Psychometric properties of WLEIS as a measure of emotional intelligence in the Portuguese and Spanish medical students

Short title: Psychometric properties of WLEIS

Vânia Sofia Carvalho, PhD, Eloísa Guerrero, PhD, Maria José Chambel, PhD, Pablo González-Rico, PhD

Vânia Sofia Carvalho is a PhD, Faculty of Psychology, University of Lisbon.

Eloísa Guerrero is associate professor of organizational psychology, Faculty of Education, University of Extremadura.

Maria José Chambel is associate professor of organizational psychology, Faculty of Psychology, University of Lisbon.

Pablo González-Rico is a PhD of Faculty of Education, University of Extremadura.

Correspondence: Vânia Sofia Carvalho, email: vscarvalho@psicologia.ulisboa.pt, address: Alameda da Universidade, 1649-013, Lisboa, Portugal, Fax: 351 21 793 34 08, phone number: 351 21 794 36 00.
Highlights

- This validation study supports the use of a short scale to evaluate EI in medical students in Portugal and Spain;

- The four dimensions of WLEIS are confirmed;

- A positive correlation between EI and engagement was observed.
Abstract

The psychometric properties of Wong and Law’s (2002) Emotional Intelligence Scale (WLEIS) were analyzed. Participants were 954 medical students: 481 from the University of Extremadura (Spain) and 473 from the University of Lisbon (Portugal). Following Messicks’ validation framework, we analyzed the scale’s response process, internal structure and relationship with other variables (i.e., engagement). Descriptive statistics, scale reliability, item characteristics, and exploratory and confirmatory analyses supported the distribution of the sixteen items across four factors. Convergent validity analyzed through the $\rho_{vc} (\eta)$ index showed that all the factors were in the 50% criterion. The factors shared, on average, 23% of the variance showing adequate discriminant validity. Furthermore, the correlations among EI dimensions and engagement were all positive and significant. Overall, the WLEIS demonstrated good psychometric properties. Thus, this study ensures that WLEIS is a valid instrument in Portugal and Spain to evaluate EI in medical students.

Keywords: Emotional Intelligence Scale; Measure; Psychometric properties Engagement; Medical Students.

Introduction

Emotional Intelligence (EI) has been considered an emergent topic in different fields (Wong & Law, 2002). Remarkably, several studies have demonstrated how EI is positively
associated with well-being (self-acceptance, life satisfaction, somatic complaints and self-esteem) and with optimal functioning (Carmeli, Yitzhak-Halevy & Weisberg, 2009; Costa, Petrides & Tillmann, 2014; Ryan & Deci, 2001). On the other hand, other studies have recognized that EI is an important skill in patient care (Neumann, et al. 2011; Taylor, Farver & Stoller, 2011) and there have been recent calls for further EI research in medicine (i.e., Cherry, Fletcher, O’Sullivan & Dornan, 2014). In fact, it may be considered that underpins the six core competencies for medicine, namely patient-care, professionalism, system-based practice, interpersonal and communication skills, medical knowledge and practice-based learning and improvement (Arora et al., 2010). Higher EI levels contribute positively to the doctor-patient relationship, to increase empathy, teamwork and communication skills, to stress management and organizational commitment and leadership. Thus, the modern medical curriculum requires the development of EI (Arora et al., 2010; Taylor, Farver & Stoller, 2011) and efforts have been made to include EI measures in the selection process of medical applicants (Carrothers, Gregory & Gallagher, 2000). Different studies have confirmed the relevance of EI in medicine. For example, Arora et al. (2011) showed that EI was crucial for the recovery of medical students from situations that had triggered high stress. Smith et al. (2012), in a study examining the relationship between EI and worry at different stages of a cancer diagnosis, concluded that low EI is predictive of increased worry levels in the early stages of the cancer diagnosis. Pau, Croucher, Sohanpal, Muirhead and Seymour (2004) showed that EI was very important to develop a good doctor-patient relationship and to read and manage emotions or traumatic experiences. Additionally, Elam highlighted that EI was imperative to establish positive relationships among members of the healthcare team (Elam, 2000).

EI has been conceptualized in two streams: the mixed-trait ability and the ability model (Goldenberg, Matheson & Mantler, 2006). Mixed-trait ability incorporates a wide
range of personality characteristics and other traits to describe EI (Bar-On, 2001; Goleman, 1995, 1998; Petrides & Furnham, 2001). This stream is criticized mainly for not embodying any conceptualization of emotion and for incorporating multiple aspects of personality (e.g., optimism, motivation, and capacity to engage in relationships) without establishing a relationship with emotion and intelligence (Goldenberg et al., 2006; Matthews, Roberts & Zeidner, 2004). In the ability model, the most influential authors are Salovey and Mayer (1990, p.189) who describe EI as “the subset of social intelligence that involves the ability to monitor one’s own and others’ feelings and emotions, to discriminate among them and to use this information to guide one’s thinking and actions”. In short, this framework makes it possible to pinpoint the specific skills required to understand and experience emotions most adaptively (Salovey & Mayer, 1990). At this level, EI is described in three domains: 1) the accurate appraisal and expression of emotion (in self and in other people); 2) the adaptive regulation of emotion (in self and in other people) and (3) the utilization of emotions to plan and motivate action (Salovey, Hsee, & Mayer, 1993). Despite broad acceptance of Salovey and Mayer’s framework (Goldenberg et al., 2006), there is no consensus as to how it can be assessed (Davies et al., 1998; Conte, 2005). In fact, performance-based measures and self-reported measures may be distinguished (Goldenberg et al., 2006). The first considers that EI should be evaluated through problem-solving in order to evaluate whether the answer is correct, i.e. indicative of high EI. The second considers that EI should be measured by asking people about their own level of EI. In the performance-based measures approach, two measures developed in an intelligence testing tradition have gained prominence: the Multifacet Emotional Intelligence Scale (MEIS) (Mayer, Salovey, Caruso, 1997) and the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) (Mayer, Salovey & Caruso, 1999). The MEIS includes more than 402 items and takes 1 to 2 hours to complete (Wong & Law, 2002) and has different methods to identify correct answers (i.e., target scoring,
consensus scoring, and expert scoring). As this scale presented low reliability and some problems with scoring procedures, the authors developed the MSCEIT (Conte, 2005). The MSCEIT consists of 141 items and takes 30-45 minutes to complete. Nevertheless, as also in the case of the MEIS, there is a pool of critics against this measure: there is no consensus among experts in the evaluation of response; the length of time to administer the test; the high costs of their application (Conte, 2005; Goldenberg et al., 2006).

Among the self-reported measures, we can distinguish the Self-Reported Emotional Intelligence Scale (SREIS; Schutte et al., 1998) and the Wong and Law Emotional Intelligence Scale (WLEIS; Wong & Law, 2002). The SREIS (Schutte et al., 1998) has 33 items and is represented in a one factor-solution. The WLEIS (Wong & Law, 2002) contains sixteen items with a four-factor solution distributed across four dimensions: Self Emotion Appraisals (SEA) – Ability to understand deep emotions and to express these emotions naturally; Others’ Emotion Appraisals (OEA) - Ability to perceive and understand the emotions of others; Regulation of Emotion (ROE) - Ability to self-regulate emotions, which will enable a more rapid recovery from psychological distress; Use of Emotion (UOE) – Individuals’ ability to make use of their emotions by directing them towards constructive activities and personal performance.

Compared to performance-based EI measures, the self-reported measures have received more psychometric support and are also simpler to administer. On the other hand, considering self-reported measures, the WLEIS it is shorter and has a four-factor structure that seems to be more reliable to represent the Salovey and Mayer (1990) EI framework. Thus, our purpose was to evaluate the psychometric properties of the WLEIS in a field that calls for more studies in EI (Cherry, et al., 2014), that is, the medical students’ context in two countries, Portugal and Spain.
The WLEIS had already presented adequate psychometric evidence in previous studies. For example, BitmiŞ and Ergeneli (2013) investigated the construct validity of the WLEIS with a sample of nurses in Turkey and confirmed the validity of the scale. Libbrecht, Beuckelaer, Lievens and Rockstuhl (2014) concluded that the WLEIS is invariant across a sample of populations in Singapore and Belgium. Moreover, Shi and Wang (2007) validated the use of the WLEIS with Chinese university students. Hence, we believe that it might also be suitable to analyze the WLEIS in the context of Portuguese and Spanish medical students. This study, therefore, sets out to analyze the WLEIS psychometric properties in these two languages, which are broadly spoken in different countries with a very large number of people worldwide. It should be noted that previous research conducted in Portugal and in Spain proved that the WLEIS is reliable for the Portuguese and Spanish context (Rodrigues, Rebolo, & Coelho, 2011; Fernandez-Berrocal; Pérez, Repetto & Extremera, 2004). Hence, these studies were considered in our translation procedure.

In order to conduct this study, we set out to use the Messicks’ validation framework (1995), which looks for multiple sources of evidence. More specifically, we followed the steps of the response process, internal structure and relationship to other variables.

To accomplish the step ‘relationship with other variables’, we decided to test the relationship of medical students’ EI with their engagement. Engagement is defined as a positive, fulfilling, work-related state of mind (Schaufeli, Salanova, González-Romá, Bakker, 2002), implying a high level of energy and involvement with work and is dependent on the resources (Demerouti, Bakker, De Jonge, Janssen, & Schaufeli 2001; Schaufeli & Salanova, 2007). In fact, researchers have explored a large number of potential causes of engagement and, according to the meta-analysis performed by Halbesleben et al. (2010), all the studies suggest that resources should increase work engagement. As a result, EI may be related to work engagement as this personal resource may facilitate motivation and involvement with
work. Vigor, dedication and absorption are considered to be the dimensions that characterize engagement (Schaufeli & Bakker, 2004). Vigor is translated as high levels of energy and mental resistance as well as the desire and capacity to invest effort in work. Dedication is a feeling of relevance, enthusiasm, inspiration, pride and challenge geared towards work. Absorption is a sense of being fully concentrated and happily engrossed in one’s work, so that time passes quickly and detaching oneself from work may seem difficult. Despite engagement being originally presented to include these three dimensions, recent empirical studies have shown that vigor and dedication are its core dimensions (Llorens, Bakker, Schaufeli & Salanova, 2007). Therefore, engagement was measured using only these two dimensions. Students’ engagement is considered to represent a likely antidote to a decline of academic motivation and achievement (Fredricks, Blumenfeld & Paris, 2004). Moreover, a study reported that engaged physicians tended to have greater choice and independence at work, a profound approach to work, a more supportive work environment, were more extroverted and more conscientious, and, finally, reported higher self-esteem (McManus, Jonvik, Richards & Paice, 2011). Thus, it is important to ascertain whether EI is a crucial variable in the prediction of engagement in medical students.

**Method**

**Participants**

In 2014, we recruited first to sixth year undergraduate medical students from the Faculty of Medicine, University of Extremadura, Spain, and the University of Lisbon, Portugal. It should be noted that students in their fifth and sixth years have practical clinical experience. The students from the University of Extremadura consisted of 481 students (314 female = 65.3%; 167 male = 34.7%; 83 first year = 17.3%; 98 second year = 20.4%; 57 third year = 11.9%; 88 fourth year = 18.3%; 65 fifth year = 13.5%; 90 sixth year = 18.7%, mean
age = 21.3 years). The students from the University of Lisbon consisted of 473 students (331 female = 70%; 142 male = 30%; 65 first year = 13.7%; 85 second year = 18%; 101 third year = 21.4%; 104 fourth year = 22%; 102 fifth year = 21.6%; 16 sixth year = 3.4%; mean age = 21.2 years). The Faculty’s local ethics committee granted ethical approval for this study.

Response process

We encouraged all the students who met the inclusion criteria to report their comprehension and availability for the purpose of this study. Participation was voluntary, anonymous and did not involve any compensation. From a population of 1657 medical students, 1003 questionnaires (60.5%) were collected. Given the robust sample size, we chose to exclude from our analyses 49 questionnaires that lacked complete data. Thus, our final sample consisted of 954 (57.6%) questionnaires. Of these, 481 (50.4%) were questionnaires answered by Spanish medical students and 473 (49.5%) were questionnaires answered by Portuguese medical students. The questionnaires were administered in paper format at the beginning of a class with the approval of the teacher. Instructions were written on the questionnaire and we also explained orally to the students that the questionnaire was related to various aspects of their student life and the way they felt on a day-to-day basis. Additionally, we also explained that the questionnaire was not a test, and so there would be no right or wrong answers. It should also be noted that the students in both universities are familiar with this type of questionnaire and they were also informed that they would have the opportunity to receive feedback of the overall results. The questionnaire took around 10 minutes to complete.

Measures
EI was measured with the Wong and Law Emotional Intelligence Scale (Wong & Law, 2002) containing 16 items and four sub-scales, with four items: Self Emotion Appraisals (SEA), Others’ Emotion Appraisals (OEA), Regulation of Emotion (ROE), and Use of Emotion (UOE). The survey questions for each of the four dimensions, shown in Table 2, were randomly included throughout the questionnaire to avoid response bias. The response format of the WLEIS is a 7-point Likert-type scale (0 = totally disagree; 6 = totally agree). We followed the Brislin’s (1980) translation-back translation procedure to analyze the previous WLEIS translations and verified that the Portuguese version had undergone minor alterations (Rodrigues, Rebelo, & Coelho, 2011) while the Spanish version remained similar (Fernandez-Berrocal et al., 2004). Additionally, Students from both universities had previously read the questionnaire and confirmed the clarity and familiarity of all items.

Engagement was measured with the Utrecht Work Engagement Scale for Students (UWES-S). We used a version of the validated student short form of engagement developed by Schaufeli, Martinez, Marques-Pinto, Salanova and Bakker (2002). This questionnaire included the dimensions of: vigor (3 items; e.g., “When studying I feel strong and vigorous”) and dedication (2 items; e.g., “I am enthusiastic about my studies”). The response format of the UWES-S is a 6-point Likert-type scale (1 = never; 6 = every day). We used the translated versions provided by Schaufeli on his website (Schaufeli, online).

Statistical analyses

The response process is the evidence of data integrity so that all sources of error associated with the test administration are controlled or eliminated to the maximum extent possible (Downing, 2003).

The internal structure is the examination of the psychometric characteristics of the questionnaire. This step includes the examination of descriptive statistics (i.e., mean, median,
standard deviation and variance), item characteristics (i.e., item difficulty and item discrimination) and the score reliability. We also performed an exploratory factor analysis followed by a confirmatory factor analysis. In order to accomplish these analyses we randomly split the data on SPSS. Thus, we applied an exploratory factor analysis to 50% of the sample, randomly selected, and also a confirmatory analysis to a further 50% of the sample that was also randomly selected. The exploratory factor analysis was calculated using SPSS version 19.0 (SPSS Inc., Chicago, IL, USA). A principal components analysis (PCA) was conducted for the extraction of the factor with orthogonal rotation whenever two or more factors emerged. In order to conduct the confirmatory factor analysis, we used AMOS version 19.0 program (Amos, Chicago, IL, USA). Five competing models were created to examine whether all the constructs were better represented by one factor model or by the four research-factors model, as recommended in the literature. The overall goodness of fit was based on the combination of several fit indexes. The models were compared based on chi-square difference tests and other fit indexes: the standardized root mean square (SRMR), the Bentler comparative fit index (CFI), the Tuckler Lewis index (TLI), and the root mean square error of approximation (RMSEA). Levels of 0.90 or higher for TLI and CFI and levels of 0.06 or lower for RMSEA, combined with levels of 0.08 or lower for SRMR, indicated that the models fit the data reasonably well (Arbuckle, 2003). We also examined the convergent and discriminant validity of the theoretical model (Model 1) using three procedures. First, we used a stringent procedure outlined by Fornell and Larcker (Fornell & Larcker, 1981) and recommended by Podsakoff and colleagues (Podsakoff, MacKenzie, 2003). Second, as suggested by Byrne (2007) we performed a multiple group analysis with the total sample (N = 954), to inspect the invariance across both samples (baseline model). The fit of this model was subsequently compared to an alternative model (fully constrained model), in which we constrained all coefficient paths to be equal in both samples. Finally, we performed a series of
increasingly more restrictive tests, where the chi-squared value of the various models with constrained parameters was compared with the baseline model to inspect the location of non-variance. Where the difference between the chi-squared values was non-significant, we included this constraint successively in the next model until we reached a final model.

Finally, the relationship with other variables was analyzed through the correlation between a newer measure and a measure that is well known (Schaufeli, et al., 2002). Thus we analyzed the correlation coefficient values between the WLEIS dimensions and engagement. Below, we present the results following the described steps.

**Results**

**Internal Structure**

Correlations, means and standard deviations are presented in Table 1. Concerning item characteristics, we observed through the item response percentage that medical students used all points of the Likert-type scale (Table 2). Moreover, the total item-correlation indicated that all 16 items have good discriminant power since all of them presented values above .30. In fact, the item with most power was item 16 (“I have good control of my own emotions”) and the item with least power was item 7 (“I am sensitive to the feelings and emotions of others”). The WLEIS presented good internal-consistency reliability for the four sub-scales since the Cronbach’s alpha was higher than .81 (SEA = .83; OEA = .82; ROE=.85; UOE=.89). The Cronbach’s alpha for engagement was also adequate: vigor = .77 and dedication = .72.

We then performed an exploratory factor analysis (Table 3). In order to decide whether or not to perform an orthogonal rotation or an oblique rotation, we followed the recommendations of Tabachnick and Fidell (2007). Thus, we first performed an oblique rotation (i.e. direct oblimin) in order to verify whether there were correlations around .32 and
above among factors. As correlations were below .32 the solution remained orthogonal. Hence, we performed a varimax rotation.

Multiple criteria for determining the number of factors to retain were used including eigenvalues greater than 1.0 and explained variance of over 60% (Ford, MacCallum, Tait, 1986; Kim & Mueller, 1978; Stevens, 1992). Furthermore, we attempted to retain only items that loaded at .50 or higher on the intended factor and less than .30 on all other factors. The measure resulted in four factors composed of 16 items. The eigenvalues for the four factors were 5.57, 2.25, 1.72 and 1.48, respectively. Together, they explained 68.87% of the variance. All the factors had four items that corresponded to each type of EI (Table 2).

Confirmatory factor analysis supported the model with four factors (i.e., SEA, OEA, ROE, and UOE) that corresponded to our theoretical model (Model 1) showing a good fit (Table 4). Other models showed a significantly lower fit in the Single Factor Model (Model 2) in which all items loaded on a single latent variable, as well as on other alternative tested models. Thus, the theoretical model was the one that showed the best fit. In figure 1 we present the factor loadings and we can see that no error variance was correlated.

In terms of convergent validity, we computed the $\rho_{vc}(\eta)$ index, which denotes the proportion of variance in the items explained by the underlying factor. The $\rho_{vc}(\eta)$ values of SEA ($\rho_{vc}(\eta) = 43\%$), OEA ($\rho_{vc}(\eta) = 48\%$), UOE ($\rho_{vc}(\eta) = 30\%$), and ROE ($\rho_{vc}(\eta) = 45\%$) were below the 50% criterion reported by Fornell and Larcker (1981).

In terms of discriminant validity, the four factors shared, on average, 23% of the variance (range 13% to 31%). Additionally, the variance shared among the other alternative
models studied was always less than the variance in items explained by each of the four factors of the theoretical model, satisfying the discriminant validity criterion reported by Fornell and Larcker (1981).

Table 5 shows the results of the multiple group analysis. The baseline model \( (N = 954) \) showed an acceptable fit. Subsequently, we performed the full constrained model. Compared with the baseline model, the difference between the chi-squared values was significant. We compared the baseline model with several alternative models, which differed in number and type of parameters that were assumed to be invariants. When we compared the baseline model with the measurement model invariant (factor loadings), we found that the difference between the Portuguese and Spanish samples was significant. However, we also found that the main difference between the two samples was in item 6 (“I am a good observer of others’ emotions”) that presents a factor loading of .90 in the Portuguese sample and a factor loading of .52 in the Spanish sample. In contrast, the smallest difference between the two samples was in item 13 (“I am able to control my temper and handle difficulties rationally”) that presented a factor loading of .77 in both samples. The factor loadings range from .54 to .92 in the Portuguese sample and the factor loading variance ranges from .52 and .90 in the Spanish sample. Thus, despite the significant difference between samples, we also found that this variance was mostly restricted to one specific item. Finally, we performed subsequent iterative tests to inspect the location of invariance across the samples. These tests, which led us to a final model, were performed by adding one constraint in a specific path. If a non-significant difference in the Chi-squared value resulted from the comparison between the baseline model and this new model, then support was provided for the invariance across the two samples in this specific constrained path. Then, we proceeded to test the variance in another specific path until we attained a final model. The final model exhibited an acceptable
fit ($\chi^2$ (192) = 454.1, $p < .001$, SRMR = .05; CFI = .97; TLI = .96; RMSEA = .04), non-significantly better than the baseline model $\Delta \chi^2 = 3.5$ n.s.; df= 2 (Table 5).

**Relationship with other variables**

Table 1 presents the differential relationships between engagement (vigor and dedication) and the four dimensions of EI examined. As expected, we found that the different dimensions of EI were positively and significantly related to dimensions of engagement; the correlations ranged from .17 to .41 ($p < .01$).

Additionally, ANOVAs were performed to verify the possible differences between male and females’ responses and the year of training regarding EI dimensions. Only the dimensions of OEA and UOE were different among males and females. More specifically, females presented 4.52 and males 4.33 as the mean in OEA ($F = 4.85; p < .01$) and females presented 3.81 and males 4.17 in UOE ($F = 11.80; p < .00$). Thus, females perceived and understood the emotions of others easily while males perceived their ability to make use of their emotions by directing them towards constructive activities and personal performance. As regards the EI differences among the years of training, the results did not provide significant differences.

**Discussion**

The present study has demonstrated that the WLEIS (Wong & Law, 2002) is a valid instrument to apply to Portuguese and Spanish medical students. Through the response process, WLEIS items proved to be correctly understood by students. The internal structure was analyzed by means of several procedures and the results corresponded to those originally anticipated, that is, four distinct dimensions and sixteen items evaluating EI. Hence, the descriptive analyses and item characteristics confirm that each item is important in order to
measure the EI. As in the original scale, the exploratory and confirmatory factor analyses of the WLEIS confirm a four-factor structure in these two different samples. This finding is consistent with the definition of EI as a multidimensional construct. The factors are also similar to four factors in the conceptual model of Salovey and Mayer (1990). Moreover, the internal-consistency reliability results of the current study are similar to other validity studies of the WLEIS. For instance, Bitmiş and Ergeneli (2014) reassessed the construct validity of the WLEIS and found that the scale presented adequate consistency (e.g., from .81 to .89). We also found support for the convergent and discriminant validity of the four factors that was needed to support the self-reported measures approach (Conte, 2005). Thus, this inventory seems to have a stable structure. Furthermore, this study examined the invariance of the WLEIS across two samples of medical students: Spanish and Portuguese. More specifically, we found that the WLEIS items seemed to be invariant across samples.

The results also showed that the four dimensions of the WLEIS are related to two dimensions of Engagement: dedication and vigor. With regard to this correlation, it is also important to note the shared variance between the four sub-scales of the WLEIS and the two sub-scales of engagement ranging from .16 (Vigor and OEA) to .43 (Dedication and ROE). The reason for this relatively small shared variance could be related to the fact that organizational resources – work, team and organizational characteristics - are determinant predictors of engagement (Bakker & Demerouti, 2007). In a specific study with students, Reeve, Jang, Carrell, Jeon and Barch (2004) observed that engagement was enhanced by increasing teachers’ autonomy support. Furthermore, Hijzen, Boekaerts and Vedder (2006) also pointed out that engagement cannot be understood separately from the organizational resources, namely task, teacher, and group characteristics. Since EI is a personal resource, it was not expected to be so highly correlated with engagement dimensions. However, some authors of the JD-R model have recognized the need to expand the model by including
personal resources (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2007). Hence, future studies should analyze the additive effects or moderating effects between students’ EI and organizational resources in order to explain students’ engagement.

The results of this study revealed that females have higher EI scores on other emotions appraisal and males have high scores on use of emotions. This result is in line with the study of Mandell and Pherwani (2003) which found that women, in comparison with men, scored higher on certain components (for example, empathy and social skills) and lower on other components (for example, motivation and self-regulation). However, the results did not reveal any differences in other dimensions. One explanation for this result may be related to the argument put forward by Goleman (1995), namely that males and females have their own personal profiles in EI. Furthermore, results revealed that EI did not decline or increase over the years of training in Portuguese and Spanish contexts. This result is contrary to what the majority of studies reveal, namely that EI declines over the years of training (Neumann et al., 2011). As the research performed by Neumann and colleagues was mainly based on longitudinal data, this result might be due to the cross-sectional characteristics of the present study. Future studies should explore this analysis longitudinally.

On a final note, this study has presented characteristics to vouch for this scale as being suitable for the development of comprehensive knowledge of EI dimensions. Unlike other approaches, such as performance-based tests, the WLEIS presents consistency to capture all EI dimensions with a simple application process since it is a shorter scale. Thus, in line with previous studies that tested the WLEIS in different contexts (Bitmioğlu & Ergeneli, 2013; Libbrecht, et al. 2014; Shi & Wang, 2007), this scale is also reliable to apply to medical students of differing languages, namely Portuguese and Spanish.

This study has limitations, including its use of cross-sectional data, and we have not tested whether this measure is distinct from other EI measures. Another concern could be that
the present study relied on self-reports, which may have led to method variance or socially desirable responses. Another shortcoming is related to the choice of engagement to evaluate the relationship of EI with other variables. Despite the acknowledged importance of engagement to medical students, this variable is widely used to explain well-being at work. Therefore, other variables closer to emotions should be analyzed. We strongly recommend that future studies analyze the WLEIS relationship with, for instance, self-awareness, empathy and core-self-evaluation.

Nevertheless, there are several strengths that are worthy of mention. These strengths include the successful validation of the WLEIS based on four dimensions, the use of a two-country sample in this validation, the large sample size and the participation of students who have one to six years of university education. Thus, we believe that the WLEIS provides a simple tool for assessing EI in medical students.

Conclusions:

The WLEIS demonstrated the ability to measure EI in medical students in Portuguese and Spanish contexts. The psychometrics properties of this self-reported instrument also demonstrated the positive relationships between EI dimensions and engagement.
Appendix
Spanish translated items

Scale

0: Nunca
1: Casi nunca / Un par de veces al año
2: Raramente / Una vez al mes
3: Algunas veces / Un par de veces al mes
4: A menudo / Una vez a la semana
5: Frecuentemente / Un par de veces a la semana
6: Siempre / Todos los días

1. Soy bastante sensible de por qué tengo ciertos sentimientos la mayoría del tiempo
2. Tengo buen conocimiento de mis propias emociones
3. Realmente entiendo lo que siento
4. Siempre sé si soy o no soy feliz
5. Siempre reconozco las emociones de mis paciente por su comportamiento
6. Soy un buen observador/a de las emociones de los demás
7. Soy sensible a los sentimientos y las emociones de los demás
8. Comprendo las emociones de la gente de mi alrededor
9. Siempre establezco metas por mí mismo/a y luego me esfuerzo para lograrlas
10. Siempre me digo a mí mismo/a que soy una persona competente
11. Soy una persona que se automotiva
12. Siempre me animo a mi mismo para esforzarme al máximo
13. Puedo controlar mi temperamento para hacer frente a las dificultades de manera racional
14. Soy perfectamente capaz de controlar mis propias emociones
15. Puedo calmarme rápidamente cuando estoy muy enojado/a
16. Tengo un buen control de mis emociones
Portuguese translated items

0: Nunca
1: Quase nunca / Algumas vezes por ano
2: Raramente / Uma vez por mês
3: Às vezes / Algumas vezes por mês
4: Bastante / Uma vez por semana
5: Frequentemente / Algumas vezes por semana
6: Sempre / Todos os dias

1. Apercebo-me realmente dos meus sentimentos a maior parte do tempo
2. Compreendo as minhas emoções
3. Realmente percebo o que sinto
4. Sei sempre se sou ou não feliz
5. Reconheço sempre as emoções dos outros pelo seu comportamento
6. Sou um bom observador/a das emoções dos outros
7. Sou sensível aos sentimentos e emoções dos outros
8. Compreendo as emoções dos que me rodeiam
9. Defino sempre metas para mim mesmo/a e depois tento alcançá-las
10. Sempre digo a mim mesmo/a que sou uma pessoa competente
11. Sou uma pessoa auto-motivada
12. Incentivo-me sempre a fazer o meu melhor
13. Consigo controlar o meu temperamento para lidar com as dificuldades racionalmente
14. Sou perfeitamente capaz de controlar as minhas próprias emoções
15. Posso acalmar-me rapidamente quando estou muito irritado/a
16. Tenho um bom controle das minhas emoções
References


with medical students and residents. *Academic Medicine, 86*, 996-1009. doi:
http://dx.doi.org/10.1097/ACM.0b013e318221e615


http://dx.doi.org/10.1037/0021-9010.88.5.879

http://dx.doi.org/10.1023/B:MOEM.0000032312.95499.6f


Figure Captions

Figure 1. Parameter estimates of the CFA
### Tables

#### Table 1. Means, standard deviations and correlations between EI and engagement for the total sample *

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>Cronbach’s alpha</th>
<th>r Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1. SEA</td>
<td>4.6 (.92)</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>2. OEA</td>
<td>4.5 (.93)</td>
<td>.82</td>
<td>.35**†</td>
</tr>
<tr>
<td>3. ROE</td>
<td>4.5 (1.04)</td>
<td>.85</td>
<td>.36**</td>
</tr>
<tr>
<td>4. UOE</td>
<td>3.9 (1.07)</td>
<td>.89</td>
<td>.41**</td>
</tr>
<tr>
<td>5. VIG</td>
<td>3.28 (1.07)</td>
<td>.77</td>
<td>.20**</td>
</tr>
<tr>
<td>6. DED</td>
<td>4.51 (1.07)</td>
<td>.72</td>
<td>.25**</td>
</tr>
</tbody>
</table>

* The 954 students from first-year to the sixth-year responded to Wong and Law Emotional Intelligence Scale at the Faculty of Medicine, University of Extremadura, Spain and University of Lisbon, Portugal.

† **P < .01

EI: Emotional Intelligence; SEA: Self-emotion appraisal; OEA: Others’ emotion appraisal; ROE: Regulation of emotion; UOE: Use of emotion; VIG: Vigor; DED: Dedication.
Table 2. Univariate Statistics for WLEIS Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Percentage of responses</th>
<th>Item total-correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-emotion appraisal (SEA)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I have a good sense of why I have certain feelings most of the time.</td>
<td>2 1.1 1.5 10 18.3 43 25.8</td>
<td>.46</td>
</tr>
<tr>
<td>2. I have good understanding of my own emotions.</td>
<td>.1 .7 2.5 10.7 21.1 42.6 22.2</td>
<td>.59</td>
</tr>
<tr>
<td>3. I really understand what I feel.</td>
<td>.2 .9 3.6 14.4 26.5 35.9 18.5</td>
<td>.60</td>
</tr>
<tr>
<td>4. I always know whether or not I am happy.</td>
<td>.5 1.2 4.1 16.1 21.5 31 25.7</td>
<td>.51</td>
</tr>
<tr>
<td><strong>Others’ emotion appraisal (OEA)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I always know my friends’ emotions from their behavior.</td>
<td>.2 .9 4.3 20.6 32.5 32.8 8.6</td>
<td>.43</td>
</tr>
<tr>
<td>6. I am a good observer of others’ emotions.</td>
<td>.2 1 3.4 14.3 26.8 36.2 18</td>
<td>.46</td>
</tr>
<tr>
<td>7. I am sensitive to the feelings and emotions of others.</td>
<td>.3 1.1 2.4 10 23.1 36.1 27</td>
<td>.31</td>
</tr>
<tr>
<td>8. I have good understanding of the emotions of people around me.</td>
<td>.1 .8 1.8 13.8 31.3 38.7 13.5</td>
<td>.50</td>
</tr>
<tr>
<td><strong>Use of emotion (UOE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I always set goals for myself and then try my best to achieve them.</td>
<td>.3 .6 2.3 10.2 15.1 34.3 37.1</td>
<td>.40</td>
</tr>
<tr>
<td>10. I always tell myself I am a competent person.</td>
<td>.8 2.0 8.1 22.9 22.1 28 16.1</td>
<td>.49</td>
</tr>
<tr>
<td>11. I am a self-motivated person.</td>
<td>.9 1.9 6.1 15.3 21.5 31.6 22.7</td>
<td>.55</td>
</tr>
<tr>
<td>12. I would always encourage myself to try my best.</td>
<td>.3 1.3 3.2 11.2 21.3 34.7 28</td>
<td>.49</td>
</tr>
<tr>
<td><strong>Regulation of emotion (ROE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I am able to control my temper and handle difficulties rationally.</td>
<td>.5 1.1 5.9 19.1 29 31.3 13</td>
<td>.57</td>
</tr>
<tr>
<td>14. I am quite capable of controlling my own emotions.</td>
<td>.6 2.3 9.5 21.5 31.7 25.7 8.8</td>
<td>.60</td>
</tr>
<tr>
<td>15. I can always calm down quickly when I am very angry.</td>
<td>1.8 4 12.9 26.8 26.5 20.1 7.9</td>
<td>.51</td>
</tr>
<tr>
<td>16. I have good control of my own emotions.</td>
<td>3 2.3 8.8 22.9 31.7 25.4 8.6</td>
<td>.64</td>
</tr>
</tbody>
</table>

Table 3. Exploratory factorial analysis

<table>
<thead>
<tr>
<th>Self-emotion appraisal (SEA)</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-emotion appraisal (SEA)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To perform the exploratory analysis we used the random sample of cases in *SPSS* and we analyzed approximately 50% of all cases, \( n = 477 \). Table 4. Structural equation models’ results for the WLEIS⁴

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>( \text{df} )</th>
<th>SRMR</th>
<th>CFI</th>
<th>TLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Theoretical model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>One latent factor model (with all 16 items grouped in one latent variable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Two latent factors model (first latent variable = self-emotion appraisal + others’ emotion appraisal; second latent variable = use of emotion + regulation of emotion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Two latent factors model (first latent variable = self-emotion appraisal + regulation of emotion; second latent variable = others’ emotion appraisal + use of emotion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Two latent factors model (first latent variable = self-emotion appraisal + use of emotion; second latent variable = others’ emotion appraisal + regulation of emotion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: To perform the exploratory analysis we used the random sample of cases in *SPSS* and we analyzed approximately 50% of all cases, \( n = 477 \) Table 4. Structural equation models’ results for the WLEIS⁴

⁴ Model 1: Theoretical model; Model 2: One latent factor model (with all 16 items grouped in one latent variable); Model 3: Two latent factors model (first latent variable = self-emotion appraisal + others’ emotion appraisal; second latent variable = use of emotion + regulation of emotion); Model 4: Two latent factors model (first latent variable = self-emotion appraisal + regulation of emotion; second latent variable = others’ emotion appraisal + use of emotion); Model 5: Two latent factors model (first latent variable = self-emotion appraisal + use of emotion; second latent variable = others’ emotion appraisal + regulation of emotion); \( \text{df} \): degree of freedom; SRMR: Standardized root mean square; CFI: Bentler comparative fit index; TLI: Tuckler Lewis index;
Note: We used the sample of participants that were not selected for Exploratory Factor Analysis (N = 504).

<table>
<thead>
<tr>
<th>Models</th>
<th>Chi-square</th>
<th>df</th>
<th>p</th>
<th>Delta chi-square</th>
<th>SRMR</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>90% confidence interval of RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>312.01</td>
<td>98</td>
<td>.00</td>
<td></td>
<td>.05</td>
<td>.95</td>
<td>.93</td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2033.62</td>
<td>104</td>
<td>.00</td>
<td>Compare to model 1</td>
<td>.14</td>
<td>.50</td>
<td>.43</td>
<td>.19</td>
<td><strong>Δ Chi- square = 1721.61</strong>, df = 6</td>
</tr>
<tr>
<td>3</td>
<td>1494.18</td>
<td>103</td>
<td>.00</td>
<td>Compare to model 1</td>
<td>.13</td>
<td>.64</td>
<td>.58</td>
<td>.16</td>
<td><strong>Δ Chi- square = 1182.17</strong>, df = 5</td>
</tr>
<tr>
<td>4</td>
<td>1588.58</td>
<td>103</td>
<td>.00</td>
<td>Compare to model 1</td>
<td>.14</td>
<td>.62</td>
<td>.55</td>
<td>.17</td>
<td><strong>Δ Chi- square = 1276.57</strong>, df = 5</td>
</tr>
<tr>
<td>5</td>
<td>1736.92</td>
<td>103</td>
<td>.00</td>
<td>Compare to model 1</td>
<td>.16</td>
<td>.58</td>
<td>.51</td>
<td>.18</td>
<td><strong>Δ Chi- square = 1424.91</strong>, df = 5</td>
</tr>
</tbody>
</table>

### Models

<table>
<thead>
<tr>
<th>Models</th>
<th>N</th>
<th>Chi-squared</th>
<th>p</th>
<th>df</th>
<th>Delta chi-square</th>
<th>SRMR</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>90% confidence interval of RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish sample</td>
<td>481</td>
<td>206.4</td>
<td>.00</td>
<td>95</td>
<td></td>
<td>.05</td>
<td>.97</td>
<td>.96</td>
<td>.05</td>
<td>[.04 - .06]</td>
</tr>
<tr>
<td>Portuguese sample</td>
<td>473</td>
<td>244.3</td>
<td>.00</td>
<td>95</td>
<td></td>
<td>.05</td>
<td>.96</td>
<td>.96</td>
<td>.06</td>
<td>[.05 - .07]</td>
</tr>
<tr>
<td>Baseline model – two samples</td>
<td>954</td>
<td>450.7</td>
<td>.00</td>
<td>190</td>
<td></td>
<td>.05</td>
<td>.97</td>
<td>.96</td>
<td>.04</td>
<td>[.03 - .04]</td>
</tr>
</tbody>
</table>
The 954 students from first-year to the sixth-year responded to Wong and Law Emotional Intelligence Scale at Faculty of Medicine, University of Extremadura, Spain and at Faculty of Medicine, University of Lisbon, Portugal.

Abbreviations: df: degree of freedom; n.s.: non significant; SRMR: Standardized root mean square; CFI: Bentler comparative fit index; TLI: Tuckler Lewis index; RMSEA: root mean square error of approximation.

Table 5. Fit statistics for the multiple group and invariance tests

<table>
<thead>
<tr>
<th>Model</th>
<th>N</th>
<th>χ²</th>
<th>P</th>
<th>Δχ²</th>
<th>df</th>
<th>P</th>
<th>Δχ²</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full constrained model</td>
<td>954</td>
<td>883.1</td>
<td>.00</td>
<td>231</td>
<td></td>
<td>.06</td>
<td>.91</td>
<td>.91</td>
</tr>
<tr>
<td>Measurement Model Invariant</td>
<td>954</td>
<td>627.24</td>
<td>.00</td>
<td>208</td>
<td></td>
<td>.05</td>
<td>.95</td>
<td>.94</td>
</tr>
<tr>
<td>Final model</td>
<td>954</td>
<td>454.1</td>
<td>.00</td>
<td>192</td>
<td></td>
<td>.05</td>
<td>.97</td>
<td>.96</td>
</tr>
</tbody>
</table>

Combined

- Full constrained model: Δχ² = 432.4**, df = 41
- Measurement Model Invariant (Factor loadings): Δχ² = 176.5***, df = 18
- Final model: Δχ² = 3.5 n.s., df = 2

\[ ** P < .01 \]
\[ *** P < .01 \]
\[ †† The 954 students from first-year to the sixth-year responded to Wong and Law Emotional Intelligence Scale at Faculty of Medicine, University of Extremadura, Spain and at Faculty of Medicine, University of Lisbon, Portugal. \]