DUAL SELF-ESTEEM IN UNIVERSITY STUDENTS: VALIDATION OF THE ROSEMBERG SCALE

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ABSTRACT
This study evaluated the Rosenberg Scale, which measures self-esteem in university students in Peru, using Confirmatory Factor Analysis. The results confirmed a good fit of the model and the subscales presented high reliability. Convergent validity was confirmed. The Rosenberg Scale, focused on positive and negative self-esteem, is reliable and valid for this population. This tool is crucial for understanding self-esteem in the educational and psychological setting, influencing well-being and academic success, and offers a complete view of self-evaluation, considering confidence and self-doubt.

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1. Introduction

The university experience is a transformative chapter in a person's life, characterized by the presence of diverse opportunities that favor personal development, academic progress and the establishment of meaningful bonds. In this context, self-esteem emerges as a factor of immense value, exerting a profound influence on how college students face challenges and take advantage of opportunities (Sánchez-Villena et al., 2021).

In his early writings, William James (1890/1892) proposed that self-esteem is a balance between individual achievements and aspirations. Researchers, such as (Harris & Orth, 2020), on the other hand, approach self-esteem as self-evaluation and self-perception arising from social interactions, stressing its close relationship with external opinions. These definitions converge on its function as an expression of self-evaluation, whether positive or negative, and exert unique influences on people's lives (Rosenberg et al., 1995; Supple et al., 2013).

Self-esteem, conceptualized as a subjective evaluation of one's own competence and worth, provides an essential framework for understanding the multifaceted implications it has on emotional adjustment, academic performance, and overall well-being of college students (Monteiro et al., 2022).

Within the university academic environment, the experience of frustration is frequent and could even be considered inevitable at certain times. The triggers for this frustration can be both external, such as environmental obstacles and social pressures, and internal, associated with psychological conditions and emotional states that influence the way students react to challenges. Faced with situations that generate frustration, students may adopt various strategies, ranging from proactive problem solving to capitulation in the face of stress or the activation of personal defense mechanisms.

One of the most critical defensive mechanisms in this context is self-esteem, which can exhibit two faces: a positive and a negative one (Salavera et al., 2020). Positive self-esteem is manifested in a set of feelings and attitudes that includes dignity, self-worth, competitiveness, a positive view of oneself, and a comprehensive satisfaction with one's capabilities. In contrast, negative self-esteem can be expressed through excessive pride, intensified feelings of frustration, self-deprecating attitudes, perceptions of ineffectiveness, and even irrational beliefs that distort self-perception. Figure 1 illustrates the structure and dynamics of this dual phenomenon of self-esteem, highlighting its role in college student adjustment and well-being.

A balanced self-esteem, which incorporates both positive and negative aspects, contributes to the formation of individuals who are more resilient, confident, and capable of facing the challenges of college life successfully (Simkin & Pérez-Márín, 2018). This balance allows students to develop greater self-acceptance, a realistic perception of themselves, a greater ability to overcome obstacles and take advantage of the opportunities offered by the university experience (Sepúlveda-Páez et al., 2021). The duality of self-esteem in college students plays an essential role in their personal growth and their ability to thrive in this academic and social environment.

Several instruments have been developed to assess self-esteem at a global level (Martín-Albo et al., 2007; Sánchez-Villena et al., 2021), with the Rosenberg Scale for Self-Esteem (RSE; 1989) being one of the most widely used. Although initially conceived as a unidimensional measure, subsequent research has revealed a two-dimensional structure in the ERA. This dual approach distinguishes between positive self-esteem, which is related to self-confidence and personal satisfaction (comprising aspects such as dignity, self-worth, self-efficacy, self-concept and satisfaction), and negative self-esteem, which encompasses feelings of worthlessness, frustration, disrespect, inadequacy and irrational beliefs that reflect self-contempt and personal devaluation (Ceballos Ospino et al., 2017; de León Ricardi & Garcia Méndez, 2016; Jurado Cárdenas et al., 2015; Ventura-León et al., 2018).
Dual self-esteem in university students: validation of the Rosenberg scale

The two dimensions of self-esteem are identified as distinct constructs, evidenced by the distribution of its ten items into two subscales: five for positive and five for negative self-esteem (Huang & Dong, 2012). Although the ERA was initially conceived as a unidimensional tool, studies indicate that cultural differences may affect the perception of the items (Gnambs et al., 2018; Wong et al., 2003).

In regions such as North America and highly individualistic countries, merging positive and negative ERA items into a single dimension is appropriate. However, in less individualistic countries, such a combination could trigger inconsistencies in responses (Gnambs et al., 2018; Schmitt & Allik, 2005; Wong et al., 2003). Thus, the structure of the ERA supports that positive and negative self-esteem are distinct constructs, the interpretation of which may depend on the cultural context and level of individualism in a society. Nevertheless, multiple investigations conducted with both university and non-university students in Spanish America have reported adequate internal consistency in relation to the unidimensional scale (Lopes Chaves et al., 2013; Pérez Villalobos et al., 2011; Sánchez-Villena et al., 2021). In addition, authors such as Vilca et al. (2022) in Peru have suggested the assessment of self-esteem using exclusively positive items. The dimensionality of the Rosenberg Self-Esteem Scale (RES) has shown variability according to the context and characteristics of the participants. For example, studies with elementary school students in Peru identified a single dimension (Sánchez-Villena et al., 2021). However, research such as that of Ventura-León et al. (2018) and Ceballos Ospino et al. (2017) with university students in Peru and Colombia, respectively, have highlighted a two-dimensional structure. These discrepancies suggest that the dimensionality of ERA may be influenced by the profile of the participants and the specific cultural context. The purpose of this study was to conduct a Confirmatory Factor Analysis (CFA), as well as to evaluate the convergent validity and internal consistency of the ERA in students from a private university in Chimbote, located in the Ancash region, northern Peru.

2. Method

This study adopted a quantitative, cross-sectional and non-experimental approach, placing special emphasis on the adaptation of tests to different contexts, based on León and Montero (2015). An in-depth analysis of the theoretical structure of the instrument was carried out using Confirmatory Factor Analysis (CFA) to check whether the proposed theoretical model coincided with the data obtained. Prior to CFA, a descriptive analysis of the data was carried out to verify its relevance and assess the convergent validity of the instrument.
The study involved a total of 601 undergraduate students from the Chimbote campus of a private university in Peru. Of this sample, 52.7% (317) were female, while 47.3% (284) were male. In terms of age, 87.9% (428) were in the [18 to 22] age range, 10.3% (62) in the [23 to 26] range, and 1.8% (11) in the [27 to 32] range.

Regarding their employment status, the following rates were identified: 22.0% (n=132) of respondents claimed to work 40 hours per week, 56.7% (n=341) mentioned having a workload of 20 hours per week, and 21.3% (n=128) reported that they were not employed.

As for the professional careers they were pursuing, 56.7% (341) of the participants were enrolled in programs related to Engineering and Architecture, 22% (132) in Accounting and Finance, while 21.3% (128) were enrolled in careers related to Sciences and Humanities.

A non-probabilistic convenience sample was chosen for the selection of participants. Data were collected digitally using a Google Forms form.

The Self-Esteem Scale, developed by Morris Rosenberg in 1965, is widely recognized for its high reliability, demonstrating an internal consistency of 0.77 and a minimum reproducibility coefficient of 0.90. In this study, we chose to use the ERA to explore the perception of self-esteem in university students. The version of the ERA that alternates items to measure both positive self-esteem (items 1, 2, 3, 4 and 5) and negative self-esteem (items 6, 7, 8, 9 and 10) was applied. This version uses four response options ranging from "never" to "always". The rating of each item related to positive self-esteem ranged from 1 to 4, with 4 being the highest score. On the other hand, items associated with negative self-esteem were scored in reverse (Rosenberg, 1965).

In addition to the evaluation of self-esteem, the questionnaire included sociodemographic questions that inquired about aspects such as age, gender identity, professional career and employment status of the participants.

A Google Forms online form was used for data collection. Of 800 students invited, 650 confirmed their interest, and 601 actually participated, achieving a response rate of 75.12%.

From the ethical point of view, aspects such as the following were respected:

- The confidentiality of the information was guaranteed by asking the students for their free consent, recorded by digital signature on the form.
- Practices were aligned with Peru's Personal Data Protection Law No. 29733.
- Official permission was obtained from the Morris Rosenberg Foundation to use the Rosenberg Scale (RAS) in this context, thus reinforcing the validity and legitimacy of its use in research (Rosenberg et al., 1989).

JAMovi software (version 2.2) (The JAMovi Project, 2021) was used to perform the statistical analysis. Cronbach’s alpha (1951) and McDonald’s omega (1970) coefficients were calculated to determine the internal consistency of the ERA. It should be noted that McDonald’s omega coefficient is often considered a more accurate measure of internal consistency than Cronbach’s alpha, particularly when scale items have significant variances in their coefficients within a factor analysis or in corrected correlations with the total score (Campo-Arias & Oviedo, 2008; McDonald, 1970).

To evaluate the fit of the models, several indices were used: $\chi^2$/df ratio, GFI (Goodness of Fit Index), CFI (Comparative Fit Index), RMSEA (Root Mean Square Error of Approximation) and AIC (Akaike's Information Criterion). A $\chi^2$/df ratio between 2 and 5 suggests a good fit. Values of 0.90 or more in CFI and GFI are interpreted as indicative of a good fit, while for RMSEA, values between 0.05 and 0.08 are considered acceptable (Byrne, 2013; Levy Mangin & Varela Mallou, 2006; Schreiber, 2017). In relation to AIC, lower values represent a better model fit (Souza de Lima & Cumba de Souza, 2019).

### 3. Results

A preliminary descriptive analysis of the data was carried out to ensure its adequacy for Confirmatory Factor Analysis (CFA). The normality of the sample distribution was examined. Overall, skewness and kurtosis indices ranged from -1 to 1, which is indicative of a distribution close to normal. Although two items showed kurtosis values close to 2, these figures are within the range accepted by many specialists (see Table 1). Based on these findings, it was concluded that it was pertinent to move forward with the CFA.
**Table 1. Descriptive analysis**

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel that I am a person worthy of esteem, at least as much as others.</td>
<td>3.240</td>
<td>0.723</td>
<td>-1.088</td>
<td>1.828</td>
</tr>
<tr>
<td>2. I am convinced that I have good qualities.</td>
<td>3.353</td>
<td>0.697</td>
<td>-1.200</td>
<td>1.941</td>
</tr>
<tr>
<td>3. I am able to do things as well as most people.</td>
<td>3.156</td>
<td>0.774</td>
<td>-0.840</td>
<td>0.640</td>
</tr>
<tr>
<td>4. I have a positive attitude towards myself</td>
<td>3.203</td>
<td>0.754</td>
<td>-0.799</td>
<td>0.498</td>
</tr>
<tr>
<td>5. I am generally satisfied with myself</td>
<td>3.017</td>
<td>0.783</td>
<td>-0.552</td>
<td>0.021</td>
</tr>
<tr>
<td>6. I feel that I don’t have much to be proud of.</td>
<td>2.200</td>
<td>0.802</td>
<td>0.130</td>
<td>-0.588</td>
</tr>
<tr>
<td>7. In general, I am inclined to think of myself as an underachiever.</td>
<td>1.775</td>
<td>0.765</td>
<td>0.764</td>
<td>0.182</td>
</tr>
<tr>
<td>8. I would like to be able to feel more respect for myself.</td>
<td>2.787</td>
<td>0.910</td>
<td>-0.486</td>
<td>-0.487</td>
</tr>
<tr>
<td>9. There are times when I really think I am useless.</td>
<td>2.107</td>
<td>0.939</td>
<td>0.319</td>
<td>-0.936</td>
</tr>
<tr>
<td>10. Sometimes I think I am not a good person.</td>
<td>2.173</td>
<td>0.954</td>
<td>0.261</td>
<td>-0.967</td>
</tr>
</tbody>
</table>

Source: Authors’ elaboration, (2023).

Table 2 shows the findings derived from the evaluation of the fit of the proposed models. We started by analyzing a unidimensional model encompassing the original 10 items. However, this approach did not provide convincing measures of fit: the $\chi^2$/df ratio exceeded the advised threshold, while values such as CFI and TLI were below 0.90, and the RMSEA exceeded the margin indicated as acceptable.

Subsequently, a two-dimensional model separating the scale into “positive self-esteem” and “negative self-esteem” was considered. This structure showed a notably better fit, with satisfactory values for $\chi^2$/df, CFI, RMSEA and TLI. Additionally, this model presented a lower AIC relative to the unidimensional model. These results underline that all the indices meet or even exceed the suggested standards, with several approaching the fit ideals proposed by experts such as Hooper et al. (2008), Hu & Bentler (1999) and Levy Mangin & Varela Mallou (2006).

**Table 2. Fit indices for the estimated models**

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>p</th>
<th>IFC</th>
<th>TLI</th>
<th>RMSEA [CI 90%]</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>409.1</td>
<td>30</td>
<td>13.63</td>
<td>0</td>
<td>0.824</td>
<td>0.737</td>
<td>0.14 [0.13-0.15]</td>
<td>1271</td>
</tr>
<tr>
<td>2</td>
<td>161.1</td>
<td>34</td>
<td>4.7</td>
<td>0</td>
<td>0.941</td>
<td>0.922</td>
<td>0.07 [0.06-0.09]</td>
<td>1146</td>
</tr>
</tbody>
</table>

Note: Model 1: unifactorial; Model 2: bifactorial; df: Degrees of freedom; p: significance; CFI: Comparative fit index. GFI: Goodness of fit index. TLI: Tucker-Lewis index. RMSEA: Root mean square error of approximation. AIC: Akaike’s information criterion.

Figure 2 illustrates the factor loadings corresponding to Model 2. In both dimensions of this model, both Cronbach’s alpha (α) and McDonald’s omega (ω) coefficients presented acceptable levels of reliability.
4. Discussion

The purpose of this research was to evaluate the confirmatory factor structure, convergent validity, and internal consistency of the Rosenberg Self-Esteem Scale for Self-Esteem (RSE).

Although some research in different contexts has supported the unidimensionality of the construct (Gnambs et al., 2018; Gomez-Lugo et al., 2016; Monteiro et al., 2022; Sanchez-Villena et al., 2021; Souza de Lima & Cumba de Souza, 2019), the hypothesis of a two-dimensional structure comprising positive and negative self-esteem components has gained solid scientific support (Boduszek et al., 2013; Galanou et al., 2014; Huang & Dong, 2012; Jurado Cárdenas et al., 2015; McKay et al., 2014; McMullen & Resnick, 2013; Mullen et al., 2013). This study supports the idea that the ERA applied to college students should be interpreted as a two-dimensional scale, supported by good model fit and strong reliability indicators.

In confirmatory factor analysis, each factor is associated with a set of indicators. It is essential to demonstrate that these indicators actually measure the proposed factor, which is known as convergent
validity. This idea is based on validity through multitrait-multimethod correlation matrices, which was introduced by Campbell and Fiske in the 1950s and further developed by Jöreskog et al. (2016).

McDonald’s (1999) coefficient was used, a reliability measure suitable for congeneric models, which consider that a construct can be assessed by a series of items. This measure provides more appropriate results than other traditional measures such as Cronbach’s Alpha (Cheung & Wang, 2017; Raykov, 1997). The McDonald coefficients (ω) obtained were 0.830 and 0.796, far exceeding the minimum threshold of 0.70 proposed by Hair et al. in 2014. These results support the convergent validity of the proposed model and suggest that it meets all the recommended criteria.

In this study, the internal consistency of the Rosenberg Self-Esteem Scale (ERA) was evaluated as a key indicator of its reliability and validity (Campo-Arias & Oviedo, 2008). Following the recommendations of Green and Yang (2015) and Moral de la Rubia (2019), both Cronbach’s alpha coefficient and McDonald’s omega coefficient were calculated. The results revealed strong internal consistency for the ERA, with values of α=0.827 and 0.784, as well as ω=0.83 and 0.796, for the positive and negative self-esteem dimensions, respectively. These values significantly exceeded those reported in previous studies in university contexts (α=0.75; 0.53 and ω=0.63) (Ceballos Ospino et al., 2017). Standards suggest that internal consistency is acceptable if Cronbach’s alpha or McDonald’s omega coefficients are in the range of 0.70 to 0.79. Under more rigorous conditions, values between 0.80 and 0.90 are preferred (Campo-Arias & Oviedo, 2008). The results obtained here, with McDonald omega values of 0.83 and 0.79, indicate excellent internal consistency for the ERA in the population studied.

In previous research related to the validation of the ERA in undergraduate, adolescent and general populations, such as those conducted by Gómez-Lugo et al. (2016), Jurado Cárdenas et al. (2015), Monteiro et al. (2022), Souza de Lima & Cumba de Souza (2019) and Ventura-León et al. (2018), the mention of the McDonald Omega coefficient was omitted. This omission underscored the relevance of calculating such a coefficient in the study.

It should be emphasized that, in social and health disciplines, it is rare to find scores that follow a perfectly normal distribution. When this happens, Cronbach’s alpha coefficient usually underestimates reliability or internal consistency. This underestimation becomes particularly relevant in scenarios where scores show skewed distributions and when responses are ordinal in nature. This is highlighted by different specialists in the field, such as Cho (2016), Moral de la Rubia (2019) and Revelle & Zinbarg (2009). In this context, the integration of the Omega coefficient in analyses can provide a more accurate and holistic overview of the internal consistency of a scale or instrument.

In recent literature, several researchers, including Vilca et al. (2022) and Cho (2016), have highlighted the predominant tendency to resort to Cronbach’s alpha coefficient in the evaluation of the internal consistency of instruments. However, this coefficient has inherent limitations, especially when certain crucial assumptions for its calculation are not met, as is the case of tau-equivalence. This assumes that all the items of an instrument have the same variance and that the factor loadings are equivalent for each item in relation to the general factor, assumptions that are not always met in practice.

In situations where tau-equivalence is not satisfied, Cronbach's alpha may provide a biased estimate, either by over- or under-estimation, of the true reliability of the instrument. Therefore, the implementation of the McDonald Omega coefficient is proposed as a more robust alternative, since it is not based on such restrictive assumptions as Cronbach’s alpha. However, the correct application of the Omega coefficient is also not free from common errors in research practice. For example, as Viladrich et al. (2017) stated, on some occasions, when the omega coefficient is employed, it is not properly done with factor loadings derived from Confirmatory Factor Analysis (CFA). This type of practice can undermine the precision of the coefficient and thus affect the validity of the findings related to the internal consistency of the instrument under study.

Among the limitations of this study, it is relevant to mention that the selection of participants was done in a non-probabilistic manner. This methodology could influence the generalizability of the results. Despite this, we tried to counteract this effect by selecting a large number of students, with n > 500 individuals, a figure that has been suggested by (Rojas-Torres, 2020) as adequate for psychometric studies. Another limitation to consider is that the sample comes from a specific region of Peru. Therefore, it is recommended that future research replicate this study, but with a random selection of participants and covering different regions of the country to broaden the generalizability of the findings.
Despite these limitations, the research provides significant insights into the usefulness and factor structure of the ERA in the context of Peruvian university students.

4. Conclusions

This Confirmatory Factor Analysis (CFA) study has provided fundamental information about the structure of the Rosenberg Scale, highlighting its positive and negative self-esteem dimensions. The results validate a two-dimensional structure of the scale, with distinct subscales for each type of self-esteem. Through consistency tests, both subscales proved to be reliable, indicating a coherent correlation between items. In addition, convergent validity reinforces the reliability and applicability of the subscales.

In essence, these findings support the Rosenberg Scale as a reliable tool for measuring self-esteem in the populations studied, providing a valuable tool for researchers and practitioners in clinical and educational settings.
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