

SOCIODEMOGRAPHIC AND UNDERGRADUATE-RELATED VARIABLES AS PREDICTORS OF DENTAL STUDENTS' EMPATHY: AN E-SURVEY IN A SOUTH BRAZILIAN DENTAL SCHOOL

Variáveis sociodemográficas e relacionadas à graduação como
preditoras da empatia de estudantes de odontologia:
um e-survey em uma faculdade de odontologia do Sul do Brasil

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ABSTRACT

Aim: To assess the associations between sociodemographic and undergraduate-related characteristics and empathy scores among dental students in a school in Southern Brazil. **Materials and methods:** Cross-sectional study developed from self-administered online questionnaires to undergraduate dental students at the Federal University of Pelotas. Outcomes were the total score of empathy obtained through the Interpersonal Reactivity Index (IRI) and the scores obtained in four domains: perspective-taking (PT), fantasy (FA), empathic concern (EC), and personal distress (PD). In RStudio version 4.1.3 simple and adjusted linear regression models with robust residual standard errors were performed. **Results:** Eighty-seven students were included (response rate 24.4%). Considering the total IRI score, there was a mean score of 3.62 (SD=0.64) by item, and dental students had a mean score of 94.07 (SD=16.62). In adjusted analysis, being a woman increased the IRI (0.505;95%CI 0.187;0.823), EC (0.494;95%CI 0.168;0.819), and PT (0.822; 95%CI 0.329;1.315) scores compared to men. Adjusted associations were found between the EC domain and skin color and between the PT domain and family income. FA scores increased with age and family income and, decreased with dissatisfaction with undergraduate studies, only in the bivariate analysis. **Discussion:** Dental professionals' empathy is essential in daily practice, improving the patient-professional relationship in a patient-centered care approach. Thus, it is relevant to recognize predictors of empathy among dental students to promote strategies to increase empathy in dental practice. **Conclusion:** Gender, skin color, family income, age, and satisfaction with undergraduate studies were associated with empathy scores among dental students. **Keywords:** Dentistry. Students, dental. Empathy. Surveys and questionnaires. Observational studies as topic.

RESUMO

Objetivo: Avaliar associações entre as características sociodemográficas e relacionadas à graduação e os escores de empatia entre estudantes de odontologia de uma escola do Sul do Brasil. **Materiais e métodos:** Estudo transversal desenvolvido com questionários on-line autoadministrados para estudantes de graduação em odontologia da Universidade Federal de Pelotas. Foram considerados desfechos o escore total de empatia medido pelo Índice de Reatividade Interpessoal (IRI) e os escores obtidos em quatro domínios: tomada de perspectiva (TP), fantasia (FA), consideração empática (CE) e angústia pessoal (AP). No RStudio versão 4.1.3 foram realizadas regressões lineares simples e múltiplas com erros residuais robustos. **Resultados:** Foram incluídos 87 alunos (taxa de resposta=24,4%). Considerando a pontuação total do IRI, houve média de 3,62 (DP=0,64) por item, e de 94,07 (DP=16,62) por estudante. Na análise multivariável, mulheres tiveram maiores pontuações no IRI (0,505; IC95%0,187;0,823), CE (0,494; IC95%0,168;0,819) e AP (0,822; IC95%0,329;1,315) em comparação aos homens. Foram encontradas associações ajustadas entre o domínio CE e cor da pele e entre o domínio PT e renda familiar. Os escores do domínio FA aumentaram com idade e renda familiar e diminuíram com insatisfação com a graduação, somente em análise bivariada. **Discussão:** A empatia do profissional de odontologia é essencial na prática diária, melhorando a relação paciente-profissional. Assim, é relevante reconhecer os preditores da empatia entre os estudantes de odontologia, visando estratégias para aumentar a empatia na prática odontológica. **Conclusão:** Gênero, cor da pele, renda familiar, idade e satisfação com a graduação foram associados aos escores de empatia entre estudantes de odontologia.

Palavras-chave: Odontologia. Estudantes de odontologia. Empatia. Inquéritos e questionários. Estudos observacionais como assunto.

INTRODUCTION

Empathy must be factored into the equation of patient-centered care to promote proper and effective communication at the dental office¹. Empathy is a complex, multidimensional concept that represents the individual responsiveness, cognitive and affective, to the experiences faced by someone else^{2,3}. Cognitive responsiveness is the ability to understand a point of view, in real or fictional situations, and, emotional responsiveness is the ability to generate emotions, such as anxiety, concern, and compassion seeing people facing difficult situations^{2,3}. In dental care, professional empathy is essential to improve the patient's experience at the dental office, promote therapy adherence, reduce anxiety related to the dental setting, and promote effective information sharing in the decision-making process⁴. Also, it is presented that among healthcare professionals, the higher the score of empathic concern and perspective-taking, the less the depersonalization related to burnout, and the higher the personal accomplishment scores⁵.

More than recognizing the essentiality of empathy for healthcare workers and patients, it is important to highlight potential sociodemographic and undergraduate-related factors that may build the background of empathy in students⁶. One of the most evaluated demographic factors is gender, despite studies showing conflicting results. On a hand, studies showed that females are likely to score higher than males in empathy, including among dental students^{1,7-9}. On the other hand, some studies have observed the absence of an association with gender in global empathy scores^{10,11} or even higher levels of empathy in men than women⁸.

In turn, other sociodemographic factors received less attention in the current literature. Even spite there is robust evidence about the impact of socioeconomic status on health¹², lower is the understanding of the impacts of sociodemographic characteristics on levels of empathy and other types of pro-social behaviors. For instance, race has been observed as a non-significant predictor of empathy in a study conducted with American dental students – probably due to the high prevalence of whites in the sample⁷. In another study conducted in Saudi Arabia, there was an observed increase in scores of empathy with the increase in parental educational levels and monthly family income, although non-statistically significant⁹. However, family income, occupational status, employment status, educational level, and being

part of a racial minority could impact the consolidation of cultural identities that shape the way people think, feel, and act when faced with difficult situations¹³.

In addition, regarding the influence of undergraduate-related factors, the relationship between students' years at dental school⁸, the phase of training^{1,11}, and empathy is still uncertain. Some studies pointed out that empathy in early-year students was significantly higher in students in advanced years than students in initial years⁷, and others showed the opposite association⁹. Also, in recent studies conducted in Germany¹⁴, Thailand¹¹, and Nigeria¹⁵ no differences were found in empathy scores between students' years and phases of training. Also, factors such as satisfaction with undergraduate studies and work⁶, academic performance⁹, and future career plans¹⁶ may be relevant to students' empathy, although being less investigated in the literature.

Regarding the Brazilian context, many studies concentrate the investigation on medical students' empathy^{17,18}. Considering Brazilian dental students, only one study was found in the current literature in which, in a sample of students and health professionals, women scored higher in the fantasy domain than men, and, age was negatively correlated with global empathy, personal distress, and fantasy domains, and positively correlated with the perspective-taking domain¹⁰. In this way, there is an important unclarity in the current literature regarding sociodemographic and undergraduate-related factors that may act as predictors of dental students' empathy. Also, no studies have evaluated socioeconomic and racial factors as influential on Brazilian dental students' empathy - a fundamental point considering the expansion of this field of study in middle- and low-income countries with important social inequalities. The study of individual characteristics associated with levels of empathy is key to fostering the development of empathy during dental professional training⁴. In this way, this study aimed to evaluate associations between students' sociodemographic and undergraduate-related characteristics and empathy scores among dental students in a school in Southern Brazil.

MATERIALS AND METHODS

The reporting of this study followed the Consensus-Based Checklist for Reporting of Survey Studies (CROSS)¹⁹ and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement²⁰. This study was pre-

registered in the Open Science Framework (OSF) platform under the domain <https://osf.io/q94dh/>.

Study design and setting

This study was designed as a cross-sectional observational study developed from self-administered online questionnaires directed to undergraduate dental students of the Federal University of Pelotas (UFPEl) a century-old institution located in South Brazil. Pelotas is a university city located near the Brazilian border with Uruguay that has approximately 325,000 inhabitants and a Human Development Index of 0.739²¹. Besides being a country with continental dimensions, Brazil has a high concentration of dental professionals and dental schools²².

Ethical concerns

This study was submitted to the Research Ethics Committee of the School of Dentistry, UFPEl, and was approved on August 15, 2022, under protocol #5.583.075. The research participants were considered volunteers and, due to the cross-sectional character of this study, the anonymity of the participants was guaranteed. Also, to participate in this study the student should read the consent form presented on the first page of the online form and select the option "I agree to participate". The principles of the Declaration of Helsinki were followed.

Participants and sample size

Undergraduate students regularly enrolled between the 4th and 10th semester of the bachelor's degree in dentistry at UFPEl were selected. Students between the 1st and 3rd semesters were excluded due to the absence of continuous clinical contact with patients.

Considering institutional data on student admission up to the first academic semester of 2022, approximately 300 students were enrolled between the 4th and 10th semesters²³. Considering an unknown prevalence of 50% for the variables of interest, a confidence interval of 95%, and 5 percentage points more or less, a sample of 169 undergraduate students would be required. Study sample calculation was performed on the OpenEpi web app²⁴.

Questionnaire development, content, and pre-testing

The questionnaire was composed of four distinct sessions, with 82 mandatory, closed items. In session A, were presented 12 sociodemographic and undergraduate-related items. Among the characteristics collected were: student's gender (male, female, or other), race or ethnicity (white, black, brown, indigenous, or yellow)²⁵, age (list between 16 and 60 years), undergraduate semester considering alternatives from 1st to 10th semester - which acted as a filter question for students from non-eligible semesters, family income in 2022 Brazilian minimum wages (~US\$ 113) (less than 1 minimum wage, 1 to 2 minimum wages, 2 to 5 minimum wages, 5 to 10 minimum wages, more than 10 minimum wages)²⁶, maternal education (illiterate, incomplete elementary education, complete elementary education, incomplete high school education, complete high school education, undergraduate incomplete, or undergraduate complete)²⁶, modalities of admission at UFPel according to the Brazilian Quotas Law²⁷, marital status (single, married, divorced, or widowed)²⁵, occupation status (student only or student and worker), satisfaction with the dentistry course (very satisfied to very dissatisfied), future career plan (private dental practice, public dental practice, hospital, military forces, research/teaching, or other), and how students had access to the questionnaire (Email, Instagram/Facebook, or WhatsApp).

The following section of the questionnaire presented the Interpersonal Reactivity Index (IRI). The IRI is an instrument used to measure dispositional empathy and is composed of four seven-item subscales: perspective-taking, fantasy, empathic concern, and personal distress². These subscales present different facets of empathy but correlate to building a multidimensional construct². The perspective-taking subscale considers the ability to put into someone else's shoes, adopting their point of view in everyday life situations². Similarly, the fantasy subscale measures the ability to imaginatively recognize oneself in the position of a character in fictional situations, such as in movies and plays². The empathic concern domain refers to the ability to be concerned and compassionate, and personal distress refers to the ability to feel discomfort or anxiety facing someone else going through a negative experience². The 26-item version validated for use in Brazil, which achieved a Cronbach alpha of 0.861²⁸, was applied in this study. For each sentence, the participant could respond through a Likert scale of five points, which will vary from 1 "does not describe me well" to 5 "describes me very well"^{10,28}. In brief, the higher the score obtained in each subscale, the higher the global level of dispositional empathy². The remaining sections

of the form had 26 items about communication and 18 items addressing patient-centered care that will not be addressed here.

The questionnaire was hosted in the Google Forms platform (Google Inc., USA) and was pre-tested in a sample of 10 dental students previously selected who did not make up the final sample of the study. The pre-test was carried out through a group created in the chat application WhatsApp® (Meta Inc., USA) on 26 August 2022 for 12 hours (10 a.m. to 10 p.m.). The estimated mean pre-test response time was 11.6 minutes (S.D. 2.8 minutes). Among the changes made in the organization of the form, it can be highlighted the insertion of a progress bar and the randomization of questions to reduce potential item ordering bias.

Recruitment of participants and questionnaire administration

Using the Google Forms platform, the questionnaire was applied from September 13, 2022, to October 7, 2022, around three weeks. To contact the dental students, the link was sent by classes' e-mail through the education committee of the UFPel School of Dentistry. In addition, the form link was spread in groups of classes in WhatsApp® (Meta Inc., USA) and a Facebook group of the Faculty of Dentistry (Faculty of Dentistry UFPel - about 1.1 thousand members). The social network Instagram® (Kevin Systrom, Mike Krieger; Burbn, Inc., Meta Inc., USA) was also used, through the research's profile (@odontistaempatico_rs). During the application, the "snowball" sharing strategy was encouraged among the participants. Messages and publications with the invitation to the research and link to the study were sent at regular intervals of 48 hours during the application of the questionnaires in the three ways of spread (Instagram/Facebook, WhatsApp, or Email).

Data management, variables of interest, and statistical analysis

After the data collection stage was completed, the information collected was imported into Microsoft Excel 2016 software (Microsoft, Redmond, Washington, USA).

The outcome variable was the total scores obtained in the IRI scale, as well as the scores obtained in the four subscales: perspective-taking, fantasy, empathic concern, and personal distress. The scores were summarized considering the mean by item (range from 1 to 5) and, for descriptive purposes, using the mean of the total score for students (range from 26 to 130). Response alternatives "Prefer not to answer" and "Not applicable" were considered missing data and excluded. If any respondent

marked the alternative "I prefer not to answer" in any of the component items of any of the subscales, the data was considered missing for the subscale and overall score of the scale.

The exposure variables were considered sociodemographic characteristics and undergraduate-related characteristics of respondents. To improve data presentation, some sociodemographic variables were recategorized. The variable age was categorized considering the median and quartiles observed. Also, the variable "undergraduate cycle" was developed from the categorization of graduation semesters, considering the laboratory cycle (4th semester to the 7th semester) and clinical cycle (8th semester to the 10th semester). In addition, the variable "Admission modality" had its category "Social quotas" obtained from the junction of the L1 and L5 quotas, and the category "Racial quotas" obtained from the junction of the L2 and L6 quota categories. The variable "maternal education" was recategorized with the category of "up to 8 years of study" representing illiterate mothers, with complete or incomplete elementary education, "9 to 12 years" for mothers with complete or incomplete high school education, and "13 years or more" for mothers who reached undergraduate or graduate levels.

For categorical sociodemographic and undergraduate-related variables, absolute and relative frequencies were obtained considering confidence intervals of 95%. Distribution and central tendency measures – mean, median, standard deviation, and quartiles, were obtained from the IRI scale and subscales by item and by dental students. To assess the association between sociodemographic and undergraduate-related variables and scores of the IRI scale and subscales by item, linear regression models with robust residual standard errors were used. The linear regression model with robust residual standard errors was used based on the heteroskedasticity of residuals observed in models of simple linear regression first developed in this study²⁹. Multivariable analyses were performed regarding the insertion of variables with p-value ≤ 0.250 in the final model. The p-value of 0.05 was used to indicate statistical significance. All analyses were performed in RStudio software version 4.1.3 (Posit Software, PBC formerly RStudio, Massachusetts, USA), using the packages dplyr³⁰, psych³¹, DescTools³², Hmisc³³, pacman³⁴, foreign³⁵, MASS³⁶, and robustbase³⁷.

RESULTS

During data collection, 92 entries were received. Five entries were excluded due to participants attending non-eligible undergraduate semesters. A total of 87 students completed the questionnaire and were included in this study, with an estimated response rate of 24.4%. The form was accessed mainly by WhatsApp (76.7%) and 14% had access through research Instagram profile. Approximately three-quarters of the respondents were in the laboratory undergraduate cycle (Table 1).

The majority of the sample declared themselves to be women, with white skin color, and aged between 23 and 25 (Table 1). Also, 40.7% of students come from families with a monthly income between two and five Brazilian minimum wages, and 56.3% were children of highly educated mothers. Furthermore, 61.6% of students did not work besides studying full-time. Regarding undergraduate-related variables, students included in the sample were admitted into higher education mainly through social quotas (45.9%), and about 60% reported being very satisfied or satisfied with undergraduate studies. In addition, 47.6% reported working in private dental offices or clinics as their further career plan (Table 1).

Table 1. Absolute (n) frequencies. relative (%) frequencies and 95% confidence intervals (95%CI) of sociodemographic variables and variables related to undergraduate dental education of students (n=87).

Variable/Category	Dental students		
	n	%	95%CI
Gender	86		
Men	29	33.7%	24.6%-44.2%
Women	57	66.3%	55.8%-75.4%
Skin color	87		
Whites	78	89.6%	81.5%-94.5%
Blacks, Browns, and Indigenous	9	10.4%	5.5%-18.5%
Age	87		
18 to 22 years old	30	34.5%	25.3%-44.9%
23 to 25 years old	40	46.0%	35.9%-56.4%
26 to 30 years old	14	16.1%	9.8%-25.2%
30 to 40 years old	3	3.4%	1.2%-9.6%
Family income	81		
<1 minimum wage	3	3.7%	1.3%-10.3%
1 to 2 minimum wages	14	17.3%	10.6%-26.9%
2 to 5 minimum wages	33	40.7%	30.7%-51.6%
5 to 10 minimum wages	18	22.2%	14.5%-32.4%
<10 minimum wages	13	16.0%	9.6%-25.5%

Variable/Category	Dental students		
	n	%	95%CI
Maternal education	87		
Up to 8 years	10	11.5%	6.4%-19.8%
9 to 12 years	28	32.2%	23.3%-42.6%
13 years or more	49	56.3%	45.8%-66.2%
Admission modality	85		
Without cotes	37	43.5%	33.5%-54.1%
Social cotes	39	45.9%	35.7%-56.4%
Racial cotes	9	10.6%	5.7%-18.9%
Undergraduate cycle	87		
Laboratorial	65	74.7%	64.7%-82.6%
Clinical	22	25.3%	17.3%-35.3%
Satisfaction with undergraduate studies	87		
Very satisfied	10	11.5%	6.4%-19.9%
Satisfied	44	50.6%	40.3%-60.8%
Indifferent	8	9.2%	4.7%-17.1%
Dissatisfied	23	26.4%	18.3%-36.5%
Very dissatisfied	2	2.3%	0.6%-7.9%
Plans for work	80		
Private dental practice (clinics or offices)	38	47.6%	36.9%-58.3%
Public dental practice (primary health care)	11	13.7%	7.8%-22.9%
Hospital	10	12.5%	6.9%-21.5%
Military forces	11	13.7%	7.8%-22.9%
Research or Teaching	10	12.5%	6.9%-21.5%
Besides studying full-time, do you also work?	86		
No, I do not	53	61.6%	51.1%-71.2%
Yes, I do	33	38.4%	28.8%-48.9%

Note. Differences between the number of observations for each variable and the number of participants are due to the missing data.

Table 2 shows the descriptive analysis of the IRI scale and subscales scores summarized by item and by dental students. Considering the total IRI score, a mean of 3.62 (SD=0.34) by item and a mean score by dental students of 94.07 (SD=16.62) were observed. Regarding dental students, in the IRI scale minimum score observed was 54 and the maximum was 124 (*data not shown*).

Considering associations between the student characteristics and the average IRI score by item, it was observed that being a woman raised statistically significant by approximately 0.50 points the empathy score (Table 3). This association was held after statistical adjustment. The other variables showed no crude or adjusted associations with IRI total score (Table 3).

Table 2. Mean (M), standard deviation (SD), median (Mdn), and percentiles of IRI scores obtained by item and by dental students.

Scores obtained by item and by dental students.					
Variable	n	Item			
		M(SD)	Mdn	25 th percentile	75 th percentile
IRI					
Total	76	3.62 (0.64)	3.73	3.19	4.08
Perspective-taking	79	4.17 (0.78)	4.50	3.75	4.83
Fantasy	79	3.44 (0.86)	3.57	2.86	4.00
Empathic concern	80	4.13 (0.79)	4.29	3.71	4.86
Personal distress	85	2.66 (1.03)	2.50	1.83	3.33
Dental students					
Variable	n	M(SD)	Mdn	25 th percentile	75 th percentile
IRI					
Total (/130)	76	94.07 (16.62)	97.00	83.00	106.00
Perspective-taking (/30)	79	25.03 (4.69)	27.00	22.50	29.00
Fantasy (/35)	79	24.06 (6.03)	25.00	20.00	28.00
Empathic concern (/35)	80	28.90 (5.52)	30.00	26.00	34.00
Personal distress (/30)	85	15.98 (6.18)	15.00	11.00	20.00

Note. Differences between the number of observations for each variable and the number of participants are due to the missing data.

Regarding the subscales, in the Perspective-taking, bivariate and multivariable analysis observed a statistically significant reduction in the score for students that came from families with more than five Brazilian minimum wages of income in comparison to families with less than two minimum wages of income (Table 4).

In the Fantasy subscale, statistically significant reductions were observed with the increase of age and among students with family incomes of 2 to 5 minimum wages compared to students with lower income (Table 5). An increase in Fantasy scores was observed among students with dissatisfaction with undergraduate studies (Table 5). However, these associations were not maintained in the final adjusted model (Table 5).

In the domain of Empathic concern, adjusted associations with gender and skin color were found. For women, an increase in the score was observed in comparison to men, and, for blacks, browns, and indigenous reduction in the score was noted in comparison to whites (Table 6). Similarly, in the personal distress domain, being a woman increased the score in comparison to being a man in both crude and adjusted analysis (Table 7).

Table 3. Crude and adjusted associations between sociodemographic, undergraduate-related variables and total IRI mean score obtained by item. Coefficients and 95% confidence intervals (95% CI).

Characteristics of respondents	IRI means score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Gender Men Women <i>R</i>²=0.115	- 0.508 (0.197 to 0.819)	=0.001	- 0.505 (0.187 to 0.823)	=0.002
Skin color Whites Blacks, Browns, and Indigenous <i>R</i>²=0.025	- 0.402 (-0.055 to 0.861)	=0.084	- -0.237 (-0.657 to 0.182)	=0.262
Age <i>R</i>²=-0.009	0.013 (-0.040 to 0.067)	=0.627	-	-
Family income <2 minimum wages 2 to 5 minimum wages >5 minimum wages <i>R</i>²=0.016	- -0.328 (-0.689 to 0.031) -0.280 (-0.669 to 0.108)	=0.072 =0.154	- -0.197 (-0.570 to 0.176) -0.235 (-0.677 to 0.206)	=0.294 =0.290
Maternal education Up to 8 years 9 to 12 years 13 years or more <i>R</i>²=-0.024	- 0.091 (-0.305 to 0.488) 0.031 (-0.326 to 0.388)	=0.648 =0.862	- - -	- - -
Admission modality Without cotes Social cotes Racial cotes <i>R</i>²=0.015	- -0.080 (-0.399 to 0.237) 0.366 (-0.088 to 0.821)	=0.113 =0.614	-0.126 (-0.492 to 0.239) 0.487 (-0.091 to 1.065)	=0.493 =0.097

Characteristics of respondents	IRI means score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Undergraduate cycle Laboratorial Clinical <i>R</i>²=-0.009	- 0.089 (-0.242 to 0.421)	=0.593	- -	- -
Satisfaction with undergraduate studies Very satisfied or Satisfied Indifferent, very dissatisfied, or dissatisfied <i>R</i>²=0.006	- 0.179 (-0.111 to 0.470)	=0.223	- 0.147 (-0.146 to 0.441)	=0.319
Plans for work Private dental practice (clinics or offices) Public dental practice (primary health care) Hospital Military forces Research or Teaching <i>R</i>²=-0.037	- 0.238 (-0.381 to 0.858) 0.141 (-0.222 to 0.506) -0.061 (-0.581 to 0.457) 0.043 (-0.340 to 0.426)	=0.445 =0.440 =0.813 =0.823	- - - -	

Note. Multivariable Linear Regression Models with robust residual standard errors: For inclusion in the final model the p -value ≤ 0.250 was required. The final p -value considered was 0.05. ^a AdjR₂(final model) = 0.155.

Table 4. Crude and adjusted associations between sociodemographic, undergraduate-related variables and Perspective-taking domain mean score obtained by item. Coefficients and 95% confidence intervals (95% CI).

Characteristics of respondents	Perspective-taking domain mean score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Gender Men Women <i>R</i>²=0.018	- 0.290 (-0.166 to 0.747)	 <i>p</i> =0.210	- 0.420 (-0.134 to 0.975)	 <i>p</i> =0.135
Skin color Whites Blacks, Browns, and Indigenous <i>R</i>²=-0.012	- 0.064 (-0.483 to 0.613)	 <i>p</i> =0.814	- -	
Age <i>R</i>²=0.004	0.033 (-0.005 to 0.072)	<i>p</i> =0.088	0.039 (-0.017 to 0.096)	<i>p</i> =0.166
Family income <2 minimum wages 2 to 5 minimum wages >5 minimum wages <i>R</i>²=0.031	- -0.407 (-0.797 to -0.017) -0.467 (-0.891 to -0.043)	 <i>p</i> =0.041 <i>p</i> =0.031	- -0.309 (-0.754 to 0.135) -0.424 (-0.843 to -0.005)	 <i>p</i> =0.169 <i>p</i> =0.047
Maternal education Up to 8 years 9 to 12 years 13 years or more <i>R</i>²=-0.026	- -0.018 (-0.648 to 0.611) 0.007 (-0.512 to 0.528)	 <i>p</i> =0.954 <i>p</i> =0.976	- - -	
Admission modality Without cotes Social cotes Racial cotes <i>R</i>²=-0.016	- -0.128 (-0.505 to 0.247) 0.086 (-0.509 to 0.681)	 <i>p</i> =0.497 <i>p</i> =0.774	- - -	

Characteristics of respondents	Perspective-taking domain mean score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Undergraduate cycle Laboratorial Clinical <i>R</i>²=0.016	- -0.295 (-0.748 to 0.157)	<i>p</i> =0.197	- -0.502 (-1.204 to 0.199)	<i>p</i> =0.157
Satisfaction with undergraduate studies Very satisfied or Satisfied Indifferent, very dissatisfied, or dissatisfied <i>R</i>²=-0.011	- 0.049 (-0.346 to 0.445)	<i>p</i> =0.803	- -	
Plans for work Private dental practice (clinics or offices) Public dental practice (primary health care) Hospital Military forces Research or Teaching <i>R</i>²=0.0001	- -0.132 (-0.706 to 0.442) -0.346 (-1.176 to 0.483) -0.109 (-0.673 to 0.453) -0.427 (-1.052 to 0.197)	<i>p</i> =0.648 <i>p</i> =0.408 <i>p</i> =0.698 <i>p</i> =0.177	- 0.180 (-0.526 to 0.887) -0.212 (-0.888 to 0.463) 0.234 (-0.332 to 0.800) -0.051 (-0.771 to 0.668)	<i>p</i> =0.611 <i>p</i> =0.531 <i>p</i> =0.411 <i>p</i> =0.886

Note. Multivariable Linear Regression Models with robust residual standard errors: For inclusion in the final model the *p*-value ≤ 0.250 was required. The final *p*-value considered was 0.05. ^a Adj*R*₂(final model) = 0.023.

Table 5. Crude and adjusted associations between sociodemographic, undergraduate-related variables and Fantasy domain mean score obtained by item. Coefficients and 95% confidence intervals (95% CI).

Characteristics of respondents	Fantasy domain mean score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Gender Men Women <i>R</i>²=0.010	- 0.282 (-0.162 to 0.727)	=0.210	- 0.175 (-0.292 to 0.644)	=0.455
Skin color Whites Blacks, Browns, and Indigenous <i>R</i>²=0.013	- 0.465 (-0.101 to 1.033)	=0.106	- 0.219 (-0.324 to 0.763)	=0.422
Age <i>R</i>²=-0.023	-0.052 (-0.101 to -0.004)	=0.032	-0.043 (-0.088 to 0.002)	=0.061
Family income <2 minimum wages 2 to 5 minimum wages >5 minimum wages <i>R</i>²=0.017	- -0.456 (-0.899 to -0.012) -0.239 (-0.759 to 0.279)	=0.043 =0.360	- -0.458 (-0.931 to 0.014) -0.340 (-0.880 to 0.199)	=0.057 =0.212
Maternal education Up to 8 years 9 to 12 years 13 years or more <i>R</i>²=-0.001	- 0.249 (-0.240 to 0.738) -0.049 (-0.497 to 0.397)	=0.314 =0.826	- - -	

Characteristics of respondents	Fantasy domain mean score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Admission modality Without cotes Social cotes Racial cotes <i>R</i>²=-0.015	- 0.046 (-0.401 to 0.494) 0.309 (-0.304 to 0.923)	=0.836 =0.319	- - -	
Undergraduate cycle Laboratorial Clinical <i>R</i>²=-0.006	- 0.155 (-0.260 to 0.570)	=0.459	- -	
Satisfaction with undergraduate studies Very satisfied or Satisfied Indifferent, very dissatisfied, or dissatisfied <i>R</i>²=0.048	- 0.440 (0.027 to 0.853)	=0.036	- 0.204 (-0.289 to 0.699)	=0.410
Plans for work Private dental practice (clinics or offices) Public dental practice (primary health care) Hospital Military forces Research or Teaching <i>R</i>²=-0.006	- 0.220 (-0.478 to 0.919) 0.313 (-0.294 to 0.920) -0.243 (-0.894 to 0.407) 0.346 (-0.127 to 0.820)	=0.531 =0.307 =0.457 =0.149	- 0.080 (-0.673 to 0.834) 0.248 (-0.338 to 0.836) -0.169 (-0.798 to 0.460) 0.227 (-0.346 to 0.801)	=0.831 =0.399 =0.592 =0.431

Note. Multivariable Linear Regression Models with robust residual standard errors: For inclusion in the final model the *p*-value ≤ 0.250 was required. The final *p*-value considered was 0.05. ^a AdjR²(final model) = 0.022.

Table 6. Crude and adjusted associations between sociodemographic, undergraduate-related variables and Empathic concern domain mean score obtained by item. Coefficients and 95% confidence intervals (95% CI).

Characteristics of respondents	Empathic concern domain mean score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Gender Men Women <i>R</i>²=0.117	- 0.538 (0.198 to 0.878)	<i>p</i> =0.002	- 0.494 (0.168 to 0.819)	<i>p</i> =0.003
Skin color Whites Blacks, Browns, and Indigenous <i>R</i>²=0.002	- 0.269 (-0.074 to 0.612)	<i>p</i> =0.123	- -0.361 (-0.702 to -0.019)	<i>p</i> =0.038
Age <i>R</i>²=0.005	0.032 (-0.024 to 0.090)	<i>p</i> =0.258	-	
Family income <2 minimum wages 2 to 5 minimum wages >5 minimum wages <i>R</i>²=-0.009	- -0.204 (-0.604 to 0.194) -0.253 (-0.667 to 0.159)	<i>p</i> =0.309 <i>p</i> =0.225	- -0.114 (-0.522 to 0.292) -0.274 (-0.714 to 0.166)	<i>p</i> =0.574 <i>p</i> =0.218
Maternal education Up to 8 years 9 to 12 years 13 years or more <i>R</i>²=-0.018	- 0.192 (-0.325 to 0.710) 0.101 (-0.391 to 0.594)	<i>p</i> =0.461 <i>p</i> =0.683	- - -	
Admission modality Without cotes Social cotes Racial cotes <i>R</i>²=0.029	- -0.257 (-0.623 to 0.109) 0.167 (-0.180 to 0.516)	<i>p</i> =0.166 <i>p</i> =0.340	- -0.284 (-0.655 to 0.086) 0.470 (-0.035 to 0.976)	<i>p</i> =0.130 <i>p</i> =0.067

Characteristics of respondents	Empathic concern domain mean score by item			
	Crude	<i>p-value</i>	Adjusted ^a	<i>p-value</i>
	Coefficient (95%CI)		Coefficient (95%CI)	
Undergraduate cycle Laboratorial Clinical <i>R</i>²=-0.012	- 0.030 (-0.386 to 0.447)	<i>p</i> =0.885	- -	
Satisfaction with undergraduate studies Very satisfied or Satisfied Indifferent, very dissatisfied, or dissatisfied <i>R</i>²=0.029	- 0.290 (-0.037 to 0.618)	<i>p</i> =0.081	- 0.263 (-0.048 to 0.575)	<i>p</i> =0.096
Plans for work Private dental practice (clinics or offices) Public dental practice (primary health care) Hospital Military forces Research or Teaching <i>R</i>²=-0.019	- 0.267 (-0.212 to 0.747) 0.258 (-0.249 to 0.767) 0.219 (-0.225 to 0.663) -0.069 (-0.499 to 0.360)	<i>p</i> =0.269 <i>p</i> =0.313 <i>p</i> =0.329 <i>p</i> =0.748	- - - -	

Note. Multivariable Linear Regression Models with robust residual standard errors: For inclusion in the final model the *p*-value ≤ 0.250 was required. The final *p*-value considered was 0.05. ^a AdjR²(final model) = 0.147

Table 7. Crude and adjusted associations between sociodemographic, undergraduate-related variables and Personal distress domain mean score obtained by item. Coefficients and 95% confidence intervals (95% CI).

Characteristics of respondents	Personal distress domain mean score by item			
	Crude	<i>p</i> -value	Adjusted ^a	<i>p</i> -value
	Coefficient (95%CI)		Coefficient (95%CI)	
Gender				
Men	-		-	
Women	0.961 (0.550 to 1.372)	<i>p</i> <0.001	0.822 (0.329 to 1.315)	<i>p</i> =0.001
<i>R</i>²=0.185				
Skin color				
Whites	-		-	
Blacks, Browns, and Indigenous	0.472 (-0.360 to 1.304)	<i>p</i> =0.262	-	
<i>R</i>²=0.006				
Age	0.004 (-0.132 to 0.140)	<i>p</i> =0.953	-	
<i>R</i>²=-0.011				
Family income				
<2 minimum wages	-		-	
2 to 5 minimum wages	-0.206 (-0.948 to 0.536)	<i>p</i> =0.582	0.185 (-0.473 to 0.845)	<i>p</i> =0.575
>5 minimum wages	-0.428 (-1.124 to 0.266)	<i>p</i> =0.223	-0.260 (-0.720 to 0.199)	<i>p</i> =0.261
<i>R</i>²=-0.001				
Maternal education				
Up to 8 years	-		-	
9 to 12 years	-0.139 (-0.803 to 0.523)	<i>p</i> =0.676	-	
13 years or more	0.004 (-0.581 to 0.591)	<i>p</i> =0.987	-	
<i>R</i>²=-0.020				
Admission modality				
Without cotes	-		-	
Social cotes	0.158 (-0.323 to 0.639)	<i>p</i> =0.515	-	
Racial cotes	0.106 (-0.928 to 1.142)	<i>p</i> =0.838	-	
<i>R</i>²=-0.019				

Characteristics of respondents	Personal distress domain mean score by item			
	Crude	<i>p</i> -value	Adjusted ^a	<i>p</i> -value
	Coefficient (95%CI)		Coefficient (95%CI)	
Undergraduate cycle Laboratorial Clinical <i>R</i>²=-0.004	- 0.205 (-0.346 to 0.757)	<i>p</i> =0.461	- -	
Satisfaction with undergraduate studies Very satisfied or Satisfied Indifferent, very dissatisfied, or dissatisfied <i>R</i>²=-0.008	- -0.119 (-0.567 to 0.327)	<i>p</i> =0.596	- -	
Plans for work Private dental practice (clinics or offices) Public dental practice (primary health care) Hospital Military forces Research or Teaching <i>R</i>²=0.030	- 0.515 (-0.363 to 1.395) 0.252 (-0.260 to 0.766) -0.527 (-1.079 to 0.024) 0.275 (-0.513 to 1.064)	 <i>p</i> =0.246 <i>p</i> =0.329 <i>p</i> =0.060 <i>p</i> =0.488	- 0.021 (-0.883 to 0.926) 0.107 (-0.472 to 0.687) -0.460 (-0.992 to 0.070) 0.162 (-0.472 to 0.798)	 <i>p</i> =0.962 <i>p</i> =0.712 <i>p</i> =0.088 <i>p</i> =0.610

Note. Multivariable Linear Regression Models with robust residual standard errors: For inclusion in the final model the *p*-value ≤ 0.250 was required. The final *p*-value considered was 0.05. ^a AdjR2_(final model) = 0.168

DISCUSSION

This study assessed sociodemographic and undergraduate-related predictors for empathy levels among students at a dental school in Southern Brazil. It was observed that for the overall IRI score, as well as empathic concern and personal distress domains, being a woman was a statistically significant predictor of high empathy scores. Also, considering the empathic concern domain, a reduction in the score was observed for self-declared black, brown, and indigenous students compared to white students. In the perspective-taking subscale, statistically significant reductions in scores were observed for students who came from families with monthly income equal to or higher than five minimum wages compared to poorer families. The Fantasy domain was the only one that showed no associations in the adjusted model, being observed in the bivariate analysis reduced score with an increase in age and monthly family income, and with dissatisfaction with undergraduate studies.

The dental office is an anxiogenic environment for a significant portion of patients. At the dental consultation – even for patients without dental fear or anxiety, communication will be the first and crucial way to develop a professional, confident, and empathic relationship between patients and the dental team³⁸. In Brazil, a country with a large population of dental professionals and dental schools²², the Brazilian National Curriculum Guidelines for graduate studies in dentistry states that the dentist trained must have communication skills that aim at empathic interaction with patients, families, communities, and other health professionals³⁹. Nonetheless, worldwide and specifically in Brazil, contemporaneous dentistry still is mostly focused on a biomedical model, which includes student- and professional-centered care⁴. Fortunately, research on empathy among dental students is increasing. Particularly, it was noted that the average empathy score, as well as the fantasy and empathic concern scores obtained, were similar to a previous study conducted in a metropolis in Southern Brazil¹⁰. Also, the scores observed in IRI domains were higher than in other studies conducted with Finland⁴⁰ and German¹⁴ dental students, and in India⁶ with dental interns and post-graduate dental students.

An important predictor of empathy noted was gender, which reinforces the findings of previous studies with dental students using the IRI instrument^{6,40}. In addition, women demonstrate higher punctuation than men in empathic concern and personal distress domains – affective components of empathy related to emotional

responsiveness in difficult situations². Similarly, a study conducted at the University of Oulu, Finland, with first-year medical and dental students observed that females scored higher than males in fantasy, empathic concern, and personal distress subscales⁴⁰. Also, a longitudinal study developed with a sample of Indian medical students showed that reductions in levels of empathy were present for both sexes, but females showed less marked reductions than men⁴¹. These results are probably the consequence of gender stereotypes established early in life, which determines the way to express and behave of both genders. In this way, gender also appears to be influential in training patterns and intended future practice in dentistry⁴². For instance, a qualitative study conducted with Brazilian dental students observed that the reasoning to stay in healthcare was related to caring and being sociable with people and having formal employment among women, while for men the main motivation was profits and business opportunities and being self-employed⁴².

Students who self-declared as black, brown, and indigenous compared to white students presented statistically significant lower empathic concern scores – which can represent an impact of discrimination increasing psychosocial stress⁴³. There is robust evidence to support that exposure to discrimination leads to important impairment in individuals' mental and physical health, as well as the establishment and maintenance of inequalities⁴⁴. In this way, the experience of social discrimination and early adversity might have the potential to influence empathetic engagement⁴³.

Considering the cognitive dimension of empathy measured through the fantasy and perspective-taking subscales, reductions in scores were observed considering the increase in family income, although the association remained in multivariate analysis only for the perspective-taking domain. Despite the uncertainty about the impact of family income on empathy levels, some evidence considers that individuals who come from low-income, working-class families are probably more empathetic than those from rich families, potentially due to using external or situational factors to explain events rather than individual factors, prejudice, and increased social engagement – which increase the awareness of other's emotions¹³. Accordingly, a study developed with a sample of Chinese adolescents observed that more altruistic behavior was observed among poor students than high-socioeconomic status students but the affective component of empathy probably was more involved than cognitive empathy⁴⁵.

Furthermore, this study did not find differences in empathy among stages of training and other undergraduate-related characteristics in multivariable analyses.

Only in the Fantasy subscale, in bivariate analysis, a statistically higher score was noted among those less satisfied with their studies. A cross-sectional study conducted with Indian dental interns and postgraduate students observed that satisfaction with work was a statistically significant predictor of the fantasy domain, increasing the likelihood of having fantasy scores higher than the median⁶. These differences in effect direction are possibly related to the quantitative and qualitative sample characteristics, which in this study was mostly composed of students from the laboratory cycle of studies. The laboratory cycle might represent the start of a student-patient relationship, being the students committed primarily to theoretical rather than clinical courses at this stage. Thus, the increase in the ability to fantasize about might be a response to a highly stressful schedule and reduced well-being in the academic dental environment. Regarding the stage of training, corroborating our findings, a previous study conducted among German dental students did not find statistical differences in IRI scores between students in the second and fourth year of studies¹⁴.

Despite the findings of this study, some limitations should be highlighted. Firstly, a relevant limitation of this study was to measure empathy in a self-administered form. Currently, there is no gold standard instrument to measure empathy in care students and professionals⁴⁶, as well as in the general population⁴⁷. Regarding the IRI instrument, a Brazilian study performed the validation for healthcare professionals and students¹⁰. In addition, many studies conducted with dental students used other instruments such as the Jefferson Scale of Physician Empathy^{7,8} and the Jefferson Scale of Empathy – Health Profession Students version,^{9,11,15} which makes it difficult to contextualize the findings because these instruments measure different theoretical constructs of empathy^{46,47}.

Moreover, a great challenge in surveys, especially among those conducted by email or social media platforms, is reaching an adequate sample size while maintaining the representativeness of the sample regarding the target population⁴⁸. Our survey was unable to reach the minimum sample size of 169 respondents estimated, although the sample included showed similarity with the characteristics of the students enrolled at the UFPel dental school²⁶. Potential reasons for the low response rate include the small target population, the potential exhaustion of respondents considering the number of online questionnaires applied in the context of the COVID-19 pandemic, and the number of items and subsequent response time⁴⁸. Finally, it was observed that the R^2 of bivariate and multivariate models was poorly explanatory, potentially by not

inserting other potentially relevant variables into student empathy - such as students' mental health, family and academic support, emotional intelligence, and academic performance^{6,41}.

Among the strengths of this study, it can be pointed out that this study was developed under a definition of empathy addressed in the scale used⁴. There is no universal definition of empathy, so it is important to understand the theoretical process behind the instrument applied. Also, another important point to emphasize is the study of empathy outside North America and Europe, which strengthens the knowledge about empathy across countries. To the best of our knowledge, this is the first study to assess levels of empathy and associated factors in a sample composed exclusively of Brazilian dental students. It is important to develop in students supportive behavior and empathy with patients, professors, and faculty staff to promote more inclusive and supportive environments that will contribute to the humanization of health services and healthcare¹.

CONCLUSION

The findings of this study suggest that there are significant differences in empathy scores among students, considering gender, skin color, family income, age, and degree of satisfaction with undergraduate studies. Considering the global measure of dispositional empathy (IRI) and cognitive responsiveness (personal distress and empathic concern), women had statistically higher empathy scores compared to men. In addition, the empathic concern score was predicted by students' skin color. Emotional responsiveness, regarding the perspective-taking score, was predicted by family income. In the fantasy domain, associations were observed only in bivariate analyses with age, family income, and dissatisfaction with undergraduate studies.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

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