in EFA and CFA

	MODELS	χ^2 (df)	χ^2/df	[1]BIC/ECVI	[2]CFI/TLI	RMSEA[90%CI]	SRMR			
[T]CFA	EQ-I: $Short_5$	2965,69(935)	3,17	3,987	,919	,052[,050-,054]	,0700			
[C]EFA	M0 (K=45):F=5			-3029,54	,802	,055[,048-,056]				
	M1 (K=42):F=5			-2548,37	,833	,054[,047-,055]				
	M2 (K=25):F=5			**-748,54**	**,907**	**,050[,041-,053]**				
[V]CFA	**[3]M2 (K=25)**	**263,972(262)**	**1,007**	**,970**	**,999**	**,004[,000-,020]**	**,053**			
	M3 (K=25)	289,32(264)	1,095	1,023	,993	,015[,000-,030[	,055			
	M4 (k=25)	815,441(169)	4,82	2,232	,780	,098[,091-,104]	,124			
[T]CFA	**M2 (K=25)**	**405,42(260)**	**1,559**	**,675**	**,982**	**,031[,021-,031]**	**,046**			
[T,5]Invariance	**M2 Sexo[4]**	χ^2 (df)	χ^2/df		CFI	RMSEA[90%CI]	SRMR	ΔCFI	ΔSRMR	ΔRMSEA
Conf.Invar.		576,23(520)	1,100		,993	,017[,003-,024]	,053			
Metr.Invar.		635,93(540)	1,177		,988	,021[,013-,028]	,056	,005	-,004	-,003
Scal. Invar		681,29(560)	1,216		,985	,023[,016-,029]	,055	,003	-,002	,001
Strict Invar		720,96(590)	1,221		,984	,024[,017-,029]	,058	,001	-,001	-,001

Legend. EQ-I:S_5, Model found by Bar-On (2002), K= 45 items and F= 5 Factors (Sincerity factor has been removed); M0= Request for a 5-factor model with K=45 items in the EFA; M1=Request for a 5-factor model where items 33 and 39 have been eliminated due to having HIc<.25, and item 17 for having bias and kurtosis >2 and mean>4,5; M2=Best adjusted model where, in addition to the three previous items, another 17 items were sequentially eliminated (items without factor loadings or factor loadings charge<.40, and complex items); M3 = higher order model with five subfactors and one second-order factor; M4=one factor model; [T]=Total sample, N=799; [1]BIC/ECVI = parsimony indices, BIC information criteria in EFA, and ECVI index in CFA respectively; [2]CFI/TLI= CFI index in CFA, and TLI in EFA; [3]= The covariance between the residuals of three pairs of items has been restricted); [4]= Boys=308 and Girls=491; [5] = Configural, Metric, Scalar and strict Invariance, respectively; Δ= Comparison of Increment of the observed value in CFI, SRMR and RMSEA; For the rest, see Table 1.

Table 2. Dimensionality models tested using EFA and CFA of the *Bar-On Emotional Quotient Short Form* (EQ-I: S_5; Bar-On, 2002) in the adaptation process to the population of Spanish university students

The factorial invariance of M2 as a function of sex was then tested. Based on the fit indexes χ^2/df, CFI, RMSEA, and based on the increase in CFI, SRMR, and RMSEA, it could be concluded that there is strong invariance configurational, metric, scalar and strict for boys and girls (see Table 2). Therefore, the items measure the same dimensions with the same structure in Boys and Girls. This property is a prerequisite for empirical scores on each one of the factors to be validly compared and interpreted.

The internal consistency evaluated by Cronbach's alpha test and McDonald's ordinal omega was adequate in Interpersonal, Stress Management, Adaptability, Mood, and on the full-scale measure, and marginally adequate in Intrapersonal (see Table 3).

	[1,2,3]**Correlation between** EQ-I **factors**						**Evidence of reliability of the** EQ-I: S_5-S_U		
	INTRA	INTER	STRES	ADAPT	MOOD	[1]Total		**C.Alpha**	**McD ω**
INTRA	**,634**	,330	,209	,227	,322	,628	INTRA	,670	,680
INTER	,457	**,805**	,220	,350	,244	,706	INTER	,802	,803
STRES	,319	,295	**,859**	,304	,172	,651	STRES	,854	,852
ADAPT	,357	,462	,361	**,732**	,356	,665	ADAPT	,786	,789
MOOD	,570	,333	,225	,505	**,713**	,550	MOOD	,709	,729
Total						**,810**	Total	,852	,836

Legend. [1]= Above the diagonal the correlation between the direct scores is represented; [2]= under the diagonal the correlation between the latent factors is represented; [3]= The correlation between the empirical measures of the factors and the total measure of the EQ-I:S_5 and EQ-I:S_5-S_U questionnaires were, in the order in which they are in the Table**,** ,868; ,955; .955; ,954; ,859, and ,943. Applying the correction proposed by Levi (1967), the values shown in the main diagonal of the Table are obtained; C.Alpha= Standardized Cronbach's Alfa; McD ω.= McDonalds' *Omega* ordinal

Table 3. Correlations, and exposition of the calculation of different reliability coefficient

Evidence of validity *based on the relationship* entre los factores de EQ-I: S_5-S_U, *y on the relationship* EQ-I:S_5-S_U - EQ-I:S_5. The results are shown in Table 3.

Based on the relationship between the factors of the EQ-I:S_5-S_U. Table 3 shows a weak correlation between the empirical score of the five factors (values between ,209 and ,356) and a moderate correlation between the score of each of them and the total empirical score (values between ,550 and ,665). In the same way that Parker et al. (2011) found, the correlation between the latent factors is moderate (except rStres-Inter=,295). The direction and magnitude of all the correlations indicate that the five factors make up a common underlying construct but without the force to be reduced to a single factor, reinforcing the result found in the study of its dimensionality, and in convergence with the results found by Parker et al. (2011).

Based on the relationship EQ-I:S_5 - EQ-I:S_5-S_U. The crude correlation between the same factors of the scale EQ-I:S_5-S_U and EQ-I:S_5 were ,868; ,955; ,955; ,954; ,859, and ,943 for Intrapersonal, Interpersonal, Stress Management, Adaptability, and Mood, and the correlation between the total score of both scales ,943. Applying the correction proposed by Levi (1967), slightly lower results are obtained, but equally in a moderate-high and high range. This allows us to conclude that the EQ-I: S_5-S_U scale constitutes a reduced scale of the EQ-I:S_5 scale and that it contains the most discriminative items to capture EI variability (in the dimensionality in which the construct is defined in the original questionnaire) in the population of Spanish university students.

Examination of the differences between boys and girls and depending on the academic year

The MANOVA (Sex x Course; 2x4) revealed that the interaction was not statistically significant. Once the model was adjusted (Tarling, 2008), it was concluded that the variability in the response in the set of 5 factors was explained in a statistically significant way by sex [Λ=,075; F=1,083 (df_1;df_2=15;745); p=<,001; η^2=,075] and for the course [Λ=,958; F=2,121 (df_1;df_2=15;2241); p=,007; η^2=,014]. Table 4 shows that the magnitude of

the means in the Intrapersonal, Interpersonal, and Stress Management variables is greater in girls, and in the Adaptability and Mood variables, it is greater in boys. Regarding the course, except for Mood, which remains stable, the average of the four remaining factors experiences an upward trend as the academic years progress. Despite this, not all the variables contribute to the differences between the levels of both variables. The discriminant analysis (see Table 4) revealed that the variables that significantly contribute to explaining the differences between boys and girls are, in this order, Interpersonal, Mood, Intrapersonal, and Adaptability. However, the differences observed between the academic courses are only explained in a statistically significant way by the Intrapersonal variable. The joint examination of the sign of the centroids and the standardized coefficients of the variables reveals that boys have higher scores in the Adaptability and Mood variables and girls in the Interpersonal and Intrapersonal variables. These same differences can be seen by observing the means. On the other hand, the Intrapersonal variable allows differentiation only between the first year and the third year. The strength of the relevant variables to discriminate between the groups is greater to distinguish between boys and girls than between academic courses (e.g., in the training sample, they allow 68,4% of boys and girls to classify correctly, and 35,2% of participants in the appropriate course). The result is replicated in the validation sample and the total sample.

Sex	**[1]INTRA**	**INTER**	**STRES**	**ADAPT**	**MOOD**	**[2]Total$_S$**	**[2]Total$_P$**
Boys (n=307)	16,57 (3,22)	27,29 (4,21)	17,63 (4,65)	**18,36 (3,09)**	**11,45 (2,28)**	91,29 (10,99)	,727 (,088)
Girls (n=487)	**17,53 (3,42)**	**29,37 (4,23)**	**18,11 (4,29)**	18,24 (3,23)	11,13 (2,20)	94,37 (11,52)	,745 (,093)
Course							
1º (n=199)	16,26 (3,39)	27,68 (5,22)	17,03 (4,92)	17,86 (3,43)	11,03 (2,40)	89,85 (12,52)	,713 (,099)
2º (n=211)	17,22 (3,21)	28,60 (3,94)	18,08 (4,37)	18,41 (3,06)	11,34 (2,11)	93,64 (10,17)	,741 (,082)
3º (n=104)	**17,95 (3,43)**	**29,88 (2,87)**	17,92 (3,81)	18,03 (2,86)	11,30 (1,84)	**95,09 (8,65)**	**,753 (,071)**
4º (n=280)	17,45 (3,34)	28,68 (4,27)	**18,44 (4,27)**	**18,59 (3,16)**	11,33 (2,34)	94,49 (11,92)	,747 (,097)
	Discriminant Analysis					**Groups centroids**	
V.G [Sex]	TS (50% aprox; n=432) [Av=,103; %σ=1; Rc=,306; Λ=,906; χ^2=41,87; *df*=4; *p*=<,000] C. Sta. [INTER=,811; MOOD= -,541; INTRA=,495; ADAPTA= -,419] Correct classification in TS 68,4%					Boy= -,390	Girl=,246
	Discriminant Analysis					**Groups centroids**	
V.G [Course]	TS (50% aprox; n=432) [Av=,034; %σ=1; Rc=,181; Λ=,967; χ^2=14,16; *df*=3; *p*=,003] C. Sta. [INTRA=1] Correct classification in TS 35,2%				1º= -,290	2º=,051	3º=,261	4º=,064

Legend. [1]=The highest means in each dimension are highlighted in bold; [2]=Total$_S$ and Total$_P$= algebraic sum of the raw measurements in the five dimensions, and algebraic sum of the adjusted measurements in the 5 dimensions (weighted sum); In Discriminant analysis [GV = Grouping variable used in the discriminant analysis (levels); TS= Training sample (in the validation sample, the result is replicated); Av=eigenvalue; % σ = percentage of explained variance; Rc=canonical correlation; Λ =Wilks'Lambda test statistic; C. Sta. = Standardized coefficients of the relevant variables in the discrimination of the 2 and 4 groups;]. For the rest, see Table 1

Table 4. Descriptive statistics of the five dimensions and the total measurement of the EQ-I: S_5-S_U depending on the variables sex and course, and summary of the results of the discriminant analysis

Evaluation of the strength that the total measure of EI must classify the sample participants into different categories.

In all the published works in which the EQ-I: Short questionnaire (Bar-On, 2002) is used, the *calculation* of a total measure of EI is proposed. This measure has been calculated using the algebraic sum of the score obtained in each one of the factors. However, the factors have a different number of items; thus, the factors with more items have a greater weight in the sum. In this paper, we propose calculating the total measure as a weighted sum as follows. The sum of the items in each factor is divided by the total sum possible in the factor. Because

there are five factors, the previous result is multiplied by ,20. Afterwards, the value obtained from the five factors is added algebraically. The maximum value of the total measure in IE will be 1 (see Table 4). When comparing the measurements of each factor, it can be done directly with algebraic addition or with the result of this calculation. The result of the statistical analysis will be identical. But when examining the total score in EI, it must be done this way to give equal weight to the five dimensions that make up the construct.

The result of the two-stage cluster analysis is conclusive. The quality of the classification reaches a value of 0,7, good, in the terminology of Kaufman & Rousseeuw (1990), which means that the data provides reasonable or strong evidence of the structure of the conglomerates. The total measure of EI allows dividing the sample of participants into three clearly differentiated clusters called high, medium, and low levels in EI. The MANOVA (Cluster:3) revealed that the size of the effect of the variable that defines the cluster is very high [Cluster: Λ=,200; F=177.32 (df_1;df_2=10;1432); p=,001; η^2= ,416], and all the variables were statistically significant with η^2=,306; ,284; ,346; ,354 and ,356 respectively for Intrapersonal, Interpersonal, Stress Management, Adaptability and Mood. However, the MANOVA (Cluster x Sex: 3x2) revealed that the interaction was marginally statistically significant [Cluster x Sex: Λ=,976; F=1,751 (df_1;df_2=10;1426); p=,065; η^2= ,012]. Therefore, it is possible to conclude that the total measure of EI allows differentiating the participants in an EI gradient, but a total measure does not allow describing the EI of the participants; that is, it is necessary to know the measure in the five dimensions. In the average levels of IE, boys and girls have an equivalent score, however, the composition of IE is not the same at this profile level, and the non-ordinal interaction explains this. In average IE, women are superior to men in Interpersonal and only slightly superior in Intrapersonal, but men have superior Adaptability and Mood. Although the Stress Management variable is important, it does not add content to the explanation of the observed interaction (see Figure 1).

4. DISCUSION

The dimensionality of the emotional intelligence (EI) construct, as represented in the original EQ-I:S_5, is fully captured in our sample of university students through the 25 items derived from our study, forming the complete set of items for the EQ-I:$Short_5$-S_U scale. The discrepancy between our findings and those of similar studies may be attributed to our decision to retain the five factors and 45 items of the original EQ-I:S_5, including the Mood factor, while most other studies have excluded it.

However, we have recognized the significance of the emotional intelligence component, Mood, identified by Bar-On (2002), and the associated impact of emotions on our lives. This underscores the need for measurement scales like the EQ-I:$Short_5$-S_U, which includes the environmental dimension considered in our work. Moving beyond the original EQ-I:S_5 validation, our study aimed to investigate specific aspects of emotional intelligence from two perspectives: overall scores and scores by factors.

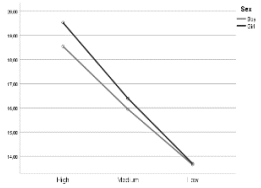
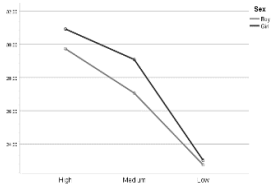
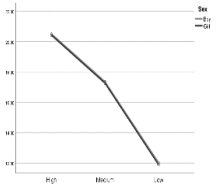
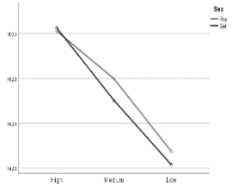
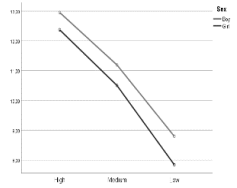
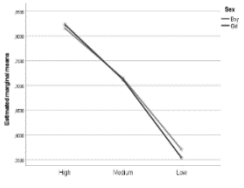
INTRA	INTER	STRES	ADAPT	MOOD	$TOTAL_P$
					

Figure 1.- In each factor, representation of the score in the three EI profiles of each sex. [High level in IE (Cluster 1; n=283; 39,1%); Medium level in IE (Cluster 2; n=355; 49,1%); Low level in IE (Cluster 3; n=85; 11,8%)]

Regarding overall scores in relation to the academic year and the age of the students, our findings indicate that, except for Mood, which remains stable, the average scores for the other four factors show an upward trend as students' progress through their studies. This suggests that emotional intelligence evolves over time. These findings are in line with Azpiazu et al., (2022), which demonstrated that people experience increased life satisfaction over time due to better adaptation to their environment, resulting from positive changes in their emotional intelligence. When examining emotional intelligence scores by gender, we observe distinct gradients. For instance, men tend to have higher average scores than women across both individual factors and the three levels of general EI established by cluster analysis. These results align with Ahmad et al., (2009), who found that men exhibited higher emotional intelligence compared to women, but contrast with studies suggesting greater emotional intelligence among women (D'Amico & Geraci, 2022; Kitsios et al., 2022;). The notion that women possess higher emotionality may stem from the social roles traditionally attributed to them, which suggest they are better at expressing emotions, considering both their own and others' emotions, and exhibiting greater affection and emotional sensitivity. This view of female emotional dominance may be influenced by gender stereotypes that have historically ascribed superior emotional perception and management capabilities to women (Joulaei et al., 2022).

Conversely, men are raised in societal contexts where emotionality often conflicts with gender expectations (Weerasinghe & Delgoda, 2021), leading them to suppress emotions associated with sadness, guilt, fear, and vulnerability (Eagly, 1987). Fortunately, societal norms and gender roles are evolving to be more egalitarian, which is blurring these differences (Azpiazu et al., 2022). Recent studies in emotional intelligence have shown no significant gender differences (Ali et al., 2021; Tommasi et al., 2023), highlighting the need for further research to clarify the relationship between sex and emotional intelligence. Given these findings, emotional intelligence should not only be evaluated based on the overall score but also in terms of the composition of the different clusters and the specific subfactors contributing to the overall score. Two individuals may have similar overall emotional intelligence scores but may possess different profiles based on the specific factors making up their scores. The variability in the factors contributing to high emotional intelligence was also observed by MacCann et al,. (2020), who found that different emotional skills mechanisms result in more positive or negative emotional experiences. For example, a greater emphasis on empathy can influence how individuals perceive and interact with others, even if their overall emotional intelligence score is like those with lower empathy scores. This suggests that behavior towards others can vary depending on specific emotional skills.

Martínez-Marín et al., (2021) identified differences between men and women in global emotional intelligence factors. Women tend to score higher in emotional awareness, empathy, and interpersonal relationship skills, while men excel in self-confidence, optimism, adaptability, stress tolerance, assertiveness, and impulse control. Xu et al., (2019) suggested that men are more adept at emotional regulation, while women excel at recognizing and expressing emotions. These results urge us to reflect on the importance of obtaining reliable assessment tools that provide a comprehensive profile of emotional intelligence, revealing the weight of each factor in determining overall EI scores. This enables individuals to adapt more effectively to their personal, professional, or life circumstances and foster positive emotional relationships. Since emotional intelligence is not fixed, but can be learned and developed, individuals can work to enhance specific factors if they are lacking.

It is essential to further investigate the lack of consensus on the influence of sex on emotional intelligence. One hypothesis we propose is that, given ongoing social and cultural changes related to gender, we must shift our focus from biological differences between sexes to consider the complexities of gender. However, this shift presents challenges due to the multiple existing perspectives. Regardless, the key requirement remains the availability of reliable assessment instruments. Our contribution lies in the EQ-I:Short$_5$-S$_U$ questionnaire, which has demonstrated reliability and validity for studying emotional intelligence among Spanish university students, as its dimensional structure is consistent for both men and women. The questionnaire's content encompasses the five factors that make up emotional intelligence.

Moving forward, it is crucial to explore and refine our understanding of emotional intelligence and its relationship with various factors, such as gender, age, and cultural influences. By investigating the specific components of emotional intelligence, we can gain insights into how individuals' emotional skills and abilities contribute to their overall well-being and success. Additionally, it is vital to consider the implications of emotional intelligence in different contexts, such as education, workplace settings, and personal relationships. Understanding how emotional intelligence manifests in these domains can provide valuable insights for developing targeted interventions and strategies to enhance emotional skills and promote positive outcomes.

In conclusion, our study highlights the importance of emotional intelligence and its multidimensional nature. The EQ-I:Short$_5$-S$_U$ questionnaire offers a reliable and valid tool for assessing emotional intelligence in Spanish university students. By recognizing the specific subfactors contributing to emotional intelligence and considering the influence of factors such as gender and age, we can deepen our understanding of this construct and its implications for individuals' lives. Continued research in this field will contribute to our knowledge and guide interventions to promote emotional well-being and foster positive social interactions. Future research should address the limitations of our study and expand its scope. By involving larger, more diverse samples that encompass a range of age groups and cultural backgrounds, not just university students, we can gather a broader range of perspectives and better understand the nuances of emotional intelligence across different populations. Longitudinal studies could also provide insights into the developmental trajectories of emotional intelligence and its evolution over time.

CONFLICT OF INTEREST

The authors declare that they have no potential conflicts of interest regarding the authorship of this research and/or the publication of this article

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