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Psychometric Analysis of the Empathy Scale in a Sample of University Students from Quito-Ecuador

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Abstract

This paper evaluates the psychometric properties of the Empathy Scale in the university context of Ecuador. The psychometric analysis was based on a non-probabilistic sample of 571 students from public and private universities in Quito-Ecuador. Based on preliminary analyses, a reduced version of the Empathy Scale (8 items) is proposed. Regarding the internal structure of the instrument, a first-order bifactorial model was verified through Confirmative Factorial Analysis (χ^2 = 133.55, gl = 19, p < .001; CFI = .96; TLI = .94; GFI = .95; RMSEA = .10, CI90% [.08 - .12]), composed of two correlated dimensions: Affective Empathy (5 items) and Cognitive Empathy (3 items). Complementarily, evidence supports the presence of a general empathy factor. Finally, satisfactory results were also obtained in terms of reliability and external (nomological) validity. Considering the proposed measurement model, the Empathy Scale is a valid and reliable instrument to measure empathy in university students. On a practical level, it constitutes a useful resource for the development of institutional strategies involving the diagnosis, monitoring, and analysis of this social skill and its dimensions. It also contributes methodologically to the advancement of research on the academic role of empathy in the regional university context.

Keywords

empathy; measurement; validity; university; Ecuador

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Análise psicométrica da Escala de Empatia em estudantes universitários de Quito-Equador

Resumo

Este estudo avalia as propriedades psicométricas da Escala de Empatia no contexto universitário equatoriano. A análise psicométrica baseou-se em uma amostra não probabilística de 571 estudantes de universidades públicas e privadas da cidade de Quito. A partir das análises preliminares, propõe-se uma versão reduzida da Escala de Empatia composta por 8 itens. Quanto à estrutura interna do instrumento, confirmou-se por meio de Análise Fatorial Confirmatória um modelo bifatorial de primeira ordem (χ^2 = 133.55, gl = 19, p < .001; CFI = .96; TLI = .94; GFI = .95; RMSEA = .10, IC90% [.08–.12]), composto por duas dimensões correlacionadas: Empatia Afetiva (5 itens) e Empatia Cognitiva (3 itens). Além disso, encontrou-se evidência da presença de um fator geral de empatia. Os resultados também foram satisfatórios em termos de confiabilidade e validade externa (nomológica). Considerando o modelo de mensuração proposto, a Escala de Empatia mostra-se um instrumento válido e confiável para avaliar a empatia em estudantes universitários. No plano prático, constitui um recurso útil para o desenvolvimento de estratégias institucionais voltadas ao diagnóstico, monitoramento e análise dessa habilidade social e de suas dimensões. Ademais, contribui metodologicamente para o avanço das pesquisas sobre o papel acadêmico da empatia no contexto universitário regional.

Palavras-chave

empatia; mensuração; validade; universidade; Equador

Análisis psicométrico de la Escala de Empatía en una muestra de estudiantes universitarios de Quito-Ecuador

Resumen

Este trabajo evalúa las propiedades psicométricas de la Escala de Empatía en el contexto universitario de Ecuador. El análisis psicométrico del instrumento se basó en una muestra no probabilística compuesta por 571 estudiantes de universidades públicas y privadas de Quito-Ecuador. A partir de análisis preliminares se plantea una versión reducida de la Escala de Empatía (8 ítems). En cuanto a la estructura interna del instrumento, mediante análisis factorial confirmatorio se verificó un modelo bifactorial de primer orden (χ^2 = 133,55, gl = 19, p < .001; CFI = .96; TLI = .94; GFI = .95; RMSEA = .10, IC90 % [.08-.12]), compuesto por dos dimensiones correlacionadas: Empatía Afectiva (5 ítems) y Empatía Cognitiva (3 ítems). Complementariamente, se aporta evidencia a favor de la presencia de un factor general de empatía. Por último, se registraron resultados satisfactorios en términos de confiabilidad y validez externa-nomológica. Si se considera el modelo de medición propuesto, la Escala de Empatía es un instrumento válido y confiable para medir la empatía en el estudiantado universitario. A nivel práctico, este instrumento constituye un recurso útil para el desarrollo de estrategias institucionales que contemplen el diagnóstico, monitoreo y análisis de esta habilidad social y sus dimensiones, además de contribuir metodológicamente al avance de la investigación sobre el rol académico de la empatía en el contexto universitario regional.

Palabras clave

empatía; medición; validez; universidad; Ecuador

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Introduction

Contemporary society is experiencing a growing crisis in interpersonal relationships, marked by a significant rise in loneliness and a progressive weakening of the social fabric, trends that have worsened because of the Covid-19 pandemic and the increasing role of technology as a mediator of social interaction (Einav & Margalit, 2023; Hertz, 2021; Kadri, 2020). In this context, promoting empathy has become a social necessity and a subject of increasing academic interest, as it represents a core individual trait essential for building healthy interpersonal bonds and acts as a form of social glue that enables people to resolve conflicts peacefully (Baron-Cohen & Wheelwright, 2004; Kelam & Kelam, 2022; Ringwald & Wright, 2021).

In the educational field, empathy operates as a social skill that supports academic achievement. Understanding formal learning as a social process in which skills and knowledge are collectively constructed (Pardo Kuklinski & Cobo, 2022), empathy promotes students' active engagement in academic activities—particularly those occurring within the classroom setting—and contributes to the formation of harmonious and productive relationships with both peers and teachers (Maslovarić et al., 2020; Zorza et al., 2019). In this regard, empirical studies have shown that empathy enhances students' sense of belonging and peer acceptance, both of which positively predict academic performance and serve as protective factors against student dropout (Beatson et al., 2024; Pedler et al., 2022; Wentzel et al., 2021). Existing literature has also revealed favorable relationships between empathy and factors conducive to academic achievement, such as the development of prosocial behaviors (Carlo et al., 2018; Farrington et al., 2012; Zorza et al., 2019), perceptions of classroom social climate (Konold et al., 2018; Zorza et al., 2015), the quality of interpersonal relationships (Košir et al., 2007; Maslovarić et al., 2020; Portt et al., 2020), academic motivation (Blaskova et al., 2017), and adaptive help-seeking behaviors (Bohns & Flynn, 2021). Moreover, by strengthening interpersonal bonds, empathy acts as a protective factor against disruptive factors to learning and academic retention, such as stress or burnout (Park et al., 2015; Wilkinson et al., 2017).

Specifically within the university context, several studies provide evidence supporting empathy as a direct and positive predictor of academic performance (Comedis, 2014; Ghazy et al., 2019; Iqbal et al., 2022; Morales Rodríguez et al., 2017). However, research on the effects of empathy on academic outcomes remains limited. Concurrently, scholars have suggested that empathy may help mitigate the psychological strain that university students experience in terms of academic pressure, loneliness, fear of failure, and extended parental dependence (Blaskova et al., 2017), factors that have contributed to a progressive deterioration in the mental health of this population segment worldwide (Evans et al., 2018).

In this regard, access to psychometrically validated instruments is essential for effectively examining the role of empathy in academic outcomes and student mental health, as well as for guiding the potential implementation of institutional monitoring and intervention strategies. However, in Latin America, significant gaps remain in instrumental research regarding the measurement of empathy among university students.

This study, therefore, aims to examine the psychometric properties of the Empathy Scale, initially developed by Bautista Hernández et al. (2016), in the university context of Ecuador. Specifically, the analytical focus lies on internal structure, reliability, and external validity.

For external validity, a nomological approach is adopted, focusing on verifying the empirical association between the scores produced by an instrument and measurements of other variables, known in the scientific literature to be related to the construct assessed by the instrument of interest (Lim, 2024). Considering the well-established relationship between empathy and cooperation—and exclusively for analyzing external-nomological validity—this study proposes examining the correlation between the Empathy Scale and cooperative behavior, measured using the Self-Assessed Collaboration Skills instrument [SACS] (Hinyard et al., 2019).

Conceptualization and Measurement of Empathy

Empathy is defined as the individual capacity to identify with another person on both cognitive and affective levels, by understanding their thoughts and emotions, and by internally and vicariously experiencing their emotional states (Abramson et al., 2020; Neumann et al., 2015). There is a broad consensus in the literature that empathy comprises two core dimensions: cognitive empathy and emotional empathy. Cognitive empathy is the ability to accurately recognize and understand others' mental and emotional states. This capacity enables individuals to anticipate and rationally predict behavior by interpreting others' thoughts, feelings, and motivations (Blaskova et al., 2017; Guasp Coll et al., 2020). Emotional empathy, in contrast, involves the capacity to feel what others feel through a process of emotional contagion that allows for the internal simulation of another person's affective states. This process facilitates more attuned and effective emotional responsiveness to such experiences (Bezzina, 2022; Merino-Soto et al., 2019; Stevens & Taber, 2021). From a neuroscientific perspective, these two dimensions correspond to distinct brain regions. Cognitive empathy is linked to areas associated with perspective-taking, mentalization, and projection, while emotional empathy is supported by neural structures involved in imitation, mirror neuron activity, and emotional processing (Abramson et al., 2020; Bezzina, 2022).

From a methodological perspective, instrumental research on the measurement of empathy in Latin America has followed two distinct trends: a) the adaptation and validation of instruments aimed at assessing empathy in the medical field, such as the Jefferson Scale of Physician Empathy (Alcorta-Garza et al., 2005; Díaz-Narváez et al., 2021), and b) the development and psychometric analysis of scales designed to measure empathy in specific populations of children and adolescents (Hess & Mesurado, 2023; Merino-Soto et al., 2019; Rey, 2003; Tezón & Mesurado, 2021). In the former case, empathy is regarded as a highly desirable trait among healthcare professionals, as it fosters improved interactions with patients and contributes to more effective healthcare delivery (Alcorta-Garza et al., 2005; Van Dijke et al., 2020). For instance, empathetic physicians tend to build greater trust with their patients, encouraging more open and detailed communication of symptoms, ultimately leading to more accurate diagnoses and more effective treatment plans (Chen et al., 2024). In the latter case, empathy in children and adolescents is considered a key factor in the development of essential social skills for adulthood. It is associated with the prevention of future behavioral and social adjustment problems, the promotion of prosocial behavior as part of responsible citizenship, and the cultivation of peaceful social coexistence (Farrington et al., 2012; Rey, 2003; Tezón & Mesurado, 2021).

In the educational field, however, the availability of empathy measures with assessed psychometric validity in student populations remains limited across the region. Particularly in higher education, studies aimed at validating general empathy metrics for university students are extremely scarce, aside from those specifically focused on medical empathy (Lemos et al., 2022). In this context, the Empathy Scale developed by Bautista Hernández et al. (2016) for the Mexican setting offers a valuable and reliable tool for assessing empathy among student populations. The scale is also well-suited in terms of parsimony, as it targets only the two core dimensions of empathy, cognitive and emotional, through its corresponding subscales (Neumann et al., 2015). However, the instrument's original validation was limited to high school students, making it necessary to evaluate its psychometric properties in a university context. Although the empirical findings reported by Bautista Hernández et al. (2016) support a two-factor structure for the Empathy Scale, it is important to explore whether these first-order factors (cognitive and emotional empathy) are part of a more complex latent structure, potentially including a higher-order general factor that would justify the calculation of a global empathy index. Moreover, further research is needed to gather evidence of the instrument's external validity by examining its relationship with measures of other variables that comprise the nomological network associated with the empathy construct.

Accordingly, this instrumental study, conducted in the Ecuadorian context, aims to address the previously identified methodological gaps by providing empirical evidence on the psychometric performance of the Empathy Scale in a university student population.

Methodology

Study design and sampling

This study is instrumental, has a non-experimental design, and is based on cross-sectional data. A convenience sampling method was used. To be eligible, participants were required to be enrolled in a university degree program at a higher education institution with a main campus or extension based in Quito. Exclusion criteria were applied: individuals enrolled in technical or technological programs were excluded, as were students in pre-university leveling modules preceding the first academic level of their degree programs. Likewise, participants with a status of "in the process of graduation" prior to obtaining their professional degree were excluded, as these academic stages typically fall outside the regular progression of the subjects that comprise a degree program's curriculum.

Instruments

Empathy Scale: This instrument was developed initially by Bautista Hernández et al. (2016) and validated in high school students in Mexico. The version recommended by the authors consists of nine items distributed across two subscales: *affective empathy* (five items, items 1–5) and *cognitive empathy* (four items, items 6–9). The items use a 5-point rating scale with the following response options: 0 (*Never*), 1 (*Almost never*), 2 (*Sometimes*), 3 (*Almost always*), and 4 (*Always*). Scoring follows a direct interpretation scheme, where higher scores reflect greater levels of empathy. In their validation study, Bautista Hernández et al. (2016) proposed a correlated two-factor first-order measurement model, with satisfactory levels of reliability for both subscales and the overall empathy index (Cronbach's α between .79 and .87).

As outlined in the introductory section, one aspect of interest in the psychometric evaluation of the Empathy Scale is to explore the external-nomological validity of its measurements. For this purpose—and given that cooperation is recognized as part of the nomological network of the empathy construct—this variable was selected as the external criterion for relational verification. From a theoretical perspective, the empathy-altruism hypothesis posits that empathy is an important cause for the development of prosocial behaviors, including cooperation (Wu et al., 2024). Similarly, Contact Theory

(Pettigrew & Tropp, 2008), applied to educational contexts through collaborative learning research, suggests that cooperative behavior fosters positive and harmonious peer relationships, thereby promoting empathy. According to this framework, students with cooperative skills are more likely to engage in shared academic activities with peers, developing relationships of mutual support for the joint achievement of learning outcomes (sharing information, providing and seeking support or feedback). This generates positive feelings, cognitive-emotional openness, and interpersonal connection, thus facilitating the development of empathy (Van Ryzin & Roseth, 2019).

These theoretical perspectives suggest a positive bidirectional relationship between empathy and cooperation, which has been empirically supported by several investigations (Calabrese et al., 2013; Hojat et al., 2015; Li et al., 2019; Van Ryzin & Roseth, 2019; Wu et al., 2024). This combined conceptual and empirical foundation supports the use of cooperation as a valid external criterion for evaluating the external-nomological validity of the Empathy Scale. The instrument used to assess cooperative behavior is presented below.

Self-Assessed Collaboration Skills (SACS): Developed by Hinyard et al. (2019), this instrument measures individuals' self-perceived collaborative ability. It is worth noting that, in the field of individual-level cooperation assessment, the development of psychometrically valid metrics is still incipient in the current methodological literature. Although alternative instruments have been developed—such as the Interprofessional Team Collaboration Scale (Orchard et al., 2018), validated in the Canadian healthcare context, and the Scale for Self-Evaluation of Collaboration Skills (Boyraz, 2021), validated in the school population of Turkey—these tools were specifically designed to assess collaborative skills within particular settings, such as the workplace or secondary education.

In contrast, the SACS instrument was initially validated in a sample of university students enrolled in the broad field of health-related programs (medicine, nursing, occupational therapy, nutrition, biology, physical training, and medical laboratory sciences) in the United States. It was developed to support the evaluation and early promotion of students' cooperative skills during the university training stage, aiming to improve competencies in interprofessional collaborative practice. However, given that teamwork and interprofessional collaboration have emerged as core competencies across a wide variety of occupational contexts, the SACS is conceived as a general instrument applicable to university students from diverse academic and professional fields (Hinyard et al., 2019).

What further distinguishes this instrument is its comprehensive approach to assessing the construct of cooperation. It not only evaluates students' ability to

support and enhance their peers' performance but also examines their ability to engage in productive conversations and contribute to team learning (Hinyard et al., 2019). Based on these considerations, the sacs measure was selected as the most suitable instrument for measuring individual cooperative behavior in the present study.

The sacs questionnaire consists of eleven items distributed across three subscales: Information sharing (2 items), Team support (3 items), and Learning (6 items). Each item is rated on a 7-point Likert-type scale, with response options ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The instrument items were translated following the criterion of semantic equivalence.

Since this instrument had not previously been validated within the Ecuadorian university context, its psychometric performance was evaluated in terms of item homogeneity and reliability, based on the three-factor measurement model proposed by its original authors. The homogeneity analysis conducted using corrected item–test correlations, revealed that all items present satisfactory item-test correlations (ranging from .770 to .901), except for item 2 (It is hard for me to share my ideas with others), which yielded a negative item–test correlation.

A negative item-test correlation indicates that the item is not measuring the same construct as the overall scale score (Roszkowski & Soven, 2010), and that it fails to adequately discriminate between individuals with high and low levels of the targeted construct (Slepkov et al., 2021). Such non-homogeneous items do not covary in the same direction as the rest of the items, which means they do not contribute to the instrument's internal consistency and can distort the quality of its measurements (Roszkowski & Soven, 2010; Santacroce, 2001). Consequently, a key step in the validation process of any instrument involves identifying and removing non-homogeneous items due to their poor psychometric performance (Kelkar et al., 2022). Consequently, the SACS measure was refined, and item 2 was removed, which improved the overall reliability of the instrument and its measurements (Cronbach's α increased from .931 to .967 when item 2 was discarded).

Based on the adjustments made, a reduced version of the SACS questionnaire comprising ten items was employed. The "Information sharing" dimension was assessed using a single item (M = 4.80; SD = 1.87). The remaining subscales showed satisfactory reliability: Team Support (α = .95) Learning (α = .97). Finally, for the analytical purposes of this study, additive indices were calculated for the cooperative dimensions: Team Support (*Theoretical range* [3 – 21]; M = 15.09; SD = 5.09) and Learning (*Theoretical range* [6 – 42]; M = 29.32; SD = 9.81).

Procedure and Ethical Considerations

Data collection was conducted virtually using the Google Forms platform between December 2022 and February 2023. Survey dissemination was facilitated by students from the Salesian Polytechnic University (Quito Campus), who shared the digital questionnaire link within their personal networks, in accordance with the established inclusion and exclusion criteria for participant eligibility. The digital survey was self-administered.

Ethical guidelines outlined in the Declaration of Helsinki for research involving human participants were followed. All necessary measures were taken to ensure data confidentiality and participant anonymity. In addition, prior to completing the digital survey, an introductory section informed participants of the study objectives and requested their informed consent to participate voluntarily.

Analytical Strategy

The evaluation of the psychometric properties of the Empathy Scale focused on internal structure, reliability, and external-nomological validity. The process began with preliminary analyses aimed at assessing the univariate and multivariate normality of the data, as well as item homogeneity. Subsequently, the internal structure of the instrument was examined using Confirmatory Factor Analysis (CFA), for which several rival measurement models were tested. The alternative models included: a first-order unidimensional model (Model I), a first-order correlated two-factor model (model II) and, aimed at exploring the presence of a general factor, two hierarchical models are proposed: a second-order model (model III) and a bi-factor model (model IV). Once the model with the best fit to the data was identified, its reliability was evaluated. Finally, the external validity of the Empathy Scale was assessed through its correlation with the SACS instrument, which measures individual cooperative ability.

Operationally, univariate normality was assessed using skewness and kurtosis coefficients, considering a normal distribution when these indicators adopt values within the range of -2 to +2 (Zumárraga-Espinosa et al., 2024). For multivariate normality, the Mardia test based on the multivariate kurtosis coefficient was considered, using the criterion proposed by Raykov and Marcoulides (2008) which states that if this coefficient is less than p (p+2) then multivariate normality can be established (p represents the number of observable variables/items). Item homogeneity was examined through corrected item-test correlations, with values above .30 being considered adequate (Zumárraga-Espinosa & Cevallos-Pozo, 2023).

In the CFA, the empirical goodness of fit of each factor model was evaluated based on the following indicators: Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), and the Akaike Information Criterion (AIC). The specialized literature recommends the following criteria to conclude that a model presents an acceptable fit to the data: CFI, TLI, GFI $\geq .90$; RMSEA $\leq .10$ (Byrne, 2010; Lai & Green, 2016; Schermelleh-Engel et al., 2013). The AIC index has a comparative function, allowing to contrast the quality of fit of different rival models, with lower values reflecting a better fit (Medrano et al., 2017). Chi-square (χ^2) test results were also reported for informative purposes.

To assess the instrument's reliability, both Cronbach's alpha (α) and McDonald's omega (ω) coefficients were calculated. Recommended cut-off values were set at above 0.70 for α coefficient (Ventura-León & Peña-Calero, 2020) and above 0.80 for ω coefficient (Goodboy & Martin, 2020). External-nomological validity (Hagger et al., 2017) was explored using the Pearson correlation coefficient (r) to analyze the associations between the Empathy Scale and the SACS measure. The statistical analyses were performed using AMOS 23 and SPSS 26 packages.

Results

Characterization of the Sample

Regarding the socio-academic profile of the participants, 50.3% (287) identified as female and 49.7% (284) as male. Participants ranged in age from 18 to 59 years, with a mean age of 20.8 years ($SD = 3.17$). In terms of academic progress, 64.6% (369) of the participants were in the first four levels of the career, while the remaining 35.4% (202) belonged to 5th level or higher. By type of major, 18.5% (105) were pursuing degrees in social sciences, 13.3% (76) in education, 19.6% (112) in business and economics, 22.2% (127) in life sciences, and 26.4% (151) in science and technology. Finally, 56.9% (325) of the students belonged to public universities and 43.1% (246) studied in private institutions.

Preliminary Analyses

As a first step, item homogeneity was assessed. Results indicated that all items demonstrated adequate item-test correlations ($r > .40$), except for item 9 (*I find it difficult to see things from the perspective of other classmates*), which yielded a correlation in the opposite direction that expected. Due to this inconsistency, the item was removed, reducing the Empathy Scale to 8 items (5 items for affective

empathy and 3 for cognitive empathy). Table 1 presents the descriptive statistics for the items in this reduced version of the Empathy Scale. In univariate terms, all items exhibited skewness and kurtosis values within the range of [–2, +2], supporting the assumption of normal distribution. Instead, Mardia's test yielded a value of 37.55, which is lower than the threshold p (p + 2) = 80, confirming multivariate normality.

Table 1

Descriptive Statistics for the Empathy Scale Items

		M	SD	Skewness	Kurtosis	Corrected Item–Test Correlation
Item 1	I feel upset when I see a classmate being treated disrespectfully	2.90	1.04	-.60	-.50	.73
Item 2	When I see that any of my peers is being treated unfairly, I feel sorry for him/her	2.85	1.01	-.61	-.21	.74
Item 3	When I see someone being taken advantage of, I feel protective toward them	2.75	.99	-.45	-.32	.75
Item 4	I feel attuned to the emotional states of my classmates	2.64	1.06	-.45	-.39	.70
Item 5	I am deeply affected by the misfortunes of my classmates	2.25	1.11	-.24	-.47	.46
Item 6	Before criticizing a classmate, I try to imagine how I would feel in their place	2.66	1.06	-.44	-.42	.71
Item 7	In case of disagreement, I try to consider the other partner's point of view	2.73	1.01	-.52	-.21	.75
Item 8	I believe there are two sides to every situation, so I try to take both into account	2.82	.99	-.54	-.24	.73

Source: Own elaboration.

Confirmatory Factor Analysis

Given that both univariate and multivariate normality were verified in the collected data and considering that the instrument items are measured on a scale with more than five response options (Lloret-Segura et al., 2014), the maximum likelihood method was chosen for parameter estimation in the CFA. The results for each alternative measurement model are presented in Table 2.

The unidimensional first-order model (Model I) exhibited poor empirical fit (χ^2 = 379.90, *df* = 20, $p < .001$; CFI = .87; TLI = .82; GFI = .83; RMSEA = .18, 90% CI [.16 – .19]; AIC = 411.90). In contrast, the correlated two-factor first-order

model (Model II), originally proposed by the instrument's authors (Bautista Hernández et al., 2016), showed acceptable fit to the sample data (χ^2 = 133.55, *df* = 19, $p < .001$; CFI = .96; TLI = .94; GFI = .95; RMSEA = .10, 90% CI [.08 – .12]; AIC = 167.55). These results therefore support a primary internal structure composed of two factors: cognitive empathy and affective empathy.

Table 2

Confirmatory Factor Analysis Results: Alternative Measurement Models

	χ^2	DF	IFC	TLI	GFI	RMSEA	RMSEA 90% CI	AIC
Model I: First-order one-dimensional	379.90***	20	.87	.82	.83	.18	[.16 - .19]	411.90
Model II: Two first-order correlated factors	133.55***	19	.96	.94	.95	.10	[.08 - .12]	167.55
Model III: Second-order factorial model	133.55***	19	.96	.94	.95	.10	[.08 - .12]	167.55
Model IV: Bi-factor model	60.37***	12	.98	.96	.97	.08	[.06 - .11]	108.37

*Note: *** p < .001. CI = Confidence Interval.*
Source: Own elaboration.

Regarding the exploration of a general empathy factor complementing the two established primary constructs (cognitive and affective empathy), the proposed hierarchical models (Model III and Model IV) presented adequate empirical fit. In the case of model III (second-order general factor), the fit indicators yield results equivalent to model II, this is explained due to the small number of primary factors (2), which means that a higher-order model cannot provide new information in terms of goodness of fit. Nonetheless, the empirical adjustment of this model remains acceptable. Finally, the bi-factor model (model IV) is the alternative that reports the best fit statistics (AIC = 108.37).

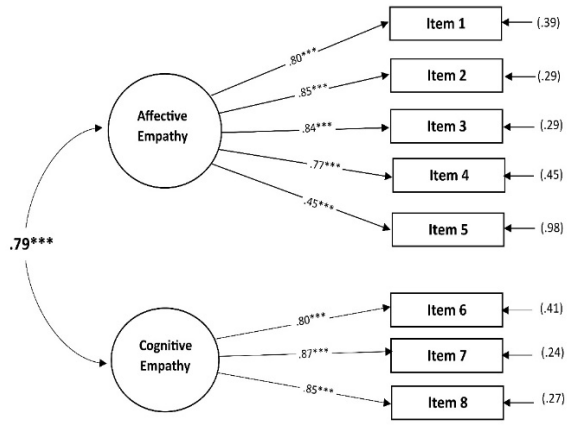
The satisfactory fit observed in both hierarchical models supports the feasibility of calculating a global empathy index. However, since a more in-depth exploration of how this general factor relates to the items and primary factors captured by the instrument is required—an analysis that exceeds the scope of this study. Therefore, measurement model II was retained as the most appropriate representation of the Empathy Scale's internal structure.

Figure 1 shows the correlated two-dimensional model, factor loadings and inter-factor correlation. As shown, all items exhibit statistically significant ($p < .001$) and relevant factor loadings ($\lambda > .40$). Moreover, the latent factors of

affective empathy and cognitive empathy are strongly and positively correlated (r = .79, p < .001).

Figure 1

First-order two-dimensional model. Empathy Scale



*Note: *** p < .001. Factor loadings, inter-factor correlation and residual variances are presented.*
Source: Own elaboration.

Reliability Analysis

Reliability refers to the ability of an instrument to accurately capture, and without noise (measurement error), the behavior of the construct to be measured. Both the Cronbach Alpha coefficient (α) and the McDonald Omega coefficient (ω) were used to analyze the reliability of the Empathy Scale. Table 3 presents the reliability results for the instrument.

Table 3

Reliability coefficients. Empathy Scale

			Cronbach's Alpha (α)		McDonald's Omega (ω)	
Scale/Subscales	**# Items**	**Theoretical range**	**Coefficient**	**95% CI**	**Coefficient**	**95% CI**
Global Empathy	8	0 - 32	.90	.89 - .92	.95	.94 - .95
Affective Empathy	5	0 - 20	.85	.83 - .87	.90	.88 - .91
Cognitive Empathy	3	0 - 12	.88	.86 - .89	.91	.89 - .92

Source: Own elaboration.

Affective and cognitive empathy subscales show fairly good levels of reliability, both when evaluating the alpha coefficient (α ≥ .85) and the omega coefficient (ω ≥ .90). Additionally, given the empirical evidence supporting the

existence of a general empathy factor, the reliability of the overall instrument was also assessed, obtaining satisfactory results (α = .90; ω = .95).

External Validity

Cooperation is a key variable within the nomological network of the empathy construct, as both empathy and cooperation are assumed as central social skills (Farrington et al., 2012). In this regard, empirical literature provides evidence in favor of a positive relationship between empathy and cooperation (Chen & Wang, 2019; Li et al., 2019; Van Ryzin & Roseth, 2019). Since more empathetic individuals tend to show greater collaborative behavior, scores derived from the Empathy Scale are expected to correlate positively with the cooperative skills measured by the SACS instrument.

Concerning the expected magnitude of the correlations between empathy, its dimensions, and collaborative behaviors, weak to moderate associations (ranging from 0.20 to 0.50) are anticipated. This expectation is grounded in empirical findings reported in previous studies (Calabrese et al., 2013; Hojat et al., 2015; Van Ryzin & Roseth, 2019; Wu et al., 2024). The results of this correlational analysis are presented in Table 4.

Table 4

Correlations between Empathy Scale and SACS

	Cooperative Skill		
	Information sharing	**Team support**	**Learning**
Global Empathy	.559***	.642***	.668***
Affective Empathy	.535***	.595***	.634***
Cognitive Empathy	.503***	.600***	.602***

*Note: *** p < .001. Spearman's rho was used for the "Information sharing" variable (single item, ordinal); Pearson's correlation coefficient was used for the remaining variables (additive indices).*

Source: Own elaboration.

Having verified the reliability of the Empathy Scale (general scale and subscales), this analysis started from the calculation of additive indices both at the global level (M = 21.6; SD = 6.40) and for each empathy subscale: cognitive empathy (M = 8.2; SD = 2.74) and emotional empathy (M = 13.4; SD = 4.14). Overall, empathy scores showed positive, moderate, and statistically significant correlations with all three subscales of the SACS measure: Information sharing (rho = .559, p < .001), Team support (r = .642, p < .001), and Learning (r = .668, p < .001). This relational pattern remained consistent when the specific empathy dimensions were analyzed separately, with all cases yielding positive and

moderate associations. Comparatively, affective empathy was more strongly associated with the dimensions of Information sharing (rho = .535, p < .001) and Learning (r = .634, p < .001), while cognitive empathy is most strongly associated with Team Support (r = .600, p < .001). Consequently, the observed correlations confirm the initial theoretical expectation regarding the positive relationship between empathy and cooperation, which provides nomological validity to the Empathy Scale.

Conclusions

This instrumental study aimed to evaluate the psychometric properties of the Empathy Scale developed by Bautista Hernández et al. (2016) within the university context of Ecuador. The psychometric evaluation carried out focused on the aspects of internal structure, reliability and external validity. Based on the results of preliminary analyses, a reduced version of the instrument was proposed, comprising eight items: five corresponding to the affective empathy subscale (Items 1–5) and three to the cognitive empathy subscale (Items 6–8).

Confirmatory factor analysis provided empirical support for the factorial validity of a measurement model composed of two correlated first-order factors (emotional and cognitive empathy), as originally proposed by the authors of the instrument (Bautista Hernández et al., 2016). Considering this factor model, the subscales of affective and cognitive empathy show good levels of reliability, which indicates that they can capture each latent construct with a satisfactory accuracy degree. In addition, the tested hierarchical models (second-order factorial model and bi-factor model) also exhibited acceptable fit indices, suggesting the presence of a general empathy factor. This finding supports the computation of a global empathy index by aggregating item-level scores (Neff et al., 2017). However, since further accumulation of evidence is required to establish the hierarchical model that best represents the structure-construct captured by the Empathy Scale, it is reasonable to maintain the first-order two-dimensional model as the most appropriate usage scheme. Accordingly, while the calculation of total empathy scores is psychometrically justified, equal emphasis should be placed on the assessment and interpretation of the instrument's primary dimensions: affective empathy and cognitive empathy.

Furthermore, this study contributes to the external validity analysis of the Empathy Scale. Correlational analyses show that scores from Empathy Scale (global and by subscale) are positively associated with various cooperative skill measured by the Self-Assessed Collaboration Skills (SACS) instrument: information sharing, team support, and learning. As cooperation is part of the nomological network of empathy, these findings align with the theoretical expectations

regarding the nature of the association between these variables (Chen & Wang, 2019; Li et al., 2019; Van Ryzin & Roseth, 2019). All observed correlations were moderate in magnitude, consistent with prior studies such as Calabrese et al. (2013), Hojat et al. (2015), which explored the link between empathy and collaborative attitudes, and Wu et al. (2024), which examined the correlation between empathy and cooperative tendencies among adolescents. Overall, correlational findings suggest that the instrument effectively measures the empathy construct and provide evidence of its external-nomological validity.

While this study marks a preliminary step in exploring the external validity of the Empathy Scale, it is recommended that future research continues to assess the criterion validity of the instrument, considering not only the external-nomological validity, based on correlating the Empathy Scale with other measures of theoretically related variables (Zumárraga-Espinosa et al., 2024), but also its convergent validity, by assessing its associations with other established measures of empathy (Bárrig-Jó et al., 2020).

In summary, this instrumental study aimed to address the existing methodological gap in the availability of metrics to measure empathy in university students in a general way. The findings support the Empathy Scale as a valid and reliable instrument for assessing empathy and its core dimensions among Ecuadorian university students. Also, considering the evidence provided, the use of the proposed reduced version (8 items) and the two-factor first-order measurement model is recommended. Hence, while the calculation of a total empathy score is empirically supported, it is suggested that equal importance is given to the diagnosis and study of the specific dimensions of affective empathy and cognitive empathy.

Regarding the practical implications of the study, having a validated empathy scale adapted to the university context constitutes a necessary methodological tool for effectively diagnosing and monitoring this essential social skill in the university population, which is very useful to expand research around the relationship between empathy and academic results in higher education. Considering that student dropout has remained a critical problem for university education in Latin America (Herbas-Torrico et al., 2021; Zumárraga-Espinosa & Cevallos-Pozo, 2022), generating evidence on potential predictors of variables such as academic performance, course repetition, and dropout intention becomes essential for universities to design more effective support strategies and intervention programs aimed at promoting student retention and academic success (Fagioli et al., 2020). Hence, the Empathy Scale is as a useful tool for deepening the understanding of the academic role of empathy in university education.

Regarding limitations, the findings are based on a non-probabilistic sample drawn from university students in Quito, Ecuador. Although the study included participants from both public and private institutions in the capital city, recognized as a major academic center in the country, the sample cannot be considered fully representative of the university population of Ecuador. Therefore, future research is encouraged to corroborate these findings using probabilistic, nationally representative samples.

Another limitation concerns the precise identification of the hierarchical model that best represents the factorial functioning of the Empathy Scale. As mentioned, the results of the hierarchical models tested (second-order factorial and bi-factor) provide empirical support for the calculation of a global empathy index. However, it is worth mentioning that in this work each alternative hierarchical model was explored only in terms of goodness of fit. A more thorough and detailed psychometric analysis is therefore needed to determine which model best reflects the empirical behavior of the items. This includes comparing the extent to which each model satisfies the full range of specific parameters required to establish the validity of a measurement model.

In this regard, the interpretative implications of each hierarchical model postulating the presence of a general factor must be taken into account, since each hierarchical model implies a different relationship between the general and specific factors. In the case of the second-order model, it is proposed that the general factor (empathy) determines the first-order factors (affective and cognitive empathy), thereby treating the items as indirect indicators of the general factor (Neff et al., 2017). In contrast, the bi-factor model proposes that both the general factor (empathy) and the specific factors (affective and cognitive empathy) explain directly and simultaneously the variability of the items (Domínguez-Lara & Rodríguez, 2017). The second-order model emphasizes the way in which the general factor influences the primary factors; meanwhile, the bi-factor model is more focused on determining whether the general factor or the specific factors have a preponderant explanatory weight over the set of items (Gignac, 2016; Rodriguez et al., 2016). Future research should therefore assess the adequacy of these competing hierarchical structures more rigorously, considering not only empirical criteria but also the strength of their respective theoretical foundations.

Finally, the evaluation of the psychometric properties of the Empathy Scale was limited to the aspects of factorial validity, reliability and nomological validity, so it is recommended that future studies focus on examining the measurement invariance of the instrument, both across cultural contexts (cultural invariance) and between student populations.

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Appendix

Empathy Scale

(Version adapted for the university context)
Instructions: In relation to your interaction with others in the university setting and related academic activities, how often do you experience the following situations?

Response options:	
Never	(0)
Almost never	(1)
Sometimes	(2)
Almost always	(3)
Always	(4)

Items

Affective Empathy

1. I feel upset when I see a classmate being treated disrespectfully
2. When I see that any of my peers is being treated unfairly, I feel sorry for him/her
3. When I see someone being taken advantage of, I feel protective toward them
4. I feel attuned to the emotional states of my classmates
5. I am deeply affected by the misfortunes of my classmates

Cognitive Empathy

6. Before criticizing a classmate, I try to imagine how I would feel in their place
7. In case of disagreement, I try to consider the other partner's point of view
8. I believe there are two sides to every situation, so I try to take both into account