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# PSYCHOMETRIC PROPERTIES OF THE TRAIT META-MOOD SCALE FOR MEASURING EMOTIONAL INTELLIGENCE IN PERUVIAN STUDENTS

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**Abstract**

The aim of this study was to analyze the psychometric properties of the Trait Meta-Mood Scale (TMMS-24) for measuring emotional intelligence in Peruvian students. A total of 699 Peruvian students participated. An exploratory factor analysis (EFA) was performed with 210 students and a confirmatory factor analysis (CFA) was performed with 489 students. The Spanish version of the TMMS-24 scale was used. A descriptive analysis of the items was made. The exploratory factor analysis (EFA) was performed with the unweighted least squares estimation method with promin oblique rotation and the confirmatory factor analysis (CFA) was performed through the modeling of structural equations. Internal consistency was estimated with the ordinal $\alpha$ coefficient. The EFA yielded a three-factor structure and the correlations between factors were high (between .530 to .689). With the CFA, adequate goodness-of-fit indices are observed ($\chi^2$= 385.868, TLI= .963, CFI= .967, RMSEA= 0.034, SRMR= .041). The $\alpha$-ordinal coefficient shows adequate internal consistency ($\alpha$= .93). The TMMS-24 presents good psychometric properties for measuring emotional intelligence in Peruvian students.
KEY WORDS: *TMMS-24, emotional intelligence, factor analysis, reliability, students.*

**Resumen**

El objetivo de este estudio fue analizar las propiedades psicométricas de la "Escala rasgo de metaconocimiento de los estados emocionales" (TMMS-24) para medir la inteligencia emocional en estudiantes peruanos. Participaron un total de 699 estudiantes peruanos. Se realizó un análisis factorial exploratorio (AFE) con 210 estudiantes y un análisis factorial confirmatorio (AFC) con 489 estudiantes. Se utilizó la versión en español de la escala TMMS-24. Se realizó un análisis descriptivo de los ítems. El análisis factorial exploratorio (AFE) se realizó con el método de estimación de mínimos cuadrados no ponderados con rotación oblicua promin y el análisis factorial confirmatorio (AFC) se realizó mediante el modelado de

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ecuaciones estructurales. La consistencia interna se estimó con el coeficiente $\alpha$ ordinal. El AFE produjo una estructura de tres factores y las correlaciones entre los factores fueron altas (entre 0,530 y 0,689). Con el AFC se observan índices de bondad de ajuste adecuados ($\chi^2$= 385,868; TLI= 0,963; CFI= 0,967; RMSEA= 0,034; SRMR= 0,041). El coeficiente $\alpha$-ordinal muestra una consistencia interna adecuada ($\alpha$= 0,93). El TMMS-24 presenta buenas propiedades psicométricas para medir la inteligencia emocional en estudiantes peruanos.
PALABRAS CLAVE: *TMMS-24, inteligencia emocional, análisis factorial, fiabilidad, estudiantes.*

## Introduction

For thirty years it has been proposed that some people are more intelligent than others when facing situations related to emotions as seen in their skills for facial recognition of emotions, understanding the meaning of words related to emotions, emotion management and other similar evidences (Mayer et al., 2016). These skills constitute what is known as emotional intelligence (EI) which has been conceptualized as the ability to monitor one's own and others' feelings and emotions, discriminate between them and use this information to guide thinking and actions (Salovey & Mayer, 1990). Subsequently, it was proposed that EI is organized in a hierarchical structure of four components or branches: perception of emotions, use of emotions, understanding and management of emotions (Mayer & Salovey, 1997). At the base of this model, emotion perception refers to the ability to identify and decipher mood states in oneself (Brackett et al., 2013), in other individuals (Papadogiannis et al., 2009), and in cultural artifacts or works of art (Grewal & Salovey, 2005; Mayer et al., 2011). The use of emotions involves the ability to manage one's own emotional changes for the purpose of effectively carrying out cognitive activities such as reasoning, problem solving, and decision making (Papadogiannis et al., 2009). Emotional understanding refers to the insight to identify the meaning of emotions and symbolic expressions when different moods occur simultaneously, as well as the ability to predict which emotions sequentially follow other emotions, in oneself as well as in others (Rivers et al., 2007). Emotion management, at the top of the hierarchical model (Brackett et al., 2013), represents the ability to successfully regulate one's own and other people's emotions (Fiori & Vesely-Maillefer, 2018). These skills have an important role for well-being and daily coping, as it is related to personal experiences and relationships with others (Mayer et al., 2016).

EI has been conceptualized using two types of models: skills and mixed models (Mayer et al., 2000). The first group includes models that present EI as a set of skills to process emotional information accurately and efficiently (Mayer & Salovey, 1997); Mayer and Salovey's model is classified as a mental skills model (Brackett et al., 2013), while mixed models define EI as a set of social skills, traits and dispositional behavior (Mayer et al., 2011; Petrides & Furnham, 2000). Among the best known

mixed models is Goleman's model (Goleman, 1995), questioned for its overlap with other constructs (Mayer et al., 2011) and Bar-On's model (Bar-On, 1997) which was developed with the purpose of measuring a set of non-cognitive abilities, competencies and skills to successfully cope with environmental demands and pressures, where the EI skills model presents sufficient empirical support to continue to be maintained as such (Mayer et al., 2016).

Joseph and Newman (Joseph & Newman, 2010) have proposed a sequential model of skills with three branches, where they argued that EI has a sequential functioning in which emotional perception precedes emotional understanding and this in turn precedes emotional regulation (Huynh et al., 2018) leaving out the branch referring to the use of emotions because it is considered conceptually redundant with the other dimensions (Joseph & Newman, 2010). Thus, it is worth noting that the factor structure of the construct is still open to research as empirical evidence is still needed for the validation of the theoretical models of EI and in addition, much more data are now available than when the construct first appeared (Mayer et al., 2016).

Instruments to measure EI could also be divided into two types. The first group includes instruments based on Mayer and Salovey's (1990) model, such as the SRRI scale (Schutte et al., 1998) or the TMMS scale to assess the cognitive aspects of EI or perceived EI (Salovey et al., 1995). The second group includes instruments that include personal development, social skills, self-esteem and personality, such as the Trait Emotional Intelligence Questionnaire (TEIQue; Petrides et al., 2004) and the Emotional Quotient Inventory (EQ-i; Bar-On, 1997).

The model of EI as an ability or skill has been widely used to design self-report instruments, dating back to the first time the term "Emotional Intelligence" was coined (Salovey & Mayer, 1990). The first scale constructed in the United States was the 48-item Trait Meta Mood Scale (TMMS-48), with the purpose of measuring the self-regulatory domain of emotional intelligence in its dimensions of attention, clarity and repair of one's own emotions (Salovey et al., 1995). The measure is based on what has been called Perceived Emotional Intelligence (PEI), or the knowledge one has about one's own emotional abilities rather than their actual capacity (Extremera & Fernández-Berrocal, 2005; Fernández-Berrocal et al., 2004; Salovey et al., 2002). The TMMS is a measure of beliefs about one's emotional attention (perceived attention paid to one's emotional states), clarity (perceived understanding of one's emotional states and ability to differentiate them), and emotional repair (perceived ability to regulate one's emotional states and modify negative experiences to a positive tone) (Extremera & Fernández-Berrocal, 2005; Fernández-Berrocal & Extremera, 2005; Fitness & Curtis, 2005).

The psychometric properties of the TMMS have been verified in other languages and cultural contexts. Palmer et al. (2003) validated the factor structure of the TMMS in Australian males and females from 15-79 years of age using the 30-item version. There is also the Portuguese version adapted for adults, and its criterion validity has been validated (Queirós et al., 2005); this same version was further adapted in athletes from 13 to 33 years old, adjusting the original factor structure

through confirmatory factor analysis (Brito-Costa et al., 2016). The French version of the TMMS shows, through confirmatory factor analysis, a 3-factor structure with 30 items, as well as a demonstrated concurrent validity with other instruments, in a young adult population (Maria et al., 2016). In Turkey, the test was adapted in university students, applying factor analysis and varimax rotation, determining 4 factors for this version (Aksöz et al., 2010); while in the Slovak Republic, it was adapted in a group of female university students, evidencing adequate properties for three factors, adding that the existence of more factors could be evaluated (Látalová & Pilárik, 2014). The TMMS was also translated into Italian, evidencing adequate concurrent validity in adults and verifying the cross-cultural adaptability of the instrument (Giromini et al., 2017).

The TMMS-48 was adapted to Spanish in Spain by replicating the three-dimensional structure of the original scale (Fernández-Berrocal et al., 1998) then, by means of an exploratory factor analysis, the scale was reduced to 24 items, maintaining the scale components: attention, clarity and repair, but items with loadings of 0.40 or lower were eliminated, thus reducing the total number by half (TMMS-24). The TMMS-24 obtained adequate indices of internal consistency and temporal stability in a population of university students (Fernández-Berrocal et al., 2004). In recent years, validation studies including adolescent populations replicated the three-factor structure (Diaz-Castela et al., 2013; Extremera et al., 2007; Salguero et al., 2010).

A 22-item version of the TMMS was validated by Martín-Albo et al. (2010) in Spanish athletes between 14 and 40 years of age. Other studies conducted in Spain also demonstrated the stability of the original three-factor structure of the TMMS-24 in people between 14 and 23 years old (Pedrosa et al., 2014) as well as in the older adult population (Delhom et al., 2017). Additionally, in Chile the TMMS-24 was validated by Gómez-Núñez et al. (2018) in an adolescent population, maintaining the original factor structure. Two other similar studies of this scale were conducted in Spain with nursing students and professionals (Aradilla-Herrero et al., 2014; Giménez-Espert & Prado-Gascó, 2017).

Although EI scales have received widespread use, more empirical data on their psychometric properties are needed, especially when these scales are adapted, translated, and then used in different countries (Li et al., 2012). The cultural context must be considered when interpreting the results of studies on emotional intelligence (Huynh et al., 2018); therefore, it is important to analyze the factor structure or adaptation of instruments measuring this construct in different cultural contexts.

In Peru, EI studies have been conducted in different populations, especially in students, and the TMMS-24 has been used as a measurement instrument. However, there is still a lack of evidence of validity and reliability in a Peruvian context. For this reason, the purpose of this study is to analyze the psychometric properties of the TMMS-24 to measure EI in Peruvian students through a confirmatory factor analysis.

## Method

### *Participants*

The non-probabilistic convenience sampling method was used for this study and 699 high school students were selected from four educational institutions in the city of Lima, two public (51.5%) and two private (48.5%). The ages ranged between 11 and 15 years old (*M*= 12.47, *SD*= .829). Details of the sociodemographic characteristics of the participants are included in Table 1.

**Table 1**
Sociodemographic characteristics

| Variables | EFA (*N*= 210) | | CFA (*N*= 489) | | Total (*N*= 699) | |
|---|---|---|---|---|---|---|
| | *n* | % | *n* | % | *n* | % |
| Type of educational institution | | | | | | |
| Public | 112 | 53.3 | 248 | 50.7 | 360 | 51.5 |
| Private | 98 | 46.7 | 241 | 49.3 | 339 | 48.5 |
| Age | | | | | | |
| 11-12 years old | 106 | 50.5 | 249 | 50.9 | 355 | 50.8 |
| 13-15 years old | 104 | 49.5 | 240 | 49.1 | 344 | 49.2 |
| Sex | | | | | | |
| Male | 102 | 48.6 | 235 | 48.1 | 337 | 48.2 |
| Female | 108 | 51.4 | 254 | 51.9 | 362 | 51.8 |
| Religion | | | | | | |
| Protestant | 82 | 39.0 | 183 | 37.4 | 265 | 37.9 |
| Catholic | 106 | 50.5 | 243 | 49.7 | 349 | 49.9 |
| Other | 22 | 10.5 | 63 | 12.9 | 85 | 12.2 |
| Region of origin | | | | | | |
| Coast | 153 | 72.9 | 373 | 76.3 | 526 | 75.3 |
| Mountains | 40 | 19.0 | 77 | 15.7 | 117 | 16.7 |
| Jungle | 17 | 8.1 | 39 | 8.0 | 56 | 8.0 |
| Family structure | | | | | | |
| Biparental/nuclear | 136 | 64.8 | 326 | 66.7 | 462 | 66.1 |
| Monoparental/extended | 74 | 35.2 | 163 | 33.3 | 237 | 33.9 |

*Note*: EFA= exploratory factor analysis, CFA= confirmatory factor analysis.

### *Instrument*

The *Trait Meta-Mood Scale* (TMMS; Salovey et al., 1995), Spanish version by Fernández-Berrocal et al. (2004). The TMMS-24 consists of 24 items distributed in a three-factor structure. Items 1-8 measure the *emotional attention* factor, which encompasses the ability to feel and express feelings adequately. Items 9-16 measure the *emotional clarity* factor, which refers to the ability to understand and differentiate one's emotional states. Finally, items 17-24 measure the *emotional repair* factor, which reflects the ability to regulate one's emotional states and modify

negative experiences into positive ones (Fernández-Berrocal et al., 2004). Responses to the items are made on a 5-point Likert scale (1= do not agree at all and 5= strongly agree). This version presents evidence of adequate validity and reliability ($\alpha$> .85) for the total scale and for each factor (Fernández-Berrocal et al., 2004).

*Procedure*

The administrators of the educational institutions were provided with a brief description of the study and were asked for authorization for its execution. Four administrators approved the request. Data were collected during in-person class periods. The students received a copy of the questionnaire that collected information about their general characteristics as well as informing them about the quantitative instrument. Additionally, they received indications about the administration of the instrument, signed the informed consent form and declared their voluntary participation. They were also informed that, if they had any personal inconvenience during the data collection process, they could stop answering the questionnaire at any time. No student reported any discomfort or problems during this process. This procedure was carried out by one of the researchers accompanied by a teacher on duty at each educational institution. The average time to answer the questions in the questionnaire was 15 minutes.

*Data analysis*

Descriptive statistics were calculated and the normality of the items was evaluated considering the skewness and kurtosis coefficients (< 1 in absolute value). The correlations of the items with the total scale were analyzed; items with values lower than 0.3 were eliminated. The adequacy of the correlation matrix for factor analysis was evaluated through the Kaiser-Meyer-Olkin test (KMO > 0.8) and Bartlett's test of sphericity ($p$< 0.05).

Exploratory factor analysis (EFA) was performed with parallel analysis to determine the number of factors, using the unweighted least squares estimation method and the prominent oblique rotation method, where items with saturations below 0.3 would be eliminated. The correlations between factors ($r$> 0.3) were also evaluated and the ordinal alpha coefficient was used to estimate the reliability of the scale, where coefficients above .7 would indicate that the instrument is reliable.

A confirmatory factor analysis (CFA) of the TMMS-24 was performed through structural equation modeling (SEM) and the robust weighted least squares mean and variance adjusted variance weighted least squares (WLSMV) estimation method was used and model goodness-of-fit indices were evaluated according to the proposals of Escobedo et al. (2016) and Kline (2016). Comparative fit indices (CFI) and Tucker-Lewis fit indices (TLI) ranging between .90 and .95 would indicate an acceptable fit and values above .95 would indicate an adequate fit. Root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) indices with values between .05 and .08 would indicate an acceptable fit

and values below .05 would indicate an adequate fit. All statistical analyses were performed using the R program, v. 4.0.3.

## Results

*Descriptive analysis*

The psychometric properties of the TMMS-24 were analyzed with 210 participants. The descriptive summary for each item (Table 2) shows that the means fluctuate between 2.37 and 4.09. It is also observed that the skewness coefficients are less than 1 in absolute value, except for item 23. However, most of the kurtosis coefficients are greater than 1, which shows that the items do not present a univariate normal distribution. The corrected correlation coefficients of the items with the total scale fluctuate between .49 and .83, which are adequate values ($r$> .3). All the items present ordinal alpha coefficients greater than .80.

*Exploratory factor analysis*

Since the items presented skewness and kurtosis coefficients greater than 1 in absolute value and the responses of the items are ordinal, a polychoric correlation matrix was used and its suitability for factor analysis was evaluated. The Kaiser-Meyer-Olkin (KMO) test was greater than .8 (KMO= .879) and Bartlett's test of sphericity showed that the correlations between items were significant (Bartlett= 2304.5; $df$= 276; $p$< .001); based on these results we proceeded with the factor analysis.

With the parallel analysis, a 3-factor oblique structure was determined (Table 3). The 24 items presented item saturations higher than 0.3 in the theoretically established factors (8 items per factor), however, items 5 and 22 saturated in more than 1 factor (factorial complexity). The items presented communalities higher than 0.3, except item 24 ($h^2$= .292), which is not negligible.

*Correlations between factors and reliability*

The analyses of correlations between factors (Table 4) yielded coefficients greater than .530 and less than .689. The total proportion of variance explained was 56.72% (Factor 1= 40.39, Factor 2= 9.91, Factor 3= 6.42). The reliability coefficient for the whole scale ($\alpha_{ordinal}$) was .93 and in the 3 factors each were higher than .8, indicating adequate internal consistency.

**Table 2**
Descriptive scores and reliability of TMMS-24 items (*n*= 210)

| Variables | *M* | *SD* | As | K | $r_{it}$ | $\alpha_{ordinal}$ |
|---|---|---|---|---|---|---|
| Factor: Emotional attention (EA) | | | | | | |
| Item1 | 3.36 | 1.37 | -.28 | -1.20 | .63 | .88 |
| Item2 | 3.30 | 1.33 | -.12 | -1.22 | .75 | .87 |
| Item3 | 3.01 | 1.32 | .07 | -1.23 | .74 | .87 |
| Item4 | 3.30 | 1.31 | -.15 | -1.18 | .67 | .88 |
| Item5 | 2.37 | 1.39 | .72 | -0.76 | .49 | .90 |
| Item6 | 2.87 | 1.34 | .15 | -1.13 | .78 | .87 |
| Item7 | 3.06 | 1.34 | .05 | -1.19 | .83 | .86 |
| Item8 | 3.24 | 1.31 | -.14 | -1.12 | .78 | .87 |
| Total | 24.51 | 7.66 | -.10 | -0.60 | | |
| Factor: Emotional clarity (EC) | | | | | | |
| Item9 | 3.48 | 1.35 | -.30 | -1.22 | .67 | .87 |
| Item10 | 3.22 | 1.26 | -.03 | -1.11 | .73 | .87 |
| Item11 | 3.40 | 1.32 | -.25 | -1.20 | .68 | .87 |
| Item12 | 3.04 | 1.37 | .03 | -1.23 | .71 | .87 |
| Item13 | 3.19 | 1.19 | .11 | -1.06 | .71 | .87 |
| Item14 | 3.09 | 1.31 | .01 | -1.15 | .65 | .87 |
| Item15 | 2.96 | 1.26 | .08 | -1.11 | .73 | .87 |
| Item16 | 3.08 | 1.24 | -.03 | -0.97 | .71 | .87 |
| Total | 25.46 | 7.37 | .04 | -0.54 | | |
| Factor: Emotional repair (ER) | | | | | | |
| Item17 | 3.25 | 1.41 | -.19 | -1.29 | .71 | .85 |
| Item18 | 3.53 | 1.30 | -.44 | -0.96 | .77 | .85 |
| Item19 | 3.29 | 1.37 | -.22 | -1.23 | .69 | .86 |
| Item20 | 3.62 | 1.38 | -.65 | -0.83 | .75 | .85 |
| Item21 | 3.40 | 1.31 | -.29 | -1.00 | .74 | .85 |
| Item22 | 3.53 | 1.31 | -.41 | -0.99 | .66 | .86 |
| Item23 | 4.09 | 1.20 | -1.03 | -0.22 | .58 | .87 |
| Item24 | 3.74 | 1.40 | -.77 | -0.75 | .53 | .87 |
| Total | 28.45 | 7.37 | -.43 | -0.52 | | |

*Note*: As= Asymmetry coefficient; K= Kurtosis coefficient; $r_{it}$= Item-total-corrected correlation; $\alpha_{ordinal}$= Ordinal alpha reliability coefficient (polychoric correlation matrix).

*Confirmatory factor analysis*

This analysis was performed with 489 participants. Since in the EFA items 5 and 22 saturated in two factors, the factor structure of the TMMS-24 was evaluated through confirmatory factor analysis (CFA) using structural equation modeling (SEM). The factor model (Figure 1) presents good goodness-of-fit indices ($\chi^2$= 385.868, *df*= 249, $\chi^2/df$= 1.549, TLI= .963, CFI= .967, RMSEA= .034 [90% CI= .027-.040], SRMR= .041).

**Table 3**
Exploratory factor analysis of the TMMS-24 in Peruvian students (*n*= 210)

| Variables | Factor 1 | Factor 2 | Factor 3 | $h^2$ |
|---|---|---|---|---|
| Item 1 | | .385 | | .430 |
| Item 2 | | .628 | | .597 |
| Item 3 | | .730 | | .514 |
| Item 4 | | .636 | | .470 |
| Item 5 | | **.616** | **-.304** | .316 |
| Item 6 | | .860 | | .644 |
| Item 7 | | .873 | | .728 |
| Item 8 | | .636 | | .616 |
| Item 9 | .527 | | | .448 |
| Item 10 | .512 | | | .515 |
| Item 11 | .668 | | | .444 |
| Item 12 | .769 | | | .532 |
| Item 13 | .642 | | | .506 |
| Item 14 | .702 | | | .443 |
| Item 15 | .850 | | | .578 |
| Item 16 | .632 | | | .528 |
| Item 17 | | | .689 | .514 |
| Item 18 | | | .835 | .612 |
| Item 19 | | | .619 | .459 |
| Item 20 | | | .823 | .589 |
| Item 21 | | | .755 | .536 |
| Item 22 | | **.368** | **.566** | .520 |
| Item 23 | | | .539 | .358 |
| Item 24 | | | .558 | .292 |

*Notes*: Factor 1= Emotional clarity; Factor 2= Emotional attention; Factor 3= Emotional repair. Factor loadings less than .3 were omitted. Bold indicates two substantial loadings for the same item.

**Table 4**
Correlations between factors and reliability of the TMMS-24 in Peruvian students (*n*= 210)

| Variables | Factor 1 | Factor 2 | % Variance | $\alpha_{ordinal}$ |
|---|---|---|---|---|
| Factor 1: Emotional clarity | - | | 40.39 | .89 |
| Factor 2: Emotional attention | .689 | - | 9.91 | .88 |
| Factor 3: Emotional repair | .621 | .530 | 6.42 | .87 |

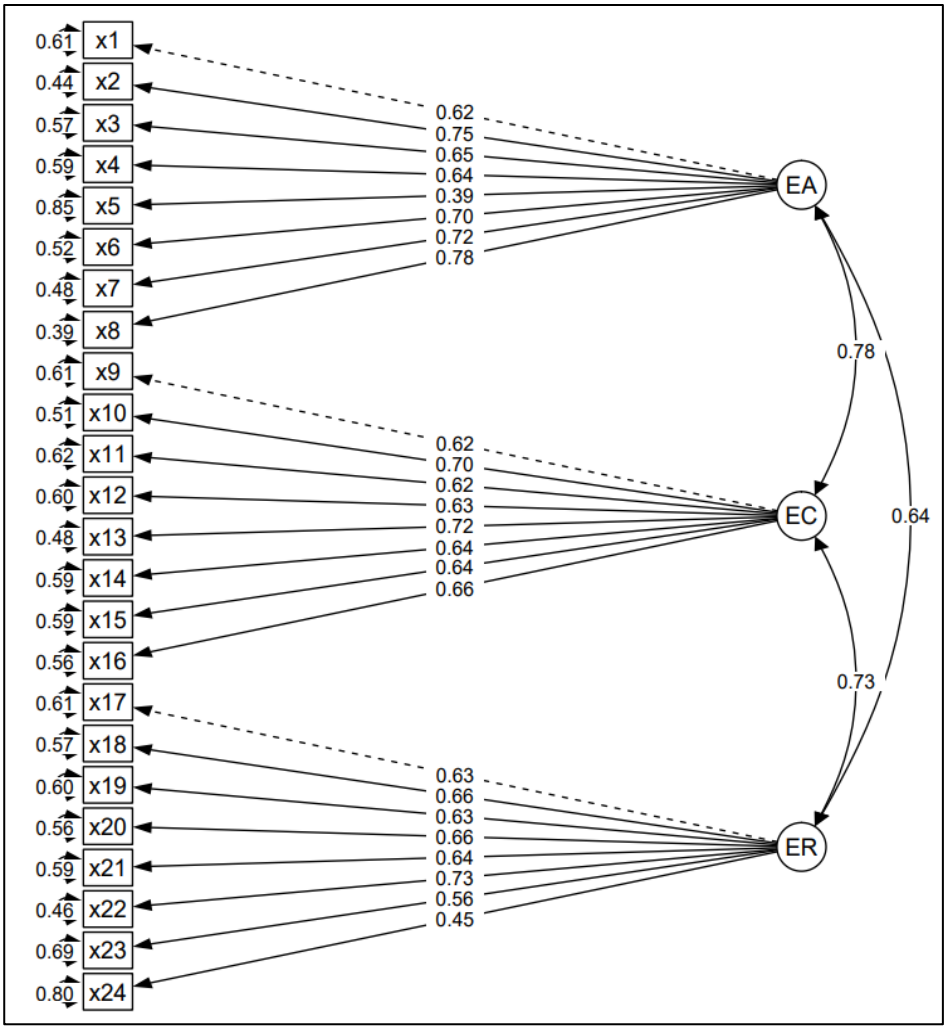
*Convergent and discriminant validity*

The convergent validity analysis was performed with the estimated values of the average variance extracted (AVE) for each factor ($AVE_{EA}$= .44, $AVE_{EC}$= .46, $AVE_{ER}$= .39), which do not exceed the acceptability criterion (AVE > .50); however, these values are not negligible either. Likewise, the composite reliability of each factor was estimated ($CR_{EA}$= .86, $CR_{EC}$= .85, $CR_{ER}$= .83), whose values were adequate (CR > .80). The analysis also suggests the absence of discriminant validity because the AVE values are higher than the squares of the correlations between the factors

(Table 5), except for the square of the correlation between the factors emotional attention (EA) and emotional control (EC).

**Figure 1**

Factor structure model of the TMMS24 in Peruvian students (*n*= 489)




*Notes*: EA= Emotional attention; EC= Emotional clarity; ER= Emotional repair. $\chi^2$= 385.868, *df*= 249, $\chi^2/df$= 1.549, *p*< .000, TLI= .963, CFI= .967, RMSEA= .034 (90% CI= .027-.040), SRMR= .041.

**Table 5**
Convergent and discriminant validity analysis (*n*= 489)

| Variables | AVE | Composite reliability | Emotional clarity | Emotional repair |
|---|---|---|---|---|
| 1. Emotional attention | .44 | .86 | .61 | .41 |
| 2. Emotional clarity | .43 | .86 | - | .53 |
| 3. Emotional repair | .39 | .83 | - | - |

## Discussion

The Trait Meta-Mood Scale (TMMS) is one of the most widely used instruments to measure perceived emotional intelligence (PEI), thus assessing an individual's perception of his or her emotional abilities in terms of general beliefs about attention to mood states, clarity of one's own mood experiences, and effort made to adjust mood states (Fernández-Berrocal et al., 2004). The main objective of this study was to analyze the psychometric properties of the TMMS-24 in a sample of Peruvian students.

In the EFA, this study shows that the TMMS-24 presents a 3-factor oblique structure. The three subscales correlate significantly, with attention and emotional clarity being the factors with the highest correlations. These results are consistent with those reported in other studies (Extremera et al., 2007; Fernández-Berrocal et al., 2006; Fernández-Berrocal et al., 2004) and reflect the existence of a functional sequence in the process of emotional regulation, since a certain level of attention to feelings is necessary to understand emotional states and a certain level of clarity of feelings is likewise required in order to adjust or modify them to a positive tone (Salguero et al., 2010).

The CFA allowed us to evaluate the factor structure of the TMMS-24, and the convergence of the items with theoretically established factors was analyzed. All items presented factor loadings above 0.5, except items 5 ("I let my feelings affect my thoughts") and 24 ("When I am angry I try to change my mood"), which were above 0.3 and 0.4, respectively, which may be acceptable (Fayers & Machin, 2007). Considering these criteria, in a similar study item 5 was deleted (Martín-Albo et al., 2010) and in another one the deletion of item 23 is suggested (Salguero et al., 2010). Thus, the version of the TMMS-24 in a population of Peruvian students retains the three-factor structure proposed in the TMMS-48 (Salovey et al., 1995) and in the Spanish adaptation (Fernández-Berrocal et al., 2004). This model presents good goodness-of-fit indices (Brown, 2006; Hu & Bentler, 1999). The fit indices (CFI and TLI) have values above 0.95.

There is another study that proposes a unidimensional and a three-dimensional model of TMMS in Chilean adolescents (Gómez-Núñez et al., 2018), where the goodness-of-fit indices (CFI and TLI) were low. In other similar studies, these indices resulted slightly lower than recommended (Delhom et al., 2017). However, in this study of the Peruvian version, satisfactory goodness-of-fit indices are presented (CFI > 0.95, TLI > 0.95), thus confirming the orthogonal three-factor structure reported

in studies with Spanish-speaking populations (del Mar Diaz-Castela et al., 2013; Espinoza-Venegas et al., 2015; Gómez-Núñez et al., 2018; Martín-Albo et al., 2010; Pedrosa et al., 2014; Salguero et al., 2012). Although another study reports a 4-factor structure (Aksöz et al., 2010), this may be due to sampling or cultural differences.

Regarding reliability, the ordinal alpha values for each factor of the TMMS-24 were satisfactory, so it presents high internal consistency (Terwee et al., 2007). These results are consistent with those of previous studies (Delhom et al., 2017; Extremera & Fernández-Berrocal, 2005; Martín-Albo et al., 2010; Salguero et al., 2012; Valdivia Vázquez et al., 2015).

On the other hand, considering the convergent and discriminant validity criteria proposed by Fornell and Larcker (1981), the results seem to show certain deficiencies of the TMMS-24. However, these results are not conclusive because convergent validity based on AVE may be affected by the number of observed variables or items, therefore the use of fixed cut-off points may be conflicting (Valentini & Damasio, 2016). Against this, it has been proposed that AVE values $< 0.50$, could also be considered acceptable if the number of items, standardized loadings $\geq 0.50$ and reliability coefficients higher than 0.70 are taken into account (Moral, 2019). Indeed, the composite reliability analysis for each factor yielded more than satisfactory values ($> 0.80$).

The discriminant validity analysis yielded unsatisfactory results. However, these results are also inconclusive because there is a debate about discriminant validity as a criterion for evaluating measurement scales. Although there are different methods of evaluating discriminant validity, this should not be done statistically because they can lead to erroneous conclusions about the suitability of the scales; on the contrary, this validity should be done theoretically, which is basically a content validity (Martínez-García & Martínez-Caro, 2009), which has been widely discussed and recommended by Borsboom et al. (2004).

Among the implications of the study, we highlight the availability of a valid and reliable version of the TMMS-24 for Peruvian students which is simple and quick to apply, and which can be useful in the field of educational management for the training of adolescents, as well as in clinical assessment, allowing for early detection in this crucial phase of human development. In addition, the use of this instrument to assess EI will facilitate the elaboration of baselines for the development of psychological intervention proposals for the management and control of emotions.

The limitations of this study are largely rooted in the lack of factorial invariance analysis. The differences in the dimensions of the TMMS may vary according to age and sex, it has been shown that in adult populations, women have a greater tendency to attend to their emotions and less clarity and repair compared to men (Fernández-Berrocal & Extremera, 2008; Thayer et al., 2003) and in adolescent populations, women have higher scores in attention than men. This difference becomes more pronounced as adolescents grow older, as differences begin to establish themselves throughout adolescence, mainly in its final stages (Salguero et al., 2010). That said, other studies suggest that people with better levels of

psychological adjustment are those who have moderate-low scores in the attention dimension and high scores in the clarity and repair dimensions (Extremera & Fernández-Berrocal, 2002; Salovey et al., 1995). Therefore, there is a need for further studies to demonstrate the factorial invariance of the TMMS in different populations.

In conclusion, this study presents the psychometric properties of the TMMS-24 to measure emotional intelligence in Peruvian students and can be used in future research in relation to other mental processes. Therefore, studies that demonstrate its concurrent predictive validity are recommended.

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