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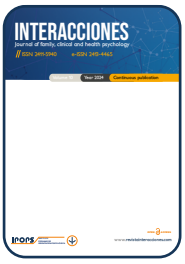

ORIGINAL ARTICLE

Psychometric evidence of the Wong-Law Emotional Intelligence Scale (WLEIS) in university students from Lambayeque-Peru

Evidencias psicométricas de la Wong-Law Emotional Intelligence Scale (WLEIS) en universitarios de Lambayeque-Perú

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ABSTRACT

Introduction: Emotional intelligence (EI) is a key skill for the personal and academic development of university students. Therefore, it is appropriate to have relevant instruments to measure this construct. **Objective:** This study aims to analyze the evidence of validity and reliability of the Wong-Law Emotional Intelligence Scale (WLEIS) in university students in the region of Lambayeque, Peru. **Method:** Our study has an instrumental design. We applied a virtual questionnaire distributed in social networks to 317 university students (124 males and 193 females) from different professional careers, aged between 18 and 30 years (M=20.3; SD=2.7). Confirmatory factor analysis was performed (WLSMV estimator), and internal consistency was assessed. **Result**: We found four correlated factors, higher order, and bifactor, the first being the one with the best-fit indices: X2(98) = 262.63, p < .001, CFI = .97, TLI = .96, RMSEA = .07 [CI 90%; .06 - .08], SRMR = .04 and WRMR = .91. Internal consistency results using the omega coefficient are ωSEA = .81, ωOEA= .79, ωUOE= .84 and ωROE = .85. **Conclusion**: The WLEIS in university students in the Lambayeque region of Peru has sufficient evidence of validity and reliability to guarantee the relevance of its application.

Keywords: Emotional Intelligence; University Students; Validity; Reliability; Testing Instrument.

RESUMEN

Introducción: La inteligencia emocional (IE) es una habilidad clave para el desarrollo personal y académico de los estudiantes universitarios. Por ello, es conveniente disponer de instrumentos pertinentes para medir este constructo. **Objetivo:** El presente estudio tiene como objetivo analizar las evidencias de validez y confiabilidad de la Escala de Inteligencia Emocional de Wong-Law (WLEIS) en estudiantes universitarios de la región de Lambayeque, Perú. **Método:** Nuestro estudio tiene un diseño instrumental. Aplicamos un cuestionario virtual distribuido en redes sociales a 317 estudiantes universitarios (124 varones y 193 mujeres) de diferentes carreras profesionales, con edades comprendidas entre 18 y 30 años (M=20,3; DE=2,7). Se realizó un análisis factorial confirmatorio (estimador WLSMV) y se evaluó la consistencia interna. **Resultados:** Se encontraron cuatro factores correlacionados, de orden superior, y bifactoriales, siendo el primero

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el que presentó los índices de mejor ajuste: X2(98) = 262.63, p < .001, CFI = .97, TLI = .96, RMSEA = .07 [IC 90%; .06 - .08], SRMR = .04 y WRMR = .91. Los resultados de consistencia interna utilizando el coeficiente omega son ωSEA = .81, ωOEA= .79, ωUOE= .84 y ωROE = .85. **Conclusión:** La WLEIS en estudiantes universitarios de la región Lambayeque del Perú tiene suficientes evidencias de validez y confiabilidad para garantizar la pertinencia de su aplicación.

Palabras claves: Inteligencia Emocional; Estudiantes Universitarios; Validez; Confiabilidad; Instrumento de Evaluación.

INTRODUCTION

It has been evidenced that emotional intelligence (EI) meets the standards to be considered an intelligence (Mayer et al., 1999), being important in different areas where people develop, since it is important for personal growth, effective leadership and well-being in general, due to its ability to unify emotions and reasoning, besides being a skill that can be trained, changed, developed and improved (Güell, 2013). In fact, it allows facing different situations through the development of its skills, so as to achieve a higher probability of success (Gutiérrez, 2020). However, in the field of university education, it has been evidenced that students, as a result of the COVID-19 pandemic, found it more difficult to achieve the best way to behave in their daily lives, added to academic stress, training requirements and personal difficulties, among others (Yang et al., 2022).

Indeed, the importance of this concept is highlighted in the literature as a key to face the challenges of life during the university stage, also considering that, nowadays, we are in the post-pandemic stage, where students are in the process of readjusting to face-to-face classes. In this context, Checa-Domene et al. (2022), in Spain, found that EI predicts a decrease in pessimism and the maintenance of adequate levels of self-esteem. This leads to think that EI is a necessary and transcendent factor for mental health care (Silva-Ramos et al., 2020).

In this regard, it is recognized that it is relevant to measure EI in processes related to academic stress or anxiety, whose association has been demonstrated (Shi et al., 2022); similarly, it is advisable to investigate the level of EI that university students have and to encourage it, given its impact on education (Puertas-Molero et al., 2020), as shown, for example, by the study carried out by Gutiérrez (2020) where the existence of differences in EI referred to sex was shown, since women obtained higher scores than men in relation to attention and emotional regulation; on the other hand, it has been proven that EI, together with resilience and self-esteem, are predictors of life satisfaction (Vilca-Pareja et al., 2022), and it is also capable of predicting academic performance (Estrada-Guillen et al., 2022; Pishghadam et al., 2022).

In the case of Latin America, Moreno et al. (2023) have pointed out that EI could play a crucial role in improving academic performance, well-being and emotional environment among university students. In this context, a study in Peru conducted by Palomino and Almenara (2019) examined EI levels in a group of university students, taking into account the expected level of competencies achieved, finding that, in men there were no differences; however, women with initial level of achievement obtained higher EI scores than those of higher achievement.

Given these situations, there is interest in having a valid and reliable instrument to measure EI in university students in the Lambayeque region, recognizing that this construct helps to react positively to the tension and stress of this stage (Gutiérrez, 2020). For this purpose, there are different proposals of instruments according to age groups and preferences by context. Among them, the Wong-Law Emotional Intelligence Scale (WLEIS) (Wong and Law, 2002) stands out, which measures EI from a self-report perspective of ability, composed of four dimensions (Extremera et al., 2019), following the theoretical model of Mayer and Salovey (1997).

In relation to what was previously mentioned, this questionnaire has versions adapted at the international level, for example, in Cuban stomatology students (Carranza-Esteban et al., 2022), university students and people from the Spanish community (Extremera et al., 2019) and adolescents and adults in China (Kong, 2017). At the Latin American level, it was validated in Chilean managers (Acosta-Prado and Zarate-Torres, 2019). In the Peruvian context, it has been adapted in nursing students (Merino-Soto et al., 2019) and adults (Merino-Soto et al., 2016), both in the city of Lima. Thus, it is also necessary to take into account that, in the previously cited versions, the factorial structure of the instrument was of four correlated factors; however, analyses with higher order and bifactor structures have been reported (Di et al., 2020). On the other hand, it is relevant to consider that there are other scales that measure EI as a skill, for example, the Mayer Salovey-Caruso Emotional Intelligence Test (MSCEIT; Extremera et al., 2006) or the Emotional Quotient Inventory: short form (EQi: S; Esnaola et al., 2016).

Despite the importance of an adequate level of EI, considering that it contributes significantly to establishing effective interpersonal relationships, facilitating adaptation, strengthening resilience, promoting teamwork, and improving learning and communication (Idrogo and Asenjo, 2021), in the Lambayeque region we do not have validated versions of the WLEIS in university students.

Therefore, having analyzed the positive implications of EI measurement in the university context, the present study aims to analyze the evidence of validity and reliability of the Wong-Law Emotional Intelligence Scale (WLEIS) in university students in the Lambayeque region of Peru, since no publication of its psychometric analysis in this city has been found in the literature.

METHOD

Design

The present study is an instrumental study, since it is aimed at obtaining psychometric evidence of a measurement instrument (Ato et al., 2013).

Participants

Snowball sampling was performed. A total of 317 female (n= 193; 60.9%) and male (n= 124; 39.1%) students, aged 18 to 30 years (M= 20.3; SD= 2.7), from 5 universities in the Lambayeque

region, from different professional careers, were included by sending a virtual form in June 2023. The distribution by academic cycles is as follows: first (n= 28; 8.8%), second (n= 30; 9.5%), third (n= 38; 12%), fourth (n= 23; 7. 3%), fifth (n= 123; 38.8%), sixth (n= 16; 5%), seventh (n= 35; 11%), eighth (n= 11; 3.5%), ninth (n= 9; 2.8%), tenth (n= 2; 0.6%), twelfth (n= 2; 0.6%). Eleven participants who indicated they came from a university outside the Lambayeque region were excluded.

Instrument

The WLEIS was initially created by Wong and Law (2002) in China. For this study, the instrument used was the version of the scale validated by Extremera et al. (2019) in which 1460 adults participated, made up of university students and settlers of the Spanish community. It is a self-report scale that measures emotional intelligence with 16 items distributed in four dimensions: 1) evaluation of own emotions (SEA); 2) evaluation of others' emotions (OEA); 3) use of emotions (UOE), and 4) regulation of emotions (ROE). The response alternatives range from 1 (strongly disagree) to 7 (strongly agree).

In their study, they reported that the instrument has adequate internal consistency and criterion validity in relation to the original instrument. They applied confirmatory factor analysis, obtaining good fit indexes (X2=610.303, NNFI= .947, CFI= .954 and RMSEA= .068). To determine reliability, they used the alpha coefficient, whose results were adequate, ranging from .79 to .84 in its dimensions.

Procedure

Before applying the instrument to the target sample, a pilot test was conducted on 20 university students in order to check the understanding of the items, opting to reduce the response options from 7 to 5 (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree), because most of the initial participants expressed confusion in deciding between one of the 7 alternatives as they considered them to be too many options. It should be noted that this reduction has also been executed in a previous Peruvian study (Merino-Soto et al., 2019). Subsequently, to have greater access to the population and at the same time optimize physical resources, the instrument was applied virtually using Google forms, which were available for 14 days. For its dissemination, social networks were used, and the message included a brief explanation of the objective and scope of the research.

Data analysis

Initially, the univariate descriptive statistics of the items were verified. Three structural models were tested: four correlated factors, higher order and bifactor (Figure 1). For the confirmatory factor analysis (CFA), the Weighted Least Square Mean and Variance Adjusted (WLSMV) estimator was used, considering the use of the polychoric correlation matrix and because it is the most recommended given the ordinal nature of the variables (Kline, 2023). The comparative fit indices (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR) and Weighted Root Mean Square Residual (WRMR) were taken into account, the latter being suitable for ordinal variables (DiStefano et al., 2017). To determine a good fit, CFI values > .95, TLI > .95, RMSEA < .08 and SRMR < .05 (Whittaker and Schumacker, 2022) and WRMR < 1 (DiStefano et al., 2017) were considered. As for reliability, it was verified through internal consistency analysis using the omega coefficient and its variants according to the structural model (higher-order omega [ωho] and hierarchical omega [ωh]).

These procedures were executed in R software with its RStudio interface version 2023.06.0, specifically using the packages lavaan version 0.6-15 (Rossel et al., 2023), psych version 2.3.6 (Revelle, 2023) and semTools version 0.6-5 (Jorgensen et al., 2022).

Ethical aspects

Fundamental aspects of the ethical principles of psychologists and code of conduct (American Psychological Association,

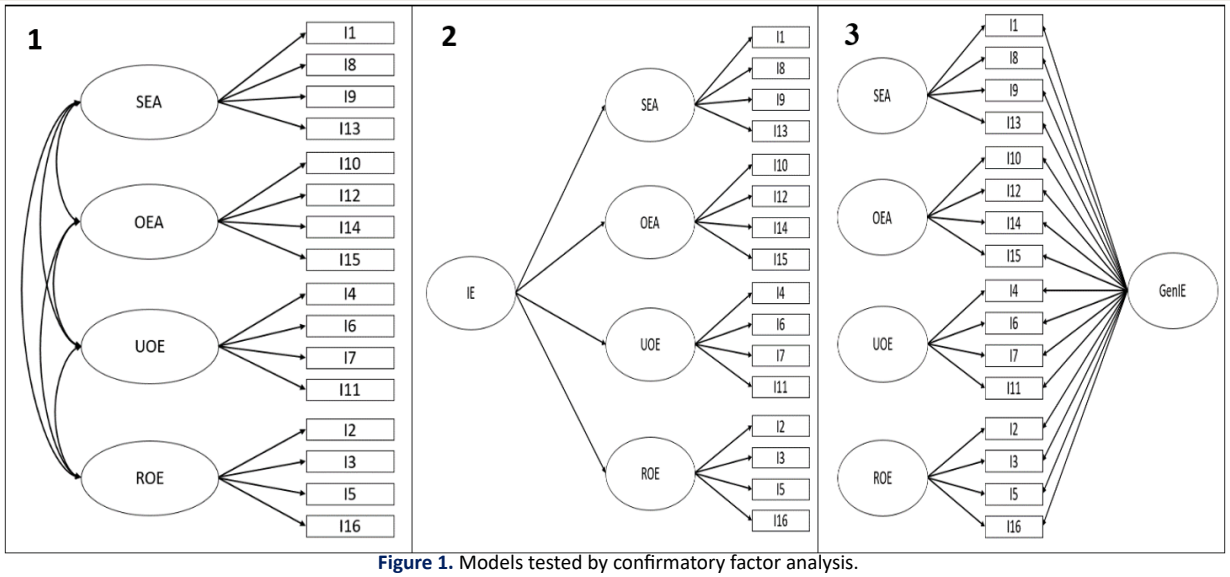

Figure 1. Models tested by confirmatory factor analysis.

Note. 1: Four correlated factors, 2: Higher order, 3: Bifactor. EI: Emotional intelligence, SEA: Self-emotional appraisal, OEA: Other´s emotional appraisal. ROE: Regulation of emotion. UOE: Use of emotions. GenEI: General Emotional Intelligence

2017) were taken into consideration, since the participants, before answering the items, were shown the informed consent through a specific item requesting their acceptance, emphasizing that their participation was voluntary, and that the confidentiality of the information provided is guaranteed. Likewise, the corresponding credit has been given to each author who served as a source of information.

RESULTS

Descriptive statistics

Regarding the descriptive analysis of the items (Table 1), it was verified that they have adequate skewness and kurtosis indicators, within the range +/- 1.5 (Ferrando and Anguiano-Carrasco, 2010), except for items 6, 12, 14 and 15.

Polychoric correlations

The matrix of polychoric correlations of the items was subsequently calculated (Table 2), being relevant in the analysis of data with polytomous response options with a view to applying CFA to confirm the internal structure of a measurement instrument (Freiberg et al., 2013). The indexes identifying the correlations between items belonging to the same dimension were placed in bold, the values ranging from .43 to .75.

Structural model comparisons by confirmatory factor analysis

Three models found in the literature were tested: four correlated factors, higher order and bifactor (Di et al., 2020). In Table 3, it is evident that the four-factor correlated model exhibits slightly better indices compared to the higher order and bifactor structures.

Table 4 shows the standardized factor loadings, according to the structure of four correlated factors, since it was the model that obtained the best fit indexes compared to the others that were tested.

Reliability

Reliability was verified by internal consistency analysis through the omega coefficient formula, obtaining adequate values for the model of four correlated factors (ωSEA = .81, ωOEA= .79, ωUOE= .84 and ωROE = .85), higher order (ωho= .84) and bifactor (ωh= .84).

DISCUSSION

EI refers to the ability to manage adverse emotions in a more fluid basis, giving people greater opportunities to achieve happiness; likewise, by having empathic skills, an improved and broader capacity to relate to others is achieved (García-Ancira, 2020). Indeed, evidence reveals that those individuals who possess high emotional intelligence experience numerous advantages both in their personal and professional spheres (Fernández-Berrocal et al., 2022); and in the university context, EI is related to a better emotional environment in the classroom, improves well-being and enhances academic performance (Moreno et al., 2023).

Thus, the psychometric properties of the WLEIS were examined in university students in the Lambayeque region, Peru, since it is a well-known instrument used by several researchers, being of brief application and adequate understanding (Merino-Soto et al., 2016).

After verifying the univariate descriptive and inter-item correlations, the internal structure was analyzed, and it was found that the four-factor correlated model had a slightly better fit than the higher-order and bifactor models. This finding is consistent with that reported in different studies with Spanish (Extremera et al., 2019), Cuban (Carranza-Esteban et al., 2022) and Peruvian (Merino-Soto et al., 2019) university students, suggesting that

Table 1. Results of the univariate descriptive statistics of the WLEIS items.

Items	M	SD	g1	g2
1	3.68	0.99	-0.70	0.09
2	3.55	0.95	-0.48	-0.10
3	3.33	1.03	-0.32	-0.42
4	3.99	0.96	-0.99	0.76
5	3.52	0.92	-0.50	0.05
6	3.98	0.88	-1.05	1.59
7	3.81	0.94	-0.77	0.47
8	3.71	0.93	-0.95	1.04
9	3.60	0.91	-0.66	0.39
10	3.85	0.97	-0.90	0.57
11	3.69	0.92	-0.77	0.63
12	3.93	0.85	-1.09	1.91
13	3.67	0.85	-0.86	1.11
14	3.96	0.86	-1.10	1.89
15	3.94	0.86	-1.07	1.90
16	3.65	0.87	-0.64	0.60

Note. M = Mean; SD = Standard deviation; g1 = Asymmetry; g2 = Kurtosis

the WLEIS structure is applicable in multiple realities, maintaining its factorial configuration. However, it differs from that proposed by Di et al. (2020), who pointed to the bifactor structure as the one that presented the best performance in Chinese university students. Internal consistency was also reported, where the calculation of the omega coefficient indicated ideal results for the four dimensions, and it can be assumed that the instrument is reliable. Likewise, for the other two structures tested, the internal consistency was also adequate.

It is important to point out that, although the reported model of four correlated factors is configured as the best in relation to the other two, these are not discarded, since their adjustment indexes are within the acceptable cut-off points, and it is therefore recommended that they be verified in subsequent studies that provide further evidence in this regard.

In this sense, the findings of this study have important implications for both academic research and educational practice. In the academic field, the validated instrument can serve as a robust tool for future studies on the relationship between emotional intelligence and various aspects of academic performance, psychological well-being, among others, of university students. From a practical perspective, the use of this questionnaire can facilitate the identification of specific areas of emotional development that could benefit students in their academic and personal trajectory. In addition, the validation of the instrument provides a solid basis for its implementation in intervention and emotional skills development programs, thus contributing to the promotion of the integral wellbeing of university students.

Limitations

However, even though adequate psychometric evidence of the scale has been demonstrated, it is necessary to consider some limitations, such as, using a non-probabilistic sampling brings consequences on the external validity of the study, not being possible to strongly ensure that these results can be applied in participants with similar characteristics; likewise, the fact of applying the instrument by virtual means may generate some selection biases. In this sense, it is recommended for future research to select samples under probabilistic criteria in order to guarantee their representativeness, as well as to carry out face-to-face applications; similarly, it would be ideal for these findings to be complemented in our context with invariance analysis and with other sources of validity, such as, for example,

Table 2. Matrix of polychoric correlations of the WLEIS items.

Item	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16
I1 (SEA)	-															
I2 (ROE)	0.53	-														
I3 (ROE)	0.46	**0.6**	-													
I4 (UOE)	0.37	0.5	0.4	-												
I5 (ROE)	0.50	**0.8**	**0.6**	0.5	-											
I6 (UOE)	0.39	0.5	0.4	**0.6**	0.60	-										
I7 (UOE)	0.39	0.5	0.4	**0.6**	0.44	**0.75**	-									
I8 (SEA)	**0.43**	0.4	0.4	0.5	0.50	0.53	0.50	-								
I9 (SEA)	**0.50**	0.5	0.5	0.5	0.57	0.53	0.51	**0.66**	-							
I10 (OEA)	0.14	0.1	0.2	0.3	0.23	0.35	0.28	0.33	0.32	-						
I11 (UOE)	0.33	0.4	0.4	**0.6**	0.44	**0.59**	**0.62**	0.44	0.50	0.30	-					
I12 (OEA)	0.22	0.3	0.3	0.4	0.42	0.47	0.43	0.41	0.45	**0.57**	0.44	-				
I13 (SEA)	**0.53**	0.6	0.5	0.4	0.64	0.55	0.46	**0.63**	**0.73**	0.31	0.46	0.49	-			
I14 (OEA)	0.28	0.4	0.3	0.5	0.37	0.41	0.41	0.40	0.35	**0.43**	0.38	**0.69**	0.47	-		
I15 (OEA)	0.18	0.3	0.3	0.4	0.29	0.37	0.36	0.39	0.33	**0.44**	0.37	**0.60**	0.39	**0.69**	-	
I16 (ROE)	0.38	**0.5**	**0.7**	0.4	**0.68**	0.43	0.35	0.44	0.53	0.26	0.43	0.48	0.64	0.44	0.41	-

Note. SEA: self-emotional appraisal; OEA: other's emotional appraisal; ROE: regulation of emotion; UOE: use of emotion. The indexes placed in bold refer to the correlations between items of the same dimension..

Table 3. Fit indexes of the structural models tested.

Models	X^2(gl)	*p*	CFI	TLI	RMSEA [IC 90%]	SRMR	WRMR
4 correlated factors	262.63 (98)	< 0.001	1	1	0.07 [0.06; 0.08]	0.04	0.91
Higher order model	283.42 (100)	< 0.001	1	1	0.08 [0.06; 0.09]	0.05	0.99
Bifactor model	275.53 (88)	< 0.001	1	1	0.08 [0.07; 0.09]	0.05	0.94

evidence based on the relationship with other variables.

Conclusion

It is concluded that the WLEIS has adequate evidence of validity and reliability that guarantees a correct measurement of EI in university students in the Lambayeque region of Peru, positioning it as the first study to determine the psychometric properties of this scale in a sample of higher education students in this city.

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AUTHORS' CONTRIBUTIONS

Katy Mendoza-Flores: Conception of the manuscript, data collection, data analysis and interpretation, drafting of the manuscript.
Herminia Aldaz-Velasquez: Conception of the manuscript, data collection, data analysis and interpretation, drafting of the manuscript.
Vranna Juárez-Adrianzén: Conception of the manuscript, data collection, data analysis and interpretation, drafting of the manuscript.
Lucía Panta-Carrillo: Conception of the manuscript, data collection, data analysis and interpretation, drafting of the manuscript.
José Gamarra-Moncayo: Analysis and interpretation of data, critical revision of the manuscript, approval of its last version, statistical advice.
Edmundo Arévalo-Luna: Critical revision of the manuscript, approval of the latest version of the manuscript.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

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Not applicable.

REVIEW PROCESS

This study has been reviewed by three external reviewers in double-blinded mode. The editor in charge was David Villarreal-Zegarra. The review process is included as supplementary material 1.

DATA AVAILABILITY STATEMENT

The authors attach the database in supplementary material 2.

Table 4. Standardized factor loadings for the WLEIS items, according to the 4-factor correlated model.

	Item	F1	F2	F3	F4
SEA	(I1) Most of the time I know how to distinguish the reasons for my feelings.	0.63			
SEA	(I8) Most of the time I know whether or not I am happy.	0.75			
SEA	(I9) I really understand how I feel.	0.82			
SEA	(I13) I am able to understand my emotions.	0.87			
OEA	(I10) I am sensitive to the feelings and emotions of others.		0.59		
OEA	(I12) I can understand the emotions of the people around me.		0.87		
OEA	(I14) I am a good observer of other people's emotions.		0.84		
OEA	(I15) I always know my friends' emotions through their behavior.		0.76		
UOE	(I4) I set goals and give my all to achieve them			0.77	
UOE	(I6) I encourage myself to perform my activities to the best of my ability.			0.86	
UOE	(I7) I am a self-motivated person.			0.82	
UOE	(I11) I tell myself that I am a competent person.			0.75	
ROE	(I2) I am able to control my own emotions.				0.80
ROE	(I3) I can calm down easily when I feel angry.				0.74
ROE	(I5) I have good control of my own emotions.				0.89
ROE	(I16) I am able to control my temperament and handle difficulties rationally.				0.80
	Correlations between factors	F1	F2	F3	F4
F1	Self-Emotional Appraisal (SEA)	-			
F2	Others' Emotions Appraisal (OAS)	0.60	-		
F3	Use of Emotions (UOE)	0.75	0.63	-	
F4	Regulation of emotions (ROE)	0.82	0.52	0.70	-

STATEMENT OF THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE

The authors declare that they have not made use of artificial intelligence-generated tools for the creation of the manuscript, nor technological assistants for the writing of the manuscript.

DISCLAIMER OF LIABILITY

The authors are responsible for all statements made in this article.

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