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VALIDATING A BRIEF EMPATHY QUOTIENT TEST WITH ADOLESCENTS FROM MEXICO

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Abstract

Empathy is a skill that enables the identification with and interpretation of others' subjective experiences. The purpose of this study was to validate the Empathy Quotient (EQ) in adolescents in Mexico. A sample of 573 Mexican adolescent students (350 female and 223 male) with an age range of 12-19 years was employed (M_{age}= 14.8 years, *SD*= 1.96). An exploratory factor analysis (EFA) was carried out which identified two factors, one with 16 items associated with the affective dimension and one with 13 items related to the cognitive dimension (model fit indices: GFI= .984, RMSEA= .034, and RMSR= .072). To evaluate the resultant bifactor model, a confirmatory factor analysis (CFA) was performed, showing good fit indexes (RMSEA= .020, RMSR= .045, CFI= .998, GFI= .988). Regarding internal consistency, we found a McDonald's ω correlation coefficient of= .941 for the affective dimension and ω= .772 for the cognitive dimension, with *p*< .001. The validation of this empathy instrument will support its use as a clinical research assessment tool in Mexican adolescents.
KEY WORDS: *empathy, social cognition, adolescents, emotion, construct validity*.

Resumen

La empatía es una habilidad que permite la identificación e interpretación de experiencias subjetivas de otros. El objetivo de este estudio fue validar el Cociente de Empatía en adolescentes mexicanos a partir de una muestra de 573 estudiantes (350 mujeres y 223 hombres) con un promedio de edad de *M*= 14,8 (*DE*= 1,96). Se realizó un Análisis Factorial Exploratorio, identificando dos factores, uno con 16 ítems asociados a la dimensión afectiva y otro de 13 ítems con la dimensión cognitiva (índices de bondad de ajuste: GFI= 0,984, RMSEA= 0,034 y RMSR= 0,072). Para evaluar el modelo bifactorial obtenido, se realizó un Análisis Factorial Exploratorio, presentando adecuados índices de ajuste (RMSEA= 0,020, RMSR= 0,045, CFI= 0,998, GFI= 0,988). En la consistencia interna, se encontró un coeficiente de correlación ω de McDonald de= 0,941 para la dimensión afectiva, y ω= 0,772 para la dimensión cognitiva (*p*< 0,001). La validación de este instrumento

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de empatía apoyará su uso como herramienta de evaluación en investigación clínica en adolescentes mexicanos.
PALABRAS CLAVE: *empatía, cognición social, adolescentes, emoción, validez de constructo.*

Introduction

Empathy is considered a skill that enables an individual to identify and interpret others' subjective experiences according to his or her mental representations of the world, knowledge, beliefs, feelings, emotions, intentions, and desires (Ward et al., 2012). Likewise, empathy implies the ability to understand these experiences and being able to transmit one's understanding to others (Cuff et al., 2016; Grau et al., 2017).

Thompson et al. (2019) consider the process of empathy to be related to three main elements: perception or detection of emotional cues (facial, bodily, and vocal expressions); mimicry/embodiment, i.e., mechanisms that can elicit spontaneous resonance with other's emotions; and finally, cognitive processes that enable a person to make inferences about another's experience and manage the coactive self in the absence of any other perceptual cues, taking into account the other's mental representation.

Empathy is a psychosocial construct that is intrinsically linked to the Theory of Mind (ToM), a cognitive construct related to the ability to understand and hypothesize about others' behavior in a psychological context, i.e., to attribute thoughts, ideas, feelings, desires, or intentions to others in order to predict their behaviors (Wellman & Peterson, 2013). The difference between these two associated constructs is that empathy has social purposes because it promotes helpful behaviors, whereas ToM refers to a meta-representation of the cognition of others (Muñoz & Chaves, 2013). Wakabashy et al. (2006) write that "Empathy has an affective component (feeling an appropriate emotion provoked by another person's emotion), a cognitive component (understanding and/or predicting what another person might think, feel, or do), and a mixed component (cognitive and affective)" (p. 930).

Given that affective and cognitive empathy are linked to one another, and individuals with a better understanding of others' emotions are likely to experience shared feelings and empathic concern; both aspects of empathy therefore promote empathic behavioral responses towards others, (for example, offering comfort when someone shows distress responses (Boele et al., 2019)). In accordance with Lim et al. (2018) and Van Lissa et al. (2017), empathy is a cognitive capacity that is more common in women than men. Empathy and emotions that are socially constructed as positive seem to predict prosocial behavior in childhood, especially girls (Andrews et al., 2021).

Empathy in adolescents is related to the development of social behavior, interpersonal relationships, higher levels of traits, and prosocial and altruistic behavior (Vossen et al., 2015). Empathy is considered the most important predictor of both present and future behaviors adjustment in adolescents (Schonert-Reichl,

1993). Stern and Cassidy (2018) noted that in adolescence, individuals intensify their relationships with others, developing significant peer relationships, and they are making overall sociocognitive advances, accordingly, adolescents show improvements in ToM, emotional understanding and regulation, and self-awareness, displaying an improved capacity for empathy, likewise, during adolescence, individuals develop a greater ability to report their internal states (Pedrero-Pérez et al., 2019).

There is a wide range of tests for measuring empathy, however, only a few foci on assessing cognitive and affective domains among Hispanic speakers have been validated with adolescents from diverse cultural groups, such as those from rural or urban areas. Malti et al. (2016) suggest that assessment tools based on school skills seek to measure empathy as a global trait, with little view towards assessing of the diverse components of empathic responses, similarly, González-Yubero et al. (2021) and Vossen et al. (2015) note that some scales do not distinguish between the affective and cognitive components of empathy.

In Mexico, some empathy scales have been validated with different populations in the context of health professions education and patient care, such as the adapted Jefferson Scale of Empathy (Hojat et al., 2018; Hojat et al., 2005), and an empathy questionnaire for children, which focused on the affective dimension of empathy (Flores-Galaz et al., 2017). However, only one scale has been registered on the online inventory system of psychosocial scales in Mexico (Calleja, 2011), namely, an empathy scale tailored for medical residents (Lozano-Razo, 2002). None of the scales currently available have been designed for adolescent subjects.

Due to the lack of instruments focused on the cognitive and affective domains of empathy among Spanish-speaking Latin-American adolescents and the importance of studying empathy in the context of this stage of development, the present study aimed to validate a brief version of the Empathy Quotient (EQ), -originally developed by Baron-Cohen & Wheelwright (2004)- among adolescents in Mexico.

Method

Participants

A non-probabilistic sample of 573 selected adolescents (*n*= 350 female and *n*= 223 male) from 12 to 19 years old (*M*= 14.8, *SD*= 1.96 years old) was included in this analysis (Table 1). All the participants (6 to 10 literacy years) were from high schools in both urban and rural locations in Baja California as well as urban areas across the whole of Mexico.

Instrument

The *Empathy Quotient* (EQ; Baron-Cohen & Wheelwright, 2004) is a self-administered instrument composed of 60 items, 40 of which are associated with empathy (1, 4, 6, 8, 10, 11, 12, 14, 15, 18, 19, 21, 22, 25, 26, 27, 28, 29, 32, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 46, 48, 49, 50, 52, 54, 55, 57, 58, 59, and 60)

and 20 of which are filler items (2, 3, 5, 7, 9, 13, 16, 17, 20, 23, 24, 30, 31, 33, 40, 45, 47, 51, 53, and 56). According to the original authors of the instrument, these filler items were included to shift the focus from the empathy content. But, for this study, the filler items were removed from the test because we wanted to use a brief version with less than 40 items, in order to decrease participants´ response time. Each item was designed with a four-option Likert scale from "totally agree" (1) to "totally disagree" (4). Test-retest reliability for the EQ is *r*= .97 (Baron-Cohen & Wheelwright, 2004).

Table 1
Sociodemographic characteristics of the participants

Sample 1 (exploratory factor analysis)					Sample 2 (confirmatory factor analysis)			
Age in years	*n*	Female	Male	Years of education	*n*	Female	Male	Years of education
12	25	10	15	6	27	15	12	6
13	34	20	14	7	35	21	14	7
14	99	58	41	8	73	45	28	8
15	37	21	16	9	92	53	39	9
16	5	3	2	10	45	31	14	10
17	-	-	-	-	18	11	7	11
18	-	-	-	-	23	21	2	12
19	-	-	-	-	60	41	19	13
Total	200	112	88		373	238	135	

Procedure

The cultural adaptation of the test was qualitatively revised by four psychology professionals who reviewed the sufficiency, clarity, coherence, and relevance of the empathy items, as well as the semantic equivalence of the items in the Spanish translation; this procedure was based on a methodology described by Escobar-Pérez and Cuervo-Martínez (2008). After the EQ revision, the instrument was applied in two different evaluations: in the first evaluation, participants were assessed by psychology students trained in the proper application of the test in well illuminated and ventilated classrooms provided by the school directors. The test took approximately 20-25 minutes to complete and was administered in groups. This evaluation included 200 adolescents from urban and rural areas of Baja California, Mexico; however, the responses of 15 of these were excluded from the analysis due to missing data. The second evaluation included 495 new participants from urban areas in Mexico. In order to reach a greater number of adolescents in the country, these participants were assessed by an online survey; 122 of these surveys were excluded due to non-completion of the instrument or missing data. The total sample of participants included was 573, superior to the sample sizes required to estimate stable measurement-error-free correlations, as Kretschmar and Gignac (2019) suggested.

According to the regulations for research on human participants in the National Law of Health, the procedures implemented in this research were deemed to be low risk (Secretary of State for Health, 2014). All procedures complied with the Helsinki ethical principles (World Medical Association, 2013), and consent was obtained from the school authorities where data collection took place. All participants agreed to collaborate voluntarily and were free to stop completing the evaluation at any time. The signing of the informed consent form took place before answering the instrument: it was carried out as a group in the classrooms, during a time assigned by the directors; and a link was enabled to accept or reject the participation and use of the data in the second group of participants who answered the instrument via a digital survey.

Data analysis

We used descriptive statistics to summarize and characterize the participants´ sociodemographic background, and multivariate procedures including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to determine the construct validity. The first evaluation sample was to EFA (*n*= 200), and the second evaluation sample was to CFA (*n*= 373). R Studio (Allaire, 2017) and FACTOR (Ferrando & Lorenzo-Seva, 2017, Lorenzo-Seva & Ferrando, 2020) were used for each analysis. We applied a McDonald's ω correlation and the inter-item correlations to determine the internal consistency reliability of the instrument (Torrano-Martínez et al., 2020). EFA assesses the dimensionality of a scale and reduces the number of variables to identify correlation patterns (Reise et al., 2000). CFA helps determine the presence of correlations between latent variables as well as associations between each latent variable and their corresponding observed variables; it is aimed at confirming the structure suggested by the model (Manzano & Zamora, 2009). According to Lloret-Segura et al. (2014), it is recommendable to use a polychoric correlation matrix on non-normal and ordinal distributions for instruments with responses of less than 5 items Likert-type scale. Muthen and Kaplan (1992) advice performing polychoric correlation when the univariate distributions of ordinal items are asymmetric or there is excess kurtosis.

EFA and CFA were performed to determine the construct validity, we used the Kaiser-Meyer-Olkin (KMO) test, as a measure of sample adequacy for the purpose of comparing the correlation coefficients with the partial correlation coefficients (Pett et al., 2003). In addition, to prove the existence of a correlation structure between the variables (in the correlation matrix), we used Bartlett's test of sphericity (Manzano & Zamora, 2009). Finally, as a means of estimating the factor analysis model, we used a polychoric correlation matrix. It was analyzed using the optimal implementation of Parallel Analysis procedure for determining dimensions, and the factorial extraction method of robust unweighted least squares (RULS) with a promin rotation (Lorenzo-Seva & Ferrando, 2019; Timmerman & Lorenzo-Seva, 2011). Likewise, for CFA analysis (the second sample *n*= 373), the following measures were determined: a) the minimum fit function Chi-Square; b) absolute fit indexes (to directly assess the fit of the model); and c) relative fit indexes (to compare the proposed model with the independent model, assuming that there were no

associations between the variables) (Manzano & Zamora, 2009). Specifically, for the absolute adjustment, comparative fit indexes were used, such as the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the comparative fit index (CFI), the goodness of fit index (GFI), and the adjusted goodness of fit index (AGFI). For the relative adjustment, the non-normed Tucker-Lewis index (TLI) was used. According to the cutoff criteria for several fit indexes for categorical data of Schreiber et al. (2006), values that should be highlighted in determining a good fit are RMSEA< .06-.08; CFI, GFI, and TLI≥ .95. Based on DiStefano et al. (2018), low values (< .90) of WRMR are to be recommended.

Results

Regarding the EFA results, the KMO test showed appropriate values for the factorial sample (r= .769, p< .001) and Bartlett's test of sphericity (χ^2= 2181.7, df= 406, p= .001). Considering the results of the factorial extraction with the 40 items evaluated, 11 items were eliminated from the analysis (when the factor loadings were less than .40), obtaining from it two factors. Table 2 presents the rotated factor loadings for 29 items grouped by a bifactorial model, of which 16 items were associated with one dimension and 13 with the other. The model fit indices were GFI= .984 (CI= [.988-.991]) values; RMSEA= .034 and RMSR= .072 (CI= [.072.-.073], model index acceptable under Kelly´s criterion = .070, indicating the good fit of the data to the model.

Table 2
Rotated factor matrix

Item	F1	F2	Item	F1	F2
6	.004	.459	38	-.037	.507
10	.434	.097	41	-.066	.661
11	.547	-.042	42	.083	.462
12	.564	-.036	43	.132	.547
15	.582	.116	44	-.017	.693
18	.528	.147	46	.642	-.113
19	.007	.512	48	.610	.021
21	.480	.169	49	.656	-.049
22	.046	.488	50	.701	-.025
25	-.076	.632	52	.011	.659
26	-.187	.693	54	.165	.482
27	.644	-.038	55	.057	.572
29	.419	.121	57	.440	.125
32	-.046	.517	60	.004	.575
36	.024	.668			

Based on the theoretical evidence and the results of the EFA, the empathy model was divided into a bifactorial model composed of the latent variables of cognitive (CA) and affective (AC) empathy. The first latent variable was composed of the factor loaded with observed items 6, 19, 22, 25, 26, 32, 36, 38, 41, 42, 43, 44, 52, 54, 55 and 60, and the second variable was associated with the factor loaded with items 10, 11, 12, 15, 18, 21, 27, 29, 46, 48, 49, 50, and 57 (see Appendix). The indicators were items adapted from the EQ (Baron-Cohen & Wheelwright, 2004), with a range of responses from 1 (totally agree) to 4 (totally disagree) (Table 3).

Table 3
Medians, means and standard deviations of participants' items scores (*N*= 573)

Items	Sample 1 (*n*= 200)			Sample 2 (*n*= 373)		
	Mdn	*M*	*SD*	*Mdn*	*M*	*SD*
6	2	1.83	.860	3	2.71	1.15
10	2	2.35	.990	2	2.31	1.02
11	3	2.71	1.13	2	2.13	1.15
12	2	2.46	1.04	2	2.11	1.04
15	2	2.06	.940	2	2.14	.990
18	4	3.13	1.10	2	2.25	1.34
19	1	1.72	.880	3	2.73	1.17
21	2	2.14	.940	2	2.28	1.02
22	2	2.27	.980	3	2.83	1.08
25	2	2.00	.870	3	2.67	1.07
26	2	1.74	.800	3	2.68	1.09
27	2	2.44	1.04	2	2.21	1.04
29	2	2.11	.950	2	2.18	.990
32	2	1.88	.990	3	2.47	1.18
36	2	1.99	.890	3	2.68	1.08
38	1	1.59	.900	3	2.72	1.29
41	1	1.56	.740	3	2.66	1.20
42	2	2.19	1.05	3	2.68	1.12
43	1	1.65	.830	3	2.66	1.18
44	2	1.80	.900	3	2.57	1.08
46	3	2.73	1.11	2	2.28	1.15
48	3	2.54	1.02	2	2.19	1.12
49	3	2.70	1.08	2	2.11	1.08
50	2	2.34	1.07	2	2.10	1.04
52	2	1.95	.830	3	2.68	.980
54	2	2.09	.910	3	2.65	1.05
55	2	1.88	.860	3	2.83	1.16
57	2	2.29	.990	2	2.37	1.01
60	2	1.94	.960	3	2.74	1.11

For CFA analysis, the items' normality tests were analyzed through multivariate descriptive analysis and Mardia's Test, where the standardized skewness score was 117.92 (p= 1.00), and the kurtosis was 1016.55 (p= .001), with asymmetrical distribution.

The sample adequacy for CFA was determined through a KMO test of the polychoric correlation matrix, which displayed a value of r = .922 (very good), as well as Bartlett's test of sphericity, which displayed an index of χ^2= 4173.4 (p= .001). Evaluating the models with 1, 2, and 3 factors, we observed that the best-fit indices found were associated with the three-factor model. However, when we reviewed the number of indicators (items) associated with one factor from the three-factor model, we found that only three items were related to it, and one item had a factor load similar in two dimensions (.444 and .379); meaning that this item was not well defined. Moreover, the FACTOR program; as a result of parallel analysis, recommended 2 factors, for which reason it was decided to keep the bifactorial model.

Our results were as follows: $\chi^2(349)$= 318.931, p= .874; RMSEA= .020, RMSR= .045 (.049-.049), CFI= .998 (.996-.997), GFI= .988 (.987-.988), TLI= .997 (.995-.996) and WRMR= .039 (.041-.041). These results showed that each of the overall goodness of fit indexes suggested that the resultant bifactorial model was correctly adjusted to the observed data. Table 4 represents the results obtained when evaluating three models of the analyzed construct.

Table 4
Comparison of the goodness of fit index for the evaluated three models (n= 373)

Model	χ^2 (*df*)	RMSEA	95% CI	GFI	CI	CFI	95% CI	RMSR	Kelley´s criterion)
One factor	**2282.83 (377)	.103	(.078-.012)	.917	(.884-.946)	.931	(.897-.958)	.122	.051
Two factors	318.93 (349)	.020	--	.988	(.987-.988)	.998	(.996-.997)	.045	.051
Three factors	246.50 (322)	.010	--	.991	(.991-.993)	.999	(.999-1)	.040	.051

Note: **p< .001.

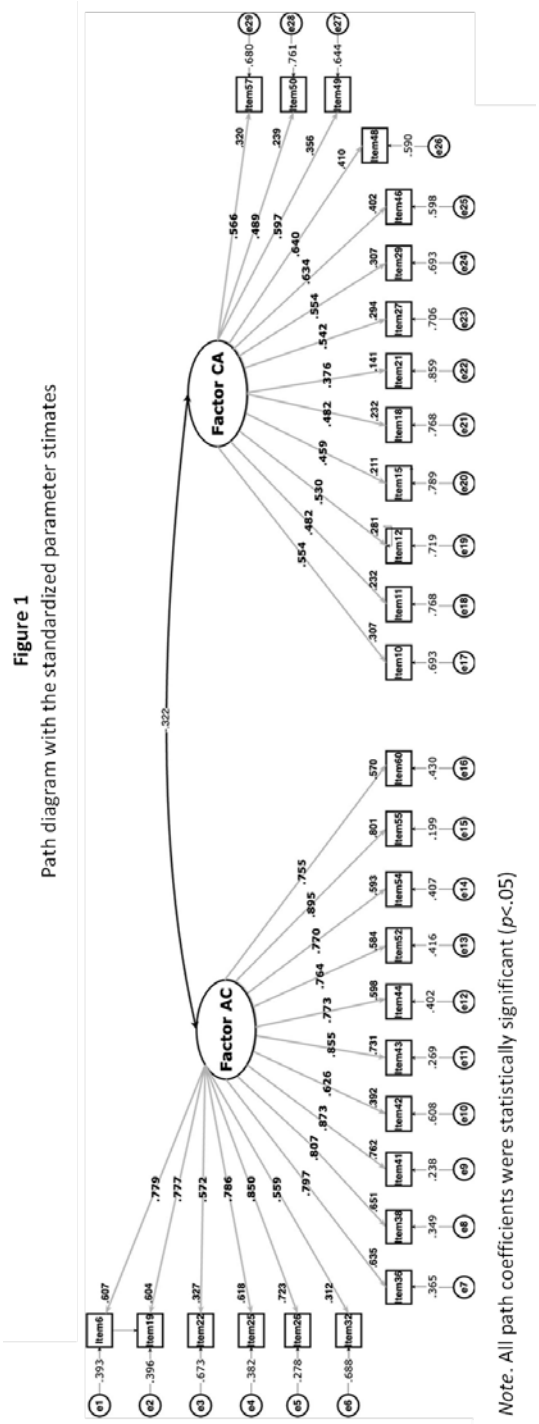
The standardized parameter estimates from the CFA solution are presented in SEM (Figure 1). All factor loadings were statistically significant ranging from .373 to .895.

Regarding the gender differences among the adolescents, a significant difference was observed with minimal effect sizes for AC factor scores in the student's t-test. However, no statistically significant differences were detected on the total test´s score (Table 5).

The validity criterion was analyzed by correlating the original instrument composed of 60 items and the short one proposed in this study by means of Pearson's r. Taking into consideration the two dimensions (AC and CA) and the total short version test, we compared the 40 empathy items, 20-filler items, and the 60 items of the original test. Regarding divergent validity, it was observed neither the individual factors (AC and CA) distinguished in our instrument nor the instrument in its entirety, exhibit statistically significant correlations with the filling items included in the original version, results are shown in Table 6.

Figure 1

Path diagram with the standardized parameter stimates



Note. All path coefficients were statistically significant (p<.05)

Table 5
Two-sample *t*-test results comparing males' and females' brief Empathy Quotient (EQ)

Factors/Construct	Sex	*n*	*M*	*Diff.*	*SD*	*t*	Cohen´s *d*	Hedge´s *g*
Affective Cognitive	Female	238	42.21	-2.00	1.00	-1.42**	.156	.156
	Male	135	44.22		.890			
Cognitive Affective	Female	238	29.17	-0.80	.480	-1.03	.112	.111
	Male	135	28.36		.590			
Total EQ	Female	238	70.58	-2.81	12.82	-2.01	.217	.217
	Male	135	73.40		13.01			

Notes: ***p*< .001. Small effect size (0-.21), medium effect size (.50-.70), large effect size (> .80).

Table 6
Correlations between short version and original version tests

Dimension	1	2	3	4	5
1. Affective Cognitive	---				
2. Cognitive Affective	-.294**	---			
3. Total, short version test	.845**	.262**	---		
4. Empathy measurement items (40 items)	.830**	.262**	.984**	---	
5. Filler items (20 items)	.024	.060	.058	.067	---
6. Total original version test (60 items)	.738**	.332**	.901**	.918**	.458**

Note: ***p*< .001.

In order to test the convergent validity, the composite reliability and the average variance extracted were obtained, resulting in a CR value of= .958 and AVE= .579 for the AC dimension, likewise, for the CA dimension, factor values of CR= .837 and AVE= .287 were determined. Regarding the internal consistency analysis, McDonald's ω correlation coefficients were obtained. For the first factor (AC), a correlation of ω= .941 and an inter-item correlation of *r*= .489-.806 were obtained; for the second factor (CA), a correlation of ω= .772 and an inter-item correlation of *r*= .219-.504 were observed. All intraclass correlation coefficients were significant (*p*< .001).

Discussion

The present study aimed to validate the EQ test, originally developed by Baron-Cohen & Wheelwright (2004), with adolescents from rural and urban areas in Mexico. Based on the results, the adapted brief EQ instrument has psychometric properties that make it a relevant indicator of empathy in adolescents from Mexico. Building on theoretical considerations, a distinction was made between the affective (AC) and cognitive (CA) components. For both factors, the factorial loadings were higher than .40, evidencing that the items contributed significantly to the measurement of both dimensions of empathy and showed strength at the factorial level. In addition, the covariance between the two factors was -.322, which may

indicate at least a partial relationship between the cognitive and affective aspects of empathy. Furthermore, the reliability for the instrument as a whole was ω= .856; being ω= .941 for the AC factor, and ω= .772 for the CA factor. All values were considered respectable according to the guidelines of DeVellis and Thorpe (2021).

This scale allows us to measure an adolescent's ability to identify and understand the emotional states of others from affective and cognitive perspectives. In addition, through the use of robust statistical techniques, the model was shown to be sustainable and parsimonious and fit the data well. Furthermore, the scale has cultural relevance for adolescents from both rural and urban areas of Mexico, having been adapted by local experts.

Previous research suggests that one can-not completely differentiate the cognitive domain from affective elements, such as the perception of emotional cues; conversely, the affective factor also involves cognitive aspects, such as interpreting mimicry/embodiment processes (Thompson et al., 2019). Therefore, the latent variables considered in the instrument (CA and AC) determine that the items may be more related to one of the dimensions than to the other, maintaining an association with each other and suggesting that this relationship could represented as an underlying cognitive component associated with ToM or perspective taking, which can be understood as the ability to infer the thoughts and beliefs, as well as the feelings and emotions of others (Healey & Grossman, 2018).

There are similar instruments to that used in this study, such as four-factor Interpersonal Reactivity Index that was administered to participants between 18 and 70 years of age (Chrysikou & Thompson, 2016). The authors indicate that they determined the fit of the bifactorial model of the original instrument (Davis, 1983), using standard cutoffs of >0.95 for the CFI and TLI and found it a poor fit, suggesting that the model did not clearly explain empathy, and that other underlying dimensions needed to be added, such as perspective-taking, empathic concern (feeling compassion for others), fantasy (the ability to put oneself in a hypothetical situation), and personal distress (feeling afraid or anxious about the stress of others). After adding in these underlying factors, the authors found a good fit for the model; a covariance between the main factors of cognitive and affective empathy was very large (*r*= .910); lending support to the idea that both are dimensions of empathy that are subtly differentiated but are yet to be more rigorously defined.

Taking this into consideration, we analyzed a bifactorial model with ordinal data, a polychoric matrix, and factor adjustment methods similar to those of the study indicated above, obtaining positive results. We suggest that the problem in the aforementioned study was that the instrument used required an updated theoretical review (the instrument on which they were based, appears to have been created in the 1980s). Notably, the underlying factors may have been theoretically ill-defined; for example, the personal distress factor could be confused with sympathy, and the fantasy factor may be functionally identical to ToM. Therefore, we agree with the idea of defining underlying factors that could influence both of the main dimensions of empathy but suggest that the most fruitful approach may be to relate them to mental functions implicit in the empathy construct such as ToM and perspective-taking.

In Mexico, Lima-Sánchez et al. (2019) created an empathy scale for an urban population evaluated through an original version of the test based on comics adapted from Völlm et al. (2006), taking into account its clinical using sensitivity (81 %) and specificity (33 %) indexes with the statistical method receiver operating characteristic curve (ROC). The authors found a concurrent validity of *r*= .88 for the EQ by Baron-Cohen and Wheelwright (2004), on which their research is based. In our study, we found a greater validity for our short version of the test, compared to their original test (*r*= .90). Nevertheless, regarding the relevance of their original way of evaluating empathy, their study lacked criteria for methodological and statistical rigor. For example, the authors did not show the characteristics of the instrument used, their sample was heterogeneous, they did not detail the procedure, the primary outcomes from the EFA or the factor load in the statistical model were omitted, and the specificity index was low.

Grau et al. (2017) note that the main limitations of studies with self-report instruments are related to the subjective nature of participants' responses to the administered instruments. However, we suggest it is most relevant to study empathy as a bidimensional neuropsychological process, with underlying factors such as perspective-taking or ToM, based on a biological perspective from which other approaches, such as cognitive and neuroanatomical development can be deployed. Another important point raised by Auné et al. (2015), is that a lack of consensus has led to a proliferation of theoretical approaches, a phenomenon rooted in the lack of an integrative explanatory mechanism for empathy; thus, it is pertinent to begin studying empathy from a transdisciplinary perspective, thereby aiding the development of a more complete explanatory model.

In conclusion, this empathy instrument will be a relevant tool for use in clinical research and is intended to facilitate a more succinct study of the interpersonal relationships of adolescents with behavioral disorders, nervous system development disorders, such as autism, or psychiatric conditions, such as depersonalization. In the areas of education and family, the early detection of poor empathic capacity is important to create intervention plans aimed at stimulating the social competencies that allow adolescents to recognize and understand the emotions of others, taking into account the consequences of these competencies in fostering the emotional and prosocial growth of adolescents (Konrath, 2011; Thompson*,* et al*.,* 2019).

References

Andrews, K., Lariccia, L., Talwar, V., & Bosacki, S. (2021). Empathetic concern in emerging adolescents: The role of theory of mind and gender roles. *The Journal of Early Adolescence*, *41*(9), 1394-1424. doi: 10.1177/02724316211002258

Allaire, J. (2017). Software R Studio. https://www.rstudio.com/

Auné, S., Abad, F., & Attorresi, H. (2015). Antagonismos entre concepciones de empatía y su relación con la conducta prosocial [Antagonisms between conceptions of empathy and its relationship with prosocial behavior]. *Revista de Psicología*, *17*(2), 137-149. doi: 10.18050/revpsiv17n2a7.2015.

Baron-Cohen, S., & Wheelwright, S. (2004). The Empathy Quotient: An investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal*

of Autism and Developmental Disorders, 34(2), 163-175. doi: 10.1023/B:JADD.0000022607.19833.00

Boele, S., Van der Graaff, J., de Wied, M., Van der Valk, I., Crocetti, E., & Branje, S. (2019). Linking parent-child and peer relationship quality to empathy in adolescence: A multilevel meta-analysis. *Journal of Youth and Adolescence,* 48(6), 1033-1055. doi: 10.1007/s10964-019-00993-5

Calleja, N. (2011). *Inventario de escalas psicosociales en México, 1984-2005* [Inventory of psychosocial scales in Mexico, 1984-2005.] National Autonomous University of Mexico, Faculty of Psychology. https://planeacion.psicol.unam.mx/cake/inventario-de-escalas

Chrysikou, E. G., & Thompson, J. (2016). Assessing cognitive and affective empathy through the Interpersonal Reactivity Index: An argument against a two-factor model. *Assessment, 23*(6), 769-777. doi: org/10.1177/1073191115599055

Cuff, B. M. P., Brown, S. J., Taylor, L., & Howat, D. (2016). Empathy: A review of the concept. *Emotion Review*, *8*(2), 144-153. doi: 10.1177/1754073914558466

Davis, M. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology,* 44(1), 113-126. doi: 10.1037/0022-3514.44.1.113

DeVellis, R. F., & Thorpe C. T. (2021). *Scale development: Theory and applications* (5th Ed.). Sage.

DiStefano, C., Lui, J., Jiang, N., & Shi, D. (2018). Examination of the weighted root mean square residual: Evidence for trustworthiness? *Structural Equation Modeling: A Multidisciplinary Journal*, *25*(3), 453-466. doi: 10.1080/10705511.2017.1390394

Escobar-Pérez, J., & Cuervo-Martínez, Á. (2008). Validez de contenido y juicio de expertos: Una aproximación a su utilización [Content validity and expert assessment: An approach to its use]. *Avances en Medición, 6*, 27-36.

Ferrando, P. J., & Lorenzo-Seva, U. (2017). Program FACTOR at 10: Origins, development, and future directions. *Psicothema*, *29*(2), 236-240. doi: 10.7334/psicothema2016.304

Flores-Galaz, M., Cortés-Ayala, M. D., & Morales-Manrique, M. (2017). Estudio de validación del Cuestionario de Empatía Emocional en Niños [Validation study of the Emotional Empathy Questionnaire in Children]. *Psicumex, 7*(2), 40-55. doi: org/10.36793/psicumex.v7i2.322.

González-Yubero, S., Palomera, R., & Lázaro-Visa, S. (2021). Empathy, coping styles and attitudes towards consumption as protective factors of binge drinking and polyconsumption in adolescence. *Behavioral Psychology/Psicología Conductual*, 29(2), 313-330. doi: 10.51668/bp.832120s

Grau, A., Toran, P., Zamora, A., Quesada, M., Carrion, C., Vilert, E., Castor, A., Cerezo, C., Vargas, S., Gali, B., & Cordon, F. (2017). Evaluación de la empatía en estudiantes de Medicina [Evaluation of empathy in medical students]. *Educación Médica*, *18*(2), 114-120. doi: 10.1016/j.edumed.2016.04.001

Healey, M. L., & Grossman, M. (2018). Cognitive and affective perspective-taking: Evidence for shared and dissociable anatomical substrates. *Frontiers in Neurology, 9*(491), 1-12. doi: 10.3389/fneur.2018.00491

Hojat, M., DeSantis, J., Shannon, S. C., Mortensen, L. H., Speicher, M. R., Bragan, L., LaNoue, M., & Calabrese, L. H. (2018). The Jefferson Scale of Empathy: A nationwide study of measurement properties, underlying components, latent variable structure, and national norms in medical students. *Advances in Health Sciences Education,* 23(5), 899-920. doi: 10.1007/s10459-018-9839-9

Hojat, M., Tavitas-Herrera, S. E., Alcorta-Garza, A., González-Guerrero, J. F., & Rodríguez Lara, F. J. (2005). Validación de la escala de Empatía Médica de Jefferson en estudiantes de medicina mexicanos [Validation of the Jefferson Medical Empathy Scale in Mexican medical students]. *Salud Mental, 28*(5), 57-63.

Konrath, S. O. (2011). Changes in dispositional empathy in American college students over time: A meta-analysis. *Personality and Social Psychology Review*, 15(2), 180-198. doi: 10.1177/1088868310377395

Kretzschmar, A., & Gignac, G. E. (2019). At what sample size do latent variable correlations stabilize? *Journal of Research in Personality*, *80*, 17-22. doi: 10.1016/j.jrp.2019.03.007

Lim, J. -A., Choi, S. -H., Joon Lee, W., Hwan Jang, J., Moon, J. Y., Chul Kim, Y., & Kang, D. -H. (2018). Cognitive-behavioral therapy for patients with chronic pain implications of gender differences in empathy. *Medicine,* 97(23), 1-8. doi: 10.1097/MD.0000000000010867

Lima-Sánchez, D., Duque-Alarcón, X., Jiménez-Ponce, F., Salín-Pascual, R., Morales Carmona, F. & Peréz, A. (2019). Validación de la Prueba de tiras cómicas para evaluar la empatía en una muestra de población mexicana [Validation of the Comic Test to assess empathy in a sample of the Mexican population]. *Gaceta Médica de México*, 155(suppl. 1), 45-49. doi: 10.24875/GMM.M19000287

Lorenzo-Seva, U., & Ferrando, P.J. (2019). Robust promin: A method for diagonally weighted factor rotation. LIBERABIT, *Revista Peruana de Psicología, 2*5(1), 99-106. doi: 10.24265/liberabit.2019.v25n1.08

Lorenzo-Seva, U., & Ferrando, P. (2020). Unrestricted factor analysis of multidimensional test items based on an objectively refined target matrix. *Behavior Research Methods*, *52* (1), 116-130. doi: 10.3758/s13428-019-01209-1

Lozano-Razo, G. (2002). *Actitudes y estrategias de persuasión hacia la donación de órganos y tejidos* [Attitudes and persuasion strategies towards organ and tissue donation] [Doctoral dissertation]. National Autonomous University of Mexico, Mexico. http://132.248.9.195/pdtestdf/0309346/Index.html

Lloret-Segura, S., Ferreres-Traver, A., Hernández-Baeza, A., & Tomás-Marco, I. (2014). El análisis factorial exploratorio de los ítems: Una guía práctica, revisada y actualizada [Exploratory item factor analysis: A practical guide revised and updated]. *Anales de Psicología, 30*(3), 1151-1169. doi: org/10.6018/analesps.30.3.199361

Malti, T., Chaparro, M. P., Zuffiano, A., & Colasante, T. (2016). School-based interventions to promote empathy-related responding in children and adolescents: A developmental analysis. *Journal Of Clinical Child and Adolescent Psychology*, *45*(6), 718-731. doi: 10.1080/15374416.2015.1121822

Manzano, A., & Zamora, S. (2009). *Sistema de ecuaciones estructurales: una herramienta de investigación. Cuaderno técnico 4* [System of structural equations: a research guide. Technical notebook 4]. Centro Nacional de Evaluación para la Educación Superior. https://docplayer.es/42086072-Sistema-de-ecuaciones-estructurales-una herramienta-de-investigacion.html

Muñoz, A., & Chaves, L. (2013*).* La empatía: ¿Un concepto unívoco? [Empathy: A unique concept?]. *Katharsis, 16*, 123-143

Muthen, B., & Kaplan, D. (1992). A comparison of some methodologies for the factor analysis of non-normal Likert variables: A note on the size of the model. *British Journal of Mathematical and Statistical Psychology, 45*, 19-30. doi: 10.1111/j.20448317.1992.tb00975.x

Pedrero-Pérez, E., Mora-Rodríguez, C., Rodríguez-Gómez, R., Benítez-Robredo, M., OrdoñezFranco, A., González-Robledo, L., & Méndez-Gago, S. (2019). Prefrontal symptoms associated with the problematic use of information and communication technologies (ICTs) in adolescents. *Behavioral Psychology/Psicología Conductual, 27*(2), 257-273.

Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research.* Sage.

Reise, S., Waller, N., & Comrey, L. (2000). Factor analysis and scale revision. *Psychological Assessment*, *12*(3), 287-297. doi: org/10.1037//1040-3590.12.3.287

Schonert-Reichl, K. (1993). Empathy and social relationships in adolescents with behavioral disorders. *Behavioral Disorders*, *18*(3), 189-204.

Schreiber, J., Stage, F., King, J., Amaury, N., & Barlow, E. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *Journal of Educational Research, 99*(6), 323-336. doi.10.3200/JOER.99.6.323-338

Secretary of State for Health (2014). Reglamento de la Ley General de Salud en Materia de Investigación para la Salud. México: Diario Oficial de la Federación; 2014 [Regulations of the General Health Law on Research for Health. Mexico: Official Gazette of the Federation; 2014]. http://www.salud.gob.mx/unidades/cdi/nom/compi/rlgsmis.html

Stern, J., & Cassidy, J. (2018). Empathy from infancy to adolescence: An attachment perspective on the development of individual differences. *Developmental Review, 47,* 1-22. doi: 10.1016/j.dr.2017.09.002

Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered polytomous items with parallel analysis. *Psychological Methods*, *16*(2), 209-220. doi: 10.1037/a0023353

Torrano-Martínez, R., Ortigosa-Quiles, J., Riquelme-Marín, A., & López-Pina, J. (2020). Psychometric properties of a questionnaire for the assessment of test anxiety in adolescents. *Behavioral psychology/Psicología Conductual*, *28*(2), 245-263.

Thompson, N., Uusberg, A., Grossc, J., & Chakrabarti, B. (2019). Empathy and emotion: An integrative account. *Progress in Brain Research, 247*, 273-304. doi: 10.1016/bs.pbr.2019.03.024

Van Lissa, C., Hawk, S., & Meeus, W. (2017). The effects of affective and cognitive empathy on adolescents' behavior and outcomes in conflicts. *Journal of Experimental Child Psychology, 158*, 32-45. doi: org/10.1016/j.jecp.2017.01.002

Völlm, B., Taylor, A., Richardson, P., Corcoran, R., Stirling, J., & Shane McKie, A. J. (2006). Neuronal correlates robust statistical techniques, the model was shown to be sustainable and parsimonious and of mind and empathy theory: A functional magnetic resonance imaging study in a nonverbal task. *NeuroImage, 29*, 90-98. doi: 10.1016/j.neuroimage.2005.07.022

Vossen, H., Piotrowski, J., & Valkenburg, P. (2015). Development of the adolescent measure of empathy and sympathy. *Personality and Individual Differences, 74,* 66-71. doi: 10.1016/j.paid.2014.09.040

Wakabayashi, A., Baron-Cohen, S., Wheelwright, S., Goldenfeld, N., Delaney, J., Fine, D., Smith, R., & Weil, L. (2006). Development of short forms of the Empathy Quotient (EQ-Short) and the Systemizing Quotient (SQ-Short). *Personality and Individual Differences*, *41*, 929-940. doi: 10.1016/j.paid.2006.03.017

Ward, J., Cody, J., Schaal, M., & Hojat, M. (2012). The empathy enigma: An empirical study of decline in empathy among undergraduate nursing students. *Journal Of Professional Nursing*, 28(1), 34-40. doi: 10.1016/j.profnurs.2011.10.007

Wellman, H., & Peterson, C. (2013). Theory of mind, development, and deafness. In S. Baron-Cohen, H. Tager-Flusberg, & M. Lombardo (Eds.), *Understanding other minds*. Oxford University Press.

World Medical Association (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, *310*(20), 2191-2194. doi: 10.1001/jama.2013.281053

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Appendix

Empathy Quotient Test, Spanish brief version

Cociente de empatía, versión breve

Edad:_____años_____meses_____ Sexo:_____ ¿Con qué mano escribes?_____
Dirección:
_____

Instrucciones: A continuación, hay una lista de afirmaciones. Por favor, lea cada frase con mucho cuidado y escoja su respuesta. No hay respuestas correctas o incorrectas, ni preguntas capciosas. El cuestionario tiene 29 preguntas. Por favor, contéstalas todas.

ítem	Pregunta	Completamente de acuerdo	Parcialmente de acuerdo	Parcialmente en desacuerdo	En completo desacuerdo
AC6	Me gusta verdaderamente cuidar de otras personas.				
CA10	Frecuentemente, al verme parte de una discusión, la gente me dice que voy demasiado lejos defendiendo mi punto de vista.				
CA11	No me preocupa mucho llegar tarde a una cita con un amigo o amiga.				
CA12	Las amistades y las relaciones son demasiado difíciles de mantener, así que procuro no pensar en ello.				
CA15	En una conversación intento concentrarme en mis propios pensamientos, antes que en lo que la otra persona pueda estar pensando.				
CA18	De pequeño me gustaba cortar gusanos en pedazos para ver qué pasaba.				
AC19	Puedo captar fácilmente si una persona dice una cosa, pero en realidad quiere decir otra (por ejemplo, cuando una persona le menciona a otra, en tono y en expresión de burla...¡¡que inteligente eres!! cuando en realidad piensa lo contrario).				
CA21	Me resulta difícil entender porque algunas cosas molestan tanto a las otras personas.				
AC22	Me resulta fácil ponerme en el lugar de otra persona.				
AC25	Tengo facilidad para predecir como se sentirá otra persona.				
AC26	Enseguida me doy cuenta de si alguien se siente molesto en un grupo.				
CA27	Si cuando yo hablo alguien se siente ofendido pienso que el problema es suyo, no mío.				
CA29	A veces no entiendo por qué alguien se ha sentido ofendido por una determinada observación mía.				
AC32	Ver llorar a la gente me pone triste.				

ítem	Pregunta	Completamente de acuerdo	Parcialmente de acuerdo	Parcialmente en desacuerdo	En completo desacuerdo
AC36	Las otras personas me dicen que tengo facilidad para entender cómo se sienten y que es lo que está pasando.				
AC38	Me da pena ver sufrir a un animal.				
AC41	Puedo captar fácilmente si a alguien le aburre o le interesa lo que estoy diciendo.				
AC42	Me afecta ver personas sufriendo en los noticieros.				
AC43	Mis amistades suelen hablarme de sus problemas porque dicen que realmente los entiendo.				
AC44	Me doy cuenta de que molesto incluso si la otra persona no me lo dice.				
CA46	A veces la gente me dice que he ido demasiado lejos con mis bromas.				
CA48	A menudo la gente dice que soy insensible, aunque yo no veo por qué.				
CA49	Si hay alguien nuevo en el grupo pienso que es cosa suya hacer el esfuerzo para integrarse en el mismo.				
CA50	Por lo general me mantengo emocionalmente indiferente cuando veo una película.				
AC52	Puedo comprender y saber cómo se siente alguien de forma rápida e intuitiva.				
AC54	Me doy cuenta de lo que la otra persona puede estar deseando hablar.				
AC55	Puedo darme cuenta de si la otra persona está ocultando sus verdaderas emociones.				
CA57	No elaboro conscientemente las reglas de como tengo que actuar en situación social (Por ejemplo, en la escuela, reuniones con amistades o familiares).				
AC60	Suelo apreciar el punto de vista de otras personas, incluso si no estoy de acuerdo con ellas.				