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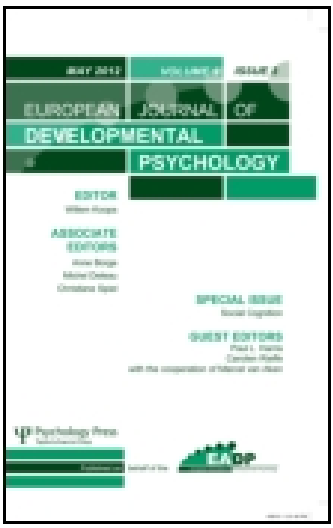

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Measurement invariance of the Emotion Regulation Questionnaire (ERQ). A cross-national validity study

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Developmetrics

Measurement invariance of the Emotion Regulation Questionnaire (ERQ). A cross-national validity study

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The goal of this research was to examine the measurement invariance of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) across two European nations. Participants were Italian and German undergraduate students. First, confirmatory factor analysis was used to test for the two-factor structure of the ERQ; subsequently, measurement invariance was analysed. The results showed acceptable fit indices for the German and Italian sample; however, results with regard to the Italian sample showed lower fit indices than results regarding the German one. Measurement invariance of the ERQ across Italy and Germany was confirmed. Despite the fact that we assumed measurement invariance of the ERQ, future research is needed to deal with the lower fit regarding the Italian version.

Keywords: Emotion regulation; Emotion Regulation Questionnaire (ERQ); Measurement invariance; Reappraisal; Suppression.

The Emotion Regulation Questionnaire (ERQ) is a self-report questionnaire to assess emotion regulation (Gross & John, 2003) that has been translated

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into several languages. Previous research suggested that the ERQ has a high temporal and internal reliability, and convergent and discriminant validity (Gross & John, 2003). The ERQ assesses two emotion regulation strategies: cognitive reappraisal, an antecedent focused strategy, and expressive suppression, a response-focused strategy. While reappraisal permits, for example, thinking of the situation so as to alter its meaning and the emotional influence, suppression contributes to the inhibition and reduction of ongoing emotion expressive behaviour (Gross, 1998). On the one hand, reappraisal has been considered as an adaptive strategy and has been linked with adaptive patterns of affective management (Sala, Molina, Freilone, & Pons, 2009). On the other hand, suppression has been associated with lack of memory (Richards & Gross, 2000) and poor social outcomes (Butler, Lee, & Gross, 2007).

Recently, there has been a growing interest in research on the role that cultural context may have on the individual's ability to manage their emotions (Myamoto & Ma, 2011), and the ERQ gained considerable relevance upon comparing emotion regulation across groups and countries (Matsumoto, Hee Yoo, & Nakagawa, 2008). Nevertheless, validity for group comparisons premises that different translations of a questionnaire measure identical constructs with the same theoretical structure across groups. The factor structure should be identical over different groups, i.e., measurement invariance should be present (e.g., Dimitrov, 2010; Van de Schoot, Lugtig, & Hox, in press). When measurement invariance is not demonstrated, groups or subjects respond differently to the items. As a consequence, factor means cannot reasonably be compared across groups. As yet, it is unclear whether the ERQ shows measurement invariance across different countries.

The aim of the current study was to test the factor structure in a large sample of Italian and German individuals and to examine measurement invariance of the ERQ. Validation studies for the Italian (Balzarotti, John, & Gross, 2010) and German (Abler & Kessler, 2009) versions of the questionnaire replicated the original factor structure of the instrument. However measurement invariance of the ERQ between these groups was never tested and thus remains unclear.

METHOD

Participants

The sample was composed of 301 undergraduate students from the University of Turin, Italy, and from the University of Ulm, Germany. Italian participants ($N = 127$) were recruited at the Psychology and Agricultural Sciences Faculties. German participants ($N = 174$) were

recruited at the Medical Faculty. In the Italian sample the age ranged from 18 to 29 ($M_{age} = 19.8$ years; $SD = 1.8$), and 44.9% were males. In the German sample the age ranged from 20 to 46 ($M_{age} = 23.7$ years; $SD = 5.6$), and 45.0% were males.

Instrument

The Emotion Regulation Questionnaire (Gross & John, 2003) consists of 10 items covering two factors: Cognitive Reappraisal (six items) and Expressive Suppression (four items). Items are rated on a 7-point Likert scale ranging from "*Strongly disagree*" to "*Strongly agree*". The Italian version of the instrument was validated by Balzarotti et al. (2010) and the translation was developed with a back translation by two independent translators. The German translation was developed in close collaboration with O. P. John, the author of the original English version who is a native speaker of German (Abler & Kessler, 2009).

Statistical analysis

To ensure that the factor structure of the ERQ was equal across countries, a measurement invariance procedure as described in Van de Schoot et al. (in press) was used (see also, Dimitrov, 2010) to test for equality of factor loadings and for equality of intercepts/thresholds of the ERQ across countries. The initial step was to specify the model of the instrument for each country separately using confirmatory factor analyses (configural invariance). We also checked whether the items can best be entered in the model as continuous or categorical indicators, and, as such, whether intercept or thresholds are estimated. The subsequent step was to check if the best fitting factor model was adequate and equal across groups. First, the factor loadings were examined to see if these were equal across groups (metric invariance), and, second, we tested whether the intercepts were similar across groups. For straightforward interpretation of the means, both the factor loadings and intercepts (scalar invariance) should be similar across groups.

Single and multiple group confirmatory factor analyses (CFAs) were calculated using the software Mplus 6.11 (Muthén & Muthén, 2010). A robust weighted least squares estimator (WLSMV) was used in combination with full information maximum likelihood estimation to deal with missing data (Enders & Bandalos, 2001). To assess model fit, we used the comparative fit index (*CFI*), Tucker–Lewis index (*TLI*), and the root mean square error of approximation (*RMSEA*). The Bayesian information criterion (*BIC*) was used to compare competing models. A lower *BIC* indicates a better trade-off between model fit and model complexity. Because

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the *BIC* value is not estimated by the WLSMV estimator, all models were repeated using a maximum likelihood estimator.

RESULTS

The CFA model to be estimated is shown in Figure 1. First, a model where the items were declared to be continuous was compared to a model where the items were declared to be categorical. The latter model had a better trade-off between model fit and model complexity ($\Delta BIC = 435$). Then, data were analysed for the German ($\chi^2 = 62.690$; $p = .002$; $CFI = .969$; $TLI = .959$; $RMSEA = .070$) and for the Italian data set ($\chi^2 = 103.776$; $p < .001$; $CFI = .903$; $TLI = .871$; $RMSEA = .127$) separately. The results showed that the fit indices regarding the Italian sample were lower than the ones from the German sample. Nevertheless, the chi-square, *CFI* and *RMSEA* showed comparable results with the original Italian validation study (Balzarotti et al., 2010): $\chi^2 = 134.54$; $p < .001$; $CFI = .913$; $RMSEA = .083$. Considering this, we chose to continue our study testing the measurement invariance although results regarding the Italian sample were not completely satisfactory.

Table 1 shows the results of the multiple group analysis. All 10 Items were entered in the model as categorical indicators; this is why thresholds were estimated. Three models were tested: Model 1 with fixed thresholds but the factor loadings were allowed to differ between the countries; Model 2 with fixed factor loadings but the thresholds were allowed to vary between the countries; and Model 3: strong measurement invariance (i.e., fixed factor loadings and fixed thresholds). It appeared that Model 3 showed the lowest value of *BIC* compared to Models 1 and 2. This result is coherent with measurement invariance. Nevertheless we should mention the not completely satisfactory fit indices. These results could be influenced by the Italian fit indices mentioned above. To improve model fit, item five was excluded from analysis because of the salient lower R^2 in both, the German ($R^2 = .13$) and Italian ($R^2 = .10$) sample. However the fit did not improve substantially. Therefore item five was re-entered in the final analysis.

The Cronbach's alpha per country indicated that the internal consistency of the questionnaire was satisfactory. The reliability for the Cognitive Reappraisal scale for Italy is .78 and for Germany .74. The reliability for the Expressive Suppression scale for Italy is .62 and for Germany .76.

Comparing the factor means across Italy and Germany, it appeared that the mean scores for Italy on factor 1 ($\Delta M = 0.108$; $SE = 0.131$; $p = .18$) and on factor 2 ($\Delta M = 0.134$, $SE = 0.132$; $p = .31$) do not significantly differ from the mean scores for Germany. Correlations, however, between the two factors differed between groups: the German sample $r = -.03$, $p = .67$ and the Italian sample $r = .18$, $p = .02$.

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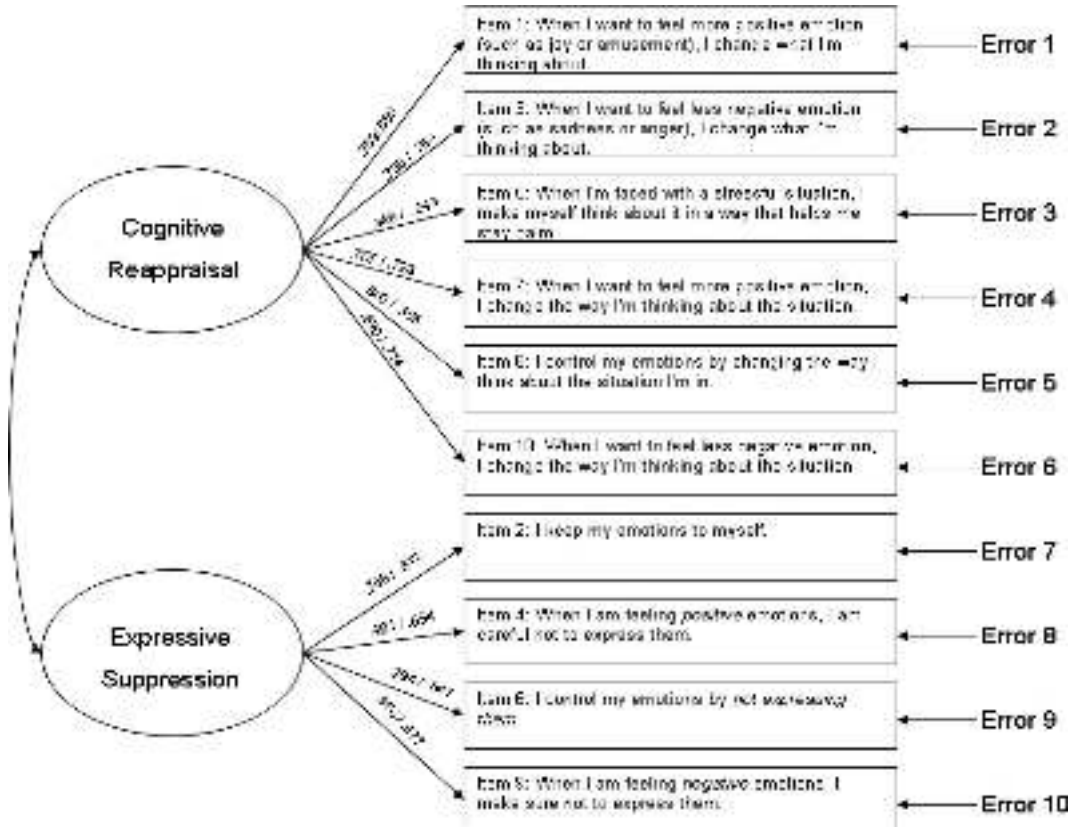

Figure 1. Factor structure of the Emotion Regulation Questionnaire (ERQ). Factor loadings are presented in the following order: Italian/German.

TABLE 1
Test of measurement invariance of the ERQ questionnaire

	χ^2	*df*	*p*	*CFI*	*TLI*	*RMSEA*	*BIC*
Model 1: factor loadings free	419.565	118	.000	.82	.86	.130	10,743
Model 2: thresholds free	169.161	68	.000	.94	.92	.099	10,753
Model 3: factor loadings + thresholds fixed	396.120	128	.000	.84	.89	.118	10,704

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DISCUSSION

In the current study we investigated the underlying structure of the ERQ questionnaire across Germany and Italy.

It appeared that fit indices of CFA were satisfactory for the German sample, but we should mention issues related to the Italian sample. Lower fit indices in the Italian sample could be due to the items' formulation. Balzarotti et al. (2010) suggested that, despite fit indices suggesting that the two-factor solution is the best one, the absolute levels of fit in the original and Italian validation studies (Gross & John 2003) advise that ERQ scales are not strictly unidimensional because some of the items share a specific aspect (regulation of positive or negative emotions) that is not shared with all the other items. We hypothesized that translations could affect this matter. For this reason, differences in fit indices between Italian and German sample could be due to the fact that the Italian translation of the ERQ, more than the German one, could stress matters regarding the unidimensionality of the ERQ scales. For instance, the Italian translation provides more examples to distinguish positive and negative emotions than examples provided from the German translation. Further studies will need to verify these hypotheses, using broader samples; moreover it would be interesting to attempt to develop an adaptation of the instrument trying to replicate the two-factor solution in a completely satisfactory way.

Results of the multiple group analyses support measurement invariance. We should affirm that, although the *BIC* value was coherent with measurement invariance, the fit indices were low. Being influenced by the Italian CFA fit indexes, we consider these data in the light of the comparison with the Italian validation data. Therefore, there is some support that the ERQ shows measurement invariance across Italy and Germany, but future studies should test it again with an updated Italian questionnaire.

In conclusion, our study provides some support for measurement invariance of the ERQ. Nevertheless further studies are needed to answer questions about troubles with the Italian version of the instrument; for example, it could be interesting to test the factor structure of the ERQ in an Italian population representative sample. Moreover, verifying measurement

invariance of the ERQ in further and broader cross-national samples is a matter for future research.

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