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Affective and cognitive empathy among university students of the health field, exact sciences, and humanities: A cross-sectional study

Empatia afetiva e cognitiva entre estudantes universitários da saúde, exatas e humanas: um estudo transversal

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Abstract

Objective

The aim of the present study was to compare levels of affective and cognitive empathy among university students of the health field, exact sciences, and humanities.

Method

A cross-sectional study was conducted in an online format with the participation of 519 students of the health field, exact sciences, and humanities. Data collection involved the use of a sociodemographic questionnaire and the Multidimensional Interpersonal Reactivity Index.

Results

The female sex predominated the overall sample (74.4%). Statistically significant differences were found regarding total empathy as well as the affective and cognitive domains. Students of in the health field had the highest levels of total and affective empathy. Students of the exact sciences had higher levels of cognitive empathy compared to those in the health sciences and humanities.

Conclusion

In conclusion, students of the health sciences have higher levels of empathy and the affective domain, whereas those of the exact sciences have higher levels of cognitive empathy.

Keywords: Cross-sectional studies; Empathy; Social skills; Students, medical.

Resumo

Objetivo

Comparar os níveis de empatia afetiva e cognitiva entre estudantes universitárias das áreas da saúde, exatas e humanas foi o objetivo desse estudo.

Método

Trata-se de um estudo transversal realizado de forma on-line com a participação de 519 estudantes das humanas, saúde e exatas. Os dados foram coletados através de um questionário sociodemográfico e a Escala Multidimensional de Reatividade Interpessoal.

Resultados

Os estudantes eram predominantemente do sexo feminino (74,4%). Diferença estatisticamente significativa foram identificadas na comparação da empatia total e dos domínios afetivo e cognitivo. Os estudantes da saúde apresentam maiores níveis de empatia total e empatia afetiva. Enquanto o domínio cognitivo é apresentado em maiores níveis pelos estudantes das exatas comparado aos da saúde e humanas.

Conclusão

Conclui-se que os estudantes de saúde apresentam maiores níveis da empatia e do domínio afetivo, enquanto os estudantes das exatas apresentam maiores níveis da empatia cognitiva.

Palavras-chave: Estudos transversais; Empatia; Habilidades sociais; Estudantes de medicina.

Empathy is a social ability characterized by the capacity to understand, express, and place oneself in the position of others (Davis, 1980, 1983; Eisenberg & Strayer, 1990). This ability is a multidimensional construct that represents several aspects of behavior (Davis, 1980, 1983; Decety, 2010; Falcone et al., 2008), and is composed of affective and cognitive domains (Davis, 1980, 1983). Affective empathy is the capacity to experience emotions and feelings, whereas cognitive empathy enables one to understand the situation of another and communicate (Davis, 1980, 1983).

Empathy is an important social ability for students in the health field, exact sciences, and humanities (Nazar et al., 2020). The development of this ability is an important part of an education that enables students to exercise their future professions with greater humanization (Falcone, 2000). However, the educational process may or may not promote the development of this ability.

Education in the health field is characterized by the training of individuals who will participate in health promotion and disease prevention, thereby contributing to the quality of life of their patients (Cañas-Lerma et al., 2021). The humanities are directed at both practical knowledge and theory, and include courses related to social issues and human relations (Marcovitch, 2002). The exact sciences involve systematic learning, with a predominance of disciplines involving calculations and quantitative logical reasoning (Schulz, 2008; Carneiro et al., 2017; J. Walther et al., 2020). The curricular structure and the content studied during undergraduate courses may or may not contribute to the development and/or enhancement of empathy (Carmo et al., 2020; Haramati et al., 2017; Segal, 2011). However, regardless of the direction that these fields can give to students/professionals, it is important to highlight the need for the development of the ability of empathy among students (Cardoso et al., 2020; Santiago et al., 2020).

A literature review identified sociodemographic factors that contribute to higher levels of empathy, such as the female sex, a higher educational level, and an older age (Maximiano-Barreto et al., 2020). Empathy enables positive results, such as a stronger bond with patients and clients (Bolsoni-Silva et al., 2009), personal well-being (Brunero et al., 2010) and a better performance in one's professional life (Haramati et al., 2017; Moudatsou et al., 2020). However, some factors can lead to a reduction in levels of empathy during undergraduate education, such as high-class loads (Neumann et al., 2011) and an excess of extracurricular activities (Chen et al., 2007), which can result in fatigue (Brazeau et al., 2010), stress, and personal anguish (Lamothe et al., 2014).

The literature offers studies on empathy conducted with students in different fields (Carneiro et al., 2017; Maximiano-Barreto et al., 2020). One study conducted with students of nursing and law showed that nursing students have higher levels of empathy (S. E. Wilson et al., 2012). Another

study conducted with students of psychology and engineering found that psychology students have higher levels of empathy (Carneiro et al., 2017). Another study compared students of medicine, psychology, social service, physics, and engineering and found the lowest levels of empathy among students of the engineering course (Rasoal et al., 2012). Higher levels of affective empathy were found among students of the social sciences compared to engineering students (Myry & Helkama, 2001). However, no studies were identified in the literature that compared the affective and cognitive domains among university students.

The constant changes in the current scenario increasingly underscore the importance of the development of social abilities, especially with regard to the development of empathy among university students. Studies comparing levels of affective and cognitive empathy among students in different fields of knowledge are scarce. Therefore, the aim of the present study was to compare levels of empathy and its domains (affective and cognitive) among students of the health field, exact sciences, and humanities.

Due to the different characteristics of the courses, as described above, two hypotheses were considered: 1) Higher levels of empathy, especially the affective domain, would be found among students of the health field compared to those of the exact sciences and humanities; 2) Higher levels of cognitive empathy would be found among students of the exact sciences compared to those of the health field and humanities.

Methods

Participants

A quantitative cross-sectional study was conducted with a convenience sample of 519 university students in three major fields of knowledge: exact sciences ($n = 46$), humanities ($n = 265$), and health ($n = 208$). This study received approval from Research Ethics Committee of, under opinion number CAAE: 34122020.7.0000.5641, Tiradentes University Center. The participants were recruited through a public call on the social media of a private higher education institution located in northeastern Brazil.

Undergraduate students at the higher education institution were included in the study. Students less than 18 years of age were excluded.

Instrument

The Multidimensional Interpersonal Reactivity Index (MIRI) was developed by Davis (1983) to measure the level of empathy and is composed of 21 statements with five scored response options, for which one corresponds to “does not describe me well” and five corresponds to “describes me very well”. The MIRI enables a multidimensional assessment of general empathy as well as the cognitive and affective domains. Seven items (2, 5, 8, 11, 16, 19, 21) address the cognitive domain (e.g., “I sometimes find it difficult to see things from the ‘other guy’s point of view”). The other items address the affective domain (e.g., “When I see someone being taken advantage of, I feel protective toward them”). The total ranges from 21 to 105 points with higher scores denoting a higher level of empathy. In the present study, the version translated and adapted to the Brazilian context was used, which has satisfactory psychometric properties (Cronbach’s $\alpha = 0.75$) (Koller & Camino, 2001).

Procedures

Students were invited to participate through a public call on social media of the higher education institution. The “snowball” method was also used, by which students and professors voluntarily shared the link to the study with other students. Those who wished to participate completed a questionnaire on Google Forms addressing sociodemographic characteristics (sex, age, marital status, course, and others) and the MIRI. Prior to answering the questionnaire, all students had access to the informed consent statement, through which they agreed to participate. Data collection occurred between October 2020 and May 2021 and was strictly online.

Statistical Analysis

Sociodemographic data were expressed descriptively as a percentage, mean (\bar{x}), and standard deviation (σ). The Kolmogorov-Smirnov test was used to determine the normality of the data. As all data were nonparametric, the chi-squared test was used for categorical variables and the Kruskal-Wallis H test was used for the comparison of groups (exact sciences, health field, and humanities) regarding continuous variables. When the Kruskal-Wallis H test identified differences, pairwise comparisons were performed using the Mann-Whitney U test. Analysis of Covariance (ANCOVA) was performed to determine the permanence or absence of the level of empathy and its domains (cognitive and affective) in relation to the groups (exact sciences, health field, and humanities), controlling for sex. The Statistical Package for the Social Sciences (23.0) was used for the statistical analyses, with the level of significance set at 5% ($p \leq 0.05$).

Results

The sociodemographic characteristics of the overall sample and the three fields of knowledge (exact sciences, humanities, and health field) are displayed in Table 1. The female sex ($n = 386$) accounted for 74.4% of the overall sample. The mean age was 23.50 ± 6.24 years. Statistically significant differences among the groups were found with regard to age ($p < 0.001$), sex ($p < 0.001$), “with whom you live” ($p < 0.031$), family income ($p < 0.011$), and employment status ($p < 0.001$).

Table 1

Sociodemographic characterization of students in different fields of knowledge (exact sciences, humanities, and health field)

1 of 2

Variables	Total ($n = 519$)	Exact sciences ($n = 46$)	Humanities ($n = 265$)	Health ($n = 208$)	H/χ^2	p
Age (years) [\bar{x} (σ)]	23.50 (± 6.24)	22.46 (± 3.42)	24.48 (± 7.43) [†]	22.48 (± 4.68) [†]	7.023	< 0.001
Schooling (years) [\bar{x} (σ)]	11.78 (± 1.91)	11.65 (± 1.96)	11.91 (± 2.03)	11.64 (± 1.74)	4.066	0.131
Sex [% (n)]						
Male	25.6 (133)	67.4 (31)	20.8 (55)	22.6 (47)	46.401	< 0.001
Female	74.4 (386)	32.6 (15)	79.2 (210)	77.4 (161)		
Ethnicity/skin color [% (n)]						
White	44.7 (232)	28.3 (13)	45.7 (121)	47.1 (98)	5.619	0.060
Non-white	55.3 (287)	71.7 (33)	54.3 (144)	52.9 (110)		
Marital status [% (n)]						
Married	9.2 (48)	8.7 (4)	12.5 (33)	5.3 (11)	-	-
Not married	90.8 (471)	91.3 (42)	87.5 (232)	94.7 (197)		
With whom lives [% (n)]						
Family	59.7 (310)	67.4 (31)	63.8 (169)	52.9 (110)	6.976	< 0.031
Others	40.3 (209)	32.6 (15)	36.2 (96)	47.1 (98)		

Table 1

Sociodemographic characterization of students in different fields of knowledge (exact sciences, humanities, and health field)

2 of 2

Variables	Total (n = 519)	Exact sciences (n = 46)	Humanities (n = 265)	Health (n = 208)	H/ χ^2	p
Family income [% (n)]						
1 to 2 x mon. min. wage*	21.2 (110)	32.6 (15)	23.4 (32)	15.9 (33)	16.518	< 0.011
3 to 4 x mon. min. wage	34.5 (179)	28.3 (13)	37.4 (99)	32.2 (67)		
≥ 5 x mon. min. wage	20.6 (107)	17.4 (8)	21.1 (56)	20.7 (43)		
Does not know	23.7 (123)	21.7 (10)	18.1 (48)	31.2 (65)		
Works [% (n)]						
Yes	33.3 (173)	60.9 (28)	41.1 (109)	17.3 (36)	46.987	< 0.001
No	66.7 (346)	39.1 (18)	58.9 (156)	82.7 (172)		

Note: * Monthly minimum wage. †: comparison between groups using Mann-Whitney U test; \bar{x} : Mean. σ : Standard deviation. H: Kruskal-Wallis H test, χ^2 : chi-squared test. Test not performed - more than 20% of cells with $n < 5$.

The universe of the fields of knowledge of the students who participated in this study is presented in Table 2. In terms of the number of students, the field of knowledge with the greatest participation was the psychology course (32.2%; humanities), followed by medicine (19.3%; health) and civil engineering (5.4%, exact sciences).

Table 2

Different courses of students who participated in study

Variables/Courses	Students (n = 519)	
	n	%
Humanities [n = 265]		
Administration	4	0.8
Architecture and urbanism	24	4.6
Computer sciences	4	0.8
Accounting	14	2.7
Social communication	2	0.4
Interior design	8	1.5
Graphic design	2	0.4
Law	25	4.8
Psychology*	168	32.2
Publicity and advertising	4	1.0
Social service	9	1.7
Information system	1	0.2
Exact sciences [n = 46]		
Mechatronics engineering	8	1.5
Mechanical engineering	4	0.8
Civil engineering*	29	5.4
Petroleum engineering	1	0.2
Electrical engineering	3	0.6
Chemical engineering	1	0.2
Health [n = 208]		
Biomedicine	18	3.5
Physical education	1	0.2
Nursing	27	5.2
Pharmaceutical sciences	16	3.1
Physiotherapy	15	2.9
Medicine*	100	19.3
Nutrition	12	2.3
Dentistry	19	3.7

Note: * Courses with greatest participation per field of knowledge.

Table 3 displays the levels of empathy among the students of the three fields of knowledge (exact sciences, humanities, and health field). Statistically significant differences were found regarding total empathy ($p = 0.020$) as well as the affective ($p = 0.010$) and cognitive ($p = 0.004$) domains. Students of the health field had a higher level of empathy compared to those of the exact sciences and humanities ($p < 0.05$). This same group had a higher level of affective empathy compared to students of the exact sciences ($p < 0.05$). Students of the exact sciences had higher levels of cognitive empathy compared to those in the health sciences and humanities ($p < 0.05$). In the analysis adjusted for sex, students of the health field continued to have the highest levels of total empathy ($[F = 8.572; p = 0.004]$) and affective empathy ($[F = 9.665; p = 0.002]$), and students of the exact sciences continued to have the highest level of cognitive empathy ($[F = 7.882; p = 0.005]$).

Table 3

Comparison of total empathy and domains (affective and cognitive) among students of exact sciences, humanities, and health field

Variables	Total (n = 524)		Exact sciences (n = 46)		Humanities (n = 265)		Health (n = 208)		H	p
	\bar{x}	σ	\bar{x}	σ	\bar{x}	σ	\bar{x}	σ		
Total empathy	71.14	± 9.01	69.33	$\pm 9.97^{\dagger}$	70.42	$\pm 8.28^{\dagger}$	72.47	$\pm 9.54^{\dagger\dagger}$	7.790	< 0.020
Affective	47.92	± 7.60	46.30	$\pm 7.20^{\dagger}$	47.8	± 7.81	49.39	$\pm 10.12^{\dagger}$	9.216	< 0.010
Cognitive	24.66	± 3.75	26.39	$\pm 4.35^{\dagger\dagger}$	24.65	$\pm 3.86^{\dagger}$	24.29	$\pm 3.35^{\dagger}$	11.199	< 0.004

Note: \bar{x} : Mean; σ : Standard deviation. H: Kruskal-Wallis H test. † : Comparison between groups using Mann-Whitney U test.

Discussion

The findings of the present study confirm the initial hypotheses. We found that students of the health field have higher levels of empathy compared to those of the exact sciences and humanities. Regarding the specific domains of this ability, students of the health field have higher levels of affective empathy, whereas those of the exact sciences have higher levels of cognitive empathy.

Higher levels of empathy among university students in the health field has been identified in previous studies (Rasoal et al., 2012; S. E. Wilson et al., 2012). One study compared 282 students of the health field (i.e., nursing and pharmacy) and the humanities (i.e., law) and found that those of the health field had higher levels of empathy (S. E. Wilson et al., 2012). This result may be explained by the presence of disciplines directed toward humanized practices. Humanization is understood as attitudes and actions considering and respecting the needs of others through a comprehensive approach (Carmo et al., 2020). During their undergraduate studies, students of the health field have greater contact with such disciplines as well as the promotion of health, which may contribute in such a way as to make these future professionals more empathetic and therefore work toward improving the lives of their patients (Cañas-Lerma et al., 2021; Ferri et al., 2019).

Another factor that may explain the higher level of empathy among students of the health field would be practical experiences during supervised stages in hospitals and primary care units, as such experiences provide greater contact with patients and, consequently, may enhance empathetic attitudes (Haramati et al., 2017; Ozcan et al., 2012). Thomazi et al. (2014) conducted a study with students of the health field and found that their relationships with patients and the

inclusion of classes and discussions on other fields of knowledge, especially disciplines that address humanization, were related to the levels of empathy in these students.

In the present study, no statistically significant difference in levels of empathy was found between students of the humanities and those of the exact sciences, although the mean score was higher among the students of the humanities. Carneiro et al. (2017) conducted a study with students of psychology (i.e., humanities) and engineering (i.e., exact sciences) and found that the psychology students had higher levels of empathy, which is similar to the results of the present study.

Higher levels of empathy among humanities students may be due to the presence of disciplines related to the study of human behavior, communication abilities, and social relations (Carneiro et al., 2017; Marcovitch, 2002). One investigation found that studying topics related to social issues, such as politics and socioeconomics, contributes to the development of this ability (Segal, 2011). In a study involving 619 university students, Rockwell et al. (2019) evaluated changes in empathy throughout a semester and found that those who participated in sociology classes presented an increase in empathy compared to those who did not participate in such classes. Moreover, classes with group dynamics and discussions are often found in humanities courses. The literature has demonstrated that the inclusion of such dynamics throughout undergraduate courses promotes the greater development of empathic abilities (Everhart et al., 2016; J. C. Wilson, 2011).

We found that students of the exact sciences had lower levels of empathy. Rasool et al. (2012) conducted a comparative study involving students of engineering, physics, medicine, psychology, and social service and found that engineering students had lower levels of empathy compared to the other fields, which is similar to the findings of the present study. This result may be explained by the curricular characteristics of these courses (Strobel et al., 2013; Walther et al., 2020).

Throughout their undergraduate studies, students of the exact sciences are in constant contact with disciplines and activities that require the development of knowledge, such as calculations, the planning of projects, and quantitative reasoning (Carneiro et al., 2017; Schulz, 2008; Walther et al., 2020). The greater contact with these disciplines as well as less or no contact with disciplines that propose the learning of social abilities may exert an impact on reducing levels of empathy among these students compared to those of other fields of knowledge (Walther et al., 2017; Walther et al., 2020). These discoveries call for a reflection on the importance of including disciplines directed at social relations and the development of social abilities, especially empathy.

Regarding the domains of empathy, the present study demonstrated that health field students have higher levels of affective empathy. The characteristics of empathy may explain the higher levels of this domain among students of the health field, as it enables individuals to exhibit empathic concern. This behavior regards emotion directed at others with some type of need and produces a motivational state to increase the well-being of others, generating pro-sociality (Davis, 1980, 1983). The promotion of well-being and prosocial behavior is found among students and professionals in the health field, as such individuals have greater contact with patients that have different needs (Cañas-Lerma et al., 2021; Ratka, 2018). Yu et al. (2020) conducted a study with 152 medical students and found that those who had greater contact with patients in the practical stages of the course exhibited greater prosocial behavior, denoting greater empathic concern, compared to those who did not have the same experiences. Moudatsou et al. (2020) found that empathic healthcare providers promote greater well-being for both their patients and themselves. This prosocial behavior may explain the higher levels of affective empathy among the students of the health field.

Another factor that may explain the higher levels of affective empathy among students of the health field is known as empathic distress, which is also a characteristic of this domain of empathy. Like empathic concern, empathic distress enables an individual to exhibit prosocial behavior with the aim of alleviating his or her pain, but it is first necessary to alleviate the pain of others (Davis, 1980; 1983). Studies have found that greater contact with patients and experiences in hospitals and clinics lead students in the health field to experience empathic distress (Wang et al., 2021; Weingartner et al., 2019).

One of the main characteristics of affective empathy is emotional resonance, which occurs subjectively, enabling an empathetic individual to feel the same emotions as another through physiological processes (i.e., mirror neurons) (Hatfield & Rapson, 2009; Ickes, 2011; Singer & Klimecki, 2014). A study conducted with university students identified activations of regions of mirror neurons in students upon observing the pain of others (Cheetham et al., 2009). This may be a situation that occurs among students and professionals in the health field and, in contrast, is not identified in students of the exact sciences, who do not have contact with pain and/or emotive situations, which may explain the higher levels of cognitive empathy among the students of the exact sciences.

Another possible explanation for the higher levels of cognitive empathy among students of the exact sciences is the concept of “perspective taking”, which is a cognitive attribute that consists of making an effort to adopt the point of view of others and see things from their perspective (Davis, 1980). However, there is no sentimental or emotional relationship among individuals who have this construct of empathy. According to Israelashvili et al. (2020), perspective-taking is inversely associated with the recognition of emotions. Moreover, compared to the students of the humanities, those of the exact sciences were younger, which may also contribute to higher levels of cognitive empathy. One study comparing adolescents, young adults, and older people in terms of empathy and its domains found that young individuals had higher levels of cognitive empathy (Sze et al., 2012).

As mentioned above, empathy has different positive contributions for both the empathizer and individual to which the empathy is directed (Brunero et al., 2010; Haramati et al., 2017). With this in mind, empathy training has been performed with students of different fields of knowledge to enable greater effectiveness and quality in their future professions (Afroogh et al., 2021; Hess & Fila, 2016; Rasoal et al., 2012; Weingartner et al., 2019). Empathy training can facilitate and improve the social and professional relations of these future professionals.

The present study has limitations that should be addressed. The cross-sectional design does not enable the establishment of causality. Moreover, the number of students from the exact sciences was low. However, the lower participation of these students was also found in a previous study (Rasoal et al., 2012) and did not exert an influence on the results, which were similar to those found in the literature. The online format may also have contributed to the low participation of students, as many may have difficulties gaining access to the internet and may have therefore decided not to participate in the study.

Conclusion

This is the first study to compare levels of empathy and its affective and cognitive domains among students of three major fields of knowledge (health, humanities, and exact sciences). The findings revealed that health field students have higher levels of empathy compared to those of the exact sciences and humanities. Regarding affective empathy, the results revealed higher levels among students of the health field compared to those of the exact sciences. For the cognitive domain, we identified higher levels among the students of the exact sciences compared to the other fields studied.

The present findings underscore the importance of disciplines and training that enable the development of the ability of empathy among university students regardless of the field of knowledge, as this ability provides significant results for these students as future professionals. Further studies should compare levels of empathy in larger, more homogeneous samples. Studies should also investigate this issue in a more comprehensive manner using a longitudinal design to assess the influence of education in the college and university setting on levels of empathy.

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Contributors

M. A. MAXIMIANO-BARRETO and A. F. O. FERMOSELI were responsible for the conception and design. J. B. SANTOS and W. M. FARIAS were responsible for the analysis and interpretation of data and discussion of results. M. A. MAXIMIANO-BARRETO was responsible for statistic analysis. M. A. MAXIMIANO-BARRETO and A. F. O. FERMOSELI were responsible for the review and approval of the final version of the article, conception and design.