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Family Functioning as a Possible Factor that Modulates Empathy Levels in Dental Students

Funcionamiento Familiar como posible factor que modula los niveles de empatía en estudiantes de odontología

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Abstract

Aim. The objective of this paper is to explore whether there are differences in the levels of empathy and its dimensions between family typologies in dental students.

Methodology. A quantitative and not experimental study, with a cross-sectional descriptive design, a population of dental students from the Evangelical University of El Salvador, and a convenience sample were applied. The levels of empathy and family functioning were evaluated using the Jefferson Scale of Empathy for Health Professions students and the Brief Scale of Family Functioning. The construct validity of both instruments was estimated using Confirmatory Factor Analysis. The reliability was estimated using McDonald's omega and Cronbach's alpha. Comparisons of empathy and its dimensions between family typologies were made using a two-factor analysis of variance.

Results. No statistical differences were observed in empathy and its dimensions based on family typologies. It was found that women are more empathic than men. This result is not in accordance with other studies carried out in Latin America on dental and medical students evaluating empathy and family functioning with the same instruments.

Conclusions. The distribution of empathy levels and their dimensions are similar among the family typologies studied. Therefore, it was not found that family functioning can influence empathy in the population studied. It is necessary to continue these studies to obtain more empirical evidence regarding the influence of family functioning on empathy.

Availability of data
All relevant data can be found in the article. For more information, contact the corresponding author.

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Authors' contribution
Nuvia Estrada-Méndez: conceptualization, data curation, research, methodology, project management, resources, software, supervision, validation, visualization, writing: original draft, writing: revision and editing.
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Keywords
Empathy; family; students; dentistry; reliability; family functioning; psychological resilience.

Resumen
Objetivo. El objetivo del presente trabajo es determinar la existencia de diferencias de los niveles de empatía y de sus dimensiones entre las tipologías familiares en estudiantes de odontología.

Metodología. Estudio cuantitativo y no experimental, con un diseño descriptivo transversal, una población de estudiantes de odontología de la Universidad Evangélica de El Salvador y una muestra por conveniencia. Fueron evaluados los niveles de empatía y el funcionamiento familiar mediante la Escala de Empatía de Jefferson para estudiantes de profesiones de la salud y la Escala Breve de Funcionamiento Familiar. Se estimó la validez de constructo de ambos instrumentos mediante Análisis Factorial Confirmatorio y la confiabilidad mediante omega de McDonald y alfa de Cronbach. Las comparaciones de la empatía y sus dimensiones entre las tipologías familiares fueron realizadas mediante análisis de varianza bifactorial.

Resultados. No se observaron diferencias estadísticas en la empatía y en sus dimensiones en función de las tipologías familiares. Se encontró que las mujeres son más empáticas que los hombres. Este resultado no está en concordancia con otros estudios realizados en América Latina en estudiantes de odontología y medicina, evaluando la empatía y el funcionamiento familiar con los mismos instrumentos.

Conclusiones. La distribución de los niveles de empatía y de sus dimensiones son semejantes entre las tipologías familiares estudiadas. Por lo tanto, no se constató que el funcionamiento familiar tenga un efecto sobre la empatía en la población estudiada. Es necesario continuar estos estudios para obtener mayor evidencia empírica respecto de la influencia del funcionamiento familiar en la empatía.

Palabras clave
Empatía; familia; estudiantes; odontología; confiabilidad; funcionamiento familiar; resiliencia psicológica.

Introduction
Medical empathy is an attribute that allows the intersubjective relationship between the patient and the treating dentist [1] and contributes to better adherence to treatment, a decrease in patient stress and complaints about the care received, among other aspects that have been described by several different authors [1-4]. Medical empathy has two components: cognitive and emotional. Some authors have pointed out that empathy is fundamentally cognitive, while others argue that empathy is a system where these two components have a dialectical relationship between them and cannot be separated at the time of caring for a patient [2-4]. The Jefferson Empathy Scale is an instrument that measures the levels of Empathy (E) in professionals and students of health sciences and is constituted by three dimensions (subscales): Compassionate Care (CC), Perspective Taking (PT) and "Walking in the Patient's Shoes" (WPS). The first one is associated with the emotional sphere of the patient, while the others are associated with the cognitive

sphere [1-4]. These three structures determine the correct prosocial behavior when they work in coordination [5]. These three dimensions are supported by independent neurological structures; however, they are connected by neural networks that allow their interaction [6-8]. The emotional component is associated with the limbic system while the cognitive one is associated with the frontal orbit part of the brain [6-9].

The development of empathy is under pressure from phylogenetic and ontogenetic factors perspective [9,10]. Currently, the factors specifically associated with ontogeny are the ones that mostly influence the positive or negative consolidation of this attribute in a human being [10]. Therefore, the study of empathic behavior must involve knowledge of the factors that can positively or negatively influence its development. Such knowledge could contribute to a correct interpretation of the observed results of empathy levels in a given population. Empathic erosion is an example of how various factors such as stress, excessive academic workload, and the bad example of the teacher, among others, have the effect of destabilizing the functioning of empathy with the patient and manifests itself with an increase in the compassionate threshold and a deterioration in the ability to understand what the patient is thinking and feeling. The consequence of this empathic erosion is a decrease in empathy levels. The literature argues that this phenomenon of empathic decline usually occurs when the student begins his academic activity in the clinical area [1-4,10].

The family is a constant element in a person's life and holds significant importance during the time span from birth to early adulthood. [11-13]. Therefore, this can be a "suspected" factor in modulating a person's empathic behavior. The family ceases to be an abstract concept provided one can establish typologies that allow observing whether empathic behavior is distributed differently among such typologies. In this sense, the FACES III (Family Adaptability and Cohesion Evaluation Scale) instrument (Faces-20-Esp) [14-16] is one of the instruments used to assess family functioning [17]. It is based on Olson's circumplex model of family and marital systems [14,16]. This instrument allows for distinguishing between balanced, intermediate-range, and extreme families, thus transitioning from functional to dysfunctional ones.

Therefore, the study of the possible modulation of Family Functioning on empathy is important to understand if such functioning can predict empathic behavior, assuming that this influence cannot necessarily be observed, since empathy is influenced by many factors at the same time [1-5]. The objective of this study is to determine whether there are differences in the levels of empathy and its dimensions among family typologies in dental students.

Methodology

Type of study and design

This was a quantitative, non-experimental study with a descriptive and cross-sectional design [18].

Variables

Dependent: Empathy. Dimensions of empathy: Compassionate Care (CC) (8 items), Perspective Taking (PT) (10 Items), and "Walking in the Patient's Shoes" (WPS) (2 Items). Independent: Family Functioning. Fixed factors: Typologies of Family Functioning (FT) and Sex(S). Covariate: Course (C).

Participants

The population consists of all dentistry students at Universidad Evangelica de El Salvador evaluated in 2022 (N = 462; Women = 329; Men = 133).

Sample
The sample was comprised of 397 students of both sexes, selected in a non-probabilistic way for convenience [18] and it was obtained from all the students who voluntarily agreed to respond to the two applied instruments (JSE-HPS version and Faces-20-Esp.), after signing the informed consent.

Inclusion criteria
Every student who agreed to respond to the instrument voluntarily, everyone who had a regular-student status (from the basic, preclinical, or clinical area) who were present at the time of the instrument application.

Exclusion criterion
Turning in incomplete instruments.

Data collection strategy
The data were collected by professors of the School of Dentistry. The informed consent and the instruments that measure empathy and discriminate family typologies were applied in paper format and in person during class time. Professors had been trained for the correct application and reception of the answers. The data were tabulated in Excel tables for further processing.

Instruments
Empathy

The empathy measurement was performed using the Jefferson Empathy Scale (JSE) version for students of health professions (HPS-Version) [18-20]. This instrument has 20 items in Likert scale format, with response levels from 1 to 7, and has been well described by several authors [1-4]. Operationalization: The empathy variable can be measured by quantifying the score that can fluctuate between 20 and 140 points, that is, CC (56 points), PT (70 points), and WPS (14 points).

Family Functioning

The Brief Family Functioning Scale, Spanish version (Faces-20-Esp), has been validated in Spain [19] and Chile [20]; it has 20 items in Likert scale format, graded from 0 to 4 points, which presents statements about situations that occur in family life. The value 0 = "Never", 1 = "Almost never", 2 = "Rarely", 3 = "Frequently" and 4 = "Almost always". It measures two dimensions: Cohesion (items 1, 4, 5, 8, 10, 11, 13, 15, 17, and 19) and Adaptability (items 2, 3, 6, 7, 9, 12, 14, 16, 18 and 20). The dimension of Cohesion can be subdivided into four levels: Disengaged · Separated · Connected · Enmeshed. The Adaptability dimension is also made up of four levels: Rigid, Structured, Flexible, and Chaotic. From the combinations of the levels of cohesion and adaptability, the family typology can be extracted: Balanced, Intermediate and Extreme: the Extreme indicates a family malfunction and the Balanced denotes good family functioning [20]. Operalization: The variable can be measured by quantifying the score that can fluctuate between 0 and 80 points.

Judges' criteria
Before the application of both instruments, it was submitted to judges' criteria (dental surgeons, psychologists, educators, and higher education experts) to obtain evidence of content validity.

Pilot test

Both instruments were applied to 30 students including all courses and both sexes [2].

Statistical analysis

Psychometric Properties

Both instruments were statistically examined by the same procedures. For the Confirmatory Factor Analysis (CFA) the Robust Maximum Likelihood estimator (MLR) was used [21], which is characterized by being robust in the absence of multivariate normality of the data. [22] The RMSEA, SRMR, CFI and TLI indices were used to evaluate the fit of the models. Values less than 0.08 were considered acceptable for the RMSEA and SRMR indices, [23]. Values greater than 0.90 were considered acceptable for the CFI and TLI indices, [24]. The evaluation of the reliability of the scale was estimated by Cronbach's alpha coefficient (α) and omega coefficient (ω), where a value ω>0.80 is suitable [25].

The Multi-group Confirmatory Factor Analysis (MGCFA) was used to measure the factor invariance of the scale according to sex, in which a sequence of four hierarchical variance models was proposed: configural invariance (reference model), metric invariance (equality of factor loads), scalar invariance (equality of factor load and intercept) and strict invariance (equality of factor loads, intercept and residuals). A modeling strategy was used to compare the sequence of models, for which the differences in the RMSEA (ΔRMSEA) were used, where differences less than <0.015 evidence the invariance of the model between the groups [24]. The differences in the CFI (ΔCFI) were also used, in which values less than <0.010 show the invariance of the model between the groups [26,27]. The univariate and multivariate normality of the data was analyzed, providing the kurtosis and asymmetry and Mardia test, respectively [28]. The psychometric study was carried out to confirm that the data observed in the present study comply with the FF and Empathy models and their respective underlying dimensions.

Comparison of empathy levels between family typologies

The mean and the standard deviation of the empathy levels (and their dimensions) were calculated in each of the two studied factors: Family Typology (FT) and Sex (S). The Course factor (C) was considered a covariate. The primary data of empathy observed in each of the FT were compared by means of a bifactorial analysis of variance (ANOVA), in order to measure the presence of differences between the FT and between the sexes. The interaction between the FT and S factors (FT*S) was calculated. The effect size was calculated (ή2=eta squared) to determine whether the differences between the variables of the compared samples were large or small, [29] and the test power (PT) was calculated to determine the magnitude of the type II error (1-β) [30]. The application of all these methods allows reliable comparisons to be made.

Mplus 8 was used for the confirmatory factor analysis and the invariance analysis, [31], making use of SPSS 29 (IBM Corp., 2020) for the other analyses. The significance level used in all cases was α<0.05 and β>0.80.

Ethical aspects

The study was conducted under the ethical principles of the Declaration of Helsinki (2013). The research project, as well as the informed consent, were approved by the Ethics Committee of the Evangelical University of El Salvador (UEES): Act N° 307/08/2022. All sociodemographic, personal data and the responses of the instrument applied, as well as the informed consent, are confidential.

Results

The sample consisted of 397 (n) students, out of a total of 462 (N) (85.93% of the studied population), between the first and seventh course. Distributed in 293 female students (73.8%) and 104 (26.2%) male. With a mean age of 21.49 years (SD=2.79).

Compliance with the model

It was evidenced that the original empathy model of three related factors presents adequate adjustment indices ($\chi 2$ = 329.87; gl = 167; p <. 01; CFI =. 92; TLI =.91; RMSEA =. 056 [90% CI,047 – .064]; SRMR = .057). Factorial Invariance: It was found that the factorial structure of the scale has shown evidence of being strictly invariant for the groups of men and women in the sequence of proposed invariance models: metric invariance (ΔCFI = -0.001; ΔRMSEA = -0.002), scalar (ΔCFI = -0.010; ΔRMSEA = 0.002) and strict (ΔCFI = -0.003; ΔRMSEA = -0.001).

Reliability

The dimensions of the empathy scale present adequate reliability indices: Perspective Taking or Perspective Adoption (α=0.89; ω=0.89), Compassionate care (α=0.79; ω=0.79), and Putting oneself in the patient's shoes (α=0.68; ω=0.71). Similarly, in the sample of women, all three dimensions presented acceptable reliability indices: Perspective Taking (α=0.89; ω=0.89), Compassionate Care (α=0.77; ω=0.78) and Putting oneself in the Patient's Shoes (α=0.64; ω=0.65). In the sample of males, the three dimensions also presented adequate adjustment indices: Adoption of Perspective (α=0.89; ω=0.90), Compassionate Care (α=0.83; ω=0.84), and Putting oneself in the Patient's Shoes (α=0.74; ω=0.76).

In the case of the family functioning variable, it is appreciated that the vast majority of the items present adequate asymmetry and kurtosis indices (As < ±2; Kurt < ±7) according to the criteria of Finney and DiStefano [32], but lacking multivariate normality with a multivariate kurtosis of 111.08. Factorial validity: A two-factor model correlated with a good result of the goodness of fit test was finally obtained ($\chi 2$ = 284.06; gl = 163; p < 0.0001; RMSEA = 0.071 [90% CI 0.057-0.084.]; (IFC=0.89; TLI=0.87; SRMR=0.057). This model presents high and significant standardized factor loads (λ), which in general are greater than 0.50. Reliability: The dimensions of the family functioning scale have adequate reliability indices: α (Cohesion)=0.89, α (Adaptability)=0.88, observing the reliability of the measure, by using McDonald's omega coefficient of ω=0.96.

Estimation of statistics and comparison of empathy levels in family typologies

In Table 1 the results of the distribution of the means and standard deviations of empathy and their dimensions as a function of FT and S are presented. From the perspective of the absolute values, it was observed that women have, in general, higher E, CC, TP, and CZP values than men (see Figure 1). In Table 2, it was observed that the E and none of its dimensions differ statistically between the FT, but in the S factor, where women have higher values of E, CC, and CZP; there were no differences in the TP dimension. The present study shows that in the studied population the absence of statistical significance of the Course covariate does not affect the distribution of the dependent variable as a function of FT and S. However, it is necessary to emphasize that the value of the effect size and the power of the test were not satisfactory; such value shows that the statistical differences found are small.

Table 1. Distribution of the means of empathy and its dimensions among the examined family typologies

Family Typology	Sex	Mean E	Standard Deviation E	Mean CC	Standard Deviation	Mean PT	Standard Deviation PT	Media WPS	Standard Deviation WPS	n
Extreme	Male	95.91	17.891	30.94	12.331	58.57	9.960	6.40	3.041	35
	Female	100.17	16.688	35.67	9.947	56.69	11.713	7.81	2.879	120
	Total	99.21	17.001	34.60	10.675	57.12	11.337	7.49	2.966	155
Balanced	Male	94.77	14.718	32.94	9.568	55.15	9.695	6.68	2.883	47
	Female	99.35	16.020	35.07	9.537	57.38	9.481	6.91	2.391	88
	Total	97.76	15.678	34.33	9.567	56.60	9.579	6.83	2.564	135
Intermediate	Male	94.27	16.063	32.27	10.138	55.18	8.937	6.82	2.684	22
	Female	99.62	15.249	34.48	10.033	57.54	9.665	7.60	2.629	85
	Total	98.52	15.496	34.03	10.047	57.06	9.527	7.44	2.646	107
Total	Male	95.05	15.982	32.13	10.621	56.31	9.676	6.62	2.874	104
	Female	99.76	16.030	35.14	9.830	57.14	10.474	7.48	2.686	293
	Total	98.53	16.132	34.35	10.117	56.92	10.266	7.25	2.759	397

Note. E: Empathy. CC: Compassionate Care. PT: Perspective Taking; WPS: "Walking in the Patient's Shoes."

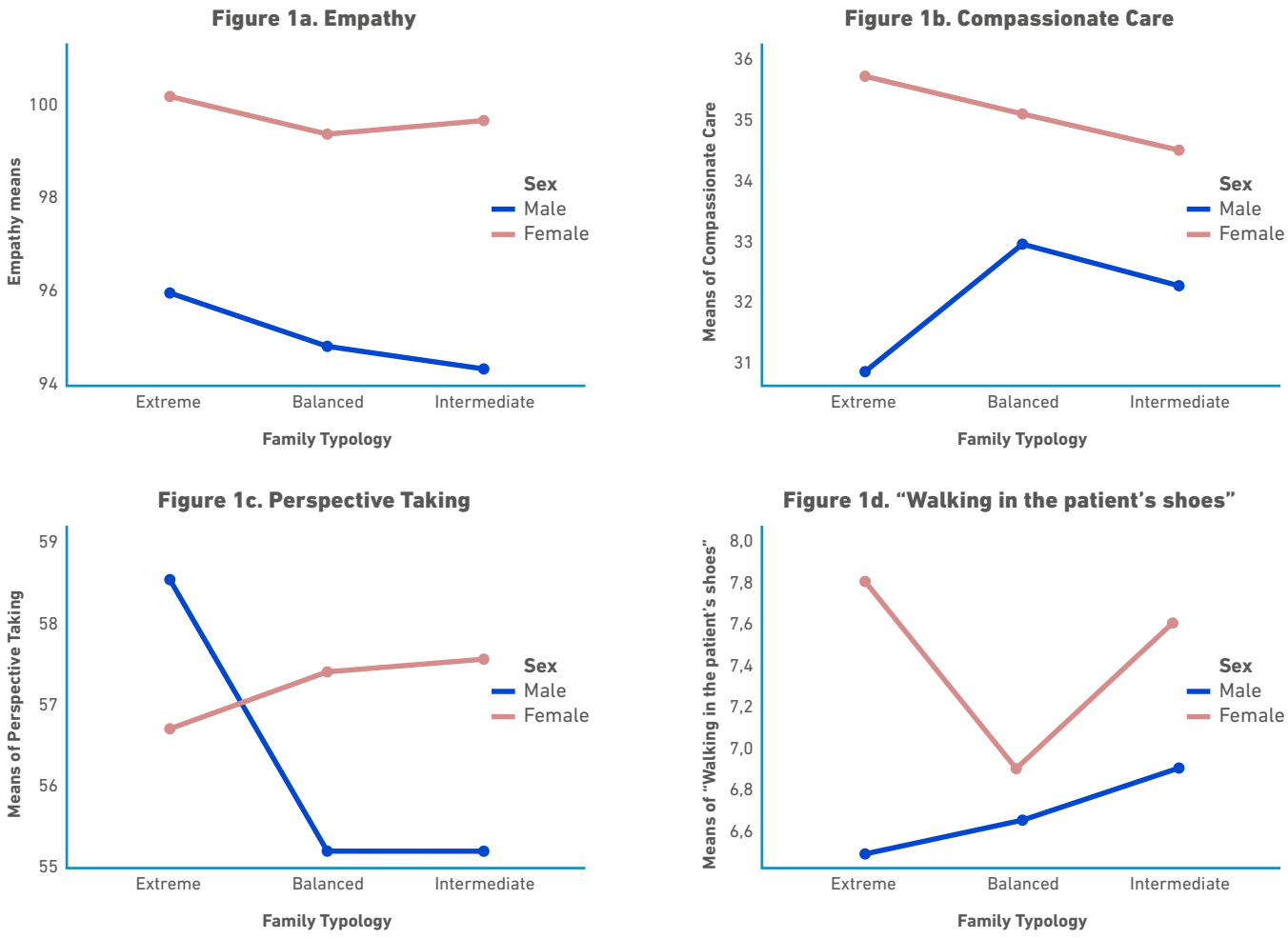

Figure 1. Value of empathy means and each of its dimensions in Family Typologies

Table 2. Results of the analysis of factor variance in Empathy and in each of its dimensions

Empathy and its dimensions	F	Statistical significance	Partial Eta squared (η^2)	Observed power (PT)
Empathy				
Course	0.003	0.955	0.0005	0.050
FT	0.142	0.868	0.001	0.072
Sex	6.057	0.014	0.015	0.690
FT * Sex	0.025	0.975	0.0005	0.054
Compassionate Care				
Course	0.029	0.866	0.0005	0.053
FT	0.170	0.844	0.001	0.076
Sex	6.400	0.012	0.016	0.713
FT * Sex	0.569	0.566	0.003	0.144
Perspective Taking				
Course	0.044	0.834	0.0005	0.055
FT	0.557	0.573	0.003	0.142
Sex	0.566	0.452	0.001	0.117
FT * Sex	1.384	0.252	0.007	0.297
"Walking in the patient's shoes"				
Course	3.089	0.080	0.008	0.418
FT	0.849	0.429	0.004	0.196
Sex	5.521	0.019	0.014	0.649
FT * Sex	1.138	0.322	0.006	0.250

Note. FT: Family Typology; *: Interaction between the factors studied.

Family functioning is important because it actively instills moral values, elicits affection, builds emotions, and teaches prosocial behaviors [1-5] among many more virtues [1-4]. Well-constituted moral values and positive affections are predictors of high levels of empathy [2,3].

The fact that, in the present work, there were no differences in the levels of empathy and its dimensions between family typologies does not imply that this situation is the same in other student populations. In other words, theoretically speaking, family functioning can be "negative", but the general context where the person develops can be positive and empathy may not be affected by a family malfunction. The results observed in this work, therefore, could

constitute an important empirical element that could help to hypothetically understand that family functioning acts on empathy within an ontogenic context. In turn, it can inform us indirectly that empathy is modulated by the presence of other factors that also participate in such modulation that act simultaneously with family functioning. However, the scarce existing empirical information limits the possibility of theorizing about it and shows the need to continue researching how empathy levels are distributed depending on family typology in a massive way to accumulate the critical empirical evidence necessary to generate well-founded hypotheses.

Discussion

The observed results allow us to infer that the three-dimensional model of empathy and two-dimensional family functioning are fulfilled in the studied sample. Additionally, the results of the fulfillment of invariance between groups (sex) are also fulfilled. These results validate the comparisons of the distribution of empathy and its dimensions; and the comparisons between male and female sex according to family typology. The sample studied was not representative of the population. However, this problem cannot be solved, since the population is naturally finite, so it cannot be artificially increased. Furthermore, in the context of voluntary participation, 100% of the population cannot be evaluated.

In relation to empathy and its dimensions, the studies carried out in Latin America let us observe some characteristics that seem to be typical of this continent. First of all, it was proved, in dentistry students, that there is variability in the distribution of the means of empathy between the courses and sex [2,33-36]. The same situation occurs with other specialties of health sciences [37,38]. In fact, it has been observed that there are six different forms of empathy behavior between courses in dental students; in addition, empathy between the sexes does not always favor females. In some cases, no differences have been found between the two sexes, in others, the male students have demonstrated higher levels of empathy than women. These observations contradict the concept of declination that has been assumed as a constant [1-4]. Such a concept has also been described as the sharp decrease in empathy from the moment students in dentistry, medicine, and other health specialties [1-4,6-13] pass through preclinical; and clinical areas. The authors agree that the process of empathic decline is an objective fact, but empirical evidence shows that in Latin America such decline is an isolated fact; the rule has been the presence of variability, as stated above [1-4,6-13].

There are authors who have suggested that a possible explanation for this variability is that empathy is an attribute that is slowly being built up along the processes associated with ontogeny [2,3,10]. Indeed, some factors such as stress, excessive evaluations, the negative behavior of the teacher towards students, the way he treats patients, the academic climate, and resilience, among other factors, are related to "empathic erosion", which potentially tend to modify the levels of empathy since entering to the preclinical or clinical areas [33-38]. However, it has been observed in some dental schools that the average levels of empathy have increased, despite the factors described above, being present, at least to some extent [35,36].

If empathy seems to be the result of the action of several factors that modulate empathic training from the point of view of its architecture, as well as its functioning [1-13], then family functioning could be an important component to explain, at least in part, empathic behavior.

In the case of family functioning, there are very few studies that analyze the psychometry of this instrument, but in all of them, it has been observed that this construct has two dimensions (Cohesion and Adaptability), confirming the results of the present work [20,39-41]. On the

other hand, there are also few studies that have tried to link empathy with family functioning through the use of Faces-20-Esp [42,43]. In this regard, the cited works it was found that the type of extreme family functioning has higher empathy values in relation to the other typologies of family functioning and concluded that this family typology could contribute to some aspects associated with the formation of empathic values. An attempt to interpret this result could be that authoritarian or absent leadership, which characterizes the qualification of "extreme typology," affects communication [44]. But this relationship has been criticized mainly for the simplistic form of characterization that exists in family communication or simply for considering extreme typology as erratic [17,43]. On one hand, it could be considered that this typology is influenced by culture; therefore, the development of the subject under certain cultures would not affect communication in the context of extreme families [42-45]. On the other hand, we could assume that dental students are people with a high IQ. Therefore, although they were raised in a family of extreme characteristics, they could have developed resilience and somehow they "cancel out" the negative effect that the condition of extreme family functioning would have on empathy [46-49]. To summarize, trying to explain how the family and, specifically, family functioning influences empathy is a complex task and it is beyond the scope of this work.

In fact, if the considerations made above are plausible, it could be inferred that the modulation of family functioning on empathy is variable, and empathy would be the result of a particular complex correlation of the different factors that contribute to the modulation of this attribute in each of the populations studied. This situation could explain the variability (different results) observed so far, in relation to the distribution of empathy levels according to family typologies. The reason seems to be "simple": not all factors influence empathy equally in different populations. However, this inference, to be admitted as a scientific fact, requires more empirical evidence. The one existing so far is not sufficient to theorize about it. In this context, the empirical evidence obtained in this work would be a manifestation of the variability described above and, as a consequence, could lead us to consolidate a consistent tendency to describe that family functioning can effectively modulate empathy, which supports the hypothesis of some authors [42-43] that consider empathy as a result of the influence of many factors acting at the same time and that such influence necessarily determines variable results.

As a consequence, there is a need to determine, in all possible contexts, [50] how empathy levels are distributed according to family typologies. As a consequence, it is likely that we are in the presence of a problematic system rather than just a simple problem, [18,51], which is, of course, more complex to solve than the determination described above.

Conclusions

The neutrality in the distribution of empathy levels in the family typologies found may be a manifestation of the presence of variability in the distribution of empathy (and its dimensions) in relation to family functioning. These studies should be complemented with those which will allow us to know the possible motivations and thoughts that determined students' responses to the instruments.

Limitations and recommendations

The main limitation is that the conclusions obtained are local in nature and the study of the relationship between empathy and family functioning has been scarcely studied. It is recommended to evaluate other populations of dental students, as well as other specialties, with the aim of accumulating empirical evidence regarding the way in which empathy levels are distributed and their dimensions based on the classifications of family typologies.

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