Research article

Individual and group emotional intelligence measurement of sex differences and invariance for individual (WLEIS-S) and group (WEIP-S) emotional intelligence measurement scales

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ABSTRACT

Different international research groups focus on the study of socio-emotional resources and tools to facilitate adequate management of daily challenges and demands among teachers. This allows for better personal and professional performance. One of these resources that has attracted most attention in recent decades has been that of emotional intelligence. In this regard, the present study set out to analyse the psychometric properties of trait emotional intelligence as a construct. For this purpose, the study focused on two EI measurement instruments. One of the instruments (WLEIS-S) measures individual emotional intelligence and the other instrument (WEIP-S) measures group emotional intelligence. Against this background, the possible invariance of both scales with respect to the sex variable is analysed, as well as possible differences in the variables measured by the scales between sexes. To this end, 452 primary education teachers from Southern Spain filled in the WLEIS-S and WEIP-S tests. The results found in the factor analyses carried out with both instruments showed an excellent fit, as well as good internal consistency. Moreover, both instruments showed robust invariance, which indicates that both scales measure the emotional intelligence construct consistently for both women and men. No differences were found in the assessed latent variables between sexes. To conclude, this study shows psychometric evidence supporting the suitability of the WLEIS-S and WEIP-S scales for the accurate assessment of individual and group emotional intelligence in women and men in the teacher population.

1. Introduction

Emotional Intelligence (EI) was born as a scientific construct three decades ago [1]. However, thanks to the book written by Daniel Goleman in 1995 (Emotional Intelligence), this concept became known worldwide. In the period of 1990–2010, the literature has clearly distinguished two major conceptual approaches to the study of EI. The first one, worldwide known as the ability models [2] indicate that EI enables the use of emotions to promote more effective reasoning and to think more intelligently about one's emotional life. This model consists of four key dimensions or branches. The first one is related to Emotional Perception, which is the ability to identify and recognise emotions in oneself and others; the second referred to Emotional Facilitation is the ability to use emotions to support thinking and problem solving; the third one is Emotional Understanding is the ability to understand the complexity of

emotions, how they evolve over time and how they interact with each other; and finally, it highlight the Emotional Management, which is the ability to manage emotions effectively in oneself and in relationships with others.

On the other hand, the trait or mixed models propose a broad approach to EI, and these are understood as a combination of established personality traits, social-emotional abilities, motivational issues and several cognitive skills [3,4]. The Bar-On Model (2000) is called the Well-Being Model, it is based on competencies that attempt to explain how an individual relates to the people around him/her and to his/her environment. This model is made up of five elements, been the first one the intrapersonal component, which brings together the ability to be aware of, understand and relate to others. In relation to the second one, the interpersonal component, which involves the ability to manage strong emotions and control one's impulses. Moreover it is, the stress management component, which involves the ability to have a positive and optimistic outlook. Regarding to the fourth one, the mood component, which is made up of the ability to adapt to change and solve problems of a personal and social nature. Finally, the adaptability or adjustment component.

The Goleman Model is called the emotional competencies model [5] which is divided into two main areas, the first one is the Personal competencies (Self-awareness and Self-regulation). The second one is the Social competencies (Empathy and Social skills). Generally speaking, its application has been focused on the business world.

Finally, the Petrides and Furham Model [6,7] called the Trait EI Model. It is a multifactorial model that considers EI as a personality trait and is based more on a subject's self-perception than on emotional abilities to work with emotional information.

It consists of fifteen dimensions: adaptability; assertiveness; self- and others' emotional perception; emotional expression; emotional management; emotional regulation; low impulsivity; relationships; self-esteem; self-motivation; social awareness; stress management; empathy; happiness; optimism.

EI in teachers is an area of study that has become more relevant in recent years due to its impact on teaching effectiveness and the emotional well-being of students and teachers themselves. This has been found in several areas of study, for example, Jennings and Greenberg [8] found that teachers with high EI are more effective in managing classroom interactions, which in turn improves students' academic performance. The study developed by Brackett et al. [9] showed that teachers with higher EI skills experience less emotional exhaustion and have higher job satisfaction. On the other hand, the study by Yoo and Carter [10] found that those teachers with higher EI skills improved their conflict management skills. Likewise, Oberle et al. [11] showed that programmes that include emotional intelligence training for teachers can improve students' social-emotional competencies. Other studies such as the one conducted by Chan [12] have found that EI acts as a protector of burnout in teachers and the studies conducted by Augusto-Landa et al. [13] and Pulido-Martos et al. [14] found that EI acts as a protective factor against stress and promotes the use of so-called adaptive strategies. This collection of research highlights the importance of the study of EI in teachers, which has been confirmed by different studies that highlight that EI is of utmost importance for this group. It not only improves their well-being and effectiveness, but also has a positive impact on the classroom climate and the development of students.

EI is measured differently depending on the models. On the one hand, the ability or capacity EI perspective measures the construct through performance or ability tests (e.g. MSCEIT, [15]), that examine differences regarding emotional information processing skills, such as perception, facilitation, understanding or management of emotions [2,16,17]. The structure of these tests is similar to that of a classical intelligence test, and they measure EI as an ability. People are asked to recognise emotions in images of faces, people or landscapes, or to select the best response to different complicated emotional situations in the personal or professional life. Recently, Mayer [18] reports a new version of MSCEIT called MSCEIT-2.

The trait EI approach, assesses a collection of emotional self-perceptions situated above and below the lowest levels of the personality hierarchies and it is based on self-reports [19]. It assesses EI through a set of questions in which no answers are right or wrong, but rather people's subjective perception of what their EI is like.

Therefore, while the former EI perspective measures cognitive abilities to manage emotional information, the latter assesses emotion-related dispositions and emotional self-efficacy judgments [20,21], which demonstrate the tendency to act accordingly in emotional situations.

In the present study, it has been analysed two widely used self-report scales for measuring trait EI. The Wong and Law Emotional Intelligence Scale (WLEIS), developed by Wong and Law [22] is considered a brief measure, as it consists of 16 items and provides an individual measure of EI. A total measure of EI can also be obtained. It consists of four dimensions (four items per dimension), which are: Evaluation of own emotions; Evaluation of others' emotions; Emotional Regulation and Use of emotions. The Spanish version was developed by Extremera et al. [23]. This scale has been widely used in studies in which teachers were involved [24–26].

Furthermore, this study is also focused on the Work Group Emotional Intelligence Scale Short version (WEIP-S) made by Jordan et al. [27]. It is used to assess Group Emotional Intelligence (GEI), which is different from individual EI, since GEI refers to a collective EI derived from the interactions that occur between group members. The scale consists of 4 dimensions with four items per dimension. The first one is Understanding one's own emotions. The second refers to the Management of one's own emotions, while the third dimension refers to the Understanding of the emotions of others. Finally, there is the dimension Management of others' emotions. The Spanish version was developed by López-Zafra et al. [28]. To date, this scale has not been used with samples of teachers, although it has been used with other types of groups [29–31]. These scales have been widely used both in the scientific literature and in the applied domain [29,32,33]. The psychometric properties of these scales have been analysed in different samples and/or populations, proving to be good measurement tools for trait EI [29,30,34–37].

An important aspect in the analysis of the psychometric properties of a test is related to assessing whether the constructs or latent factors measured by the scale evaluate the meaning of these factors equally in different groups or measurement situations. In such case, it can affirm that they are in a situation of invariance in the measurement of this factor for the analysed variable, and this would allow to assume that the members of the different groups of the variable will interpret the observed variables associated with the latent factor

measured through the scale in the same way [38]. Otherwise, it could be faced with a situation in which a scale measures a factor unequally depending on the measured group. Several studies have analysed the invariance of the WLEIS instrument for grouping variables, such as subjects from different countries [39,40]. The study conducted by Li et al. [39], with 2 samples from China and one sample from Canada, replicated the structure of the 4 dimensions of the instrument and found metric invariance in the 3 groups of subjects analysed. The study carried out by Libbrerch et al. [40], using samples from Singapore and Belgium, reports that the scalar invariance model was partially supported, as the authors warn about non-invariance in the use of the emotions dimension. A recent study done by Meilin et al. [41] with adolescent subjects aged 12–17 years replicated the structure of the four factors and found that the measurement structure of the WLEIS was invariant across gender. Although the results of these studies are promising, further research is needed to investigate invariance in cross-cultural studies involving different countries.

Sex has traditionally been a variable under study in the invariance of self-report tests. In the case of the scales under study, only the sex invariance of the WLEIS-S scale has been analysed in a sample of Spanish university students [23]. In the mentioned study, the authors reported a slight violation of the scale's configural invariance with respect to sex. The authors additionally analysed sex differences with respect to the level of EI measured. The results showed that women had slightly higher scores in appraising the emotions of others and in total EI scores than men. According to the authors, this suggests that women are more interpersonally sensitive than men. Their results are in line with those found by Whitman et al. [42]. To date, no study has attempted to analyse the invariance and difference of group EI (WEIP-S) with respect to sex. Another more recent study with Chinese adolescents was conducted by Di et al. [43], who found that confirmatory factor analysis (CFA) reported support for the four-factor WLEIS model strategy to be the best fit to the data. The multi-group CFA found that the measurement structure of the WLEIS-S did not vary between sexes. The aim of the present paper was to analyse the psychometric properties of the scales used to measure EI individually and as a group (WLEIS-S and WEIP) on a sample of primary education teachers in Southern Spain. Additionally, the possible invariance of both scales with respect to the sex variable is analysed, as well as the possible differences of the variables measured through the scales between sexes.

2. Method

2.1. Participants and procedure

In this study, 452 primary education teachers from Southern Spain participated voluntarily. Of the total number of teachers 178 (39.38 %) were men and 274 (60.61 %) were women. This proportion is consistent with the sex distribution in Education degrees in Spain [44]. The age of the teachers ranged from 22 to 65 years ($M = 39.12$, $SD = 10.25$). The average professional experience of the teachers was $M = 13.47$ years ($SD = 9.92$). Regarding the teachers' workplace, 70 % belonged to public schools, 27 % were worked in public institutions, and 3 % of them taught in private schools. All subjects voluntarily consented to participate after being made aware of the research objectives. Declaration of Helsinki guidelines (59th General Assembly of the World Medical Association, Seoul, October 2008) had been adhered to and approved by the Ethics Committee of a Spanish university (University of Jaén: Ref. OCT.20/1.TES).

2.2. Instruments

Spanish adaptation of the Work Group Emotional Intelligence Profile-Short (WEIP-S; [30]*)* developed by López-Zafra et al. [28].
The scale used replicates the factor structure of the original scale. This version is composed of 16 items, which are divided into four subgroups that measure the different components of EI: 1) Knowledge of own emotions (Items 1–4; α = .922) Management of own emotions (Items 5–8; α = .71), 3) Knowledge of others' emotions (the items 9–12; α = .82), and 4) Management of others' emotions, formed by the items 13–16 (α = .91). Responses are on a 7-point Likert scale (1 indicates the highest degree of disagreement, while 7 corresponds to the highest degree of agreement with what the item states).
The Spanish *adaptation of Wong and Law Emotional Intelligence Scale (WLEI-S;* [22]*),* developed by Extremera et al. [23].
This scale consists of 16 statements used to assess four dimensions: Self-Emotion Appraisal (SEA, α = .79), Other's Emotion Appraisal (OEA, α = .81), Use of Emotion (UOE, α = 81) and Regulation of Emotion (ROE, α = .84). Responses are on a five-point Likert scale, which ranged from 1 (strongly disagree) to 5 (strongly agree). The Spanish adaptation of the questionnaire was used, due to its good validity and reliability in this context. The global scale obtained α = .91.
Negative Affect Scale of the Positive and Negative Affect Scales (PANAS, [45]*).*
The PANAS scale is a self-report questionnaire that assesses a general dimension of the affect felt by individuals. This scale measures two dimensions of affect, the positive dimension (P-PANAS) and the negative dimension (N-PANAS). This scale is composed of 20 items which are measured through a 5-point Likert-type scale, where 1 indicates "Not at all" and 5 indicates "Extremely". This scale has been adapted to Spanish showing good levels of reliability with Cronbach's Alpha of 0.88 [46].
Satisfaction with Life Scale (SWLS; [47]).
The Life Satisfaction Scale is a self-report scale consisting of only five items. Through a 7-point Likert-type scale, participants are asked to indicate how much they like each of the statements used in the scale, where 1 indicates "strongly disagree" and 7 indicates "strongly agree". This scale was adapted to Spanish by Vazquez et al. [48] showing good reliability, with Cronbach's Alpha of 0.88.

2.3. Data analysis

All analyses contained in this paper were carried out using the R software, where the *α* value was set to 0.05 to provide significance. As a preliminary step to the factorial analysis, a data screening was carried out to assess the required assumptions for the factorial

analysis and its distribution. Multiple imputation of the treatment for missing values was performed with a package of R called MICE [49]. In addition, confirmatory factor analysis (CFA) allowed the extraction from the resulting data obtained of each scale to verify the validity and internal consistency of these scales, by the r lavaan package [50]. However, it used the diagonally weighted least squares estimator (DWLS, [51]) to check the validity and internal consistency of these scales.

The fit indices used were the root mean squared error of approximation (RMSEA), the comparative fit index (CFI) and the standardised root mean square residual (SRMR). Scores below 0.06 for the RMSEA and SRMR and equal to or above 0.90 for the CFI indicate the goodness of fit of the model. To analyse the overall fit model good fit we use the following parameters: the Root Mean Square Error of Approximation (RMSEA) with values < 0.08 being indicative of reason-able fit and values < 0.05 indicating a good fit; the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) with values > 0.90 indicating an acceptable fit and values > 0.95 indicating a good fit; and the Standardized Root Mean Square Residual (SRMR) with values < 0.05 being indicative of good fit [52]. Cronbach's alpha and McDonald's ω [53] values indicated the reliability of the scales used. We analysed the convergent validity or nomological validity, examining the degree of correlation that the overall scores obtained by means of the scales, as well as the factors that compose them, with other factors theoretically related to the constructs analysed (in this case with life satisfaction and positive and negative affect).

Finally, the invariance of the structures of the two scales used for teachers' sex at the configural, metric, scalar and strict levels was analysed. For this purpose, a series of nested hierarchical models (configural, metric, scalar and strict) were tested to test hypotheses about the fit of the CFA data. To assess a possible violation of measurement invariance, the fit of the measurement model to the observed data model was analysed. The configural invariance evaluated the overall fit of the models, while the comparison of the remaining nested models was analysed by comparing the difference in the fit statistics of the two models. Also, it considered as a violation of invariance when comparing one level of analysis to the next more stringent level, it there was a change in CFI greater than 0.01 together with a change in RMSEA greater than 0.015 [54].

3. Results

3.1. Descriptive statistics

Table 1 shows the descriptive results of the observed variables for each of the scales grouped by the different factors of which they are composed. It began analysing multivariate normality by means of Mardia's Multivariate Normality Test. The results showed that the data found for both scales did not have a multivariate normal distribution (WLEIS $Z_{Kurtosis} = 39.06, p < .01$; WEIP $Z_{Kurtosis} = 53.73, p$

Table 1
Descriptive statistics for the different items.

Item	Mean	Median	SD	Skewness	Kurtosis	Shapiro-Wilk W	$p_{Shapiro-Wilk}$
Wleis1	5.84	6.00	0.934	−0.789	1.060	0.858	<0.001
Wleis2	5.23	5.00	1.00	−0.491	0.367	0.898	<0.001
Wleis3	5.85	6.00	0.936	−0.974	1.810	0.846	<0.001
Wleis4	5.33	5.00	1.06	−0.600	0.304	0.898	<0.001
Wleis5	5.71	6.00	0.913	−0.738	0.578	0.857	<0.001
Wleis6	5.43	6.00	1.08	−0.622	0.271	0.897	<0.001
Wleis7	5.35	5.00	1.09	−0.474	−0.075	0.907	<0.001
Wleis8	5.25	5.00	1.13	−0.827	0.796	0.888	<0.001
Wleis9	5.62	6.00	0.973	−0.739	0.835	0.874	<0.001
Wleis10	5.88	6.00	1.00	−1.12	1.940	0.840	<0.001
Wleis11	5.48	6.00	1.07	−0.657	0.401	0.891	<0.001
Wleis12	5.04	5.00	1.26	−0.450	−0.253	0.923	<0.001
Wleis13	5.84	6.00	1.07	−0.806	0.159	0.859	<0.001
Wleis14	5.46	6.00	0.963	−0.540	0.321	0.888	<0.001
Wleis15	5.65	6.00	0.991	−0.670	0.459	0.879	<0.001
Wleis16	5.34	6.00	1.08	−0.836	0.870	0.883	<0.001
Weip1	5.26	5.00	1.26	−0.929	0.946	0.888	<0.001
Weip2	5.16	5.00	1.15	−0.626	0.532	0.910	<0.001
Weip3	4.78	5.00	1.26	−0.463	0.003	0.930	<0.001
Weip4	5.20	5.00	1.08	−0.318	−0.365	0.914	<0.001
Weip5	5.68	6.00	1.16	−1.01	1.080	0.863	<0.001
Weip6	5.29	5.00	1.16	−0.790	0.814	0.895	<0.001
Weip7	5.69	6.00	1.06	−0.789	0.658	0.875	<0.001
Weip8	5.47	6.00	1.10	−0.656	0.226	0.894	<0.001
Weip9	4.95	5.00	1.12	−0.266	−0.206	0.925	<0.001
Weip10	4.64	5.00	1.11	−0.322	0.317	0.922	<0.001
Weip11	4.58	5.00	1.20	−0.480	0.205	0.925	<0.001
Weip12	4.65	5.00	1.13	−0.307	0.203	0.927	<0.001
Weip13	5.01	5.00	1.08	−0.293	0.043	0.920	<0.001
Weip14	5.12	5.00	1.05	−0.365	−0.027	0.910	<0.001
Weip15	5.03	5.00	1.01	−0.580	0.735	0.895	<0.001
Weip16	4.93	5.00	1.07	−0.329	0.424	0.914	<0.001

< .01). Correlation of variables conducted for the purpose of analyzing proved the data to be showed neither multicollinearity ($r > 0.90$) nor singularity ($r > 0.95$). A linear regression is used to analyse linearity, homogeneity and homoscedasticity. The residuals from this regression were then explored. If the analysis of the residuals resulting from this regression shows any anomaly, it should be due to the behaviour of the data as the other data set was created randomly [55]. The distribution of the residuals showed no anomalies, being mostly distributed between -2 and $+2$.

3.2. Factor-level analysis

The psychometric characteristics of each of the scales were analysed independently. For each of the scales, a confirmatory factor analysis was performed. Table 2 presents the factor loadings of the different variables of each of the scales, as well as the psychometric properties of the different factors that make up the scales.

In the case of the WLEIS scale, the CFA showed an excellent fit, $\chi^2 (98) = 261.944, p < .001$, with CFI $= 0.963$, TLI $= 0.955$, SRMR $= 0.078$, RMSEA $= 0.061$ (RMSEA 90 % CI [0.052, 0.070]) [52]. Also, the Cronbach's $\alpha = .882$ and McDonald's $\omega = 0.884$ indices were excellent.

In the case of the WEIP scale, its CFA was also excellent [52], $\chi^2 (98) = 72.109, p < .977$, with CFI $= 1.00$, TLI $= 1.00$, SRMR $= 0.042$, RMSEA $= 0.000$ (RMSEA 90 % CI [0.000, 0.000]). Cronbach's ($\alpha = .898$) and McDonald's ($\omega = 0.900$) obtained high reliability.

3.3. Validity with respect to a Creiterion (convergent validity)

Table 3 describes the association between the overall scores of the scales used as well as the subfactors with other theoretically

Table 2
Factor loadings for each of the items of each scale.

Scale	Latent Factor	Indicator	Estimate	*SE*	*Z*	*p*	Stand. Estimate	AVE	CR
WLEIS	SEA							0.249	0.565
		Wleis1	0.568	0.034	16.512	<0.001	0.568		
		Wleis2	0.436	0.030	14.649	<0.001	0.436		
		Wleis3	0.409	0.031	13.244	<0.001	0.409		
		Wleis4	0.564	0.034	16.453	<0.001	0.564		
	OEA							0.349	0.679
		Wleis5	0.689	0.032	21.865	<0.001	0.689		
		Wleis6	0.594	0.029	20.696	<0.001	0.594		
		Wleis7	0.501	0.028	17.896	<0.001	0.501		
		Wleis8	0.564	0.029	19.571	<0.001	0.564		
	UOE							0.329	0.659
		Wleis9	0.672	0.031	21.347	<0.001	0.672		
		Wleis10	0.493	0.029	17.060	<0.001	0.493		
		Wleis11	0.563	0.028	19.999	<0.001	0.563		
		Wleis12	0.552	0.028	19.977	<0.001	0.552		
	ROE							0.380	0.709
		Wleis13	0.674	0.030	22.691	<0.001	0.674		
		Wleis14	0.533	0.027	19.531	<0.001	0.533		
		Wleis15	0.616	0.028	21.684	<0.001	0.616		
		Wleis16	0.636	0.030	21.432	<0.001	0.636		
WEIP	OwnA							0.547	0.828
		Weip1	0.719	0.032	22.195	<0.001	0.719		
		Weip2	0.706	0.031	22.531	<0.001	0.706		
		Weip3	0.753	0.031	24.181	<0.001	0.753		
		Weip4	0.779	0.030	26.107	<0.001	0.779		
	OwnM							0.446	0.762
		Weip5	0.670	0.033	20.339	<0.001	0.670		
		Weip6	0.597	0.032	18.872	<0.001	0.597		
		Weip7	0.721	0.034	21.034	<0.001	0.721		
		Weip8	0.678	0.032	20.937	<0.001	0.678		
	OthA							0.560	0.835
		Weip9	0.769	0.031	24.648	<0.001	0.769		
		Weip10	0.800	0.032	25.301	<0.001	0.800		
		Weip11	0.731	0.031	23.501	<0.001	0.731		
		Weip12	0.689	0.031	22.361	<0.001	0.689		
	OthM							0.659	0.885
		Weip13	0.775	0.030	26.100	<0.001	0.775		
		Weip14	0.819	0.030	27.072	<0.001	0.819		
		Weip15	0.860	0.032	26.823	<0.001	0.860		
		Weip16	0.791	0.031	25.733	<0.001	0.791		

Notes. SEA = Self-Emotion Appraisal; ROE = Regulation of Emotion; UOE = Use of Emotion; OEA = Other's Emotion Appraisal; OwnA = Own Awareness; OwnM = Own Management; OthA = Other Awareness; OthM = Other Management.

related scales and variables (SWLS and PANAS). As can be seen in Table 3, both the general factors and the subfactors within each scale correlate significantly both with each other and with the other scales used as convergent criteria. All the correlations between the different variables analysed were positive, except, as could not be otherwise, with the negative affect evaluated through N-PANAS. Also as expected, the highest correlations resulted between the general factors and their subfactors, showing signs of internal consistency.

3.4. Measurement invariance

After verifying that the two scales showed very good psychometric properties in the analysed sample, the dimensionality of the model was explored by analysing the invariance of the scales as a function of the teachers' sex. This analysis was intended to measure whether the dimensionality of the two scales used was equivalent for male and female teachers. The results of the invariance analysis for the configural, metric, scalar and strict levels are shown in Table 4.

According to the results, all levels of invariance were achieved for both scales. The difference in changes from one level of invariance to the immediately more restrictive one did not differ by more than 0.01 for the CFI parameter, along with RMSEA changes greater than 0.015 [54].

3.5. Sex differences

Sex differences across the four dimensions are shown in Fig. 1 for WLEIS scale and in Fig. 2 for WEIP. The scores for each of the dimensions of the two scales were compared according to the sex of the teachers by a contrast of means (Student's t-test). The results indicated that none of the dimensions showed significant differences according to the teachers' sex on any of the two scales (larger $t = -1.30$, $p < .19$).

4. Discussion

The aim of the present study was to use the WLEIS-S and WEIP-P scales to measure individual and group EI in a sample of primary education teachers from Southern Spain. Through its application, the aim was to analyse its psychometric properties. The results of this analysis provided information on the internal consistency and validity of the factorial structure of the scales. Additionally, considering what has been reported in previous studies [23,42], it was proposed to analyse the invariance of the scales and the possible differences in the measures of the latent variables as a function of the sex variable.

The results of the Confirmatory Factor Analysis applied to each of the scales showed that both scales had excellent fit and very good internal consistency. In the case of the WLEIS-S scale, the results found on the factorial structure fit were consistent with those found by Di et al. [43] with Chinese adolescents. Similarly, in the case of the WEIP scale, the results found on factor structure are in line with those recently found in the Spanish sport setting by Marchena-Giraldez [37].

In the analysis of the invariance of the scales for the sex variable, both scales showed robust invariance for sex across all the analysis levels. These results suggest that the scales used to evaluate EI measured this construct consistently for both men and women. These findings are not consistent with those of Extremera et al. [23], who analysed the invariance of the WLEIS-S scale in a population of university students and community participants. Extremera et al. [23] reported different dimensionality of the scale between males and females. They came to this conclusion by finding a difference of 0.011 for the Comparative Fit Index (CFI) between the two models at the configural level of analysis. During the last few years, the psychometric literature has proposed that the configural level of invariance should not be considered as a true invariance analysis per se, but rather as an analysis of the underlying model from which

Table 3
Correlation of the different factors and subfactor of the scales.

Escale/Factor	1	2	3	4	5	6	7	8	9	10	11	12	13
1. WIEIS	–												
2. SEA	0.85[c]	–											
3. OEA	0.75[c]	0.61[c]	–										
4. ROE	0.78[c]	0.55[c]	0.48[c]	–									
5. UOE	0.79[c]	0.57[c]	0.35[c]	0.51[c]	–								
6. WEIP	0.49[c]	0.42[c]	0.43[c]	0.42[c]	0.29[c]	–							
7. OwnA	0.35[c]	0.35[c]	0.29[c]	0.29[c]	0.21[c]	0.77[c]	–						
8. OwnM	0.38[c]	0.37[c]	0.29[c]	0.30[c]	0.26[c]	0.73[c]	0.47[c]	–					
9. OthA	0.36[c]	0.28[c]	0.41[c]	0.28[c]	0.20[c]	0.77[c]	0.39[c]	0.40[c]	–				
10. OthM	0.40[c]	0.30[c]	0.33[c]	0.42[c]	0.24[c]	0.81[c]	0.47[c]	0.43[c]	0.58[c]	–			
11. SWLS	0.41[c]	0.38[c]	0.25[c]	0.37[c]	0.31[c]	0.39[c]	0.32[c]	0.27[c]	0.22[c]	0.39[c]	–		
12. P-PANAS	0.33[c]	0.26[c]	0.24[c]	0.30[c]	0.26[c]	0.35[c]	0.31[c]	0.24[c]	0.16[c]	0.37[c]	0.35[c]	–	
13. N-PANAS	−0.32[c]	−0.31[c]	−0.15[b]	−0.26[c]	−0.29[c]	−0.22[c]	−0.12[a]	−0.32[c]	−0.07	−0.15[b]	−0.32[c]	−0.01	–

Note.
[a] $p < .05$.
[b] $p < .01$.
[c] $p < .001$.

Table 4

Fit indices for teacher sex invariance.

		χ^2	$\Delta\chi^2$	df	p	CFI	ΔCFI	RMSEA	RMSEA (CI 90 %)	ΔRMSEA
WLEIS	configural	297.31	–	196	<0.01	0.97	–	0.04	0.037–0.059	–
	metric	328.27	30.96	204	<0.01	0.97	0.005	0.05	0.041–0.062	−0.004
	scalar	370.77	42.50	220	<0.01	0.97	0.006	0.05	0.045–0.065	−0.003
	strict	392.08	21.30	236	<0.01	0.96	0.001	0.05	0.045–0.064	0.001
WEIP	configural	122.86	–	196	= 0.99	1.00	–	0.00	0.000–0.000	–
	metric	143.03	20.17	204	= 0.99	1.00	−0.000	0.00	0.000–0.000	−0.000
	scalar	147.36	4.32	220	= 0.99	1.00	−0.000	0.00	0.000–0.000	−0.000
	strict	150.36	2.99	236	= 0.99	1.00	−0.000	0.00	0.000–0.000	−0.000

Note. df: degree of freedom; CI: confidence interval; RMSEA: root mean square error approximation; ΔCFI: comparative fit index increase; ΔRMSEA: root mean square error approximation increase; CFI: comparative fit index.
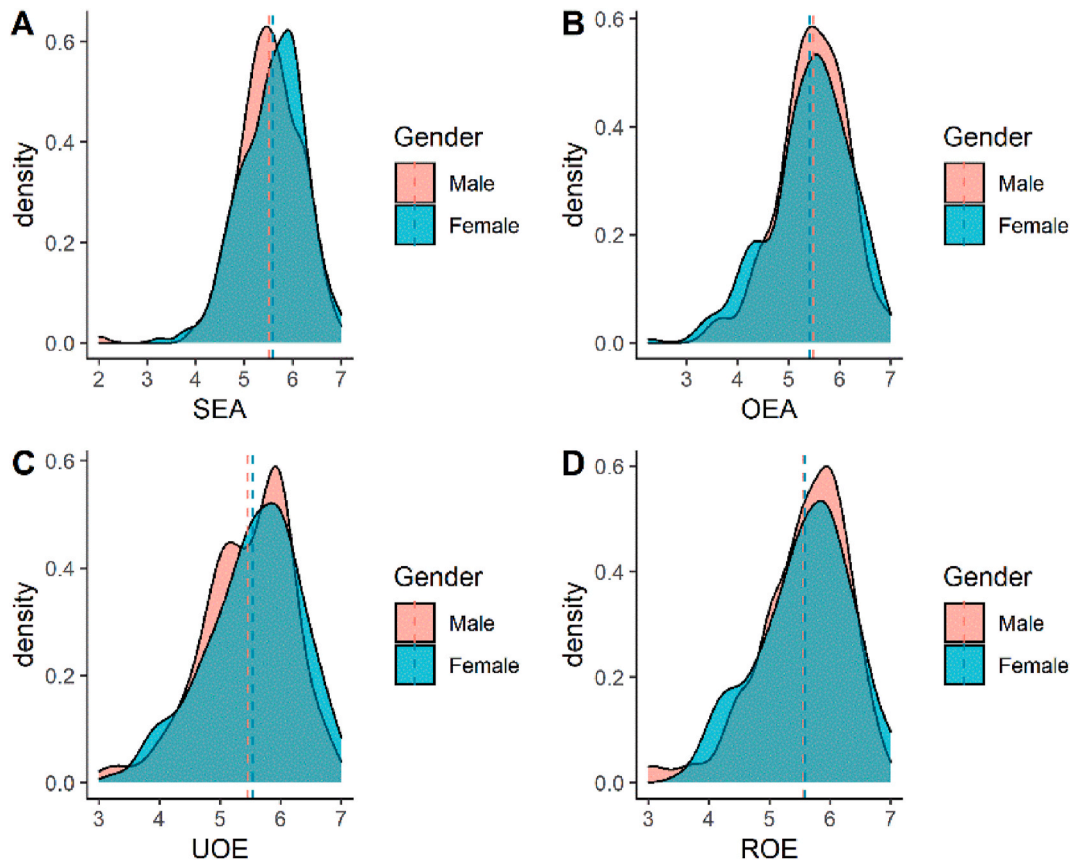
Fig. 1. Sex differences for WLEIS scale.

to start [56]. Nowadays, different levels of analysis and invariance are increasingly demanding and stringent from one level to the next. This is why a correct invariance analysis requires approaching the analysis at least from the configural, metric, scalar and strict invariance levels [56–58]. In contrast with what was reported by Extremera et al. [23] and in line with the findings found in this study, Di et al. [59] also found evidence of invariance (at the configural, metric and scalar levels) for the WLEIS-S in Chinese adolescents. Unfortunately, the results concerning the invariance of the WEIP-S test cannot be compared with other studies to date, since, as was previously reported, this study is the first evidence of invariance in the WEIP-S scale. This is why this study is particularly important.

The literature shows different examples in which sex has been proved to be a significant predictor of EI scores measured by scales [60,61], although the direction of the effect is not entirely consistent [62]. Thus, it has been found contradictory data on the relationship between gender and EI. On the one hand, some studies suggest that men show higher levels of EI than women [63], while other studies show an opposite pattern in which it is women who show higher levels of EI than men [64,65]. This finding has been supported by the hypothesis that men tend to show less emotion than women [66]. Lastly, several studies have found no differences in EI levels between men and women [67]. In relation to this aspect, this study would be in line with the latter group of studies, since these results did not show significant differences in any of the latent factors measured through the scales used.
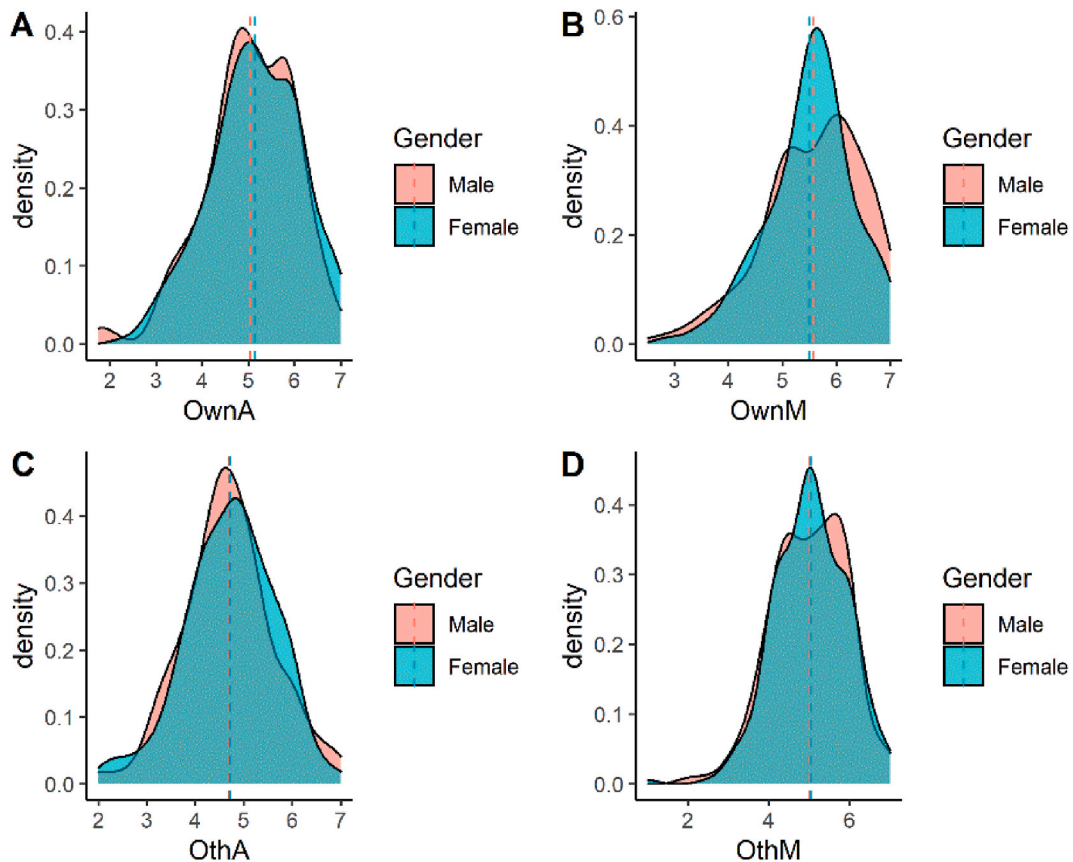
Fig. 2. Sex differences for WEIP scale.

5. Conclusions

This study performed a systematic validation of the psychometric properties of the WLEIS-S and the WEIP-S with primary education teachers. The results suggest that both instruments are valid for measuring trait emotional intelligence (individual and group) of teachers, and they are the first tools to be validated with this type of population. The two scales showed good factorial validity and reliability, indicating that both WLEIS-S and WEIP-S have a reliable 4-factor structure for teachers. Secondly, it was found that both scales were robustly invariant to the sex variable, i.e., the dimensionality of the latent factors measured by the scales was invariant both measuring these factors in both men and women. Finally, these findings revealed that the latent factors measured across the two scales showed similar levels in both the male and female teacher groups. These results indicated that both males and females showed the same levels of individual and group EI.

5.1. Limitations and prospective

This study is not exempt from limitations. Firstly, this is the first work to analyse the possible difference and invariance of group EI (WEIP-S) according to sex. The generalisability of the results found should be considered with caution, as they are the first evidence in this area. Regarding the results on the difference and invariance for individual EI (WLEIS-S), there are more background in the literature. The closest work to the one presented, due to the population used (Spanish students) is that conducted by Extremera et al. [23], which reported variance and sex differences for EI. The analysis of the possible discrepancy between these results and those reported by the mentioned authors is based on an analysis of the analytical procedure performed in their study, although it cannot provide data to confirm this position. However, there is an example of a comprehensive analysis of invariance with this scale with a Chinese adolescent population in Di et al. [43], which supports the results found in this study. In this line, further studies are encouraged where these scales are applied to measure EI in different populations, in order to provide more evidence on the possible difference and invariance according to sex.

Another limitation is that teachers who participated in the study may be the most "cooperative and willing to participate", which may restrict the generalisability of these results. Also, the participants were recruited in a specific geographical area (southern Spain); future studies should consider selecting a country-level sample (Spain) in order to generalise findings across a larger sample.

Future studies in different countries would be necessary using the WEIP-S test in order to be able to contrast the results obtained,

since in this aspect we have carried out a pioneering study that cannot be contrasted by others.

6. Theoretical and practical implications

The study we have presented provides two easy-to-administer scales that can have an eminently practical application when we want to analyse teacher EI individually and as a group over a short period of time. In addition, these two tools could shed light on the predictive capacity at both individual and group level of teachers in important aspects of life (Burnout, stress, psychological well-being …). Likewise, and as pointed out by the studies shown in the introductory section, both individual and group EI was associated with well-being and psychological maladjustment outcomes. Therefore, future EI intervention programmes measured by WLEIS and WEIP with the teaching population should examine the contribution of EI on different aspects related to this group.

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Data availability statement

Data will be made available on request article upon publication.

CRediT authorship contribution statement

Samuel P. León: Writing – review & editing, Software, Methodology, Formal analysis, Writing – original draft, Conceptualization. **Inmaculada García-Martínez:** Writing – review & editing, Writing – original draft, Funding acquisition, Conceptualization. **José María Augusto-Landa:** Writing – review & editing, Project administration, Investigation, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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