

## Erosion of empathy during medical training by gender. A cross-sectional study

Aracelis Calzadilla-Núñez, M.D.<sup>a</sup>, Víctor P. Díaz-Narváez, M.D.<sup>b</sup>,  
Yolanda Dávila-Pontón, M.D.<sup>c</sup>, Juan Aguilera-Muñoz, M.D.<sup>c</sup>, Natalia Fortich-Mesa, M.D.<sup>d</sup>,  
Dilia Aparicio-Marengo, M.D.<sup>e</sup> and Alejandro Reyes-Reyes, M.D.<sup>f</sup>

### ABSTRACT

**Introduction.** Empathy erosion may be defined as a sudden decline in the levels of empathy that occurs as of the third year of medical school and continues until the fifth year. According to some authors, this process is normal during medical training and may be considered a model of empathic behavior. The objective of this study was to verify whether empathy erosion is a general phenomenon in the schools of medicine included in the study and its relation to gender.

**Design.** Exploratory, cross-sectional study.

**Population.** Students from first through sixth year of the School of Medicine of Universidad del Azuay (Cuenca, Ecuador) and from first through fifth year of the School of Medicine of Corporación Universitaria Rafael Nuñez (Colombia).

**Material and methods.** The levels of overall empathy and of each component were estimated using the Jefferson Scale of Empathy, which was administered in both schools during July and August of 2016. The significance level was established at  $\alpha < 0.05$ . Results. Universidad del Azuay: n=278 (98% of all students); women=112; men=166; Corporación Universitaria Rafael Nuñez: n=756 (77.86% of all students); women=434; men=322. The model of erosion of empathy is not fulfilled at the level of overall empathy or of each studied component according to gender.

**Conclusions.** Empathy erosion is a specific element of several different models of empathic response (and of its components). Men and women do not have the same empathic response. Such response, in the studied conditions, is variable.

**Key words:** empathy, empathy erosion, medicine students.

<http://dx.doi.org/10.5546/aap.2017.eng.556>

**To cite:** Calzadilla-Núñez A, Díaz-Narváez VP, Dávila-Pontón Y, et al. Erosion of empathy during medical training by gender. A cross-sectional study. *Arch Argent Pediatr* 2017;115(6):556-561.

- a. School of Psychology, Universidad Gabriela Mistral, Santiago, Chile.
- b. School of Dentistry, Universidad San Sebastián, Santiago, Chile.
- c. School of Medicine, Universidad del Azuay, Cuenca, Ecuador.
- d. School of Dentistry, Corporación Universitaria Rafael Nuñez, Cartagena, Colombia.
- e. Medicine Program of Corporación Universitaria Rafael Nuñez, Rafael Nuñez, Cartagena, Colombia.
- f. School of Psychology, Universidad Santo Tomás, Chile.

E-mail address:  
Víctor Díaz Narváez, M.D.:  
victor.diaz@uss.cl

Funding:  
None.

Conflict of interest:  
None.

Received: 2-28-2017  
Accepted: 6-16-2017

### INTRODUCTION

It is known that empathy is a relevant skill in the doctor-patient relationship.<sup>1-3</sup> The presence of empathy among physicians helps to develop advantages for a better care of patients: it improves doctors' and patients' satisfaction, increases indulgence, enhances the physician's ability for diagnosis and treatment, significantly reduces the risk of malpractice claims, and cuts across all medical specialties.<sup>4,5</sup> All this information becomes particularly relevant in the setting of general and pediatric primary care and of specialized pediatric care with patients and their caregivers.<sup>6-10</sup>

There are many instruments used to measure empathy and are developed based on different theories.<sup>11</sup> This hinders the possibility of comparing the results observed in studies on empathy which were conducted using different instruments.<sup>12</sup>

Erosion of empathy may be defined as a sudden decline in the levels of empathy that occurs as of the third year of medical school and continues until the fifth year.<sup>13-15</sup> According to some authors, this process is normal during medical training and may be considered a model of empathic behavior. Some studies have found empirical evidence of the presence of such erosion; however, others<sup>16-20</sup> have demonstrated that such phenomenon does not occur. In the specialized bibliography, there is no consensus that erosion of empathy could be conceptualized into an empirical law or scientific fact.<sup>10,12</sup> In addition, there is no agreement that women are more empathic than men,<sup>10-12</sup> which allows

to explore the behavior of empathy (and its components) by gender based on the school year outcome measure.

According to the curricular characteristics of Corporación Universitaria Rafael Núñez (CURN) (Colombia), as of third year, students focus on academic clinical practice by means of clinical clerkships in each area of professional training and have direct interaction with patients, so they acquire skills related to history taking, patients' course, etc. Universidad del Azuay (Ecuador) offers two types of pre-professional practices during training: as of third year, at the community level, and as of fifth year, clinical clerkships in different health facilities.

The objective of this study was to verify whether empathic erosion is a general phenomenon in the schools of medicine included in the study and its relation to gender.

## MATERIAL AND METHODS

**Design:** exploratory and cross-sectional study conducted following the bioethical standards of the Declaration of Helsinki and approved by the research ethics committee (REC) of each school of medicine included in this study.

**Population:** students from first through sixth year of the schools of medicine of Universidad del Azuay (Cuenca, Ecuador) and CURN (Cartagena, Colombia). All students present at the moment of the study were assessed. The levels of overall empathy and of each of its components were estimated in July and August of 2016 using the Jefferson Scale of Empathy (JSE), Spanish version for medical students (version S), validated in Mexico<sup>5</sup> and Chile;<sup>12</sup> it was administered in the classroom or a clinical area in an anonymous, confidential manner by a neutral interviewer (once the informed consent was signed). Before administering the JSE, it was submitted for assessment before experts (a committee made up of three important academicians: a psychologist, a specialist in medical training, and a specialist physician) to verify its cultural validity and content<sup>5</sup> in each school. No exclusion criteria were applied since the objective of this study was to assess the outcome measure in the largest number of students possible. The understandability of the culturally adapted scale was pilot-tested in a random sample of 35 students from each university.

The scores obtained in the JSE were tested for normality (Shapiro-Wilk) and homoscedasticity (Levene) in relation to studied factors (university,

school year, and gender). The internal reliability of data was measured using the total Cronbach's alpha as each element was removed (questions), an intraclass correlation coefficient, Hotelling's T<sup>2</sup> distribution, and Tukey's test of non-additivity.

Descriptive statistics were estimated; arithmetic mean and standard deviation for all factors and levels corresponding to overall empathy and each of its components or dimensions were also determined. Regression type testing was done to study the mean values of each school year. First of all, an analysis of variance (ANOVA) was done sequentially; the standard deviation of the dependent outcome measure (S) and the coefficient of determination (R<sup>2</sup>) were estimated. The type of curve (linear, quadratic, cubic, exponential, S curve, etc.) was calculated using regression curves. Results are presented in regression graphics and tables. Data were processed with the SPSS® 20.0 and Minitab® 15.0 statistical software. The significance level was established at  $\alpha < 0.05$ .

## RESULTS

A total of 278 students (98% of all students; women= 112; men= 166) of Universidad del Azuay and 756 students (77.86% of all students; women= 434; men= 322) of CURN participated in the study.

*Table 1* shows the results of means and standard deviation, and sample size for overall empathy and each empathy component for each year in the school of medicine, by gender and for each university.

The details of the statistical analysis are described in *Annex 1*.

*Annex 2* shows the graphics of estimated regressions. It was observed that, for overall empathy, the curves estimated for Universidad del Azuay (*Figures 1* and *2*) corresponded to the model proposed by Hojat et al.,<sup>13</sup> in both genders (i.e., the decline described by this author actually occurred); however, exactly the opposite was observed in both genders at CURN (*Figures 3* and *4*) (i.e., the decline proposed by Hojat's model did not occur). The same situation was observed in relation to overall empathy in relation to the compassionate care (CC) component (*Figures 5* and *6* reflect a decline in third year, and *Figures 7* and *8*, a constant increase of empathy). In relation to the perspective taking (PT) component (*Figures 9* and *10*), it was observed that the model proposed by Hojat et al.<sup>13</sup> occurred in both male and female students from Universidad del Azuay but there

was a difference: in sixth year, women showed an increase in their levels of empathy, whereas men showed a decline. The contrary was observed in CURN (Figures 11 and 12): in fifth year, women showed a decline whereas men described an increase. Lastly, in relation to the standing in patients' shoes (SPS) component, the distribution of the means in Universidad del Azuay (Figures 13 and 14) fell among women between first and

third year but increased in the last years of school, which was not consistent with the erosion model described above. In the case of CURN, both women and men showed a constant increase of SPS levels, but the latter showed a decline in third year (Figures 15 and 16, respectively). The model of empathic erosion is not fulfilled at the level of overall empathy or of each studied component according to gender.

TABLE 1. Results of mean, standard deviation, and sample size estimations for overall empathy and each empathy component

University	School year	Gender	Mean OE	Standard deviation OE	Mean CC	Standard deviation CC	Mean PT	Standard deviation PT	Mean SPS	Standard deviation SPS	n	
Universidad del Azuay	First year	Women	105.74	13.343	37.44	5.184	58.04	8.510	10.26	3.839	27	
		Men	109.22	14.006	39.29	7.219	58.98	7.294	10.96	3.437	45	
		Total	107.92	13.772	38.60	6.553	58.62	7.727	10.69	3.583	72	
	Second year	Women	110.29	12.013	40.26	6.888	60.32	6.355	9.71	3.320	38	
		Men	114.87	10.674	42.39	6.370	61.07	6.472	11.41	3.902	54	
		Total	112.98	11.409	41.51	6.636	60.76	6.399	10.71	3.749	92	
	Third year	Women	115.78	12.387	43.44	7.384	63.22	5.191	9.11	3.296	9	
		Men	117.73	11.967	45.93	3.615	60.73	7.905	11.07	4.862	15	
		Total	117.00	11.894	45.00	5.332	61.67	6.995	10.33	4.371	24	
	Fourth year	Women	108.05	11.075	38.90	7.259	58.95	6.281	10.19	2.600	21	
		Men	115.38	10.214	43.54	4.845	62.54	6.731	9.29	2.911	24	
		Total	111.96	11.133	41.38	6.457	60.87	6.700	9.71	2.777	45	
	Fifth year	Women	107.50	7.232	38.67	4.502	57.83	7.757	11.00	2.898	6	
		Men	116.18	9.358	41.27	5.387	65.45	4.132	9.45	3.236	11	
		Total	113.12	9.453	40.35	5.111	62.76	6.600	10.00	3.122	17	
	Sixth year	Women	118.55	9.417	42.91	5.412	64.91	4.679	10.73	2.412	11	
		Men	113.65	16.344	40.18	7.291	61.82	11.555	11.65	2.422	17	
		Total	115.57	14.038	41.25	6.648	63.04	9.465	11.29	2.417	28	
	Total	Women	109.88	12.196	39.76	6.539	60.06	6.987	10.05	3.201	112	
		Men	113.63	12.451	41.73	6.507	61.05	7.490	10.84	3.618	166	
		Total	112.12	12.464	40.94	6.580	60.65	7.295	10.53	3.472	278	
	Universidad Rafael Nuñez	First year	Women	100.04	14.696	33.25	8.744	56.18	8.285	10.61	3.131	115
			Men	99.32	14.125	33.49	7.333	54.94	8.282	10.89	3.223	71
			Total	99.77	14.446	33.34	8.214	55.71	8.284	10.72	3.160	186
Second year		Women	100.96	16.387	34.51	8.775	55.32	10.51	11.12	3.298	105	
		Men	98.37	14.683	32.50	9.112	54.43	8.345	11.44	3.215	70	
		Total	99.93	15.736	33.71	8.940	54.97	9.683	11.25	3.260	175	
Third year		Women	105.09	15.171	37.06	8.325	56.93	9.522	11.11	3.479	54	
		Men	101.17	13.988	32.85	8.693	58.32	7.822	10.00	3.290	47	
		Total	103.27	14.692	35.10	8.714	57.57	8.757	10.59	3.421	101	
Fourth year		Women	109.21	14.723	38.77	7.887	59.30	7.769	11.15	3.866	94	
		Men	104.36	14.182	35.61	9.220	57.51	7.436	11.24	3.825	72	
		Total	107.11	14.647	37.40	8.608	58.52	7.655	11.19	3.837	166	
Fifth year		Women	107.02	11.600	39.24	6.879	56.36	7.217	11.41	2.882	66	
		Men	109.05	13.478	38.73	7.475	58.50	7.323	11.82	3.678	62	
		Total	108.00	12.537	38.99	7.150	57.40	7.319	11.61	3.285	128	
Total		Women	103.94	15.170	36.14	8.573	56.77	8.859	11.03	3.348	434	
		Men	102.39	14.565	34.66	8.661	56.58	8.004	11.14	3.487	322	
		Total	103.28	14.925	35.51	8.636	56.69	8.500	11.08	3.406	756	

OE: overall empathy.

Components of empathy: CC (compassionate care); PT (perspective taking); SPS (standing in patients' shoes).

## DISCUSSION

Results helped to prove that observed data were reliable. Two potential restrictions are set out: a) comparing the results of different instruments used to measure empathy may lead to misconceptions and b) the cross-sectional nature of this study. However, some investigations have found that the "school year" factor has low  $R^2$  values (from 0.02 to 0.06); this means that this factor may only explain 2-6% of the total variation in the empathy outcome measure.<sup>21-23</sup> Based on this empirical evidence: a) cross-sectional studies about empathy, considering the school year factor, may be valid to analyze empathic erosion and b) in agreement with some authors, empathy should be studied exploring several factors<sup>3,11,16,17,24</sup> and, from the causality standpoint, it has an alternative-contributory nature.<sup>25</sup> These results show that there is variability in the overall empathic response and its components over the school years and do not fit completely into the erosion model proposed by Hojat et al.<sup>13</sup> Our objective was not to deny the model of empathic erosion but to establish that this may be considered a specific element of several different models of distribution of the means in the school year factor.<sup>24,26-30</sup>

Empathy is not merely the mechanical connection of three components but the product of how the dialectical interaction occurs among these components,<sup>10</sup> and is the result of the evolutionary and ontogenetic development of subjects<sup>31,32</sup> who interact with environmental factors.<sup>10,33-35</sup> As a consequence, dissecting the concept of empathy has a strictly analytical purpose. The CC component is associated with the emotional plane of subjects. The results of this study are not consistent with the proposal that interaction with suffering may inevitably induce students to make a "personal adjustment," which may lead to fatigue and negligence. This explanation is not consistent with the studies that found that overall empathy did not decline, or with the results obtained in this study.<sup>12,23,33</sup> As a result, such suffering (which is real) is a necessary but insufficient condition to generate the empathic erosion process. However, this does not deny the fact that compassion may decline or become eroded because of the "personal adjustment" mentioned above. Compassion is highly associated with morals; the combination of emotions and morals is closely related to compassion and, therefore, the latter may be modulated by a subject's biologic makeup

and culture.<sup>34,35</sup> As a result, subjects with high moral grounds and surrounded by a culture inclined to established principles of respect and consideration of fellow men should not experience sudden changes in this component, especially, a decline in empathy caused by the presence of suffering. On the contrary, it may be possibly reinforced in the presence of patient suffering (in our case). In addition, the PT and SPS components are part of the cognitive phase of empathy. PT is related to the ability of a subject to differentiate him/herself from other subjects and, therefore, prevent emotional contagion. In the case of SPS, a decline may lead to students losing their ability or skills to recognize the information transmitted to the subject's exterior and look into his/her interior. In both situations, empathy is affected. However, in relation to the two latter components, since they are part of the cognitive plane, they could be "taught" effectively as part of the curriculum of the school of medicine if the adequate teaching-learning processes are in place to allow the introduction and acquisition of knowledge associated with the form and content necessary to develop the cognitive phase of empathy. The results of this study differ between both universities but such difference was not considered in this study because it is not related to its objectives; however, this finding is consistent with those observed by other authors who found differences in empathy levels among different schools of medicine from the same country and from other countries<sup>10,12,29,30</sup> and also between genders and among different universities and countries.<sup>12</sup> Altogether, these results show that there are no general patterns of how overall empathy and its components behave over school years. Erosion of empathy is actually a fact but not a general behavior represented by the distribution of the means across all school years observed in this study, but a specific element among other forms of distribution which imply, in general, linear and non-linear models: a) of decline; b) of stable distribution, and c) with a constant increase in the levels of empathy and its components over school years. The findings of this study as a whole support the concept that there may be particular factors encompassing and modulating empathy in interaction with the specific ontogenetic factors of each subject. Such inference is based on the variability observed in empathic response, which may be attributed to the presence of several factors that affect the determination of empathic response. As a

consequence, if the introduction of empathy in the curricula of the schools of medicine becomes a requirement, first of all it is necessary to make a strong diagnosis of empathy (and its components) levels in the schools of medicine. Such diagnosis will help to identify whether overall empathy, or one of its components, is in the process of development, has halted or has simply declined, all of which may guide the response strategy in order to increase empathy levels. In other words, a specific university will have to take its own particular measures for the purpose of increasing empathy and consider those measures with universal effects, but none have been duly studied.

## CONCLUSIONS

The erosion of empathy is a specific element of several different models of empathic response (and of its components). Men and women do not have the same empathic response. Such response, in the studied conditions, is variable. ■

## Acknowledgments

The authors of this article would like to thank Hernán Sacoto, M.D. and Dean of the School of Medicine of Universidad del Azuay (Cuenca, Ecuador), and Juan Carlos Lozano, M.D. and Dean of the School of Health Sciences of the CURN (Cartagena de Indias, Colombia), for providing the necessary help to administer the instruments to the students of their corresponding schools.

## REFERENCES

- Gual Sala A, Oriol Bosch A, Pardell Alenta H. El médico del futuro. *Med Clin (Barc)* 2010;134(8):363-8.
- Moore P, Gómez G, Kurtz S. Comunicación médico-paciente, una de las competencias básicas pero diferente. *Aten Primaria* 2012;44(6):358-65.
- Esquerda M, Yuguero O, Viñas J, et al. La empatía médica, ¿nace o se hace? Evolución de la empatía en estudiantes de medicina. *Aten Primaria* 2016;48(1):8-14.
- Ratanawongsa N, Roter D, Beach MC, et al. Physician burnout and patient-physician communication during primary care encounters. *J Gen Intern Med* 2008;23(10):1581-8.
- Alcorta-Garza A, González-Guerrero JF, Tavitas-Herrera SE, et al. Validación de la Escala de Empatía Médica de Jefferson en Estudiantes de Medicina Mexicanos. *Salud Ment* 2005;28(5):57-63.
- Rossato NE. En busca de un modelo de atención del recién nacido normal y de bajo riesgo. *Arch Argent Pediatr* 2015;113(4):290-1.
- Salazar-Blanco OF, Gómez-Gómez MM, Zuliani-Arango LA. El proceso formativo y transformador de la práctica pediátrica de docentes del Área de Niñez: Facultad de Medicina de la Universidad de Antioquia. *Rev Fac Med* 2016;64(2):267-76.
- Moore P, Gómez G, Kurtz S, et al. La comunicación médico-paciente: ¿Cuáles son las habilidades efectivas? *Rev Méd Chile* 2010;138(8):1047-54.
- Blanco OA. ¿Quién cuida nuestros niños? *Arch Argent Pediatr* 2011;109(1):3-4.
- Díaz-Narváez VP, Alonso-Palacio LM, Caro SE, et al. Compassionate Care Component of the Construct Empathy in Medical Students in Colombia and Dominican Republic. *Acta Medica Mediterr* 2017;33:115-21.
- Fernández-Pinto I, López-Pérez B, Márquez M. Empatía: Medidas, teorías y aplicaciones en revisión. *Anal Psicol* 2008;24(2):284-98.
- Díaz-Narváez VP, Erazo Coronado AM, Bilbao JL, et al. Empathy Gender in Dental Students in Latin America: An Exploratory and Cross-Sectional Study. *Health* 2015;7(11):1527-35.
- Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in medical school. *Med Educ* 2004;38(9):934-41.
- Hojat M, Vergare MJ, Maxwell K, et al. The devil is in the third year: a longitudinal study of erosion of empathy in medical school. *Acad Med* 2009;84(9):1182-91.
- Galán González-Serna G, Romero Serrano R, Morillo Martín MS, et al. Descenso de empatía en estudiantes de enfermería y análisis de posibles factores implicados. *Psicol Educ* 2014;20(1):53-60.
- Díaz-Narváez VP, Muñoz-Gámbaro G, Duarte-Gómez N, et al. Empatía en estudiantes de enfermería de la Universidad Mayor, Sede Temuco, IX región, Chile. *Aquichán* 2014;14(3):388-402.
- Varela T, Villalba RH, Gargantini P, et al. Niveles de orientación empática en estudiantes de odontología de la Universidad Católica de Córdoba, Argentina (UCC). *Claves Odontol* 2012;19(70):15-22.
- Tavakol S, Dennick R, Tavakol M. Empathy in UK medical students: Differences by gender, medical year and specialty interest. *Educ Prim Care* 2011;22(5):297-303.
- Costa P, Magalhães E, Costa MJ. A latent growth model suggests that empathy of medical students does not decline over time. *Addict Sci Clin Pract* 2013;18(3):509-22.
- Quince T, Parker R, Wood D, et al. Stability of empathy among undergraduate medical student: a longitudinal study at one UK medical school. *BMC Med Educ* 2011;11:90.
- Díaz-Narváez VP, Calzadilla-Nuñez A, López Salinas H. Una aproximación al concepto de hecho científico. *Rev Austral Cienc Soc* 2004;8:3-16.
- Rivera Ugalde I, Arratia Bulboa R, Zamorano Arancibia A, et al. Evaluación del nivel de orientación empática en alumnos de odontología. *Salud Uninorte* 2011;27(1):63-72.
- Vera C. Empathetic Orientation in Dentistry students from Latin America. Literature review. *J Oral Res* 2014;3(2):123-7.
- Silva Urday H, Rivera Ugalde I, Zamorano Arancibia A, et al. Evaluación de los niveles de orientación empática en estudiantes de odontología de la Universidad Finis Terrae de Santiago, Chile. *Rev Clin Periodoncia Implantol Rehabil Oral* 2013;6(3):130-33.
- Díaz-Narváez VP. Metodología de la Investigación Científica y Bioestadística para Profesionales y Estudiantes de Ciencias de la Salud. 2.ª ed. Santiago: RiL Editores; 2009: 69.
- Bilbao JL, Iglesias JE, Díaz-Narváez VP, et al. Orientación empática en estudiantes de medicina de las Universidades Libre y San Martín, Barranquilla, Colombia. *Rev Fac Med* 2015;63(4):657-63.
- Bilbao Ramírez J, Alcócer Olaciegui A, Salazar G, et al. Evaluación de la orientación empática en estudiantes de odontología de la Fundación Universitaria San Martín. Puerto Colombia (Atlántico, Colombia). *Salud Uninorte* 2013;29(1):34-41.
- Huberman-Casas J, Rodríguez-Hopp MP, González-

- Providell S, et al. Niveles de orientación empática en estudiantes de odontología de la Universidad del Desarrollo, sede Santiago (Chile). *Rev Clin Periodoncia Implantol Rehabil Oral* 2014;7(3):169-74.
29. Díaz-Narváez VP, Gutiérrez-Ventura F, Varela de Villalba T, et al. Empathy Levels of Dentistry Students in Peru and Argentina. *Health* 2015;7(10):1268-74.
30. Díaz-Narváez VP, Erazo Coronado AM, Bilbao JL, et al. Empathy Levels of Dental Students of Central America and the Caribbean. *Health* 2015;7(12):1678-86.
31. Decety J, Lamm C. Human empathy through the lens of social neuroscience. *Scientific World Journal* 2006;6:1146-63.
32. Decety J, Svetlova M. Putting together phylogenetic and ontogenetic perspectives on empathy. *Dev Cogn Neurosci* 2012;2(1):1-24.
33. Delgado-Bolton R, San-Martín M, Alcorta-Garza, et al. Empatía médica en médicos que realizan el programa de formación médica especializada. Estudio comparativo intercultural en España. *Aten Prim* 2016;48(9):565-71.
34. Mercadillo RE, Díaz JL, Barrios FA. Neurobiología de las emociones. *Salud Ment* 2007;30(3):1-11.
35. Sánchez-Teruel D, Robles-Bello MA. El modelo "Big Five" de personalidad y conducta delictiva. *Int J Psychol Res* 2013;6(1):102-9.

## ANNEX 1

### Description of the statistical analysis

The Kolmogorov-Smirnov test and Levene's test were not significant ( $p > 0.05$ ); therefore, data were distributed normally and showed equality of variances. Cronbach's alpha values were satisfactory (non-typified = 0.789; typified = 0.799), and this suggests that data display internal reliability. The total Cronbach's alpha value, if an element is removed, ranged between the values [0.77, 0.80]; and it is inferred that the test keeps a high reliability regardless of the removal of any element from this statistics. The test associated with the intraclass correlation coefficient was 0.789 ( $F = 4.74$ ,  $p = 0.001$ ) and highly significant, which is consistent with reliability indicators. Hotelling's T2 test ( $F = 169.6$ ) and Tukey's test of non-additivity ( $F = 76.76$ ) were highly significant ( $p < 0.005$ ). In the first case, it is inferred that the mean value of questions are different, which demonstrates that not all questions provide the same value to the overall mean of questions (mean = 5.28); in the second case, it is inferred that it is necessary to increase tests' power to achieve the additive effect of data.

The Table shows the results of estimating the type of regression curve based on the mean values of overall empathy and its components or dimensions in each school of medicine in the study.

It was observed that curves formed a set of straight, quadratic, and cubic curves, both ascending and descending. This implies a variability in the distribution of behavior of mean values among school years and demonstrates that the model proposed by Hojat et al.<sup>13</sup> is only a particular case. The estimation of these curves helps investigators to predict the behavior of empathy levels for any of the years and genders under study (in our case, the studied populations) and, therefore, they have an intrinsic value for investigators who wish to test empathic behavior. If the curves are ascending, empathy is not in line with the model described above.  $S_{y,x}$  values, in general, are low; this indicates a relatively adequate adjustment of the regression curves estimated in most cases.  $R^2$  values, in general, are high and consistent with the standard deviations described above. As a result, the equations estimated here provide a relatively adequate description of the distribution of the means of empathy levels.

TABLE. Results of regression equations for overall empathy and each component of empathy by university (Azuay y Rafael Núñez)

University	Empathy	Curve type	Regression equation	$S_{y,x}$	$R^2$
Azuay	OE	Cubic	OE F= 80.86 - 33.94 AA - 10.98 AA <sup>2</sup> + 1.06 AA <sup>3</sup>	3.35	0.83
Azuay	OE	Quadratic	OE M= 103.9 + 6.81 AA - 0.876 AA <sup>2</sup>	1.41	0.86
CURN	OE	Cubic	OE F= 108 - 13.83 AA + 6.69 AA <sup>2</sup> - 0.79 AA <sup>3</sup>	0.36	0.99
CURN	OE	Quadratic	OE M= 100.7 - 2.46 AA + 0.834 AA <sup>2</sup>	0.63	0.99
Azuay	CC	Cubic	CC F= 24.2 + 17.9 AA - 5.62 AA <sup>2</sup> + 0.52 AA <sup>3</sup>	1.80	0.78
Azuay	CC	Quadratic	CC M= 35.18 + 5.18 AA - 0.734 AA <sup>2</sup>	1.51	0.75
CURN	CC	Straight	CC F= 31.69 + 1.624 AA	0.61	0.96
CURN	CC	Quadratic	CC M= 35.87 - 3.197 AA + 0.76 AA <sup>2</sup>	0.34	0.99
Azuay	PT	Cubic	PT F= 43.54 + 18.97 AA - 6.6 AA <sup>2</sup> - 0.64 AA <sup>3</sup>	2.01	0.81
Azuay	PT	Cubic	PT M= 61.78 - 4.17 AA + 2.03 AA <sup>2</sup> - 0.2197 AA <sup>3</sup>	1.63	0.77
CURN	PT	Cubic	PT F= 65.03 - 13.7 AA + 5.68 AA <sup>2</sup> - 0.657 AA <sup>3</sup>	0.51	0.97
CURN	PT	Quadratic	PT M= 52.83 + 1.75 AA - 0.12 AA <sup>2</sup>	1.44	0.72
Azuay	SPS F	Cubic	SPS F= 13.71 - 4.57 AA + 1.39 AA <sup>2</sup> - 0.114 AA <sup>3</sup>	0.56	0.89
Azuay	SPS M	Cubic	SPS M= 7.18 + 5.66 AA - 2.17 AA <sup>2</sup> - 0.225 AA <sup>3</sup>	0.34	0.96
CURN	SPS F	Cubic	SPS F= 9.33 + 1.81 AA - 0.587 AA <sup>2</sup> + 0.062 AA <sup>3</sup>	0.05	0.99
CURN	SPS M	Cubic	SPS M= 10.08 + 1.61 AA - 0.80 AA <sup>2</sup> + 0.11 AA <sup>3</sup>	0.96	0.72

OE= overall empathy. CC= compassionate care component. PT= perspective taking component.

SPS= standing in patients' shoes component. F= female. M= male. CURN: Corporación Universitaria Rafael Núñez.

ANNEX 2

**Graphics of regression curves for the empathy outcome measure and its components in both genders and studied schools: Universidad de Azuay (Azuay), Corporación Universitaria Rafael Núñez (R. Núñez)**

Figure 1

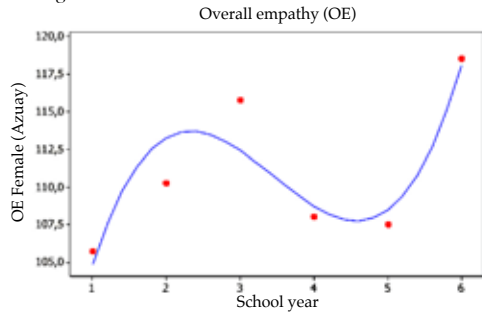


Figure 2

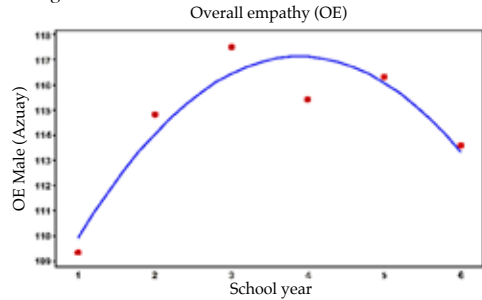


Figure 3

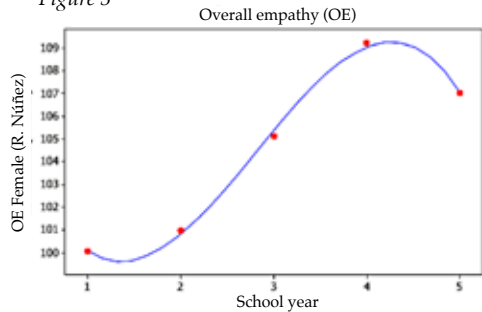


Figure 4

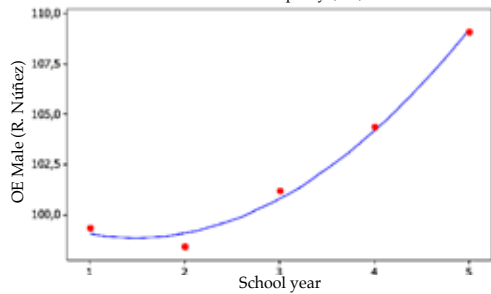


Figure 5

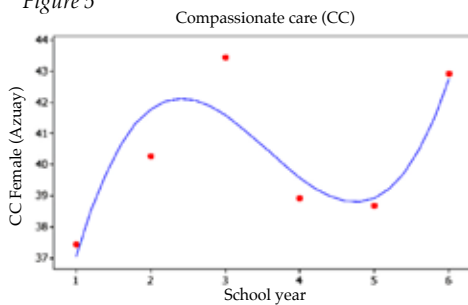


Figure 6

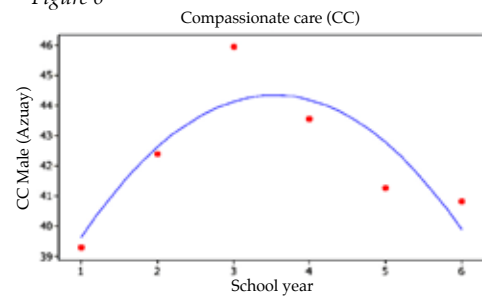


Figure 7

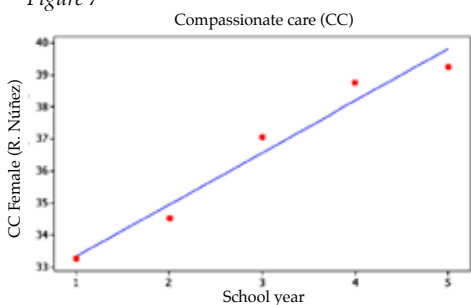
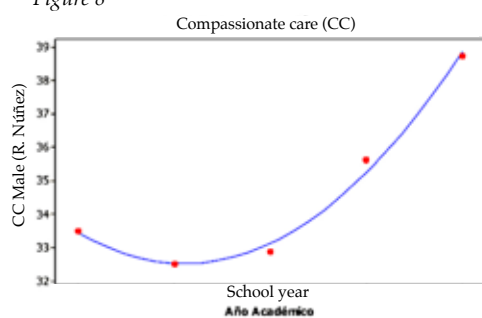
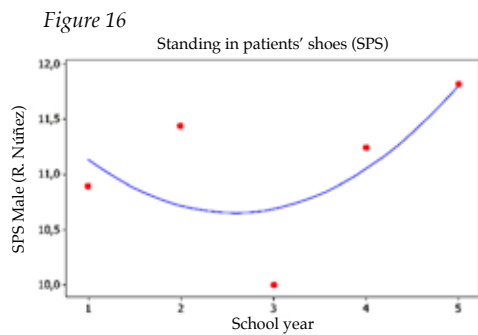
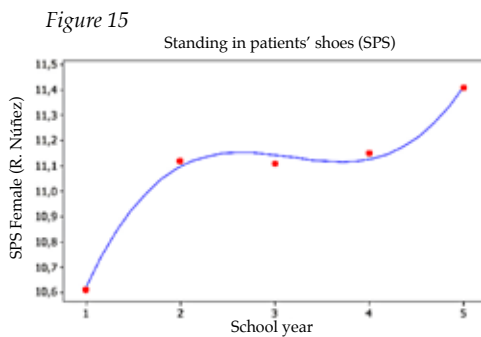
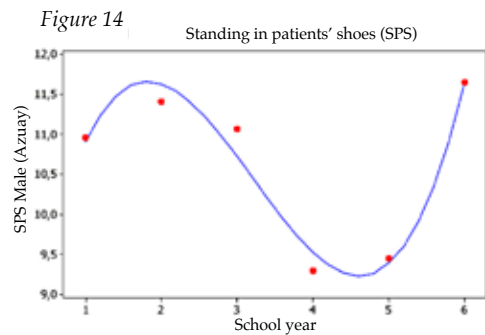
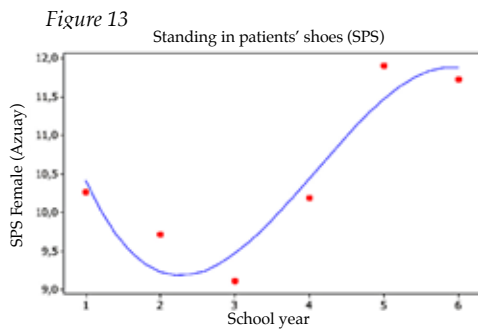
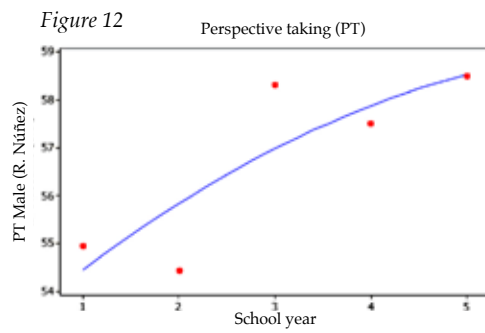
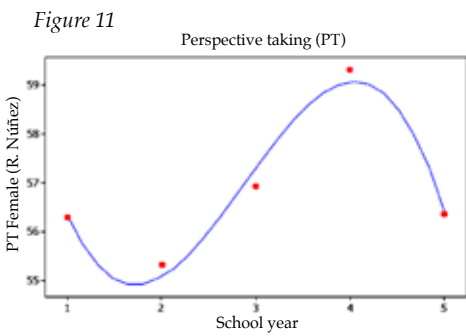
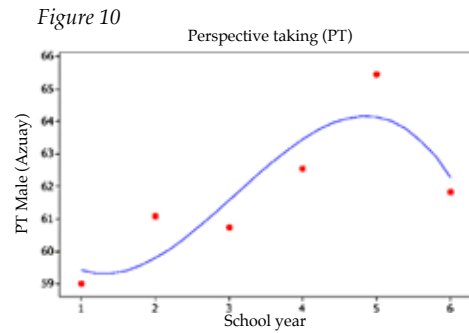
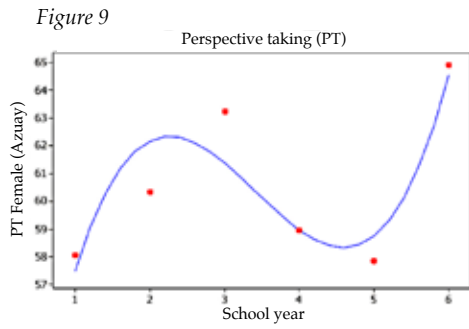


Figure 8







OE= overall empathy.

Components of empathy: CC= compassionate care. PT= perspective taking. SPS= standing in patients' shoes.