



Evidence for validity, reliability and measurement invariance of the emotion regulation questionnaire for children and adolescents (ERQ-CA) in secondary students from Chile

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Abstract

Emotion regulation (ER) is associated with both healthy and unhealthy behavioral and affective responses, especially in adolescents. It is frequently assessed by self-report measures such as the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA), which has shown mixed psychometric properties when used in Spanish-speaking adolescents. The present study provides evidence for its validity and reliability in a sample of secondary students in Chile. Six-hundred and thirty-four students were recruited from ten educational institutions to complete the ERQ-CA, along with the Cognitive Behavioral Therapy Skills Questionnaire (CBTSQ), the Suicide Ideation Questionnaire Junior (SIQ-JR), the Multidimensional Adolescent Functioning Scale (MAFS) and the Patient Health Questionnaire-9 (PHQ-9). Confirmatory factor analysis (CFA) was performed on the ERQ-CA for two- and single-factor models. Convergent and discriminant validity as well as measurement invariance were also tested. The original ERQ-CA two-factor structure showed the best model fit and parsimony along with high internal consistency. It also demonstrated high convergent and discriminant validity, with reappraisal strategies positively correlating with cognitive-behavioral skills and psychosocial functioning and negatively with suicide ideation and depressive symptoms, while the opposite was true for suppression strategies. Partial scalar invariance was established when testing by biological sex (male/female) and psychiatric treatment history (past/current/no). We conclude that the ERQ-CA was found to be a valid and reliable self-report instrument for the assessment of ER strategies in secondary students, proving its utility as a research and clinical tool.

Keywords Emotion regulation · Cognitive reappraisal · Expressive suppression · Psychometric properties · Secondary students

Introduction

Increasing evidence shows that emotion regulation (ER) is associated with both healthy and unhealthy behavioral and affective responses in different populations, particularly in adolescents and youths (Klein et al., 2022) and then can be regarded as a transdiagnostic process (Cludius et al., 2020; Harvey et al., 2004). While adaptive ER strategies are associated with prosocial behavior, better social competence and academic performance (Riediger & Klipker, 2014), maladaptive ER strategies have been consistently associated with the development and maintenance of a wide range of psychopathological manifestations (Aldao et al., 2010; Sheppes et al., 2015). Given this evidence, literature strongly encourages to regularly include ER when assessing mental health in preventive and interventional programs

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with young people, using reliable and valid measures to accurately identify ER strategies and their associations with psychopathology and well-being in this population (Berardis et al., 2020).

ER is usually assessed through self-report measures and one of the most frequently used questionnaires to evaluate ER in adolescents is the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA; Gullone & Taffe 2012). Based on Gross's Model of ER (Gross & John, 2003), it assesses two regulatory strategies, labeled as cognitive reappraisal (CR) and expressive suppression (ES). CR is an antecedent-focused strategy acting before.

the complete emotional response generation and represents the attempt to positively reinterpret an emotion-eliciting situation (Gross & John, 2003). Its use decreases the negative emotion experiences and negative expression without additional physiological activation and use of cognitive resources (Cutuli et al., 2014). It is associated with a greater well-being (Balzarotti et al., 2017), positive functioning (good self-esteem and higher life satisfaction levels) (Teixeira et al., 2015), better interpersonal functioning (John & Gross, 2004), lower vulnerability to psychosis (Chapman et al., 2020), lower risk for suicidal related behaviors (Ong et al., 2019), and diminished impact of depressive symptoms (Shapero et al., 2019). On the other hand, ES is defined as the attempt to hide, inhibit or reduce ongoing emotion-expressive behavior after the occurrence of an emotional response (Gross & Thompson, 2007). As stated by the process model (Gross & John, 2003), the efforts to suppress an already activated emotional response requires cognitive efforts, which probably interfere with other relevant executive functions such as memory, problem-solving and coping with social interactions. As shown by Lantrip et al. (2016), adolescents with a prominent use of ES present difficulties in some of these functions, and also a sense of discrepancy between their inner experience and outer emotional and behavioral expression (Cutuli et al., 2014). Among others, in adolescents, these have been posited as potential factors underlying the associations between higher use of ES and emotional and social functioning difficulties (Gross & Cassidy, 2019), depressive and anxiety symptoms (Schäfer et al., 2017), suicidal ideation and suicide attempts (Forkmann et al., 2014; Kaplow et al., 2014), maladaptive coping (Compas et al., 2017), loneliness (Verzeletti et al., 2016) and less self-perceived social competence (Gross & Cassidy, 2019).

Overall, the evidence on the psychometric properties of the ERQ-CA supports the original two-factor structure and biological sex-invariance, but mixed results have been reported concerning both reliability and validity. Favorable evidence has been observed in samples with different age-ranges from countries such as Australia (ages 10–18; Gullone & Taffe 2012), Portugal (ages 14–18; Teixeira et

al., 2015), China (ages 7–16; Ling et al., 2019; Liu et al., 2017), and Japan (ages 8–18; Namatame et al., 2020). On the other hand, Ng et al. (2017) found good internal consistency for CR, but low for ES, along with a low test-retest reliability in adolescents from the US. Prior studies with Spanish-speaking adolescents, which have been mainly conducted in Spain, have also found mixed results concerning both reliability and validity and some minor issues about the structure of the scale. For instance, Pastor et al. (2019) reported adequate reliability and validity levels for both scales in adolescents aged 13–14 years. However, in participants between 10 and 19 years old, Navarro et al. (2018) found a very low reliability for both subscales. Martín-Albo et al. (2018), in individuals aged between 11 and 17 years, observed adequate and low reliability for CR and ES subscales respectively. Additionally, these authors found significant and positive associations between CR and ES subscales, which contrast with the negative associations reported by Gullone and Taffe (2012). To our knowledge, the only study with Latin America Spanish-speaking adolescents was recently conducted by Alfonso and Prieto (2021). In Colombian university students aged 15–25 years, they found some conflicts between some items and the original two-factor structure and proposed an 8-item version with good reliability for CR and ES. Therefore, further research focused on Spanish-speaking adolescents from Latin American countries is needed.

In summary, under the general framework of transdiagnostic approaches to psychopathology (Klein et al., 2022), ER is currently regarded as a core process associated with risk and protective factors in relation to psychopathological manifestations (Gross & Jazaieri, 2014). Considering the advantages of self-report instruments (e.g., quick to administer, easy to score, suitable for being used as part of a broad survey) (McDonald, 2008), and due to the inconclusive evidence on the psychometric properties of the ERQ-CA when used in Spanish-speaking young people, the present study sought to provide evidence on its validity, reliability, and measurement invariance in a sample of secondary students in Chile. Based on the theoretical framework underlying the measure, we expected to confirm a two-factor structure. Given that ER may help to explain relationships between outcomes such as suicidal ideation and psychological difficulties, including several psychiatric diagnoses (Turton et al., 2021), and the lack of research examining these links in Spanish-speaking adolescents, we explored the associations between CR and ES and some adaptive and maladaptive processes. We hypothesized positive associations between CR and cognitive-behavioral skills and psychosocial functioning, and between ES and depressive symptoms and suicidal ideation. Moreover, in line with previous research (Gong et al., 2021; Ling et al., 2019; Ng et al., 2017), we assessed for

measurement invariance across biological sex groups (male/female). Finally, we also explored for invariance based on psychiatric treatment history (past/current/no) as a criterion.

Method

Participants

The study was conducted in the context of a research project where other instruments were included to test psychometric properties aiming at more than 600 participants for this sample size. Therefore, we approached several schools in order to reach this anticipated sample size and recruited 634 students aged 14 to 21 years between April and August 2021 from 10 Chilean secondary schools using a convenience sampling method. According to Muthén and Muthén (2002), a minimum sample size of 150 participants is required to achieve a statistical power of 0.81 when assessing for construct validity of a measure. The authors also state that a sample size of 256 subjects would be sufficient to achieve a statistical power of 0.80 even in presence of non-normal factor indicators. Due to our study being focused on the age range originally defined by the ERQ-CA (Gullone & Taffe, 2012), we excluded from the analysis a total of 31 subjects (4.89%) aged over 18 years old. The final sample included 603 adolescents aged 14 to 18 years ($M=15.834$; $SD=1.233$; Female=51.74%). We asked the participants regarding their psychiatric treatment history. A total of 195 students (32.34%) reported having had a past psychiatric treatment, while 75 (12.44%) reported being currently on a psychiatric treatment. Finally, 333 individuals (55.22%) reported not having any past or current psychiatric treatment history. Participants received no monetary or academic compensation for their participation.

Measures

Emotion regulation. We used the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA) (Gullone & Taffe, 2012), in its Spanish version (Pastor et al., 2019). It is a 10-item measure with Likert responses ranging from 1 (completely disagree) to 5 (completely agree) assessing two main dimensions: Cognitive reappraisal (CR, 6 items) and expressive suppression (ES, 4 items). A higher score means a higher usage of each ER strategy. Different studies have found good internal consistency through Cronbach's alpha for its subscales, ranging from 0.71 to 0.83 (Gong et al., 2021; Gullone & Taffe, 2012).

Cognitive-Behavioral Therapy Skills. We used the Cognitive-behavioral Therapy Skills Questionnaire (CBTS) (Jacob et al., 2011). This 16-item scale measures two skills:

(a) cognitive restructuring skills (CgRs), which refer to ability to identify, assess and modify thoughts that produce psychological distress (Clark, 2013); and (b) behavioral activation skills (BA), an important component of cognitive-behavioral therapy focused on 'activating' depressed individuals through potentially reinforcing experiences in order to improve treatment effectiveness (Jacobson, 2001). Respondents rank each item on a 5-point Likert scale from 1 (I don't do this) to 5 (I always do this). The minimum score is 15 and the maximum score is 80. A higher score means a higher presence of cognitive-behavioral skills. The authors reported the measure to have shown good fit and internal consistency indices, with Cronbach's alpha values of 0.88 for the CgRs subscale and 0.85 for the BA subscale.

Suicide ideation. We used the Suicidal Ideation Questionnaire Junior (SIQ-JR) (Reynolds, 1987). It is a 15-item self-report measure designed to determine suicidal ideation in adolescents. Scores are ranked from 0 to 6, with higher scores indicating greater severity of suicidal ideation. The maximum score is 90 and a cut-off score of 31 indicates a clinically meaningful level of suicidal ideation. Previous studies have reported high levels of internal consistency ($\alpha=0.978$) and both construct and criterion validity (Davis, 1992; Jia et al., 2014).

Psychosocial functioning. We used the Multidimensional Adolescent Functioning Scale (MAFS; Wardenaar et al., 2013). This is a 23-item self-report measure designed to assess adolescent functioning in three areas: general functioning (GF), family-related functioning (FF) and peer-related functioning (PF). The MAFS has shown good internal consistency, with values ranging from 0.72 to 0.88 in general population and student samples (Wardenaar et al., 2013; Mayle et al., 2020). Each subscale score is calculated by adding up the item scores within each scale. The MAFS-GF subscale consists of 10 items and has a scoring range of 0–40, the MAFS-FF subscale includes seven items and has a scoring range

of 0–28, and the MAFS-PF consists of six items and has a scoring range of 0–24. On all scales, a higher score indicates better functioning (Wardenaar et al., 2013).

Depressive symptoms. We used the Patient Health Questionnaire-9 (PHQ-9) (Johnson et al., 2002), a 9-item self-report questionnaire with responses ranging from 0 (not at all) to 3 (nearly every day). Total scores can range from 0 to 27. Scores of 0–4 indicate no depressive symptoms, 5–9 mild severe depressive symptoms, 10–14 moderate depressive symptoms, 15–19 moderately severe depressive symptoms, and 20–27 severe depressive symptoms (Johnson et al., 2002). In a sample of adolescents in Chile, Borghero et al. (2018) observed the following values: internal consistency=0.78; sensitivity=86.2%, specificity=82.9%.

Procedure

We invited ten public schools to participate in the study. After meetings with their administration teams where they received information on the study and its objectives, all of them agreed to participate. Upon obtaining each school's written approval, students and their caregivers were contacted and informed at parents' meetings of the characteristics of the study. Voluntariness and confidentiality, along with information on action protocols in case of detecting potential risk or need for psychological assessment were explicitly stated. Once written and informed consent were obtained from both the students and their caregivers, the participants completed a series of questionnaires through an online platform. Ethical approval was obtained from a University's Scientific Ethics Committee.

Data analysis

We tested the factor structure of the ERQ-CA through confirmatory factor analysis (CFA) using a robust maximum likelihood estimator (RML). The first CFA was performed using the original two-factor structure as presented by Gullone and Taffe (2012), including cognitive reappraisal (CR; items 1, 3, 5, 7, 8 and 10) and expressive suppression (ES; items 2, 4, 6 and 9). In order to determine if a simpler structure would perform better, we also tested a single-factor model. The models were compared based on well-known fit indices such as Chi-square divided by degrees of freedom ratio (χ^2/df), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the comparative fit index (CFI), the Tucker-Lewis index (TLI) and the goodness of fit index (GFI). Comparisons were performed based on their closeness to established cut-off values ($\chi^2/df < 5$; $RMSEA < 0.06$; $SRMR < 0.08$; $CFI \geq 0.95$; $TLI \geq 0.95$; $GFI \geq 0.95$; Hu & Bentler, 1999). We additionally compared model parsimony using indices such as the Akaike information criterion (AIC) and the Bayesian information criterion (BIC), where lower values in both indices could provide evidence for better fit and model parsimony.

To assess internal consistency and reliability, we calculated the McDonalds' omega (ω), Cronbach's alpha (α) and the average inter-item correlation (r_M) for the ERQ-CA, the CBTSQ, the MAFS and the SIQ-JR full scales and their subscales.

We assessed convergent validity using both CBTSQ subscales, all three SIQ-JR and MAFS subscales, and the total score of the PHQ-9. We expected that higher scores in the CBTSQ and MAFS subscales would correlate significantly and positively with higher scores in the ERQ-CA's CR subscale, while the SIQ-JR subscales and the PHQ-9's total

score would do the same with the ERQ-CA's ES subscale. Discriminant validity was assessed using the same measures, but since both subscales of the ERQ-CA are aimed to measure opposite constructs, we expected that SIQ-JR subscales and the PHQ-9's total score would correlate significantly and negatively with the ERQ-CA's CR subscale, while higher scores in the CBTSQ and MAFS subscales would do the same with the ERQ-CA's ES subscale.

Finally, we tested for measurement invariance by biological sex (male/female) and by psychiatric treatment history (past/current/no) at configural, metric, scalar, and strict levels when possible through multigroup CFA. Due to their robustness when working with more complex models (Fan & Sivo, 2007), we calculated Gamma Hat ($\hat{\gamma}$) and McDonald's noncentrality index (NCI). To test significant changes in the RMSEA values after adding constraints to the model, we computed Probability of close fit (p_{Close}) at every level. To establish measurement invariance, it is expected to observe low differences on fit indices between models and non-significant changes in χ^2 and RMSEA ($p_{\Delta\chi^2} > 0.05$; $\Delta CFI \leq 0.01$; $\Delta NCI \leq 0.02$; $\Delta \hat{\gamma} \leq 0.001$; $p_{Close} > 0.05$) (Cheung & Rensvold, 2002).

Statistical analyses were performed using JASP v0.16.2, an open-source statistical package running on R (Love et al., 2019) and IBM Amos Graphics v26.

Results

Statistical descriptive

Descriptive for each scale are presented in Table 1.

Confirmatory factor analysis (CFA)

Results indicate that the original two-factor structure demonstrated relatively good fit indices, whereas the single-factor structure had poor fit and lower parsimony overall (Table 2). Thus, the original two-factor model was chosen as the most appropriate. However, indices such as CFI and TLI remained suboptimal. To address this, we examined each items' modification indices (MI) in order to assess whether a better fit was possible. Examination of MI revealed that the residuals of item 1 (*when I want to feel happier, I think about something different*) and item 3 (*when I want to feel less bad (i.e., sad, angry, or worried) I think about something different*) seemed to be highly correlated ($MI = 47.269$; $EPC = 0.230$). However, bivariate correlations between these items were moderate ($r = .504$), which suggests that even though these items do share variance, they are heterogeneous enough to be considered independent from each other (Davenport et al., 2015). This process was repeated for item 7 (*when I*

Table 1 Descriptive statistics and scores for the students of the sample ($n=603$)

		M(SD)		Range	Skewness	Kurtosis
ERQ-CA	CR	20.713	(4.113)	6–30	-0.423	0.874
	ES	13.280	(3.370)	4–20	-0.337	-0.326
CBTSQ	CgRs	19.425	(6.089)	7–35	0.093	-0.473
	BA	19.978	(5.956)	7–35	0.035	-0.487
SIQ-JR	AI	9.643	(6.405)	6–42	2.542	6.554
	GI	15.846	(9.099)	6–42	1.059	0.207
	IP	6.452	(4.872)	3–21	1.639	1.652
MAFS	GF	28.886	(5.463)	13–39	-0.412	-0.445
	FF	18.821	(3.034)	9–24	-0.695	-0.308
	PF	12.961	(3.403)	6–20	-0.380	-0.663
PHQ-9	Total score	11.013	(6.431)	0–27	0.345	-0.720

ERQ-CA=Emotion Regulation Questionnaire for Children and Adolescents; CR=Cognitive reappraisal; ES=Expressive suppression; CBTSQ=Cognitive Behavioral Therapy Skills Questionnaire; CgRs=Cognitive restructuring; BA=Behavioral activation; SIQ-JR=Suicide Ideation Questionnaire Junior; AI=Active ideation; GI=General ideation; IP=Interpersonal problems; MAFS=Multidimensional Adolescent Functioning Scale; GF=General functioning; FF=Family-related functioning; PF=Peer-related functioning; PHQ-9=Patient health questionnaire

want to feel happier about something, I change the way I'm thinking about it) and item 8 (I control my feelings about things by changing the way I think of them) ($MI=24.204$; $EPC=0.166$; $r=.426$). To address this, these residuals were covaried in order to test for a better fit without removing items from the original structure. Figure 1 shows the path diagram for the final model.

Reliability analysis

Results show acceptable values in terms of internal consistency for both subscales (CR: $\omega=0.758$, $\alpha=0.757$, $r_M=0.343$; ES: $\omega=0.715$, $\alpha=0.710$, $r_M=0.296$). However, results were unsatisfactory for the entire scale ($\omega=0.675$; $\alpha=0.612$; $r_M=0.177$), which can be expected and attributed to the fact that both subscales address independent strategies.

Regarding the rest of the measures, internal consistency indices were good for the CBTSQ ($\omega=0.843$, $\alpha=0.841$, $r_M=0.276$) and for each factor (CgRs: $\omega=0.806$, $\alpha=0.805$, $r_M=0.374$; BA: $\omega=0.819$, $\alpha=0.818$, $r_M=0.391$). Internal consistency indices for the SIQ-JR were good to very good for both the entire scale ($\omega=0.955$, $\alpha=0.951$, $r_M=0.577$) and each subscale (AI: $\omega=0.921$, $\alpha=0.905$, $r_M=0.608$; GI: $\omega=0.896$, $\alpha=0.894$, $r_M=0.591$; and IP: $\omega=0.909$, $\alpha=0.909$, $r_M=0.772$). As a side note, the high r_M found for the IP subscale may imply that the three items comprising it might be too similar among themselves. Moreover, internal consistency values for the MAFS were good for each subscale (GF: $\omega=0.817$, $\alpha=0.801$, $r_M=0.260$; FF:

$\omega=0.832$, $\alpha=0.810$, $r_M=0.372$; and PF: $\omega=0.838$, $\alpha=0.769$, $r_M=0.301$). Finally, we observed good values for the PHQ-9 ($\omega=0.892$, $\alpha=0.889$, $r_M=0.473$).

Convergent and discriminant validity

As expected, the CR subscale correlated positively and significantly with both subscales of the CBTSQ and all three subscales of the MAFS, while the ES subscale correlated positively and significantly with all of the SIQ-JR subscales and with the PHQ-9's total score. Results for discriminant validity were also satisfactory. The CR subscale correlated negatively and significantly with all the SIQ-JR subscales and the PHQ-9's total score, while the ES subscale did the same with the CBTSQ's CgRs subscale and all three of the MAFS subscales. No correlation was found between the ES and BA subscales (Table 3).

Measurement invariance

As shown in Table 4, measurement invariance tests showed satisfactory results based on biological sex (male/female) and psychiatric treatment history (past/current/no) grouping variables. Biological sex invariance was established at configural and metric levels. Thus, we can assume that the measure's ability to assess CR and ES is equivalent across groups at baseline and after constraining all items' factor loadings (Putnick & Bornstein, 2016). However, we did not confirm invariance at the scalar level, which is based on invariance of item intercepts ($p\Delta\chi^2<0.05$). This result suggests that the

Table 2 Confirmatory factor analysis results for the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA)

	Absolute fit			Relative fit					Parsimony	
	χ^2	df	χ^2/df	RMSEA	SRMR	CFI	TLI	GFI	AIC	BIC
Single-factor	610.391	35	17.440	0.165	0.140	0.543	0.413	0.800	17239.514	17327.552
2-factor (original)	185.53	34	5.457	0.086	0.060	0.880	0.841	0.993	16846.943	16983.402
2-factor (MI)	118.354	32	3.699	0.067	0.054	0.931	0.903	0.996	16783.682	16928.945

latent constructs (CR and/or ES) do not capture the mean differences in the shared variance of each item (Putnick & Bornstein, 2016). Thus, a partial scalar invariance model was tested where two items' intercepts were allowed to vary between groups. Constraints were freed for the intercepts of items 1 and 5, which showed the highest variability between groups after individually testing all items. Results for partial scalar invariance were satisfactory ($p\Delta\chi^2 > 0.05$). Thus, partial scalar invariance was established, which allows for assuming at least partial equivalence of construct measurement across male and female groups. Second, we tested for measurement invariance based on psychiatric treatment history. Here, measurement invariance was fully established at configural, metric and scalar levels. As a final step, we tested for strict invariance, which implies equivalence of item residuals and measurement error across groups (Putnick & Bornstein, 2016). Results show that full strict invariance was established ($p\Delta\chi^2 > 0.05$), thus allowing us to conclude that the ability of the ERQ-CA to assess CR and ES is fully equivalent across individuals with past, current and no psychiatric treatment history. Overall, differences in CFI, NCI and Gamma Hat were small ($\Delta CFI \leq 0.01$; $\Delta NCI \leq 0.02$; $\Delta \hat{\gamma} \leq 0.001$), which provides additional evidence for model fit invariance across groups. There were also no significant changes in RMSEA between models ($p_{Close} > 0.05$).

Comparison of latent means

Finally, we tested for differences across groups through comparison of latent means. We observed significant differences for biological sex, where we found that males reported a significantly higher usage of CR ($M_{male} = 21.344$; $SD_{male} = 4.220$; $M_{female} = 20.125$; $SD_{female} = 3.928$; $p = .000$ $d = 0.299$), while females reported a significantly higher use of ES ($M_{male} = 12.852$; $SD_{male} = 3.504$; $M_{female} = 13.679$; $SD_{female} = 3.195$; $p = .003$; $d = 0.247$). When comparing latent means across psychiatric treatment history groups, results show statistically significant differences in CR usage between participants with past and current ($M_{past} = 20.718$; $SD_{past} = 3.734$; $M_{current} = 19.213$; $SD_{current} = 4.304$; $p = .019$; $d = 0.369$) and current and no psychiatric treatment history ($M_{current} = 19.213$; $SD_{current} = 4.304$; $M_{no} = 21.048$; $SD_{no} = 4.217$; $p = .001$; $d = 0.450$). However, when comparing usage of ES across groups, no statistically significant differences were detected ($F = 2.766$; $p = .064$; $\eta^2 = 0.009$). Additional analyses assessing the differences across psychiatric treatment history groups on the SIQ-JR, CBTSQ, MAFS and PHQ-9 scores are available in Supplementary Table S1.

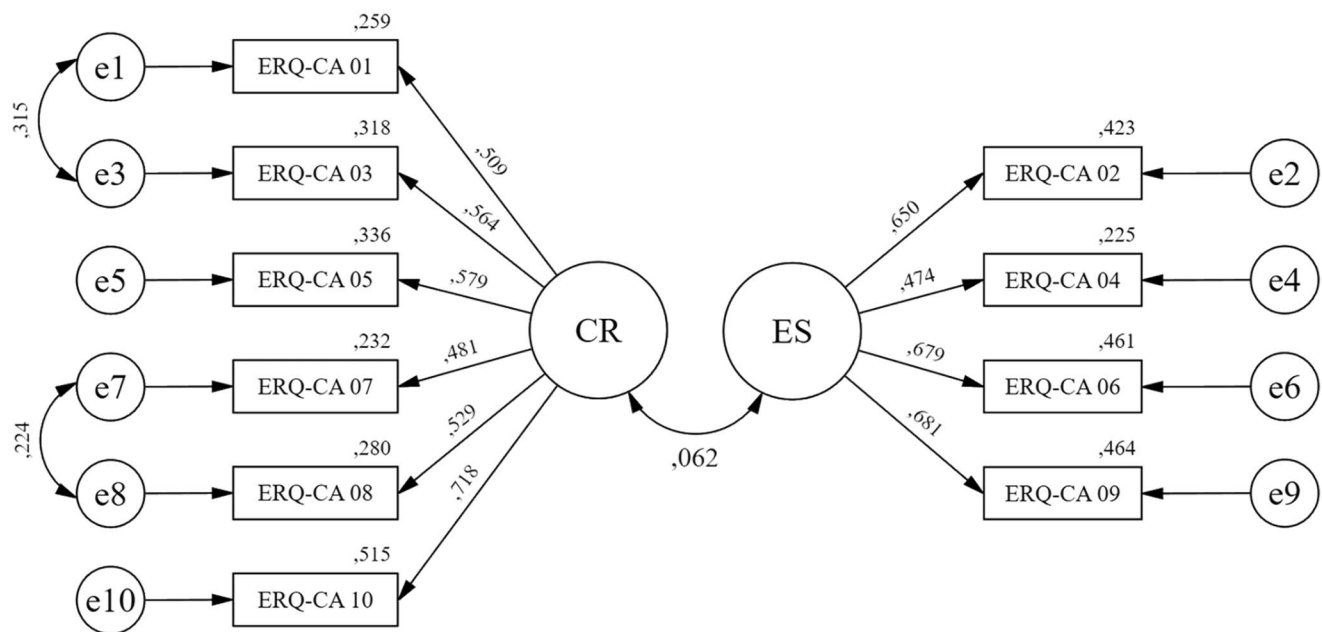


Fig. 1 Path diagram for the final two-factor model of the ERQ-CA showing standardized factor loadings and regression coefficients

Discussion

The present study sought to provide evidence on the psychometric properties of the ERQ-CA in a sample of secondary students in Chile. Our results confirm the original two-factor model by Gross and John (2003), and Gullone and Taffe (2012). The good fit and structural validity, and also the good reliability values of the scale support its use in Spanish-speaking secondary students.

Although our findings mirror prior research in terms of both factor structure and factor loadings for the CR and ES subscales (Liu et al., 2017; Ng et al., 2017; Ling et al., 2019) some specific differences with other studies deserve mention. Previous research with Spanish-speaking populations has reported conflicts between some items and the original two-factor structure. For instance, the exploratory factor analysis (EFA) by Alfonso and Prieto (2021) in a sample of university students yielded that that items 1 (*when I want to feel happier, I think about something different*), item 7 (*when I want to feel happier about something, I change the way I'm thinking about it*) and item 10 (*when I want to feel less bad (e.g., sad, angry, or worried) about something, I change the way I'm thinking about it*) were loading on a third factor. They removed items 1 and 7 and proposed a final eight-item version focused on adolescent and adult populations. By contrast, we found no need to remove or change any of the items of the scale, supporting prior studies using the English (Ng et al., 2017), Chinese (Gong et al., 2021; Ling et al., 2019), Japanese (Namatame et al., 2020) and Portuguese (Teixeira et al., 2015) versions of the ERQ-CA. Additionally, we did not observe associations between

ER and CS subscales, which is similar to Alfonso & Prieto (2021), but differs from Martín-Albo et al. (2018), who found positive associations, and also with Gullone & Taffe (2012), who found negative correlations. This independence has also been observed in other studies testing this model with children (Liu et al., 2017; Gong et al., 2021), adolescents (Ng et al., 2017; Pastor et al., 2019; Teixeira et al., 2015) and adult populations (Balzarotti et al., 2010). As stated by Gross and John (2003), our results suggest that CR and ES can be conceived as independent strategies that could be alternatively used.

Regarding the internal consistency of the questionnaire, alpha and omega indices were found to be good and relatively similar for both the CR and ES subscales. This is congruent with the study by Namatame et al. (2020) in Japanese adolescents but differs from Pastor et al. (2019) and Navarro et al. (2018) who, respectively, reported relatively low reliability indices for both scales in Spanish adolescents (α_{CR} between 0.54 and .67; α_{ES} between 0.59 and 0.65). Moreover, our results slightly differ from Ng et al., (2017) who observed a much higher internal consistency for the CR subscale in contrast with the ES subscale (α_{CR} between 0.54 and 0.77; α_{ES} between 0.52 and 0.67). Likewise, Martín-Albo et al. (2018), in a secondary school sample, found a low reliability for the ES subscale, particularly for item 9 (*when I'm feeling bad (e.g., sad, angry, or worried), I'm careful not to show it*). However, it must be noted that this latter study tested a slightly different Spanish translation of the ERQ-CA (ERQ-Spa), and that the adaptation of this item was slightly different from the one by Pastor et al. (2019).

Table 3 Pearson correlation matrix between the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA) subscales and convergent and discriminant subscales

	ERQ-CA		CBTSQ		SIQ-JR		MAFS		
	CR	ES	CgRs	BA	AI	GI	IP	GF	PF
ERQ-CA	ES	0.052	—	—	—	—	—	—	—
CBTSQ	CgRs	0.398**	-0.256**	—	—	—	—	—	—
	BA	0.150**	0.003	0.399**	—	—	—	—	—
	AI	-0.251**	0.262**	-0.249**	0.113**	—	—	—	—
SIQ-JR	GI	-0.251**	0.322**	-0.287**	0.202**	0.791**	—	—	—
	IP	-0.264**	0.305**	-0.314**	0.069	0.759**	0.805**	—	—
	GF	0.362**	-0.295**	0.564**	0.095*	-0.465**	-0.529**	-0.528**	—
MAFS	FF	0.195**	-0.245**	0.372**	0.031	-0.336**	-0.372**	-0.415**	0.553**
	PF	0.209**	-0.132**	0.465**	0.169**	-0.069	-0.099**	-0.151**	0.326**
	PHQ-9	-0.297**	0.395**	-0.361**	0.176**	-0.616**	0.719	0.665**	-0.640**

ERQ-CA = Emotion Regulation Questionnaire for Children and Adolescents; CR = Cognitive reappraisal; ES = Expressive suppression; CBTSQ = Cognitive Behavioral Therapy Skills Questionnaire; CgRs = Cognitive restructuring; BA = Behavioral activation; SIQ-JR = Suicide Ideation Questionnaire Junior; AI = Active ideation; GI = General ideation; IP = Interpersonal problems; MAFS = Multidimensional Adolescent Functioning Scale; GF = General functioning; FF = Family-related functioning; PF = Peer-related functioning; PHQ-9 = Patient health questionnaire; * = $p < .05$; ** = $p < .001$

Table 4 Measurement invariance tests

	Model fit				Invariance tests										
	χ^2	df	CFI	NCI	$\tilde{\gamma}$	RMSEA	$\Delta\chi^2$	Δdf	$p\Delta\chi^2$	ΔCFI	ΔNCI	$\Delta\tilde{\gamma}$	$\Delta RMSEA$	p_{Close}	
Biological sex	Configural	211.675	68	0.884	0.887	0.954	0.059	—	—	—	—	—	—	—	
	Metric	225.743	76	0.879	0.883	0.953	0.057	14.068	8	0.080	-0.005	-0.004	-0.001	-0.002	0.080
	Scalar	251.018	84	0.865	0.870	0.947	0.058	25.275	8	0.001	-0.013	-0.013	-0.006	0.001	0.063
Psychiatric treatment history	Scalar (partial)	233.485	82	0.877	0.881	0.952	0.055	7.742	6	0.258	-0.002	-0.002	-0.001	-0.002	0.136
	Configural	297.592	102	0.847	0.850	0.938	0.057	—	—	—	—	—	—	—	
	Metric	312.936	118	0.847	0.850	0.939	0.052	15.344	16	0.500	0.000	0.000	0.001	-0.005	0.273
Scalar	334.589	134	0.843	0.846	0.938	0.050	21.653	16	0.155	-0.004	-0.004	-0.001	-0.002	0.492	
	Strict	357.940	154	0.840	0.844	0.937	0.047	23.351	20	0.272	-0.003	-0.002	-0.001	-0.003	0.775

CFI = Comparative fit index; NCI = Non-centrality index; $\tilde{\gamma}$ = Gamma hat; RMSEA = Root mean square error of approximation; Δ = Difference with previous level; p_{Close} = Probability of close fit

Some of these discrepancies could be partially explained by the differences in the age-ranges of the samples of the studies using the same questionnaire, which vary from 13 to 14 years old (Pastor et al., 2019) to 15–25 years old (Alfonso & Prieto, 2021). The only study with Spanish-speaking adolescents (10–19 years) examining associations with age (Navarro et al., 2018), suggests that the instrument's ability to assess these ER strategies could change based on different stages such as early and late adolescence. Using other instruments, prior evidence on the age-related changes in ER during adolescence is mixed. While some studies have reported that aging is associated with an increased use of adaptive strategies (Zimmerman & Iwanski, 2014) and a decreased use of maladaptive strategies (Gullone et al., 2010), others have found negative associations between age and adaptive strategies (Kovacs et al., 2019).

Concerning convergent and discriminant validity of the measure, we found that depressive symptoms were positively associated with ES strategies while being negatively associated with CR strategies. Additionally, we observed negative and positive associations between suicidal ideation and CR and ES strategies, respectively. This is in accordance with prior literature, suggesting that adaptive ER strategies protects against suicidal risk (Ong et al., 2019), while avoidant strategies increase the risk (Forkmann et al., 2014). Finally, we found associations between both ER strategies and cognitive-behavioral skills and three specific dimensions of psychosocial functioning (general, family and peer-related), where CR showed positive correlations while correlations with ES were negative. Overall, these results highlight the adaptive nature of CR strategies, being associated with positive psychosocial functioning and cognitive skills, and the negative outcomes associated with ES strategies. Furthermore, our findings provide insight on the relevance of family- and peer-related experiences in the development of ER strategies, a subject that requires additional research.

In terms of measurement invariance, our findings provide evidence for biological sex and psychiatric treatment history equivalence across groups. This suggests that the ability of the ERQ-CA to measure CR and ES strategies in secondary students remains stable regardless of the student's biological sex or psychiatric treatment history. Requirements for equivalence across groups were not met when testing for full scalar invariance across male and female groups. Therefore, we tested a partial scalar invariance model where constraints were freed for two items for each grouping variable. Noticeably, the two less invariant items belonged to the CR subscale. Similar results have also been reported in past studies, where only metric or partial invariance levels have been confirmed when assessing between male and female participants on the two-factor model (Ling et al., 2019; Pinto

et al., 2021). At least two explanations can be preliminary offered for this: First, measurement of reappraisal strategies may be moderated by specific variability associated with the participants' biological sex or with sample attributes such as socioeconomic status, ethnicity or culture (Rogier et al., 2019). Second, both particularly non-invariant items (item 1 and item 5) may be measuring domain-specific attributes that are not always shared by males and females when expressing reappraisal strategies or might be based on specific contexts. Overall, this can be difficult to ascertain as these studies have focused on fairly different samples, assessing either adults ranging from 18 to 65 (Pinto et al., 2021) or Chinese students ranging from 11 to 16 years-old (Ling et al., 2019), whereas our sample focused on secondary students from Chile. On the other hand, some studies have been able to confirm full biological sex invariance on Chinese students aged 7 to 13 (Gong et al., 2021) and students from the United States with a mean age of 12.2 years-old (Ng et al., 2017). In this context, findings regarding the understanding of differences in measurement between male and female participants have been inconclusive.

Concerning the differences between males and females, we found a higher use of CR strategies in males and ES strategies in females. This contrasts with prior studies reporting no gender differences (Ling et al., 2019; Ng et al., 2017; Pastor et al., 2019) a greater use of CR and a decreased use of ES in females (Alonso & Prieto, 2021; Balzarotti et al., 2010; Gross & John, 2003; Martín-Albo et al., 2018; Rogier et al., 2019; Teixeira et al., 2015). Our finding might reflect that girls are often socialized to consider that their emotions can affect others, and discouraged to express socially disengaging negative emotions such as anger or frustration (Gross & Cassidy, 2019). Additionally, Rogier et al. (2019), suggested a reciprocal influence between the usage of culturally deviant regulatory strategies and the maintenance of psychopathological symptoms could be relevant. For instance, we found that the higher use of ES in girls was associated with the higher levels of depressive symptoms and suicidal ideation and the poorer psychosocial functioning. Further research addressing the interaction of contextual and cultural variables with the expression of ER strategies, and especially important, examining the difference between boys and girls, through longitudinal design is needed.

Regarding psychiatric treatment history group equivalence, evidence on the differences in ER expression between clinical and non-clinical samples has been limited to specific groups experiencing or not certain psychotic symptomatology (Chapman et al., 2020), dysregulatory strategies in suicidal adolescents (Turton et al., 2021) or gambling disorder (Rogier et al., 2021). While this study did not focus on a clinical sample, individuals who reported being on a psychiatric treatment either past or current, could provide

valuable preliminary evidence regarding clinical populations. Further research is required before drawing meaningful conclusions.

Some limitations must be discussed. First, because of our cross-sectional design, we cannot assess for temporal stability of the ER strategies. Second, we recruited participants from public schools, so secondary students from higher socioeconomic status backgrounds -which usually attend private schools- could be underrepresented. Furthermore, regarding the measure, researchers must keep in mind that the ERQ-CA focuses on the assessment of ER strategies through two main dimensions. While this measure has proven to be a valid and reliable tool to approach assessment of regulatory strategies, it only provides a limited understanding of the multidimensional nature of ER (te Brinke et al., 2020).

In conclusion, the evidence provided by this study in terms of the psychometric properties of the measure supports that the ERQ-CA is a valid and reliable two-factor questionnaire for the assessment of adaptive and avoidant ER strategies in Chilean adolescents from the general population, standing as a highly valuable tool for researchers and clinicians.

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Data Availability All data generated or analysed during this study are included in this published article (and its supplementary information files).

Declarations

Ethical approval Ethical approval was obtained from the Scientific Ethics Committee of the University of Talca (1210093; 05/12/2021).

Conflict of interest The authors have no conflict of interest to disclose.

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