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METHODS ARTICLE

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Spanish validation of the Emotion Regulation Checklist (ERC) in preschool and elementary children: Relationship with emotion knowledge

Beatriz Lucas-Molina[1] | **Marta Giménez-Dasí**[2] | **Laura Quintanilla**[3] | **Ana Belén Gorriz-Plumed**[4] | **Cristina Giménez-García**[5] | **Renata Sarmento-Henrique**[6]

[1] Department of Developmental and Educational Psychology, University of Valencia, Valencia, Spain

[2] Department of Research and Psychology in Education, Complutense University of Madrid, Madrid, Spain

[3] Department of Methodology for Behavioral Sciences, National University of Distance Education (UNED), Madrid, Spain

[4] Department of Developmental and Educational Psychology, Jaume I University, Castellón, Spain

[5] Department of Basic, Clinical and Psychobiology Psychology, Jaume I University, Castellón, Spain

[6] Centro de Ensenanza Superior Cardenal Cisneros, Division of Psychology, Madrid, Spain

Correspondence
Beatriz Lucas-Molina, Department of Developmental and Educational Psychology, Faculty of Psychology and Speech Therapy, University of Valencia, Avda. Blasco Ibáñez, 21, 46010, Valencia, Spain.
Email: beatriz.lucas@uv.es
Marta Giménez-Dasí, Department of Research and Psychology in Education, Faculty of Psychology, Complutense University of Madrid, Campus de Somosaguas, 28223 Madrid, Spain.
Email: magdasi@ucm.es

Abstract

Emotion Regulation is one of the most widely studied variables in child development. However, it is a complex construct, and there are few validated instruments to evaluate children. The main goal of this study was to test the factorial structure of the Emotion Regulation Checklist (ERC) in two samples of Spanish children, one with 284 preschool children (48.3% girls; $M = 4.38$) and the other with 323 elementary school children (49.2% girls; $M = 8.82$). The ERC was completed by the children's teachers. Although this instrument has been validated in different cultural contexts, no studies have analyzed its psychometric properties in Spanish samples. An examination of the internal structure, using Exploratory Structural Equation Modeling (ESEM), revealed that the original two-factor model (Emotion Regulation and Lability/Negativity) fitted the elementary school children's data well; however, in the sample of preschool children, the factorial model showed poor goodness-of-fit indices. The reliability of the ERC subscales was .77 for ER and .88 for L/N in the preschool-aged sample, and .80 for ER and .77 for L/N in the sample of elementary school children. In addition, the relationship between the ERC and the Test of Emotion

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Comprehension (TEC) was explored. L/N correlated negatively and significantly with TEC in the sample of elementary school children. These findings provide some support for the use of the Spanish teachers' version of the ERC with elementary school children.

KEYWORDS
emotion regulation, emotion regulation checklist, Spanish version, teacher report, validation

1 | INTRODUCTION

Emotion regulation (ER) has become one of the most important variables in the study of child development. In line with Denham (2010) or Izard, Stark et al. (2008), we can define ER as the capacity to manage and control emotional states in order to facilitate adaptation to different contexts. In recent decades, considerable attention has been paid to the study of ER and its influence on development throughout life (Jones et al., 2015; Sánchez Puerta et al., 2016). More specifically, a close relationship has been found between ER and the appearance of mental health problems in adulthood and childhood (Berking & Wuppernam, 2012; Cicchetti et al., 1995). Some studies have found relationships between low ER in adulthood and mental health problems such as anxiety, depression, addictive behaviors, or personality disorders (Berking & Wuppernam, 2012). In childhood, an interesting relationship has also been found between ER skills and mental health problems such as anxiety, depression, and aggressive behavior (Eisenberg et al., 2001; Kim & Cicchetti, 2010; Lonigan et al., 2017; Robson et al., 2020). A recent meta-analysis points to ER in the preschool and school years as a predictor of internalizing and externalizing problems 30 years later (Robson et al., 2020). In sum, all this research highlights the relevance of ER in development and mental health from childhood.

One of the main challenges in examining ER in children is its measurement (Cole, Martin, & Dennis, 2004). A variety of approaches have been used to investigate children's ER (Adrian et al., 2011), such as observational studies, interviews, self-reports, and other-reports. Whereas observational and interview methods are time-consuming and costly, self-report instruments are inappropriate for preschoolers and younger elementary school children. Thus, researchers studying preschool children have frequently used the informant report method (e.g., parents, teachers, or other informants) (Adrian et al., 2011).

The Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997) is one of the most widely used instruments to obtain informant reports of ER in preschool and school-aged children. It conceptualizes ER as "the capacity to modulate one's emotional arousal such that an optimal level of engagement with one's environment is fostered" (Shields & Cicchetti, 1997). Although it was originally designed for children aged 6–12 years old, it has also been used with younger children (Morgan et al., 2010).

The ERC consists of 24 items grouped in two separate scales: Emotion Regulation (ER; children's emotional self-awareness, empathy, and constructive emotional expressiveness) and Emotional Lability/Negativity (L/N; children's emotional dysregulation, mood lability, negative effect, and inflexibility). This original two-factor structure of the ERC was obtained through a Principal-Components factor Analysis (PCA) with Varimax rotation. In this initial factor solution, one item (Item 12, "*Is whiny or clingy with adults*") did not load on any factor. Internal consistencies were .83 and .96 for ER and L/N, respectively. In addition, the two subscales were significantly correlated ($r = -.50$).

The ERC can be completed by parents, teachers, or other adults familiar with the child (Hyson, 2004; Shields & Cicchetti, 2001). It has been translated and validated for use in different languages and cultures, including Brazilian-Portuguese (Reis et al., 2016), French-Belgian (Nader-Grosbois & Mazzone, 2015), Italian (Molina et al., 2014), Norwegian (Oseland, 2019), Persian (Meybodi et al., 2018), and Turkish (Danisman et al., 2016). However, most of these

studies (e.g., Danisman et al., 2016; Meybodi et al., 2018; Nader-Grosbois & Mazzone, 2015; Reis et al., 2016) have merely used an exploratory approach, but without confirming the two-factor original structure of the ERC (Shields & Cicchetti, 1997) through Confirmatory Factor Analysis (CFA). Moreover, when these Exploratory Factor Analyses (EFA) have been conducted on both parent and teacher versions, questionably low loadings of some items (i.e., items 11, 19, and 23 in the Italian version) and several cross-loading items (i.e., items 1, 3, 4, and 7 in the French-Belgian version) were found (see Table 1). Indeed, this occurred in the studies that only conducted EFAs (i.e., Brazilian-Portuguese, French-Belgian, and Persian), and in the studies that performed both EFAs and CFAs (i.e., Italian and Norwegian).

Regardless of the differences between the two-factor solutions proposed by the EFAs and the original solution, all these previous studies found support for a two-factor solution with adequate internal consistency resembling the original solution by Shields and Cicchetti (1997). In the same vein, the CFAs performed with the Italian sample's data yielded modest support for the original two-factor model (Molina et al., 2014). Nonetheless, the results of the EFAs and CFAs conducted on the Norwegian sample did not support the fit of Shields and Cicchetti's two-factor model (Oseland, 2019), in contrast to the other validations of the ERC (Danisman et al., 2016; Meybodi et al., 2018; Molina et al., 2014; Nader-Grosbois & Mazzone, 2015; Reis et al., 2016). It is worth noting that, to our knowledge, the Norwegian study was the only one that used a randomized sampling method to confirm the structure of the ERC in elementary school children (6–12 years old).

Culture can influence the way people react and regulate their emotions (Ford & Mauss, 2015). For instance, European American populations can be more permissive about the experience and expression of emotions than Asian populations (Matsumoto et al., 2008). However, the features of culture (e.g., independence vs. interdependence values, among others) that shapes ER across the world remains unclear (Ford & Mauss, 2015). In this regard, some of the discrepancies about the factorial validity of the ERC could be attributed to cultural differences in the understanding of ER as a construct, in the interpretation of the items, and in the raters' expectations about children's ER and related behavior (e.g., Reis et al., 2016; Oseland, 2019). For example, the low loadings of items 11 (*"Can modulate excitement in emotionally arousing situations")* and 23 (*"Displays appropriate negative emotions (anger, fear, frustration, distress) in response to hostile, aggressive or intrusive acts by peers")* in the Italian version (Molina et al., 2014) could point to a different tolerance level to the child's display of negative emotions between Italian informants and informants in other cultures and contexts. Nonetheless, the differences in the methodology used (e.g., sampling method, analytical approach) and the results obtained in the studies (see Table 1) make it difficult to determine plausible culture-specific patterns and explanations.

The ERC has been extensively used to investigate the relationships between ER in children and several indicators of parents' and children's psycho-social functioning. For instance, its associations with parental maltreatment (Kim & Cicchetti, 2010), attachment (Borelli et al., 2010), children's social and behavioral functioning (Keane & Calkins, 2004; Onchwari & Kengwe, 2011), and children's academic achievement and cognitive processes (Leerkes et al., 2008) have been examined. In addition, the ERC has emphasized the role of ER and dysregulation in children with specific language impairments (Fujiki et al., 2002) and in children's bullying and victimization (Toblin et al., 2005). Similarly, it has provided a better understanding of the mediating effect of ER and L/N on internalizing symptomology in children over time (Kim-Spoon et al., 2013). Furthermore, some studies have used the ERC to assess the effectiveness of intervention programs (Izard, King et al., 2008).

Within the emotional domain, one of the constructs that has been closely related to ER is emotion knowledge (EK). The ERC has been widely used to explore this relationship. According to some theorists, it is necessary to first know one's emotions to regulate them. By understanding the emotion (i.e., identifying it and understanding its causes and consequences), the child can adapt the emotion to the situation (Di Maggio et al., 2016; Izard, Stark et al., 2008). Other authors indicate that ER might precede EK. Thus, in order to know the emotion, it would be necessary to be able to regulate attentional and emotional states. For instance, Lucas-Molina, Quintanilla, Sarmento-Henrique, Martín-Babarro, and Giménez-Dasí (2020) detected a predictive relationship between the ERC and EK in preschool children in a 3-year longitudinal study. In addition, the ERC has not only been used to explore this relationship and its direction, but also to validate EK measures (Morgan et al., 2010).

TABLE 1 Results of previous studies on the factorial validity of the ERC

Versions of the ERC	Participants N/Informant/Children age	Analytical Approach Internal consistency/Factors correlation	Cross-loading items Low loading items	Adaptations
ERC-Original (Shields & Cichetti, 1997)	143 counselors 6–12 y.o.	EFA (PCA, Varimax Rotation)/2 factors L/N α = .83 (15 items) ER α = .96 (8 items) r = -.50	LL: Item 12	Item 12 excluded
ERC-I Italian (Molina et al., 2014)	Study 1 417 mothers 3–6 y.o (n = 241) 6–11 y.o. (n = 1176)	EFA(PCA[a])/2 factors (n = 722)	CL: Items 2, 4, 5 LL: Items 4, 6, 9, 10, 11, 19, 23, and 24 showed loadings lower than .30	Item 12 loaded on L/N
		CFA/2 factors (n = 695) L/N α = .72 (16 items) ER α = .59 (8 items) r = –.30		
	Study 2 910 teachers 3–6 y.o (n = 532) 6–11 y.o. (n = 378)	EFA (PCA[a])/2 factors (n = 453)	CL: Items 4, 5, 6 LL: Items 12 and 23 showed loadings lower than .25	Item 12 loaded on L/N
		CFA/2 factors (n = 457) L/N α = .90 (16 items) ER α = .79 (8 items) r = -.32		
ERC-vf French-Belgian (Nader-Grosbois & Mazzone, 2015)	152 teachers 3–6 y.o.	EFA (PCA, Varimax Rotation)/2 factors L/N α = .82 (15 items) ER α = .72 (9 items) r = -.66	CL: Items 1, 3, 4, 7	Items 1 and 3 kept in ER Item 7 moved from ER to L/N Item 4 moved from L/N to ER Item 12 loaded on ER
ERC Turkish (Danisman et al., 2016)	600 parents, teachers, counselors 4–5 y.o.	EFA (PCA, Varimax Rotation)/2 factors (n = 309) CFA/2 factors (n = 291) L/N α = .98 (16 items) ER α = .98 (8 items)		Item 12 loaded on L/N

(Continues)

TABLE 1 (Continued)

Versions of the ERC	Participants N/Informant/Children age	Analytical Approach Internal consistency/Factors correlation	Cross-loading items Low loading items	Adaptations
ERC Persian (Meybodi et al., 2018)	354 mothers 3–6 y.o.	EFA (PCA[a])/2 factors L/N α = .81 (15 items) ER α = .68 (9 items) r = -.49	CL: Items 2, 6	Item 12 loaded on L/N Items 2 and 6 kept in L/N Item 23 moved from ER to L/N Item 19 moved from L/N to ER Item 5 moved from L/N to ER
ERC Brazilian-Portuguese (Reis et al., 2016)	561 parents and teachers 3–12 y.o.	EFA (MRF, Promin Rotation)/2 factors L/N α = .77 (13 items) ER α = .73 (10 items) r = -.49	CL: Items 4, 5, 15, 19, 23	Item 15 kept in ER Items 4, 5, and 19 moved from L/N to ER Item 12 loaded on L/N Item 23 excluded
P-ERC Norwegian (Oseland, 2019)	Parents Same sample, 4 time points: 6 y.o. (n = 753) 8 y.o (n = 659) 10 y.o. (n = 691) 12 y.o (n = 653)	EFA (Geomin Oblique Rotation)/2 factors CFA/2 factors (EFA/CFA conducted separately per each age group)	CL: Items 11, 17, 20, 23 LL: item 20 (some differences between group ages)[b]	Different CFA model constraints were examined. No one was considered acceptable (statistically and/or theoretically)
T-ERC Norwegian (Oseland, 2019)	Teachers Same sample, 4 time points: 6 y.o. (n = 787) 8 y.o. (n = 605) 10 y.o. (n = 658) 12 y.o. (n = 627)	EFA (Geomin Oblique Rotation)/2 factors CFA/2 factors (EFA/CFA conducted separately per each age group)	CL: Items 5, 13, 17, 22 LL: 20, 23 (some differences between group ages)[b]	Different CFA model constraints were examined. No one was considered acceptable (statistically and/or theoretically)

Abbreviations: CFA, confirmatory factor analysis; CL, cross-loading; EFA, exploratory factor analysis; ER, emotion regulation subscale; ERC, emotion regulation checklist; ERC-I, Emotion Regulation Checklist – Italian version; ERC-vf, Emotion Regulation Checklist – French Version; LL, low loading; L/N, Lability/Negativity subscale; MRF, minimum rank factor analysis; PCA, principal component analysis; P-ERC, parent version of the emotion regulation checklist; T-ERC, teacher version of the emotion regulation checklist.

[a]No information on the rotation method.

[b]For more information on these results see the original source.

Together, these results highlight the need to further explore the original theoretical two-factor model proposed by Shields and Cicchetti (1997) in other cultures. To our knowledge, no previous studies have examined the factorial structure of the ERC in Spanish children. Moreover, most of the previous research has investigated the factorial validity of the ERC in children aged 3–12 years (e.g., Molina et al., 2014; Nader-Grosbois & Mazzone, 2015; Reis et al., 2016) or 6–12 years (e.g., Oseland, 2019; Shields & Cicchetti, 1997). The few studies that have used exclusively preschool samples (Danisman et al., 2016; Meybodi et al., 2018) have adopted an exploratory approach and found several inconsistencies. In fact, only one study has confirmed the ERC's structure specifically in a subsample of preschool children (Molina et al., 2014). Thus, given the extensive use of the ERC in preschool children, it is vital to validate the ERC separately in this age group. In addition, much of this research assumes that the ERC and its underlying constructs behave similarly and have the same significance in both age groups (i.e., 3–6 vs. 6–12 years). From a methodological standpoint, however, this assertion is untenable if measurement invariance is not tested first. If the data do not fulfill MI, or if this invariance has not been examined, the validity of the inferences and interpretations drawn from the data could be completely erroneous or unfounded (Byrne, 2012).

Within this research context, the main goal of the present study was to examine the dimensional structure of the teachers' version of the ERC (Shields & Cicchetti, 1997) in two samples of Spanish children: one of preschool children and the other of elementary school children. For this purpose, the two-factor structure of the ERC was assessed using the categorical CFA and Exploratory Structural Equation Modeling (ESEM) approaches. Due to the inconsistencies found in previous research on the factorial validity of the ERC (i.e., low loadings of some items and several cross-loading items), we aim to: 1) use a more appropriate and less restrictive measurement model than the CFA to test the factorial structure of the ERC and 2) test the factorial structure in a sample of elementary-aged children and another sample of preschool-aged children to find out whether the ERC is a valid measure to use with preschoolers. To the best of our knowledge, no prior study has examined whether the two-factor structure of the ERC is psychometrically invariant across preschool and elementary school children. We also examined the internal consistency of the ERC subscales. In addition, we explored the relationship between ER and EK. In this regard, children's EK was assessed using the Test of Emotion Comprehension (TEC; Pons & Harris, 2000). Thus, we evaluated possible relationships between the ERC and the TEC in both samples. We expected to validate the Shields and Cicchetti (1997) two-factor model and find a positive relationship between the ERC and the TEC in both samples.

2 | METHOD

2.1 | Participants

This study used two independent convenience samples: Sample 1 with 298 preschool children and Sample 2 with 327 elementary school children. Cases with missing data on ERC scores were excluded. Final Sample 1 consisted of 284 preschool children (48.3% girls) with a mean age of 4.38 years (SD = .90; range: 2.8–5.9), from three public schools in the regions of Madrid and Castellón (Spain). Final Sample 2 consisted of 323 elementary school children (49.2% girls) with a mean age of 8.82 years (SD = 1.76; range: 5.8–11.8), recruited in one public school in Castellón (Spain). In both samples, the gender distribution was similar to that of the general population of children in Spain (48.5% of girls between ages 3 and 12; INE, 2021). Most of the children in both samples were of Spanish origin (93%). This percentage is higher than the percentage in the general population from 3–12 years old in Spain (86.3%; INE, 2021). Two authors contacted the schools and presented the study aims to the principal and the families. In both samples, the children resided in middle- and upper-middle class neighborhoods, and their native language was Spanish. The families that lived in both municipalities had an average income above the Spanish mean (i.e., $30.792). Children with atypical development were not included in the sample.

2.2 | Measures

Test of Emotion Comprehension (TEC; Pons & Harris, 2000). This test was chosen because, as Pons et al. (2003) stated, it is the only test that covers a wide range of EC components and is easy to administer. In addition, it has previously been used in Spanish populations (Giménez-Dasí et al., 2015). The TEC assesses emotional comprehension in children between 3 and 11 years old. The child is shown a series of cartoon scenarios and asked to identify how the protagonist feels in each cartoon. The TEC is divided into nine components: 1) identification of basic emotions, 2) understanding of the situational causes of emotions, 3) understanding that desires can cause emotions, 4) understanding the role of beliefs in emotions, 5) understanding the role of memories in emotions, 6) understanding that emotions can be hidden, 7) knowledge about ER strategies, 8) understanding mixed emotions, and 9) understanding the role of morality in emotions. In turn, these components are grouped in three levels of emotional understanding that are hierarchically organized: external level (components 1–3), mental level (components 4–6), and reflective level (7–9). The TEC has shown a high test-retest correlation within a 13-month period ($\alpha = .68$) (Pons & Harris, 2005).

Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997). The ERC is a 24-item other-report measure that can be completed by parents and/or teachers. In this study, the informants were teachers. We used the Spanish translation by Riquelme (2013). Raters use a 4-point scale to indicate how often a child displays affective behaviors (1 = never, 2 = sometimes, 3 = often, 4 = almost always). The ERC has two subscales: ER and Emotional Lability/Negativity (L/N). The ER subscale assesses crucial adaptive regulation processes, including socially appropriate emotional displays and empathy. This subscale consists of eight items[1], such as "is a cheerful child" or "responds positively to neutral or friendly overtures by peers." Six items are rated positively (1, 3, 7, 15, 21, and 23), and two are inversely rated (16 and 18). High scores indicate a greater capacity for ER. The L/N subscale assesses mood lability, lack of flexibility, dysregulated negative effect, and inappropriate affective displays through 15 items, such as "exhibits broad mood swings." Eleven items are scored positively (2, 6, 8, 10, 13, 14, 17, 19, 20, 22, and 24) and four inversely (4, 5, 9, and 11). Higher scores indicate greater emotional dysregulation. In the original instrument, Item 12 did not load on any factor. As indicated above, the original study by Shields and Cicchetti (1997) reported good internal reliability for the ER ($\alpha = .83$) and L/N ($\alpha = .96$) subscales.

2.3 | Procedure

Participants took part in a longitudinal socioemotional development study during their preschool and elementary school years. This research was approved by the University Bioethical Research Committee. The research team informed the three schools' principals of the study's objective. The participating children's teachers and parents signed the appropriate consent forms. Teachers completed the ERC at home after receiving information from the research team. Teachers had 10–15 days to return the questionnaires. The TEC was administered to the children in individual 30-min sessions in a quiet room during school hours by psychologists who were members of the research team. The testing language for the whole sample was Spanish. No incentives were provided for participation. Confidentiality of the data was guaranteed.

2.4 | Data analyses

First, descriptive statistics (means and standard deviations) for the ERC items in both samples were calculated.

Second, Confirmatory Factor Analyses (CFA) were conducted to examine the factor structure of the ERC in both samples. CFA makes it possible to test the factor structure of an instrument in later stages of its psychometric development, especially when its structure has been previously validated by means of EFA. Due to the inconsistencies found in previous studies on the underlying structure of the ERC scores, especially in preschool samples, ESEM for the preschool and elementary school samples was also used. The ESEM approach allows us to test less restrictive

measurement models than those used in traditional CFA models (e.g., where all cross loadings are constrained to zero). Hence, the ESEM integrates the advantages of EFA (using factor loading matrix rotations) and CFA (access to all the usual SEM parameters). The ESEM model makes it possible to solve some of the problems associated with CFA, such as cases where no satisfactory goodness-of-fit indexes are found or where model modifications (e.g., cross-loading between items, low loadings, correlating error terms) are required (Marsh et al., 2014). Based on prior research, this could be the case of the validation of the ERC structure. All the factor loadings are estimated in the ESEM model, whereas specific restrictions are imposed on the parameters in CFA. We used the robust weighted least squares means and variance-adjusted (WLSMV) estimator for ordinal data for our analyses (Newsom, 2015). For the ESEM model, factor extraction was performed with GEOMIN oblique rotation. The criteria used for model fit were the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA) (and its 90% confidence interval). CFI and TLI values greater than .95 are preferred, whereas values close to .90 are considered acceptable. The RMSEA values should be less than .08 for a reasonable fit, and less than .05 for a good fit (Brown, 2006; Hu & Bentler, 1999).

Third, we studied the MI of the ERC across both samples (preschool vs. elementary school children) using the model that showed the best fit and following Byrne's (2012) recommendations. Thus, a hierarchical set of three levels of group invariance is tested, including configural, weak, and strong invariance. The configural model is the first and least restrictive model tested. When the configural variance model is found, it is assumed that the general factor structure is at least similar, although not necessarily equivalent, across groups. Once the configural model has been established, the next step is to test the weak invariance model (all factor loadings are simultaneously constrained across groups) and subsequently, the strong invariance model (contains cross-group equality constraints on all factor loadings and item intercepts). In testing the invariance hypothesis, the change in CFI (ΔCFI) is used to determine whether the nested models are practically equivalent (Cheung & Rensvold, 2002). When ΔCFI is $< .01$ between two nested models, all the specified equal constraints are considered tenable.

Fourth, Cronbach's alpha was calculated as an estimation of the reliability of the ERC subscales. Finally, we investigated the associations between the ERC subscales and the TEC dimensions (external, mental, and reflective) using Pearson correlations.

All analyses were performed with IBM SPSS Statistics Version 26.0 (SPSS, 2019) and Mplus 7.0 (Muthén & Muthén, 2012).

3 | RESULTS

3.1 | Descriptive statistics

Table 2 shows the descriptive statistics for the ERC scores (means, standard deviations, skewness, and kurtosis) for the preschool ($N = 284$) and elementary school ($N = 323$) samples. In both samples, the highest mean score was on item 7 "Responds positively to neutral or friendly overtures by peers" ($M = 3.63$; $SD = .60$; $M = 3.62$; $SD = .58$, for preschool and elementary school children, respectively). In preschool children, the lowest mean score was on item 24 "Displays negative emotions when attempting to engage others in play" ($M = 1.28$; $SD = .48$), whereas in elementary school children, it was on item 10 (recoded inversely) "Takes pleasure in the distress of others (e.g., laughs when another person gets hurt or punished; enjoys teasing others)" ($M = 1.19$; $SD = .46$). In both samples, there were several items that had skewness and kurtosis values outside the −1 to 1 range.

3.2 | Validity evidence based on the internal structure of the ERC

Based on Shields and Cichetti's model (1997), a two-factor model with 23 items (15 and 8 items, respectively, for the L/N and ER scales) was tested in both samples. As Table 3 shows, although the CFI and TLI indicated an acceptable fit of this model to the elementary school children's data, the RMSEA suggested that caution should be used. For the

TABLE 2 Descriptive statistics for the ERC items for the Preschool and Elementary school samples

	Preschool ($N = 284$)				Elementary school ($N = 323$)			
Items	M	SD	Skewness	Kurtosis	M	SD	Skewness	Kurtosis
1	3.51	.61	−.86	−.26	3.54	.62	−1.02	−.01
2	1.51	.69	1.32	1.60	1.36	.63	1.83	3.26
3	3.47	.68	−.96	.02	3.62	.57	−1.30	1.24
4*	3.30	.93	−1.08	.02	3.43	.88	−1.48	1.18
5*	3.16	.81	−.54	−.64	3.34	.75	−.87	.03
6	1.88	.81	.87	.58	1.57	.72	1.25	1.42
7	3.63	.60	−1.46	1.58	3.62	.58	−1.33	1.29
8	1.39	.63	1.56	2.00	1.28	.59	2.44	6.47
9*	3.05	.91	−.42	−1.04	2.99	1.05	−.74	−.67
10*	1.33	.55	1.55	2.21	1.19	.46	2.77	9.53
11	3.08	.94	−.63	−.71	3.37	.84	−1.20	.60
12	1.67	.82	1.11	.64	1.56	.81	1.43	1.33
13	1.46	.72	1.60	2.15	1.30	.66	2.47	6.01
14	1.62	.76	1.15	1.00	1.42	.70	1.65	2.11
15	3.08	.86	−.53	−.62	3.15	.86	−.77	−.13
16*	1.39	.60	1.59	2.86	1.29	.54	1.83	3.13
17	1.46	.75	1.60	1.98	1.24	.58	2.76	7.99
18*	1.36	.65	1.88	3.38	1.33	.73	2.45	5.53
19	1.33	.68	2.33	5.44	1.20	.51	3.17	11.52
20	1.98	.99	.72	−.53	1.49	.79	1.60	1.77
21	2.97	.85	−.26	−.89	3.15	.93	−.89	−.14
22	1.40	.71	1.91	3.37	1.28	.65	2.61	6.75
23	2.83	.93	−.30	−.84	2.87	.90	−.58	−.33
24	1.28	.48	1.36	.71	1.20	.44	2.18	4.10

Note. Asterisk (*) indicates reverse items.

preschool children's data, the fit of the two-factor model was less acceptable. In this regard, it is worth noting that some indices, such as the CFI and TLI, can be affected by sample size, and some authors have proposed the RMSEA as an even more appropriate fit index (Marsh et al., 2004).

Several approaches were followed to improve the model's fit. To begin with, we opted for a specification search based on parsimony criteria. Thus, guided by prior research on the ERC's dimensionality in preschool and elementary school children (e.g., Molina et al., 2014; Reis et al., 2016), different modifications to the original model were made. First, following Molina et al. (2014), item 12 was added to the L/N factor. As a result, this model consisted of 24 items, 16 for the L/N scale, and 8 for the ER scale. Next, item 23 was excluded from this model (Reis et al., 2016), leaving a total of 23 items, with 16 and 7 items in the L/N and ER factors, respectively. Finally, item 23 was excluded from the original Shields and Cicchetti model, resulting in a total of 22 items, 15 items for L/N and 7 for ER. However, as Table 3 reveals, none of these modifications revealed a better fit in either of the two samples.

Consequently, we conducted a specification search based on the modification indices (MIs) and the expected parameter change values (EPC) of the original two-factor CFA model. These indices revealed that several cross-loadings and some error correlations had to be included in the model for both samples. For instance, for the

TABLE 3 Goodness-of-fit statistics resulting from the dimensional models tested

Model	χ^2	df	CFI	TLI	RMSEA [90% CI]
Preschool children ($N = 284$)					
2-factors, 23 items[a] (Shields & Cicchetti, 1997)	861.0	229	.894	.883	.099 [.092, .106]
2-factors, 24 items[b] (Molina et al., 2014)	910.1	251	.891	.880	.096 [.089, .103]
2-factors, 23 items[c] (Reis et al., 2016)	884.6	229	.890	.879	.100 [.093, .107]
2-factors, 22 items[d]	834.5	208	.894	.882	.103 [.096, .110]
2-factors, 23 items, 7 specifications	606.0	222	.936	.927	.078 [.071, .086]
ESEM 2-factors, 23 items	681.9	208	.921	.904	.090 [.082, .097]
Elementary school children ($N = 323$)					
2-factors, 23 items[a] (Shields & Cicchetti, 1997)	856.9	229	.925	.917	.092 [.086, .099]
2-factors, 24 items[b] (Molina et al., 2014)	926.7	251	.919	.911	.091 [.085, .098]
2-factors, 23 items[c] (Reis et al., 2016)	897.8	229	.920	.912	.095 [.089, .102]
2-factors, 22 items[d]	838.7	208	.924	.916	.097 [.090, .104]
2-factors, 23 items, 4 specifications	649.3	225	.949	.943	.076 [.070, .083]
ESEM 2-factors, 23 items	543.8	208	.960	.951	.071[.063, .078]

Abbreviations: CI, confidence interval; CFI, comparative fit index; ESEM, exploratory structural equation modeling; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation.

[a]Item 12 was not considered in the original model.

[b]Item 12 was added to Lability /Negativity factor.

[c]Item 12 was added to Lability/Negativity factor and item 23 was excluded from model.

[d]Item 23 was excluded from the original model.

sample of elementary school children, at least four modifications (e.g., items 1 and 7 loading on L/N, item 20 loading on ER, and an error correlation between items 1 and 16) had to be included to reach acceptable fit statistics. In the case of the preschool-aged sample, at least seven specifications (e.g., item 7 loading on L/N, items 4, 5, 11, and 20 loading on ER, and two error correlations, between items 18 and 6 and between items 8 and 2, among others) had to be added to the model[2]. Nonetheless, given the fact that these specifications were difficult to justify theoretically, and based on parsimony and methodological criteria and recent criticisms of model specification (Heene et al., 2012), the factor structure of the ERC was further explored with ESEM.

When the ESEM model with two factors was tested in both samples, a better fit to the data was found in the sample of elementary school children. For the preschool-aged sample, the RMSEA value was still higher than the acceptable value (< .08). In addition, for the most part, in both samples the standardized factor loadings for the ESEM two-factor model were high and statistically significant, supporting the two-factor structure of the ERC (Shields & Cicchetti, 1997). However, in line with previous CFA results, some exceptions were found (see Table 4). Whereas in the solution proposed by the authors of the original instrument, item 23 loaded on the ER factor (Shields & Cicchetti, 2011), in our samples, this item showed loadings lower than .30. This result is similar to that found in the Italian and Brazilian-Portuguese adaptations (Molina et al., 2014; Reis et al., 2016). Nonetheless, Molina et al. (2014) kept this item in their CFA models. In fact, when we excluded this item from our previous CFAs, no improvement in model fit was found. In addition, in the preschool-aged sample, items 4, 5, and 22 loaded negatively on ER. Furthermore, in the sample of elementary school children, item 19 loaded negatively on ER, whereas items 3 and 7 loaded negatively on L/N. As indicated above, some of these cross-loadings have been found in previous studies that examined the internal structure of the ERC by means of EFA (e.g., Danisman et al., 2016; Meybodi et al., 2018; Nader-Grosbois & Mazzone, 2015; Reis et al., 2016). Nevertheless, when the criterion of setting the cross-loading cutoff at .40 was adopted (Matsunaga, 2010), the original two-factor model of the ERC (with the exception of item 23) emerged. This model was

TABLE 4 Standardized factor loadings for ESEM two-factor model for Preschool and Elementary school children

	Preschool		Elementary	
ERC Items	**ER**	**LN**	**ER**	**LN**
1. Is a cheerful child.	.867		.954	
3. Responds positively to neutral or friendly overtures by adults.	.823		.617	*-.394*
7. Responds positively to neutral or friendly overtures by peers.	.607		.600	*-.389*
15. Can say when s/he feels sad, angry or mad, fearful or afraid.	.550		.649	
16. Seems sad or listless. *	.812		.857	
18. Displays flat affect (expression is vacant and inexpressive; child seems emotionally absent) *	.840		.678	
21. Is empathic towards others; shows concern when others are upset or distressed.	.426	.295	.641	
23. Displays appropriate negative emotions (anger, fear, frustration, distress) in response to hostile, aggressive or intrusive acts by peers.	*.295*		*.167*	
2. Exhibits wide mood swings (child's emotional states difficult to anticipate because s/he moves quickly from positive to negative moods).		.783		.734
4. Transitions well from one activity to another; does not become anxious, angry, distressed or overly excited when moving from one activity to another. *	*-.398*	.427		.622
5. Can recover quickly from episodes of upset or distress (for example, does not pout or remain sullen, anxious or sad after emotionally distressing events). *	*-.309*	.472		.576
6. Is easily frustrated.		.507		.666
8. Is prone to angry outbursts/tantrums easily.		.810		.593
9. Is able to delay gratification. *		.478		.509
10. Takes pleasure in the distress of others (e.g., laughs when another person gets hurt or punished; enjoys teasing others).		.694		.748
11. Can modulate excitement in emotionally arousing situations (e.g., does not get 'carried away in high-energy play situations, or overly excited in inappropriate contexts). *		.680		.665
13. Is prone to disruptive outbursts of energy and exuberance.		.929		.976
14. Responds angrily to limit-setting by adults.		.784		.787
17. Is overly exuberant when attempting to engage others in play.		.930		.942
19. Responds negatively to neutral or friendly overtures by peers (e.g., may speak in an angry tone of voice or respond fearfully).		.380	*-.324*	.659
20. Is impulsive.		.786		.903
22. Displays exuberance that others find intrusive or disruptive.	*-.372*	.918		.952
24. Displays negative emotions when attempting to engage others in play.		.603		.685

Abbreviations: ER, emotion regulation; LN, Lability/Negativity.

Factor loadings under .30 have been omitted except for item 23. Italic font indicates cross-loadings; Asterisk (*) indicates reverse items.

TABLE 5 Correlations among ERC subscales and TEC dimensions for both samples

	Preschool					Elementary school				
Subscales	**ER**	**L/N**	**TEC_E**	**TEC_M**	**TEC_R**	**ER**	**L/N**	**TEC_E**	**TEC_M**	**TEC_R**
ER	–	.005	.064	.030	−.119	–	−.185*	.005	.034	.044
L/N	–	–	.002	−.037	−.039	–	–	−.143*	−.250*	−.207*
Mean	22.2	29.2	2.19	1.57	1.28	22.6	27.6	2.82	2.45	2.05
SD	2.38	4.16	.69	.83	.94	2.56	3.86	.47	.69	.95

Note. TEC_E, TEC external dimension; TEC_M, TEC mental dimension; TEC_R, TEC reflective dimension.
*$p < .05$.

adopted for further analysis in both samples (although the RMSEA value for the preschool-aged children suggested that caution should be used). Factor correlations between ER and LN in the ESEM model were negative and statistically significant, ranging from −.27 to −.29 for preschool and elementary school children, respectively.

3.3 | Measurement invariance of the ERC across preschool and elementary school children

The measurement invariance of the ERC across the two samples was tested with the ESEM two-factor model. The configural invariance model, where the factorial structure has to be the same for both groups (preschool vs. elementary school children), was untenable (CFI = .792, TLI = .747, RMSEA = .087, CI: .082 – .092). Thus, no further analyses were conducted to explore weak and strong invariance across the two samples. Indeed, partial configural invariance was also tested for the CFA two-factor models with modifications (i.e., seven and four specifications for the sample of preschool and elementary school children, respectively), but again the invariance models did not fit the data (CFI and TLI < .60, RMSEA > .10).

3.4 | Reliability estimation of the ERC scores

To examine the reliability of the two subscales in both samples, we computed Cronbach's alpha coefficients. Scale score reliabilities of the ERC subscales ranged from acceptable to good in both samples, with $\alpha = .77$ for ER and $\alpha = .88$ for L/N in the sample of preschool-aged children, and $\alpha = .80$ for ER and $\alpha = .77$ for L/N in the sample of elementary school children.

3.5 | Relationship with TEC

Correlation analyses were conducted to examine the relationship between the two ERC subscales and the three TEC dimensions (i.e., external, mental, and reflective). Table 5 provides the Pearson correlations. For the preschool-aged children, no relationships were found between the ERC subscales or between the ERC subscales and the three TEC dimensions. For the elementary school sample, L/N was significantly and negatively associated with ER and with the three TEC dimensions.

4 | DISCUSSION

The main goal of the present study was to examine the internal structure of the Spanish teachers' version of the ERC in two samples of Spanish children to contribute to better understanding the nature of ER by using the ERC. Although

the ERC has been previously used in Spain to assess ER in preschool- and school-aged children (e.g., Giménez-Dasí et al., 2015), to our knowledge its structural validity has not been tested in this country. Indeed, from an international perspective, only one study has confirmed the ERC's structure separately in preschool and elementary school children (Molina et al., 2014). Moreover, to the best of our knowledge, no prior study has examined the measurement invariance of the two-factor structure of the ERC across preschool and elementary school children.

To this end, the original two-factor model was analyzed in preschool and elementary school children. The results indicate that the two-factor model proposed by Shields and Cicchetti (1997) provided a poor fit to the data, particularly to the preschool children's data. The few previous studies that have attempted to validate the factorial structure of the ERC using the CFA approach in other languages also reported a poor fit of the original two-factor model. This is the case, for example, of the Norwegian (Oseland, 2019) version of the ERC. When the ESEM approach was explored in this study, a better fit to the data was found, especially in the sample of elementary school children. However, based on the goodness-of-fit indices and the numerous cross-loading and low loading items (i.e., item 23), the two-factor model found by the ESEM may still be questionable, particularly for the preschool-aged children. Previous validations of the teachers' version of the ERC have also found several poor-performing items. For instance, the low loading of item 23 was also found in the Italian (Molina et al., 2014) and Brazilian-Portuguese (Reis et al., 2016) versions. Although it is difficult to draw comparisons due to the numerous differences between the studies (i.e., sampling method, analytic strategy, etc.), some authors have argued that these discrepancies could be partly due to cultural differences (Oseland, 2019). Research has shown that ER depends on personal experiences, the cultural context, and the demands of the specific environmental situation (Ford & Mauss, 2015; Gross, 2014; Matsumoto et al., 2008). Thus, the low loading of item 23 could reflect different degrees of acceptance of children's displays of negative emotions, excitement, and energic behavior in Spanish, Italian (Molina et al., 2014), and Brazilian-Portuguese (Reis et al., 2016) preschool and elementary school teachers, compared to French-Belgian (Nader-Grosbois & Mazzone, 2015) and Turkish (Danisman et al., 2016) preschool teachers and the North American elementary school counselors who participated in the original study by Shields and Cicchetti (1997). It is important to note that this is only speculation, and future studies should explore this hypothesis and aspects of specific cultural values that could explain these differences. Additionally, the results for the cross-loading and low loading items could also indicate the importance of verifying the equivalence of the instruments translated for use in different cultural contexts (Molina et al., 2014).

In addition, the measurement invariance of the ERC across the two samples with the ESEM two-factor model seemed untenable. In particular, configural invariance was not supported. Therefore, the general factor structure of the ERC was not similar in preschool and elementary school children. Nevertheless, the two-factor model had acceptable psychometric properties in the elementary sample, with acceptable to good scale score reliability.

The second aim of this study was to examine the relationship between the ERC and the TEC, in order to obtain further evidence of its construct validity. The results showed a negative and significant correlation between the L/N subscale and the three TEC dimensions only in the elementary school sample. The lack of correlations between the TEC and the ERC in the preschool sample is surprising at first glance. Nevertheless, this result could be interpreted by considering previous longitudinal research that found significant predictive relationships between the two variables. Lucas-Molina et al. (2020) evaluated ER and EK through the ERC and the TEC in children from 3 to 5 years old. Results showed a predictive relationship between ER at age of 3 and EK at age of 4, and between ER at age of 4 and EK at age of 5. Negative and significant relationships were also observed between L/N and EK at the same ages. Furthermore, they did not find any correlations between the two variables cross-sectionally at any time. These results may indicate that cross-sectional strategies may not be appropriate for evaluating relationships between ER and EK, at least in preschoolers. In the same vein, it can be assumed that longitudinal strategies could also more clearly express these relationships in elementary age children.

Together, these results provide some support to the validity and reliability of the teachers' version of the ERC as an instrument to measure ER in Spanish elementary school children. It is worth noting that, to our knowledge, no previous study has examined the structure of the ERC using the ESEM approach. In this study, the results obtained for the

sample of preschool children were inconclusive. Therefore, the use of the ERC in Spanish preschool children should be carefully considered due to interpretation difficulties and validity issues. Hence, further research would be necessary in order to clarify and confirm the structure of the ERC in other preschool and elementary samples from Spain and other countries. This would also make it possible to establish whether the factorial structure of the ERC is determined by the language or the country.

The findings of this study should be considered in light of several limitations. First, the sample is limited to two Spanish convenience samples, which impacts the generalizability of the study results. However, all the previous ERC validation studies, with the exception of Oseland (2019), also used convenience samples. Second, the sample size was also limited. Future research could examine the factorial structure in a representative population in order to identify the structure of the ERC in the Spanish population and make further decisions. It might be necessary to make changes in the ERC or design and validate a new measure to assess emotional regulation in children. In addition, a larger sample would make it possible to explore other evidence of internal validity of the ERC, such as its invariance across genders and, more importantly from a developmental point of view, across age groups. For instance, Oseland (2019) intended to explore the longitudinal measurement invariance of the ERC in a Norwegian sample (from 6 to 12 years old). However, the poor fit of the baseline two-factor model in each age group kept her from attempting this goal. Third, the cross-sectional nature of the present study kept us from examining the stability and evolution of the two-factor structure of the ERC, as well as its relationship with the TEC, over time. Further studies with two or more time intervals should be carried out in order to analyze the stability of the ERC in the Spanish population. Fourth, it would be interesting to investigate other sources of construct validity of the ERC by linking the ERC scores to other measures and observations. Additionally, other studies should examine the structure validity and reliability of the Spanish version of the ERC as a parent-report instrument. Some studies have indicated that emotional self-regulation is probably not a stable skill that the child can use in any situation, but rather a capacity that is dependent on the child's context (Gross, 2014). Therefore, administering parent and teacher versions of the ERC would provide a comparison of children's ER in different social settings (i.e., home vs. school). Finally, some of the differences between the original version and other versions of the ERC, such as the Spanish one, may be due to important cultural dimensions that can influence the way people regulate their emotions, such as individualism versus collectivism (Matsumoto et al., 2008). For instance, future work should consider other variables, such as parents' and teachers' cultural beliefs, values, and expectations about children's behavior.

Future longitudinal research might address these limitations, test developmental trends in ER, and provide a basis for comparison with these cross-sectional results. Moreover, future research should consider studying the MI of the teacher and parent versions of the ERC across cultures, in order to validate the comparability of its structure. This, in turn, would make it possible to examine the factors responsible for apparent cross-cultural differences in ER (Ford & Mauss, 2015).

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DATA AVAILABILITY STATEMENT

The data are not publicly available due to ethical restrictions. Therefore, only the principal investigators have access to the raw data files. The anonymized data to support the findings of this study are available upon reasonable request from the corresponding author.

ORCID

Beatriz Lucas-Molina https://orcid.org/0000-0003-4370-4799
Laura Quintanilla https://orcid.org/0000-0002-5923-2899

ENDNOTES

[1] This excludes Item 12, which in the original validation did not load on either scale (Shields & Cicchetti, 1997).

[2] Readers can contact the first author for additional information on these confirmatory factor analyses and the associated modification indices.

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