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# Psychometric properties of the 16-item Difficulties in Emotional Regulation Scale (DERS-16) in Ecuadorian teenagers

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Abstract

Emotional regulation difficulties correspond to an important attribute in the mental health adolescents. However, the availability of validated measurement tools makes it difficult to monitor this phenomenon. This study aims to validate a hierarchical factor model of the 16-item Difficulties in Emotional Regulation Scale (DERS-16), the measurement invariance by sex and reliability in a sample of Ecuadorian adolescents. A descriptive and instrumental design was employed to assess the DERS-16 in a cross-sectional sample of 904 adolescents (53.5% female, 46.5% male) aged between 15 and 18 years ($M = 16.6$ years; $SD = 1.15$) from nine cities. The findings provide evidence supporting the factorial validity of DERS-16, using a hierarchical adjustment model that comprises five first-order factors and a general second-order factor. The model was found to be invariant across sex, with statistically significant differences in latent means ($p < .05$), indicating that females experience more difficulties in emotional regulation (DER) than males. Furthermore, the DERS-16 demonstrated high internal consistency overall. In conclusion, these results suggest that the DERS-16 is a valid tool for assessing emotional regulation difficulties in adolescents from Ecuador. Which implies a relevant contribution to the psychometric study of this measure in Ecuador and Latin America.
*Keywords: adolescents; affectivity; difficulties; emotional regulation; factorial validity.*

Resumen

*Propiedades psicométricas de la Escala de Dificultades en la Regulación Emocional (DERS-16) de 16 ítems en adolescentes ecuatorianos.* Las dificultades de regulación emocional corresponden a un atributo importante en la salud mental de los adolescentes. Sin embargo, la disponibilidad de herramientas de medición validadas dificulta el seguimiento de este fenómeno. Este estudio tiene como objetivo validar un modelo factorial jerárquico de la Escala de Dificultades en la Regulación Emocional (DERS-16) de 16 ítems, la invarianza de medición por sexo y la confiabilidad en una muestra de adolescentes ecuatorianos. Se empleó un diseño descriptivo e instrumental para evaluar el DERS-16 en una muestra transversal de 904 adolescentes (53.5% mujeres, 46.5% hombres) de edades comprendidas entre 15 y 18 años ($M = 16.6$ años; $DE = 1.15$) de nueve ciudades. Los hallazgos proporcionan evidencia que respalda la validez factorial de DERS-16, utilizando un modelo de ajuste jerárquico que comprende cinco factores de primer orden y un factor general de segundo orden. Se encontró que el modelo era invariante entre sexos, con diferencias estadísticamente significativas en las medias latentes ($p < 0.05$), lo que indica que las mujeres experimentan más dificultades en la regulación emocional (DER) que los hombres. Además, el DERS-16 demostró una alta consistencia interna en general. En conclusión, estos resultados sugieren que el DERS-16 es una herramienta válida para evaluar las dificultades de regulación emocional en adolescentes de Ecuador. Lo que implica un aporte relevante al estudio psicométrico de esta medida en Ecuador y América Latina.
*Palabras clave: adolescentes; afectividad; dificultades; regulación emocional; validez factorial.*

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Emotional regulation (ER) encompasses the cognitive resources and behavioral strategies employed to effectively manage and modulate emotional expression and accompanying physiological responses which interact with environmental stimuli (Eisenberg & Spinrad, 2004; Gross, 1999; Rodas et al., 2022). ER strategies are implemented both before the elicitation of an emotional response, such as cognitive reappraisal and situation-focused reappraisal; as well as after the response, including emotion suppression, modulation of emotional expression, bodily control, and others (Gross, 1999; Moreta-Herrera et al., 2021; Szasz et al., 2011). These strategies benefit individuals by enabling better social adaptation and maintaining mental well-being (Gross & John, 2003).

The extent of activation of these strategies is contingent upon learning, training, practice, and mastery across various situations. Consequently, adolescence represents a critical stage for the development and consolidation of ER (Silvers, 2022). Due to individual differences in neurodevelopment during this period, some adolescents may experience difficulties in controlling and regulating emotions (Schweizer et al., 2020). Such challenges can hinder the attainment of specific objectives that demand precise emotional responses (Thompson, 2019). A substantial body of research has established robust correlations between these challenges and their adverse implications across critical domains, including healthy adolescent development (Herd & Kim-Spoon, 2021; Larzabal-Fernandez et al., 2023; Schweizer et al., 2020; Silvers, 2022), as well as mental health and psychopathology (Charak et al., 2019), among other noteworthy examples.

Within the domain of adolescent psychology, an increasing interest has emerged not only in the well-established processes of ER (Bardeen et al., 2012; Moreta-Herrera et al., 2022a; Szasz et al., 2011) but also in the difficulties in emotional regulation (DER) field. DER refers to the impaired or dysfunctional use of ER strategies that either restrict or fail to elicit an appropriate emotional response (Gratz & Roemer, 2004), thereby hindering the attainment of specific goals that rely on effective emotional reactions (Thompson, 2019). Research on DER in adolescents holds significant importance due to the inherent heightened mental and physical vulnerability during this stage of life (Aponte-Zurita & Moreta-Herrera, 2023; Fallahi et al., 2021), where DER can further exacerbate this vulnerability.

With regard to DER in Ecuadorian adolescents, the available studies are limited, although their description are being expanded. At present, interactions with other phenomena have been identified at the covariance level, such as with alcohol consumption (Castro-Ochoa & Moreta-Herrera, 2023), the perpetration of cyberbullying (Moya-Solís & Moreta-Herrera, 2022), stress and mental health (Zumba-Tello & Moreta-Herrera, 2022), and school adjustment, for example. However, the main difficulty is that the measure used in these studies (DERS-16) does not provide sufficient evidence of its validity, which does not guarantee the precision and accuracy of the results obtained.

Therefore, it is imperative to have appropriate and adapted assessment tools to accurately measure the specific conditions faced by adolescents, providing researchers and practitioners with comprehensive insights, making well-informed decisions, and developing targeted interventions with enhanced effectiveness within this specific population.

### Assessment of Difficulties in Emotional Regulation

Validation and standardization of tests entail processes that examine the measurement properties of an instrument, ensuring its accuracy in assessing a specific construct. This involves evaluating the instrument's internal structure, its relationships with other variables, its discriminative ability across populations, and the performance of its items. The validation process ensures that an assessment tool effectively captures the intended construct in a given context (American Educational Research Association [AERA]; American Psychological Association [APA]; National Council on Measurement in Education [NCME], 2014).

Regarding DER assessment, the Difficulties in Emotional Regulation Scale (DERS; Gratz & Roemer, 2004) has emerged as a widely used instrument. The DERS measures both cognitive and behavioral strategies that hinder adequate emotional regulation. The scale presents an oblique factor model and comprises 36 items rated on a five-point Likert scale. It encompasses six factors: a) nonacceptance of emotional responses; b) lack of emotional awareness; c) limited access to emotion regulation strategies; d) difficulty engaging in goal-directed behavior; e) impulse control difficulties; and f) lack of emotional clarity.

The DERS was initially validated in adults and adolescents, demonstrating adequate psychometric properties (Gómez Simón et al., 2014; Sarıtaş-Atalar et al., 2015). However, there are limited studies on its adaptation and validation in this second group. In fact, the instrumental research on the DERS has identified two relevant aspects that suggest changes in its structure. First, it has been proposed to reconsider the factorial structure and adopt a version of five correlated factors. This is because the "lack of emotional awareness" factor shows weaker correlations with the other factors of the scale, and some researchers argue that it does not adequately represent the DER construct (Bardeen et al., 2012). Secondly, there is a need to develop a short version of the DERS by selecting items that contribute the most to the construct based on item-test correlations and eliminating items with the highest error variation (Smith et al., 2000). These changes aim to make the evaluation of the construct more efficient, rapid, and precise.

Building upon prior research, a short version of the DERS, the DERS-16 was developed specifically for the adult population; this version displays five factors (No Acceptance, No Goals, Impulses, No Strategies, and No Clarity) (Bjureberg et al., 2016). Initial analyses demonstrated discriminant validity in both clinical and general populations, as well as convergent validity with constructs such as anxiety, depression, and stress. Additionally, the DERS-16 displayed strong internal consistency and stability over time. Moreover, a study in Brazilian adults also found factorial validity for the DERS-16, with an appropriate five oblique factors structure and satisfactory internal consistency. The DERS-16 also showed convergence with constructs related to affectivity, empathy, perception of emotions, and personality (Miguel et al., 2017).

In recent years, the DERS-16 has gained widespread adoption, leading to several national and language adaptations and validations, demonstrating adequate psychometric properties in adult samples from countries such as the United States (Sörman et al., 2022), Iran (Shahabi et al., 2020), Finland (Westerlund & Santtila, 2018), Turkey (Yiğit & Guzey Yiğit, 2019), and Brazil (Lawlor et al., 2021). However, there is currently no validated Spanish version for the adult population. While adaptation and validation studies have been carried out in adolescent samples, the available evidence remains limited. Notable studies include those conducted on hospitalized adolescents and adults (Charak et al., 2019) and Iranian adolescents (Fallahi et al., 2021), which reported a similar factorial structure and high internal consistency akin to observations in adult studies. Therefore, despite the importance of this age group, the current evidence is still insufficient and warrants further research.

### Present Study

As mentioned, there is still limited research on the psychometric properties of the DERS-16 in Latin American adolescents, particularly concerning confirmatory studies of its internal structure. This insufficiency is underscored by the absence of validation efforts within Spanish-speaking nations. Furthermore, while the scale delineates a factorial configuration involving five oblique factors, exploration into alternative, more intricate adjustment models has been lacking. For instance, hierarchical models offer the potential to ascertain a general factor (GF) that encompasses the original five factors, thereby preserving the measure's multidimensional nature.

Furthermore, it is important to investigate other less-explored psychometric properties of the DERS-16, such as measurement invariance, particularly regarding sex. Some studies have found sex differences ($p < .05$) that suggest greater difficulties in emotional regulation (DER) in women than in men (Bender et al., 2012), that includes in an Ecuadorian sample of adolescents (Jarrín & Moreta-Herrera, 2024; Zumba-Tello & Moreta-Herrera, 2022), while other studies have come to the opposite conclusion (Kivisto & Culpepper, 2015). One possible explanation for these divergent findings is that previous studies did not report measurement invariance, which is why it is unknown whether the differences found are due to variations in the interpretation of the items of the scale or to actual differences in DER among the groups. This lack of consideration for measurement bias (Asparouhov & Muthén, 2014; Byrne, 2008; Meade et al., 2008; Moreta-Herrera et al., 2023) may lead to misinterpretation of results and pose a technical barrier to the development of multi-group studies, such as those exploring sex differences. Additionally, limiting the precision and confidence in measuring emotional regulation not only affects accurate diagnosis but also hinders the development of effective psychological interventions for adolescents. The practical implications of inaccurate measurements can lead to errors in the application of evidence-based techniques and strategies for correcting emotional regulation problems. Consequently, it is crucial to improve the precision and confidence of the measurements of emotional regulation to ensure effective diagnosis and treatment for adolescents.

Given these concerns, the objectives of this study are: a) to confirm the factorial validity of the DERS-16 using a hierarchical adjustment model in a sample of Ecuadorian adolescents; b) to assess measurement invariance by sex of the DERS-16 using the hierarchical model; and c) to calculate the internal consistency reliability of the measure in the overall sample, as well as in sex-segregated subgroups.

## Method

### Participants

The study recruited a sample of 904 adolescents, with 53.5% identifying as female and the remaining 46.5% identifying as male. The age of participants ranged from 15 to 18 years ($M$= 16.6 years; $SD$= 1.15). About 14.5% of the participants reported experiencing economic vulnerability in their families due to low income. The sample comprised students from several educational centers in Ecuador, including 77.4% from public institutions and 22.6% from private and fiscal institutions across nine cities in the country. About the year they are in, 46% come from the first year of high school, 21.5% from the second year and 32.5% from the third year.

Participants were selected through intentional sampling, which included the following criteria: a) voluntary participation; b) written authorization from the adolescent's legal representative; c) enrollment in one of the educational centers participating in the study; and d) age of 18 years or less. The following were considered exclusion criteria: e) participants over 18 years of age; f) participants without the authorization of legal guardians; g) participants not enrolled in authorized educational institutions.

## Instruments

### The Brief version of the Difficulties in Emotional Regulation Scale

(DERS-16; Bjureberg et al., 2016; Gratz & Roemer, 2004) in the Spanish version validated by Hervás and Jódar (2008). The scale is designed to assess levels of DER through a 16-item questionnaire that includes statements such as "I have difficulty finding meaning in my feelings" or "When I am upset, I feel out of control", which are answered on a 5-point Likert scale, where 1 represents "Almost never" and 5 represents "Almost always". The scale includes 5 dimensions, whose names have been abbreviated for this report as follows: a) Non-acceptance of emotional responses (Non acceptance) with 3 items; b) Difficulty engaging in goal-directed behavior (No goals) with 3 items; c) Impulse control difficulties (Impulse) with 3 items; d) Limited access to emotion regulation strategies (No strategies) with 5 items; and e) Lack of emotional clarity (No Clarity) with 2 items. The sum of the scores from all dimensions indicates higher levels of DER, with a cutoff point of 48 points used to identify individuals at risk. Regarding its psychometric properties, the DERS-16 demonstrated satisfactory reliability in this study, with a measure of $\omega = .91$, with a 95% confidence interval of [.89 - .92], indicative of optimal levels (Hervas & Jódar, 2018).

## Procedure

The study followed ethical principles and human subject research standards following the guidelines of the Helsinki Convention and the institutional regulations for the development of research with human beings. Furthermore, the research project from which this work is derived was approved by the Institutional Review Commission of the Pontificia Universidad Católica del Ecuador Sede Ambato. Authorization was obtained from 9 participating educational institutions for data collection, from 2 cities in the province of Tungurahua, Ecuador. Students were provided with information about the study's objectives, activities, and the preservation of anonymity. Interested participants provided a signed consent letter from their parents or legal guardians and completed the evaluation remotely from their homes due to the conditions of remote learning resulting from the COVID-19 pandemic. Data collection was conducted from the fourth quarter of 2021 to the first quarter of 2022. Participants were obtained from 961 students, of which 57 of them (5.93%) were withdrawn because they did not meet all the inclusion criteria. Subsequently, data underwent filtering, database construction, and statistical analyses to test hypotheses. The study's findings were then formulated and presented in this research report.

### Data Analysis

Data management occurred in four stages. The first stage involved a preliminary analysis of the DERS-16 items. This encompassed assessing item behavior using central tendency measures like mean

Table 1.Preliminary analysis of the DERS-16 items (Spanish version)

| | Items | M | SD | $g_1$ | $g_2$ |
|---|---|---|---|---|---|
| 5 | Me cuesta entender mis sentimientos | 2.56 | 0.86 | 0.31 | 0.03 |
| 9 | Estoy confuso sobre lo que siento | 2.63 | 0.89 | 0.14 | -0.09 |
| 12 | Cuando estoy molesto, me da vergüenza sentirme de esa manera | 2.51 | 0.86 | 0.31 | 0.26 |
| 13 | Cuando estoy molesto, me cuesta terminar el trabajo | 2.54 | 0.91 | 0.43 | 0.30 |
| 14 | Cuando estoy molesto, pierdo el control | 2.39 | 0.84 | 0.28 | 0.17 |
| 15 | Cuando estoy molesto, creo que estaré así durante mucho tiempo | 2.45 | 0.83 | 0.12 | 0.01 |
| 16 | Cuando estoy molesto, creo que acabaré sintiéndome muy deprimido | 2.50 | 0.86 | 0.42 | 0.51 |
| 18 | Cuando estoy molesto, me cuesta centrarme en otras cosas | 2.56 | 0.87 | 0.54 | 0.64 |
| 19 | Cuando estoy molesto, me siento fuera de control | 1.82 | 0.82 | 0.99 | 1.11 |
| 23 | Cuando estoy molesto, me siento como si fuera una persona débil | 2.65 | 0.89 | -0.02 | -0.09 |
| 27 | Cuando estoy molesto, me cuesta controlar mi comportamiento | 2.59 | 0.86 | 0.07 | 0.19 |
| 28 | Cuando estoy molesto, creo que no hay nada que pueda hacer para conseguir sentirme mejor | 2.35 | 0.86 | 0.54 | 0.55 |
| 29 | Cuando estoy molesto, me enfado conmigo mismo por sentirme de esa manera | 2.63 | 0.87 | 0.03 | 0.16 |
| 30 | Cuando estoy molesto, empiezo a sentirme muy mal conmigo mismo | 2.66 | 0.84 | 0.08 | 0.34 |
| 33 | Cuando estoy molesto, me cuesta pensar sobre cualquier otra cosa | 2.68 | 0.83 | 0.01 | 0.30 |
| 36 | Cuando estoy molesto, mis emociones parecen desbordantes | 2.32 | 0.86 | 0.60 | 0.50 |
| | | | Mardia | $3391.6^{***}$ | $74.58^{***}$ |

*Note: *** p < .001; g1: Skewness; g2: Kurtosis; Original English items within parentheses*

(M), dispersion measures such as standard deviation (SD), and distribution indicators like skewness ($g_1$) and kurtosis ($g_2$). The univariate normality assumption was evaluated, which is met when the values of $g_1$ and $g_2$ fall within the range of ± 1.5 (Ferrando & Anguiano-Carrasco, 2010). The analysis also included an assessment of multivariate normality, which was carried out by examining the significance of the Mardia test for $g_1$ and $g_2$ ($p > .05$) (Mardia, 1970).

In the second stage, we performed a confirmatory factor analysis (CFA) of the DERS-16 using Robust Maximum Likelihood (MLR) estimator, due to the categorical nature of the items and the absence of multivariate normality (Li, 2016). The model fit was evaluated using several absolute and relative fit indices such as the Chi-Square ($\chi 2$), the normed Chi-square ($\chi 2/df$), the Standardized Root Mean Squared Residual (SRMR), the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and the Root Mean Squared Error of Approximation (RMSEA). Factor loadings (λ) of the items were also examined, and loadings greater than .40 were considered appropriate. A good model fit is indicated when the $\chi 2$ is not significant ($p > .05$) or the $\chi 2/df$ is less than 4, and CFI and TLI are greater than .95, while SRMR and RMSEA are less than 0.06 (Byrne, 2008; Brown, 2015; Dominguez-Lara, 2018; Jonason et al., 2020; Yang-Wallentin et al., 2016).

The third stage involved a multigroup CFA (MG-CFA) analysis, categorizing the sample by sex to ensure that the scale's interpretation is similar across groups (Asparouhov & Muthén, 2014; Moreta-Herrera et al., 2022b). This step included comparing the DERS-16 CFA´s independently for males and females and identifying the levels of fit. Subsequently, an ANOVA test was used to determine whether there are significant differences ($p < .05$) in the absolute fit ($\chi 2$) to determine similarity. Finally, the analysis of measurement invariance involved subjecting the adjustment model to different degrees of restrictions (metric, strong, and strict) of the fit indices ($\chi 2$, CFI, and RMSEA) to assess the extent of variability in the changes. If the differences (Δ) do not exceed the specified tolerance values, such as non-significance in χ2, the variation of the ΔCFI is not > -.010 and ΔRMSEA is ≤ .010 (Chen, 2007), or the ΔCFI is > -.002 and ΔRMSEA is ≤ .007 (Meade et al., 2008), then the DERS-16 can be considered equivalent or invariant across groups.

Furthermore, once strong invariance was established, the analysis proceeded to examine differences in latent means of the factors and the overall scale. This was achieved by setting the intercepts of the male group to zero and allowing the intercepts of the female group ($\Delta_K$) to remain unrestricted to determine statistical differences ($p < .05$). Additionally, t-tests were conducted, and practical significance ($\Delta_K^*$) was calculated using effect size tests (Cohen's d) where values of .20, .50, and .80 corresponded to small, medium, and large sizes, respectively (Fritz et al., 2012).

Finally, the fourth stage entailed calculating the internal consistency reliability using the Omega coefficient (ω; McDonald, 1999) with 95% confidence intervals (95% CI) for both the factors and the general DERS-16 scale. This analysis is conducted for both the total sample and the groups classified by sex. The statistical analyses of the study were conducted using the R programming language version 4.2.2 (R Core Team, 2019) with the foreign, lavaan, MBESS, and MVN packages.

## Results

### Preliminary analysis of the items

Table 1 presents the mean scores of the participants in the DERS-16 items, revealing homogeneity. The mean scores ranged from *M(item 19)* = 1.82; *SD* = 0.82 to *M(item 33)* = 2.68; *SD* = 0.83. The assumption of univariate normality was checked, and the values of g1 and g2 were within the parameters of ±1.5, indicating a normal distribution. However, the results of the Mardia test for multivariate normality in $g_1$ and $g_2$ were statistically significant ($p < .05$), indicating that this assumption was not met, therefore, the use of robust estimators for factor analysis is adequate.

### Confirmatory factor analysis

Table 2 shows the outcomes of the CFA conducted on the DERS-16. To identify the optimal internal structure, three models were assessed: a) a single-factor model; b) a five-factor oblique model; and c) a hierarchical model consisting of five first-order factors and one second-order factor. Each of these models displayed satisfactory fit indicators, with the five-factor oblique model slightly surpassing the hierarchical model in fit performance. However, factor intercorrelations within the five-factor oblique model were greater than r > .90, suggesting multicollinearity. This is evidence of the presence of a gen-

Table 2. Confirmatory factor analysis of DERS-16

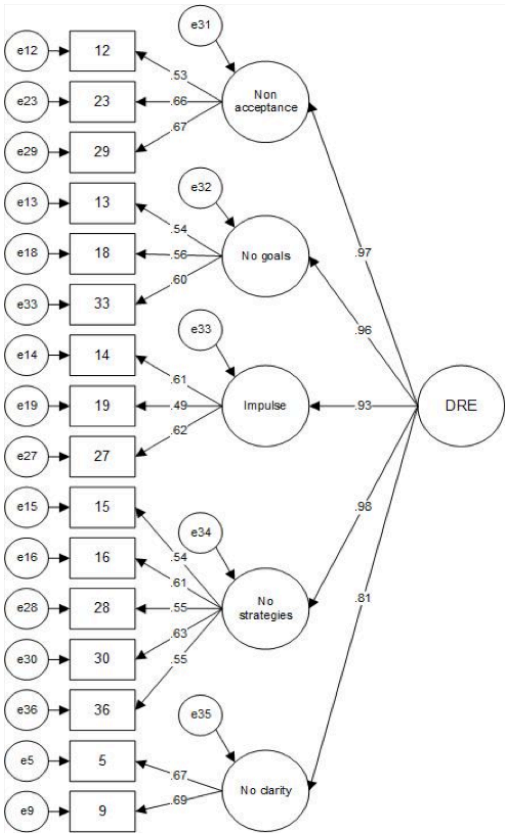
| Model | $\chi^2$ | df | $\chi^2$/df | CFI | TLI | SRMR | RMSEA |
|---|---|---|---|---|---|---|---|
| One Factor | 278.7*** | 104 | 2.68 | .940 | .930 | .039 | .051 [.044 - .058] |
| 5 oblique factors | 227.4*** | 94 | 2.42 | .955 | .942 | .036 | .046 [.039 - .054] |
| Hierarchical+ | 245.3*** | 103 | 2.38 | .952 | .940 | .041 | .046 [.039 - .053] |

*Note: χ2: Chi-squared; df: Degrees of freedom; χ2/df: Chi-squared; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; SRMR: Standardized Root Mean Squared Residual; RMSEA: Root Mean Squared Error of Approximation*
*+ Five first-order factors and one second-order factor*

eral second-order factor that encompasses the first-order factors and items. As a result, the hierarchical model is deemed the most suitable as the best-fitting estimated model.

Figure 1 illustrates the internal structure of the hierarchical model of the DERS-16, showcasing the factor loadings (λ) of the items covered by the first-order factors, as well as the saturations of the first-order factors concerning the second-order factor. It can be observed that all the factors display suitable values, indicating that they significantly contribute to the structure of the proposed model. Additionally, the notable saturations provide robust evidence for a strong explained variance of the scale.

Figure 1. The internal structure of the hierarchical fit model of the DERS-16




*Note: The circles represent the latent variables and the rectangles the observable ones. The values of the arrows that point to the latent variables are the factor loadings (λ)*

### Measurement invariance by sex and latent mean differences

Table 3 presents the CFA results of the DERS-16 for both male and female participants. The hierarchical model fits well for both groups, with no significant differences in the model's absolute fit ($\Delta\chi^2$= 9.01; $p$ > .05), indicating their similarity. As the restrictions on the DERS-16 model increase in the multigroup analysis, the fit indices ($\chi^2$, CFI, and RMSEA) remain relatively constant, indicating that the difference (Δ) between imposed restrictions is within the tolerance margin. Thus, it can be concluded that the DERS-16 is invariant across sex, and the level of equivalence between groups is considered to be strict.

Additionally, since strong and strict equivalence is identified, it is possible to discern the variations in latent means between the groups for both the DERS-16 factors and the overall scale. Within this context, the "No goals" factor shows that females currently have a higher latent mean compared to males $\Delta_K$ = .053; $p$ < .05; t= -2.99; $p$ < .01 with an effect size $\Delta_K^*$= .20 equivalent to small. Conversely, this pattern is not observed in the other factors. There are also differences with a similar trend on the global scale of the DERS-16 with $\Delta_K$ = .053; $p$ < .05; t= -2.62; $p$ < .01 and a small effect size $\Delta_K^*$= .20.

### Internal consistency analysis

Table 4 presents the results of the internal consistency reliability analysis of the DERS-16 for both its factors and the overall scale, categorized by sex and considering the total sample size. The reliability of the DERS-16 factors, except for the "No strategies" factor, is relatively low and does not meet acceptable parameters. However, the internal consistency of the overall scale is acceptable, with higher values for males than for females. Overall, internal consistency appears to be lower in females than in males, with significant differences observed in the factors of "No goals", "No strategies", and "No clarity" (since the confidence intervals include 0). No significant sex differences were observed in the overall scale of the DERS-16.

Table 3. Measurement Invariance by Sex of the DERS-16

| Model | $\chi^2$ (df) | CFI | RMSEA | $\Delta\chi^2$ | ΔCFI | ΔRMSEA |
|---|---|---|---|---|---|---|
| Baseline Male | 188.4 (103) | .956 | .051 | - | - | - |
| Baseline Female | 179.2 (103) | .935 | .039 | - | - | - |
| Without restrictions | 487.9 (206) | .943 | .042 | - | - | - |
| Metric | 507.7 (217) | .942 | .041 | 15.8 (11) | .001 | .001 |
| Strong | 524.2 (227) | .940 | .041 | 14.8 (10) | .002 | .000 |
| Strict | 535.9 (233) | .937 | .041 | 14.0* (6) | .003 | .000 |

*Note: * p < .05; χ2: Chi-squared; df: degrees of freedom; CFI: Comparative Fit Index; RMSEA: Root Mean Squared Error of Approximation; Δ: Delta*

## Discussion

This study aimed to examine the hierarchical factorial structure model of the DERS-16, which comprises five first-order factors and

Table 4. Internal consistency reliability of the DERS-16

| Factor | General | Male | Female | $\Delta\omega$ |
|---|---|---|---|---|
| Non-acceptance | .63 [.58 - .68] | .70 [.63 - .75] | .57 [.42 - .49] | .13 [ .02 - .29] |
| Without objectives | .60 [.54 - .66] | .65 [.60 - .72] | .58 [.49 - .67] | .07 [-.03 - .18] |
| No impulse control | .61 [.55 - .66] | .68 [.61 - .74] | .54 [.45 - .63] | .14 [ .03 - .25] |
| No strategies | .71 [.67 - .74] | .77 [.73 - .81] | .65 [.57 - .71] | .12 [-.08 - .22] |
| No clarity | .59 [.52 - .65] | .65 [.59 - .70] | .56 [.45 - .67] | .09 [-.04 - .21] |
| DERS-16 | .89 [.87 - .90] | .91 [.90 - .93] | .85 [.82 - .88] | .06 [ .03 - .10] |

*Note: Δ: Delta; ω: McDonald´s Omega*

one second-order factor, and to explore its measurement invariance across sex and the internal consistency reliability in a sample of Ecuadorian adolescents.

The results of the CFA analysis provide strong support for the adequacy of the DERS-16's factorial structure. Both the original five-factor oblique model and the hierarchical model demonstrate a good fit, aligning with previous research findings (Bjureberg et al., 2016; Miguel et al., 2017), and the multidimensional nature of the scale in the adolescent population, in line with earlier investigations by Charak et al. (2019) and Fallahi et al. (2021). Given the substantial intercorrelations among the factors, it is plausible that an overarching global factor encompassing all dimensions and items is at play. Thus, the hierarchical model emerges as the preferred interpretation framework, given its robust indicators and item saturations, which converges with findings in prior research (Byrne, 2008; Brown, 2015; Dominguez-Lara, 2018; Jonason et al., 2020; Yang-Wallentin et al., 2016), further solidifying the hierarchical model's utility, and underlines its appropriateness and effectiveness to assess DER in Ecuadorian adolescents. Notably, there are currently no other reference studies available to compare the hierarchical model of the DERS-16, either in adults or adolescents, which highlights the significance of this study's contribution to the interpretive mechanics of the DERS-16 under CTT.

Concerning measurement invariance, the results of the multi-group confirmatory factor analysis (MG-CFA) demonstrate that the DERS-16 exhibits adequate fit indices in independent CFA (baseline) by sex, with no significant differences ($p > .05$) in the absolute indicator ($\chi^2$). After imposing restrictions to the model, the changes ($\Delta$) in $\chi^2$, CFI, and RMSEA stay within the tolerance thresholds (Chen, 2007; Meade et al., 2008), which indicates that the DERS-16 is invariant at a strict level and that the interpretation of the scale's items within the factorial structure remains consistent between males and females (Asparouhov & Muthén, 2014; Moreta-Herrera et al., 2022b). It is noteworthy, however, that these findings mark a pioneering effort in the domain of MG-CFA-based measurement invariance analysis, warranting cautious interpretation.

Moreover, since the strong and strict level is identified, it is possible to discern variations in latent means. The analysis reveals slight effects ($\Delta_K^* > .20$; $p < .05$) in the "No goals" factor and in the general factor, indicating a higher tendency toward DER in female adolescents compared to male adolescents. These findings align with the outcomes reported by Bender et al. (2012) and Zumba-Tello & Moreta-Herrera (2022) and Jarrín & Moreta-Herrera (2024) in Ecuador, albeit through a distinct analytical approach (comparative analysis using observable variable means) than the method employed in the present study (comparative analysis of latent means using SEM).

In terms of internal consistency reliability, the obtained values for the factors, both across the entire sample and when categorized by sex, demonstrate partial acceptability, whereas the global scale exhibits strong internal consistency. This pattern of internal consistency aligns with preliminary validation studies involving adolescents (Charak et al., 2019; Fallahi et al., 2021). It should be highlighted that the heightened reliability observed on the global scale as compared to the individual factors offers additional evidence of the enhanced performance of the DERS-16 under a hierarchical model.

This is the first study that validates the DERS-16 scale for adolescents in Ecuador and potentially for Spanish-speaking samples, which is a significant contribution as the scale has not been used in this population before. The study introduces an interpretation model of the items that offer a more comprehensive approach to assessing DER, thereby improving upon the prevailing model (five correlated factors). Another notable implication emerges from the exploration of measurement invariance, which has not been previously addressed, and provides evidence of the invariance across sex of the scale, allowing for future multi-group studies. Additionally, the study provides relevant evidence of the presence of greater DER in females than in males, using a methodology based on the analysis of latent means, which incorporates measurement error of the item into the analysis and provides greater precision in the results compared to classic bivariate tests. Finally, this study introduces a validated tool to assess DER among adolescents in Ecuador. The availability of this refined scale facilitates more precise assessments and enhances the potential for informed decision-making in the times ahead. The presence of a meticulously designed tool for gauging DER in adolescents promises to contribute to more effective diagnostic insights, offering a pathway to improved clinical and educational interventions. This tool facilitates a finely tuned strategy to tackle, bolster, and rectify issues in emotional regulation, all within the framework of evidence-based intervention models centered on emotions and emotional management. Moreover, it paves the way for personalized interventions tailored to individual requirements, amplifying treatment efficacy and yielding enhanced mental health outcomes.

### Limitations and recommendations for the future

It is important to note that this work presents some limitations that should be considered for new studies in the future. The first deals with the characteristics of the sample, given that the evidence of validity reported is limited only to adolescents between 15 and 18 years of age, so it is not possible to generalize these conclusions to early or pre-adolescent adolescents and young or emerging adults. Reason why other studies directed towards these population groups are suggested. Finally, another limitation to consider is that no analysis of the external validity of the measure was addressed, for example analyzing validity based on the relationship with other variables. In this regard, it is recommended to explore this type of validity evidence with similar constructs such as emotional regulation or the presence of positive or negative emotions to know the degree of convergence or divergence.

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## Conflicts of interest

No potential conflict of interest was reported by the authors.

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