Psychometric properties of the Emotion Regulation Questionnaire in a Mexican sample and their correlation with empathy and alexithymia

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Abstract: The Emotion Regulation Questionnaire (ERQ) measures the use of two emotional regulation strategies, cognitive reappraisal, and expressive suppression. Although widely used, there is no description of the psychometric properties of the ERQ and its correlations with alexithymia and empathy in a Mexican sample. We examine the psychometric properties of the ERQ in a Mexican sample (N = 792) assessing its correlations with alexithymia and empathy utilizing the Toronto Alexithymia Scale and the Interpersonal Reactivity Index. Confirmatory factor analyses confirmed the two-factor model. Each factor showed acceptable levels of Cronbach's alpha reliability scores. Cognitive reappraisal scores correlated negatively with alexithymia and positively with higher empathy measures, while expressive suppression correlated positively with alexithymia and personal distress, and negatively with cognitive empathy scales and empathic concern. The ERQ has strong psychometric properties in a Mexican sample and can be applied in a confident manner in conjunction with other tests to complement the assessment of affective traits. In addition, considering previous suggestions regarding the relation between emotion regulation strategies and different components of the empathic response, the correlations between empathy measures and the emotional

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V.E. Olalde-Mathieu is a Ph.D. Candidate of biomedical sciences at the Instituto de Neurobiologia at the Universidad Nacional Autónoma de México, with a M.Sc. in Neurobiology and a Master in Psychotherapy. Currently, he is part of a group interested in understanding the cognitive and neural basis of empathy and social interactions. Empathy is regulated in social interactions to communicate, cooperate and understand each other's affective states and intentions. Thus, the empathic response encompasses several sub-processes, i.e. emotional regulation, perspective taking, emotional activation. There is limited knowledge about the distinct interactions that are involved in the empathic process. To answer these questions, he uses psychometric and neuroimaging tools.

PUBLIC INTEREST STATEMENT

To regulate our emotions, we make use of different strategies, two of the most studied strategies are: cognitive reappraisal, and expressive suppression. The assessment of such strategies could complement the evaluation of affective traits, extending our knowledge on the relations between these strategies and different cognitive and affective processes such as empathy. Psychometric tools that are reliable and can discriminate among adults from different cultural backgrounds are necessary and useful for research. The purpose of this study was to describe the psychometric properties of the Emotion Regulation Questionnaire in the Mexican population, that would yield similar results to those obtained in other cultures and explore further the relation between emotion regulation strategies and different components of the empathic response.
regulation strategies shown in this study opens a pathway to further research such interactions.

**Subjects:** Economics and Development; Social Cognition; Emotion; Motivation; Cognition & Emotion

**Keywords:** Emotion regulation; alexithymia; empathy; cognitive reappraisal; expressive suppression

1. Introduction

Emotion regulation plays an essential role in our affective functioning and in our social interactions. Adaptation of our emotional reactions can allow us to adjust poorly matched reactions to situational demands; this can be done by exerting control using a range of emotional regulation strategies. Cognitive reappraisal and expressive suppression are two of the most studied emotional regulation strategies. Cognitive reappraisal refers to the attempt to alter the intensity of the emotional reaction or the perceived meaning, by modifying the current appraisal of the situation (Gross & John, 2003). On the other hand, expressive suppression consists in attempting to inhibit or reduce the emotion’s expressive behavior. According to the model of emotion regulation of Gross (1998), both strategies exert their effects in different ways. Cognitive appraisal acts before the full emotional response has been formed, altering the emotion trajectory in an efficient/adaptive manner. Conversely, expressive suppression modifies the behavioral components of the emotional response, consuming more cognitive resources that could otherwise be used for optimal performance in the social contexts. Thus, the use of either reappraisal or suppression will imply different effects in psychological functioning in the individual’s personal and social life. To assess these differences, Gross and John (2003) developed the Emotional Regulation Questionnaire.

The Emotional Regulation Questionnaire (ERQ) is a self-report test that measures the habitual use of both emotional regulation strategies in two scales: cognitive reappraisal composed with six items (e.g., “I control my emotions by changing the way I think about the situation I’m in”) and expressive suppression with four items (e.g., “When I am feeling negative emotions, I make sure not to express them”). The ERQ presents a two-factorial structure, where cognitive reappraisal and expressive suppression are two independent regulatory strategies (John & Gross, 2004), with suitable internal reliability scores, cognitive reappraisal with $\alpha = 0.79$ and expressive suppression with $\alpha = 0.73$ (Gross & John, 2003).

Previous research utilizing the ERQ has shown that expressive suppression correlates negatively with age, and women tend to use less suppression as a strategy than men (Haga et al., 2009). Studies have also shown that greater use of cognitive reappraisal relates with better interpersonal functioning, more social adaptability and lower levels of psychopathology symptoms (Gross & John, 2003; Joormann & Gotlib, 2010; D. A. Preece et al., 2020). In contrast, the use of suppression has been related to adverse psychological functioning, greater anxiety and depression, and correlates negatively with the individual’s health, this in part because the use of expressive suppression generally causes an increase sympathetic arousal, while augmenting negative affect (Cisler & Olatunji, 2012; Gross & John, 2003; Soto et al., 2011). Furthermore, previous studies have suggested that reappraisal correlates negatively with psychological distress and alexithymia, whereas expressive suppression correlates positively (Haga et al., 2009; D. A. Preece et al., 2020).

Alexithymia is a personality trait, which is associated with difficulties in emotion recognition and regulation, individuals with alexithymia use more suppressive and less reappraisal strategies (D. A. Preece et al., 2020; Swart et al., 2009). People with alexithymia present a lack of appraisal of their emotional states resulting in a difficulty in understanding and developing their emotion schemas, this difficulty influences directly the way they regulate their emotions, tending to use more experiential avoidance-related strategies often associated with emotional suppression (Kashdan & Steger, 2006; Panayiotou et al., 2015; D. Preece et al., 2017, 2018; Qingqing et al., 2018).
Similarly, empathy which refers to the ability of one person to understand and share the emotional state of someone else, has been associated with emotional regulation that involves the regulatory process that are used to shape our emotions (Thompson et al., 2019; Weiz & Cikara, 2020). Thus, it has been suggested that the way we exercise control over our own emotional reactivity will moderate our empathic response (Decety, 2011; Naor et al., 2018; Weiz & Cikara, 2020). The emotion regulation strategy of cognitive reappraisal has been related to the moderation of the empathic response and the association between prosocial behavior and affective empathy, where greater cognitive reappraisal relates to a lesser relation between prosocial behavior and affective empathy; contrastingly, it has been suggested that expressive suppression hampers the empathic response, reducing emotion sharing and empathic concern (Butler et al., 2003; Lebowitz & Dovidio, 2015; Lockwood et al., 2014; Naor et al., 2018).

In this study, we assessed the factor structure, internal consistency and test–retest reliability of the ERQ in a Mexican sample (N = 792). In addition, we examine concurrent validity against established measures of alexithymia and affective and cognitive empathy. Alexithymia, measure by the Toronto Alexithymia scale has been related to both strategies, cognitive reappraisal, and expressive suppression (Laloyaux et al., 2015; D. Preece et al., 2018; D. A. Preece et al., 2020), people with alexithymia have difficulties processing their emotions resulting in a reduced emotional awareness, which has been proposed as a rate-limiting component for successful emotion regulation (Gross, 2015). Emotional regulation also participates in the modulation of the empathic response, reappraisal and suppression strategies interact with both affective empathy and cognitive empathy (Decety, 2011; Lockwood et al., 2014; Naor et al., 2018; Zaki & Ochsner, 2012).

Although, there are some studies that describe the relation of both strategies with empathy, to our knowledge, we are the first to explore such associations using the Interpersonal Reactivity Index (IRI), which is one of the most widely used empathy questionnaires and has been validated for Mexican population (Konrath et al., 2011; Velázquez et al., 2019), given that the questionnaire has four independent subscales, two related to cognitive empathy and two with affective empathy, we could examine the empathy-related associations with both strategies (reappraisal and suppression) in a more specific manner, in comparison with other tests that have only two major scales regarding affective and cognitive empathy (Chrysikou & Thompson, 2016; Lockwood et al., 2014). Furthermore, it has been suggested that different empathy subprocesses interact with one another and affect the way we regulate our emotions a thus our empathic response (Decety, 2011; Eisenberg & Eggum, 2009; Naor et al., 2018; Tousignant et al., 2017; Weiz & Cikara, 2020); given the multidimensional assessment of the IRI, we could explore the interaction effect of the IRI scales in relation with the use of emotion regulation strategies. In addition, the personal distress scale, which correlates negatively with the other three scales of the IRI, measures a form of psychological distress related to a social context (M. H. Davis, 1983; Konrath et al., 2011), previous research has shown that psychological distress correlates negatively with reappraisal and positively with suppression (Haga et al., 2009; D. A. Preece et al., 2020), the use of the IRI will allow us to explore this association related also with empathy. A characterization of the associations and interactions between the ERQ emotional regulation strategies and IRI’s subscales could extend our knowledge of the way both strategies relate to the empathic response.

Given other evaluations of the ERQ in Spanish-speaking countries, we expect adequate internal consistency scores and that the two-factor structure will be maintain in the Mexican sample (Pérez & Bello, 2017). Also given the previous research we expect that the psychometric properties of the ERQ concord with those shown in other countries, including sex differences and age correlation. We also expect to find the predicted correlations and interactions with other constructs: cognitive reappraisal will correlate negatively with alexithymia scores and positively with greater empathic scores, while expressive suppression will correlate positively with alexithymia scores and negatively with greater empathic scores.
2. Methods

2.1. Participants
A total of 792 (55% females) Mexican volunteers, age range 17 to 76 years with a mean of 27.1 ± 11.7, concluded the Spanish version of the ERQ, 698 (56% females) of them also completed the Toronto Alexithymia scale and IRI, to assess alexithymia and cognitive and affective empathy. A subset of 101 participants (61% females), age range 17 to 62 years with a mean of 34.0 ± 9.7, completed the ERQ after 3 months for test-retest reliability. All participants were native Spanish speakers.

2.2. Measures
The administered questionnaires were the ERQ (Gross & John, 2003; Rodriguez-Carvajal et al., 2006), Toronto alexithymia scale (TAS–20; Bagby et al., 1994; Moral de la Rubia, 2008) and the Interpersonal reactivity index (IRI; M. Davis, 1980; Velázquez et al., 2019). The Emotional regulation questionnaire Spanish version measures the habitual use of two emotional regulation strategies: cognitive reappraisal comprised by six items and expressive suppression composed by four items. The 10 items are answered with respect to the participant's degree of agreement using a 7-point Likert scale, ranging from 1 to 7 (strongly disagree to strongly agree).

2.2.1. Toronto alexithymia scale
Is a 20 item self-report questionnaire, designed to measure alexithymia within three subscales: an externally orientated thinking style (EOT) comprised by 8 items, difficulty describing feelings (DDF) comprised by 5 items and difficulty identifying one’s own feelings (DIF) comprised by 7 items. The 20 items are answered with respect to the participant’s degree of agreement using a 5-point Likert scale, ranging from 1 to 5 (strongly disagree to strongly agree). All items are summed into a total alexithymia score. Higher scores indicate higher levels of alexithymia.

2.2.2. Interpersonal reactivity index
The IRI measures four independent scales: personal distress (PD) and empathic concern (EC) regarding affective empathy and perspective taking (PT) and fantasy (FS) regarding cognitive empathy. The test is comprised by 28 items 7 for each subscale. The items are answered using a 5-point Likert scale, ranging from 0 to 4 (describes me very well to does not describe me well). Greater scores in fantasy, perspective taking and empathy concern, indicate greater empathic abilities, while lower scores in personal distress indicate greater empathy (M. H. Davis, 1983).

2.3. Data analyses
All statistical analysis were done using R software (Core Team & ca. 2019), using in-house scripts and packages psych and lavaan (William Revelle, 2018; Yves Rosseel, 2012). Psychometric properties of the ERQ were evaluated: means, standard deviations, Cronbach’s α reliability coefficient and test–retest reliability coefficients were obtained. Univariate and multivariate preliminary distribution analysis was indicative of non-normality of data distribution. For the test–retest reliability, we used interclass correlation coefficients.

To assess the two-factor model, the confirmatory factor analysis (CFA) was implemented with a Satorra-Bentler scaled correction of maximum-likelihood, since it provides a more robust fit (Hu et al., 1992). To test that the two-factor independence model (no correlation between factors) of the original version of the ERQ had also the best fit in our sample, we compared the fit of the model with three possible CFA models used in the original version of Gross and John (2003): a) general-factor model (one-factor model), b) hierarchical model (two factors forming two facets of emotion regulation correlating .50) and c) a two-factor model (augmented model) were the correlation between the two factors was freely estimated (Supplementary material).

To evaluate differences between sexes and correlations with other constructs, we converted to z-values, applied a t-test controlling age as a covariate, and for the correlations, we did partial correlations controlling sex as a covariate.
A multiple regression analysis was performed to explore if there was an interaction effect between the IRI scales and the emotion regulation strategies. Two regression models were tested, one for each strategy, each strategy was modeled as a dependent variable, the four scales of the IRI where modeled as independent variables, with their corresponding interactions, sex, and age where controlled. For the significant interaction, a moderation analysis was conducted to explore the interaction effect between perspective taking and empathic concern as independent variables, with cognitive reappraisal as a dependent variable. First, we performed a regression model, were independent variables were mean centered; then, we evaluated the conditional effect of perspective taking on reappraisal at one standard deviation (SD) below and above the mean, and at the mean of empathic concern.

3. Results

3.1. Psychometric properties and factor analysis
The internal consistency measure by Cronbach’s α coefficients, was 0.80 for cognitive reappraisal and for expressive suppression 0.76. For the test–retest reliability, the interclass correlation coefficient for reappraisal was 0.81 (p < 0.001) and 0.82 (p < 0.001) for suppression.

Similar to Gross and John (2003), the independence model and the augmented model, presented the better fit across the standard fit indexes (Supplementary material, Table S1). Age presented a negative correlation with expressive suppression ($r = -0.17$, $p < 0.001$), but not with cognitive reappraisal. Sex differences, were only found within expressive suppression habitual use $t (767) = 3.81$ ($p < 0.001$), with a Cohen’s $d$ of 0.25, where women (mean $= 3.37$, sd = 1.4) suppress less than men (mean $= 3.71$, sd = 1.3).

3.2. Correlations with alexithymia and empathy
As expected, cognitive reappraisal correlated positively with higher empathy scores, in both cognitive empathy measures (fantasy, perspective taking) and Empathic concern, while suppression correlated negatively with the same constructs with the exception of fantasy. In addition, reappraisal correlated negatively with personal distress and all the alexithymia scales, while suppression correlated positively with the same constructs (Table 1).

From the multiple regression models, no significant interaction was found for the suppression strategy model (supplementary materials, Table S2). However, a significant interaction effect between perspective taking and empathic concern ($t = -3.2$, $p < 0.01$) was found in the regression model of Cognitive reappraisal (dependent variable) and the empathy scales as predictors: perspective taking ($t = 3.24$, $p = 0.001$), empathic concern ($t = 3.05$, $p < 0.01$), personal distress ($t = -0.76$, n.s.) and fantasy ($t = 0.87$, n.s.) (supplementary materials, Table S3). For the moderation analysis, the regression model considered perspective taking and empathic concern as mean centered independent variables, and reappraisal as dependent variable. The model showed a positive relation between perspective taking and reappraisal ($t = 5.7$, $p < 0.001$), but no association between empathic concern and reappraisal ($t = 0.6$, n.s.; Table 2). However, the interaction between perspective taking and empathic concern was significant ($t = -3.2$, $p = 0.001$). 1 SD below the mean of empathic concern, the positive association between perspective taking and reappraisal was $t = 6.2$, $p < 0.001$; while at 1 SD above the mean on empathic concern, the association between perspective taking and reappraisal was lower ($t = 2.3$, $p < 0.05$; Figure 1). In other words, perspective taking was associated with reappraisal but such association was lower for those individuals with high levels of empathic concern.

4. Discussion
The results confirmed the two-factor structure and reliability of the Emotional regulation questionnaire Spanish version within a Mexican community sample. The Cronbach’s alpha reliability scores of both factors were comparable to those obtained in the original version and in other validations (Balzarotti et al., 2010; Cabello et al., 2013; Gross & John, 2003; D. A. Preece et al., 2020). Test–retest reliability supported a temporal stability of the ERQ, while confirmatory factor analysis corroborated the original two-factor structure.
The performance of the Emotional regulation questionnaire was also similar to other samples, in respect to the predicted negative correlation between expressive suppression and age. The sex differences were also as expected, none present in cognitive reappraisal, whereas in expressive suppression, women tend to suppress less than men. Similarly, the expected correlations between the emotional regulation strategies and, alexithymia and empathy (Lockwood et al., 2014; D. A. Preece et al., 2020), were also present in this study. Cognitive reappraisal correlated negatively with alexithymia and positively with higher empathic measures. Cognitive reappraisal has been related to positive affect, being considered as a good adaptive regulation strategy, given that alexithymia is a rate-limiting component for emotion regulation, the relation between these two constructs has been considered to be negative, as shown in this study. In addition, the use of cognitive reappraisal has also been related to higher scores in affective and cognitive empathy, this relation was also presented in this study, positively with the empathic concern, fantasy and perspective taking scales, and negatively with the personal distress scale, which is in concordance with the negative relation between personal distress and the other scales of the Interpersonal reactivity index (M. H. Davis, 1983). Contrary to cognitive reappraisal, suppression has been generally related with maladaptive behavior and enhancing negative affect, hence that expressive suppression presented the same relation, but in an opposite manner, with all the scales, with the exception of the fantasy scale. It is worth to notice, that the association between both strategies and personal distress was present as expected, since personal distress entails a form of psychological distress within a social context, being associated with a deterrent effect in our empathic response. Thus, as in previous reports reappraisal correlated negatively, whereas suppression correlated positively (Dryman & Heimberg, 2018; Gross & John, 2003; Haga et al., 2009; D. A. Preece et al., 2020). The relation of both emotional strategies with both positive and negative affect, can be further reflected in the direction of their respective correlations with the other constructs, as shown, cognitive reappraisal

Table 1. Relations with other constructs with sex and age as covariates

| Cognitive Reappraisal | Test | Construct | rho | p.value*  | t.value |
|-----------------------|------|-----------|-----|-----------|---------|
| IRI                   | FS   | 0.10      | 0.012 | 2.61      |
|                       | PT   | 0.24      | < 0.001 | 6.39      |
|                       | EC   | 0.12      | 0.002 | 3.24      |
|                       | PD   | −0.09     | 0.021 | −2.34     |
| TAS-20                | DDF  | −0.11     | 0.004 | −2.99     |
|                       | DIF  | −0.09     | 0.019 | −2.39     |
|                       | EOT  | −0.15     | < 0.001 | −3.89     |
|                       | TAS total | −0.14 | < 0.001 | −3.66     |

| Expressive Suppression | Test | Construct | rho | p.value*  | t.value |
|------------------------|------|-----------|-----|-----------|---------|
| IRI                    | FS   | 0.01      | 0.887 | 1.4       |
|                       | PT   | −0.14     | < 0.001 | −3.69     |
|                       | EC   | −0.20     | < 0.001 | −5.32     |
|                       | PD   | 0.12      | 0.003 | 3.07      |
| TAS-20                 | DDF  | 0.47      | < 0.001 | 14.13     |
|                       | DIF  | 0.37      | < 0.001 | 10.35     |
|                       | EOT  | 0.26      | < 0.001 | 7.11      |
|                       | TAS total | 0.45 | < 0.001 | 13.14     |

Results are shown controlling Sex and Age as covariates. Interpersonal reactivity index (IRI) subscales: Fantasy (FS), Perspective taking (PT), Empathy concern (EC), Personal distress (PD). Toronto alexithymia scale (TAS-20): Difficulty describing feelings (DDF), Difficulty identifying feelings (DIF), Externally orientated thinking (EOT), total alexithymia score (TAS total). *FDR-corrected.
Table 2. Regression table of the interaction of EC and PT, with reappraisal as dependent variable. Mean centered moderation analysis model

| Predictor   | b    | b 95% CI | beta | beta 95% CI | sr2 | sr2 95% CI | Fit       |
|-------------|------|----------|------|-------------|-----|------------|-----------|
| (Intercept) | 5.02** | [4.67, 5.37] |      |             |     |            |           |
| PT          | 0.06** | [0.04, 0.08] | 0.23 | [0.15, 0.31] | 0.04 | [0.01, 0.07] |           |
| EC          | 0.01 | [-0.01, 0.03] | 0.03 | [-0.05, 0.11] | 0   | [-0.00, 0.00] |           |
| PT * EC     | -0.01** | [-0.01, -0.00] | -0.12 | [-0.19, -0.05] | 0.01 | [-0.00, 0.03] |           |
| Sex         | -0.05 | [-0.24, 0.14] | -0.02 | [-0.09, 0.05] | 0   | [-0.00, 0.00] |           |
| Age         | 0    | [-0.01, 0.00] | -0.03 | [-0.11, 0.04] | 0   | [-0.00, 0.01] |           |

R² = 0.073**
95% CI[0.04,.11]

Note. A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights. beta indicates the standardized regression weights. sr2 represents the semi-partial correlation squared. Perspective taking (PT), Empathic concern (EC). Square brackets are used to enclose the lower and upper limits of a confidence interval. * indicates p < .05. ** indicates p < .01. Results are shown controlling Sex and Age as covariates.
correlates positively with constructs that are related with positive affect, and expressive suppression positively with those that are related with negative affect.

Furthermore, the positive relation of reappraisal with positive affect was portrait in the stronger correlation of perspective taking with reappraisal and the suggested moderation of empathic concern over perspective taking in such relation. Our finding that higher levels of empathic concern interact with the way perspective taking and reappraisal relate to each other, could indicate the overlapping nature of the interaction between affective and cognitive processes in the empathic response. Thus, the tendency to reappraise can be associated with the ability to appreciate more the other’s view point, the association will be greater in individuals with higher levels of perspective-taking/cognitive-empathy, however this relationship will be lesser in those individuals that also possess higher levels of empathic-concern/affective-empathy. This could suggest that individuals with lower empathic concern utilize other cognitive abilities to compensate, and thus increase their empathic accuracy. It must be stress, that given that this is the first time that such relation is reported, reaffirmation of the aforesaid relation and the positive or negative consequences of such dynamic interactions should be explore in future studies.

In conclusion, the results confirm that the ERQ can be applied with confidence, with the complete 10-item version and a two-factor structure, in Mexican samples. The relationships between ERQ, with the Toronto alexithymia scale and Interpersonal reactivity index, could open a path to further our research into the relation between emotional regulation strategies, positive behavior and affective personality traits.
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Disclosure statement

No potential conflict of interest was reported by the author(s).

Availability of Data

The data that support the findings of this study are available at the DataVerse public site with DOI: https://doi.org/10.7910/DVN/756FWB

Supplementary material

Supplemental data for this article can be accessed here

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