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Empathy Levels of Dental Students of Central America and the Caribbean

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Abstract

Objective: The aim of this study is to check whether there are differences in the distribution of empathy levels in dental students from nine faculties of dentistry Colombia, Panama, Costa Rica and Dominican Republic. Methods: The levels of empathy and matrices of empathy construct matrices are estimated dental students by using the Jefferson Scale of Physician Empathy, the Spanish version for students (S version) culturally validated in Colombia, Panama, Costa Rica and Dominican Republic measured by arbitrator criteria. Cronbach α is estimated. Data of empathic orientation of the studied factors between faculties are analyzed and compared by ANOVA and Duncan

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test and matrices of empathy construct using discriminant analysis. Results: We find that there are differences in levels of empathy between universities, courses, gender and interaction between the Dental Faculty (University) and Course. The comparison between matrices shows unexplained variances and differences observed between the levels of empathy in student populations. Conclusions: Variability in empathy is observed in the studied factors and among student populations. The variability is an empirical finding, but is not possible in this work, to explain why.

1. Introduction

Empathy is an attribute that contributes positively [1]-[5] in the process of patient care by the health professional. Empathy should also be given attention in the process of formation of these health professionals [6]. Empathy is defined based on three dimensions: a) to put into perspective, b) care with compassion and c) the ability to "step into the shoes of the patient" [7] [8]; as a result, they are involved in complex cognitive and emotional processes.

The empirical evidence observed in several studies of faculties of various health careers appears to be contradictory in relation to the examination of, at least, two factors: year (academic year) and gender [1]-[5] [7]-[10]. The possible explanation for this diversity of results may be due to the varying components of empathy maybe, in turn, influenced by other variables that affect the structure of the components of empathy [5]. According to Silva *et al.* [11], these differences open new areas of investigation concerning the possible socio-cultural implications that can influence the empathy. However, there are no studies comparing the empathy between different higher education institutions within a country and between countries. The existence of such differences may constitute empirical evidence of socio-cultural factors that affect the structuring of empathy in ontogenetic processes in the subjects. The aim of this study is to test whether there are differences in levels of empathy among student populations of nine dental schools from four countries of Central America and the Caribbean.

2. Materials and Methods

This study, an exploratory, cross-sectional and ex post facto cause-effect [12], (was approved by the Ethics Committee of Research, University of Development and German Clinic with approval of code CAS-UDD approval: 2011-64 in Santiago de Chile). It addresses students composed by levels from first through fifth years of Dental School, from the Faculty of Dentistry of Metropolitan University (Erazo *et al.*) [13] and San Martin de Barranquilla (Bilbao *et al.*) [3], University of Magdalena (sent to publish) and University of Cartagena (sent to publish) of the Republic of Colombia; Universidad Latina (sent to publish) and University of Panama (sent by publish) of the Republic of Panama; Latin University of Science and Technology (Sanchez *et al.*) [14] and the University of Costa Rica (Howard *et al.*) [15] of the Republic of Costa Rica, and the Universidad Central del Este (Silva *et al.*) [11] of the Dominican Republic. Data collection was conducted from June to August 2012, simultaneously at designated schools. The sample was comprised of those subjects who could be evaluated on the day the instrument was applied. All students, upon the application of the scale, were attending the last part of the first semester of each course. Participants from each of the samples were applied the Jefferson Scale of Physician Empathy (JSPE), the Spanish version for students (S version), and culturally appropriate in each of the countries studied by Committee Criteria [7] [16] [17]. There were no exclusion criteria, since the object was to evaluate the variable of interest of the majority of students. Consistent with referred to above, a single anonymous and confidential measurement (after signing informed consent), performed by a neutral operator, was first applied to students of fourth year classes. In the case of fifth year students, the instrument was administered on a visit to the clinical setting, with the same indications previously mentioned.

3. Statistical Methods

The data were subjected to a Cronbach α (reliability by internal consistency) [18]-[20] and Cronbach α based on

established elements. Subsequently, it estimated with Cronbach α that removing an item (question applied instrument) for each estimate, in order to verify the explanatory role of each question.

The summation score of raw data of empathy levels obtained were initially subjected to an Shapiro-Wilk normality test [21] and Levene test of homoscedasticity [22] on the three factors studied: University (Faculty), Course (Academic Year) and Gender. The descriptive statistics were estimated; arithmetic mean and standard deviation. The comparison of means among the factors within the levels of the main factors and the interactions between the main factors were performed using a general linear model and Duncan test for unbalanced data [12]. Observed power ($1-\beta$) and the effect size ($\eta2$) [12] [23] were evaluated. Subsequently, a discriminant analysis was performed. The λ statistic of Wilks [24] was used in order to measure the proportion of the total variance of the discriminant scores not explained by differences in the factors examined. To test whether the variance and covariance matrices of each University (School of Dentistry) come from or not the same population, Box's M test [24] [25] was used. Data were analyzed using the SPSS 20.0 statistical program. The level of significance was set at $\alpha \leq 0.05$ and $\beta \leq 0.20$ in all cases.

4. Results

The general value of Cronbach α was 0.775 and evidence of internal consistency can be characterized as good and the value of this statistic, based on established elements, resulted similar to the non-typified (0.782), all of which show that the variances are similar between elements [25] [26]. When the Cronbach α values were eliminated they fluctuated between 0.752 - 0.784, all of which indicates that all elements are providing some degree of explanation of the construct studied. The statistic F = 6363.07; of a Hotelling T2 test, was highly significant ($p < 0.0005$), and shows that the means of the elements are distributed differently and indicates that the questions, possibly associated with some dimensions, are contributing in different ways to the explanation of the construct. All this, in general, shows that the scale is reliable in the data analyzed in this study.

The application of a three-factor model allowed to observe that the factors "University", "Course", Gender and, finally, "University" in interaction with the factor "Course" (University * Course), were highly significant ($p < 0.0005$), which indicates that there are differences between the universities studied, between courses, between gender and between courses of different universities. However, the $\eta2$ statistic, which indicates the magnitude of the effect size, is small (0.104, 0.009, 0.007 and 0.061 respectively). The observed values of the power of the test was 1.00; 0.903; 0.937 and 1.00 respectively; all of which show that there is low risk of committing a Type II error. The R2 value was 0.217 uncorrected and corrected 0,177; which show that the model does not explain all the variation, but also shows the existence of other factors (other than those studied) that are influencing the determination of the values of the observed levels of empathy.

In **Table 1**, the mean values of the variable levels of empathy in every University studied are presented. In **Table 2**, the results of applying the Duncan test are presented. It is noted that four groups are formed. The first consists of the means of the University of Magdalena (Colombia), that was significantly different ($p < 0.05$) from the means of the Universities of Metropolitan and San Martin (Colombia) and Central del Este (Dominican Republic), which form a second group and, among them, there are no significant differences (p > 0.05). Later a third group was composed of the means of the Universities America (Panama), ULACIT of Costa Rica, Cartagena (Colombia) and the University of Panama, among which there are no significant differences ($p > 0.05$). Finally, a fourth group was formed, only consisting of the means of the University of Costa Rica, which differed significantly ($p < 0.05$) of all previously formed groups.

Table 3 shows the mean results of the factor "Course". It is noted that two groups are formed, which differ significantly among them ($p < 0.05$).The first consists of the average of the "first year"; while the second group consists of the rest of the means of which between them there are no significant differences ($p > 0.05$). Regarding the "gender" factor, an average of 104.265 for the female gender (typical error = 0.446; confidence interval with a Lower Limit = 103.351 and Upper Limit = 105.179) and, for males, the average was 101.446 (typical error = 0.79; confidence interval Lower Limit = 99.517 and Upper Limit = 102.615), with significant differences ($p < 0.05$) between them. In **Table 4**, the results of the estimation of means between the University and Course factors (University * Course) are presented.

The comparison between the complete data arrays of the instruments applied permit the estimation of the Box M statistic (3947.847), which was highly significant ($p < 0.005$); indicating that the covariance matrices between

Table 1. Results of the estimation of mean, standard error and confidence interval of empathic orientation in each of the Dental University studied.

Dental University	Median	Standard Error	Confidence Interval 95%	
			Lower Limit	Upper Limit
Universidad Latina de Panamá	102.637	2.312	98.102	107.172
Universidad de Cartagena (Colombia)	105.525	0.794	103.968	107.081
Universidad de Magdalena (Colombia)	92.490	1.098	90.336	94.644
Universidad Metropolitana (Colombia)	100.061	1.224	97.659	102.462
Universidad Central del Este (Dominicana)	101.724	1.120	99.528	103.921
ULACIT de Costa Rica	103.468	1.179	101.156	105.780
Universidad de Costa Rica	111.888	.940	110.045	113.732
Universidad de Panamá	105.198	1.818	101.633	108.762
Universidad San Martín (Colombia)	100.999	1.228	98.590	103.408

Table 2. Results of the comparison between the means of empathic orientation between different universities studied.

Dental University	N	Subset			
		1	2	3	4
Universidad de Magdalena	173	92.48			
Universidad Metropolitana	154		99.41		
Universidad San Martín	168		100.92		
Universidad Central del Este	239		101.26		
Universidad Latina de Panamá	92			104.55	
ULACIT de Costa Rica[*]	225			105.49	
Universidad de Cartagena	360			105.99	
Universidad de Panamá	133			107.67	
Universidad de Costa Rica	290				111.88
Sig.		1.000	0.255	0.062	1.000

[*]In the case of ULACIT Costa Rica, being a 4-year program, students will be distributed in 5 groups, according to school cycles.

Table 3. Results of the comparison of means between courses by Duncan's test.

Course	N	Subset	
		1	2
First	377	99.62	
Second	439		104.08
Fourth	323		105.10
Fifth	330		105.30
Third	365		106.28
Sig.		1.000	0.057

universities compared differ. X^2 tests, associated with the contrasts of the discriminant functions were highly significant ($p < 0.0005$) and fluctuated between 884.263 and 31.92; all of which show that the unexplained va the presence of different populations. Something similar occurs when comparing the data of the populations riance between the matrices is higher than the explained variance within these matrices, and in most cases are in

Table 4. Results for the estimation of means of empathic orientation. Standard error and Confidence Intervals for each level of combination of the factors University and Course.

Dental University	Course	Median	Standard Error	Confidence Interval of 95%	
				Lower Limit	Upper Limit
Universidad Latina de Panamá	First	100,833	5450	90,144	111,522
	Second	101,806	5578	90,865	112,746
	Third	102,056	7331	87,677	116,434
	Fourth	98,769	3345	92,208	105,330
	Fifth	109,722	2814	104,202	115,242
Universidad de Cartagena	First	100,618	1593	97,494	103,743
	Second	106,634	1561	103,572	109,696
	Third	107,509	2044	103,499	111,518
	Fourth	105,146	1828	101,561	108,732
	Fifth	107,715	1804	104,178	111,253
Universidad de Magdalena	First	92,977	2323	88,421	97,533
	Second	98,272	2611	93,151	103,394
	Third	98,100	2421	93,352	102,849
	Fourth	88,881	2543	83,894	93,868
	Fifth	84,220	2368	79,576	88,864
Universidad Metropolitana	First	97,615	2799	92,126	103,105
	Second	98,023	2314	93,485	102,561
	Third	100,089	2298	95,582	104,596
	Fourth	95,185	2833	89,629	100,740
	Fifth	109,392	3316	102,889	115,895
Universidad Central del Este	First	93,043	2247	88,636	97,449
	Second	97,783	1829	94,195	101,370
	Third	105,474	1894	101,759	109,189
	Fourth	105,050	2985	99,195	110,905
	Fifth	107,272	3234	100,930	113,614
ULACIT de Costa Rica	First	98,291	2515	93,358	103,224
	Second	103,847	2130	99,669	108,025
	Third	102,063	3474	95,249	108,877
	Fourth	105,188	2436	100,410	109,966
	Fifth	107,951	2423	103,199	112,703

Continued

	First	107,463	2209	103,130	111,796
	Second	109,383	1772	105,908	112,859
Universidad de Costa Rica	Third	109,290	1846	105,669	112,911
	Fourth	116,570	2382	111,899	121,242
	Fifth	116,733	2233	112,354	121,113
	First	106,899	2885	101,241	112,557
	Second	106,795	3368	100,191	113,400
Universidad de Panamá	Third	110,926	3965	103,149	118,704
	Fourth	100,317	4080	92,315	108,319
	Fifth	101,050	5527	90,209	111,891
	First	97,038	2424	92,285	101,792
	Second	99,625	2764	94,205	105,045
Universidad San Martín	Third	99,222	3761	91,846	106,598
	Fourth	112,655	2310	108,125	117,185
	Fifth	96,455	2177	92,185	100,724

formed by the interaction between the factors "Universities * Courses". The value of the Box M statistic (15553.48) was highly significant ($p < 0.005$); also indicating that the covariance matrices between populations, resulting from the combinations between the University and Course factors, differ.

5. Discussion

The results observed in the statisticians estimate for the variables of empathic orientation, comparing averages of this variable and the resulting matrix values and comparing these estimates between dental schools studied in Colombia, Panama, Costa Rica and Dominican Republic, allow the following generalizations: a) there are differences between dental schools of the universities studied; b) There are differences between courses, c) females have higher levels empathic orientation then males; d) interactions between factors (University and Course) were observed and, therefore, differences between populations derived from a combination at both levels; e) the existence of a coefficient of determination (R^2) relatively low and observation of a unexplained variance could be the expression of unknown factors or those not considered in this study and that they are influencing the variable factors of the level of empathy.

The variability of results observed in other studies, in which empathy levels were studied within each University or Faculty [11] [13]-[16] [27]-[38], allowed different findings. These differences are expressed in the factors studied, considering the course and gender. In some populations women were more empathic than men and in others the opposite occurred or simply there were no differences between genders. In the course factor, in some of the student populations, increasing with the elapsed academic years, in others it decreased and others remained stable. Besides the differences within these populations, we have found that they also occur among populations of students of the same career; possibley meaning, differences exist between schools within a country and between schools from different countries. One possible explanation for this variability is that the structure of each component of empathy depends on the influence of factors other than those of the other component. At the same time, empathy itself depends on the interaction between these components. Therefore, it is hypothetically possible to induce what is actually measured, with the applied scale, is the result of a complex process consisting in structuring and interaction of the components of empathy, a process that occurs in the context of another dimension: ontogenetic. As a consequence, the explanation of the variability between populations of students in relation to empathy is a complex problem [5]. The theory of mind and mirror neurons [39]-[46] can try to explain the processes occurring within the mind and there is empirical evidence to support it, but does not explain

the entire process of formation of empathy. In this regard, the development process of the anatomical, psychological and neural basis of a subject, the way these are constructed and interact, are subjected to the action of external factors that act on the dialectical process [5]. As a result of the complex action of these factors, the way to integrate cognitive and affective components of empathy should be different among individuals, but also among populations, as these populations may have different economic standards and conditions, cultural, moral, educational, among others [1] [5]; which, can also differentially influence the building process of empathy. Therefore, the differences cannot be explained in this work; at best, be apprehended and a limitation of this study, which opens the doors to the need for further research to answer the question: What are all the factors responsible for these differences and how exactly do these modulate the process of the formation of empathy?

Current knowledge about empathy allows us to a firm that the formation of this construct in dentists (and in all professions in the area of health) is part of the responsibility of the universities [5] and, in this sense, some authors suggest that empathy can be learned [47] [48]. Therefore, the university has the task of studying the action of concrete practices that are possible to perform in order to raise levels of empathy in students, considering two aspects: a) that students who come to universities already have some empathic structure obtained by a previous experience of life and b) that the teaching of empathy in higher education (and in all educational systems) cannot be assumed with mechanistic conceptions. However, this work has restrictions which can be summarized as: a) the design used is cross-sectional and longitudinal study is needed to confirm whether these observed facts are maintained over time or vary with him and b) is necessary to study factors that could explain the behavior of the observed levels of empathy.

6. Conclusion

In accordance with the objective of this work, it was established that there was variability among student populations composed of dental schools in the same country and between schools from different countries. These differences could be empirical evidence of social and cultural factors that shaped empathy levels of a population and constituted a working hypothese for the future to clarify why this phenomenon occurred.

Competing Interests

The authors declare that they have no competing interests.

Financing

Research funded by the authors.

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