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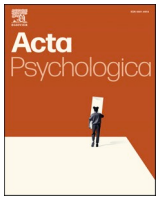

Empathy among first year university students: A cross-sectional analytical study

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ABSTRACT

Objective: This study aimed to compare empathy levels among first-year students beginning different health-related programmes (medicine-dentistry, physiotherapy, psychology, veterinary medicine) and to compare them to students in non-health-related programmes. A secondary objective was to identify factors influencing.
Methods: First-year students from a variety of academic fields, recruited from three different universities at the very beginning of their academic year, participated in the study. An anonymous online questionnaire was administered, including sociodemographic data, the Interpersonal Responsiveness Index (IRI) and for students enrolled in health-related programmes, the Jefferson Scale of Empathy for Health Professionals (JSPE-HPS). Incomplete questionnaires were excluded. The Spearman and Pearson correlations examined the relationships between self-report items and IRI and JSPE-HPS scores, respectively. Parametric ANOVAs compared empathy scores between groups.
Results: A total of 1787 responses were analyzed, 1132 women, 600 men and 11 non-binary people, the average age of the respondents was 18.78 years (s-d 2.51). Students in the psychology curriculum had significantly higher total IRI scores than those in non-health fields ($p < 0.001$). Among health students, those in psychology, medicine, and dentistry scored higher IRI and Jefferson scores than physical therapy students ($p < 0.001$). The regression models identified gender, field of study, and communication training as significant predictors, although these explained only a small portion of the variance in the scores.
Conclusion: The results highlight the existence of significant differences in empathy levels by field of study, with empathy particularly high among mental health students and lower among physiotherapy and non-health students. While certain factors such as gender, age, and communication training influence these levels, other variables, such as personality traits or emotional regulation, are worth exploring. These observations argue for the integration, from the first year, of educational programmes that promote the development of empathy, particularly in fields where it seems to be less present.

1. Introduction

1.1. Background

Empathy, understood as the capacity to comprehend and share another person's emotions, is a key transversal skill underpinning the development of human relationships. It plays a central role in communication, cooperation, and problem-solving, and is crucial across numerous professional contexts. In management, for instance, empathy contributes to strengthening client relationships, increasing team engagement, and reducing occupational stress (Allan et al., 2021; Kurniawan et al., n.d.). More broadly, this ability fosters mutual understanding and social adaptation, regardless of the field of study or professional activity.

While empathy serves as a lever for performance and adaptability across various disciplines, it holds a particularly central place within the

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health professions. Indeed, it lies at the core of patient-centred care approaches. It involves a wide range of cognitive and emotional factors that enable healthcare providers to place themselves in the patient's position, understanding their perspective and emotional state (Serrada-Tejeda et al., 2022). Two main forms of empathy are generally distinguished: emotional empathy, referring to an effective response to the patient's pain and suffering, and cognitive empathy, which is based on a more intellectual and objective reasoning process (Serrada-Tejeda et al., 2022). The latter, often referred to as *clinical empathy*, is particularly valued in the therapeutic relationship.

The literature reports numerous benefits associated with empathic listening by healthcare professionals, such as improved treatment adherence, greater patient satisfaction, and reduced symptoms and anxiety (Lucas & Parker, 2022). Several studies (Hernández-Xumet et al., 2023; Savvoulidou et al., 2024) have highlighted the importance of an empathic therapeutic relationship in shared decision-making. Empathy thus constitutes a fundamental component at the core of interactions between healthcare professionals and patients, contributing to the development of the therapeutic alliance.

Studies by Hojat et al. (2009) and Neumann et al. (2011) have underlined the importance of empathy in therapeutic outcomes but have also reported a decline in empathy levels throughout medical training. This reduction has likewise been observed among students in physiotherapy, occupational therapy (Serrada-Tejeda et al., 2022), and pharmacy (Walker et al., 2022). Several factors may account for this phenomenon. While some can be attributed to the structure of medical education systems, others such as early exposure to the specificities of patient care, the clinical environment, self-awareness, and broader societal changes—also play a role in the development of empathy (Jobling & Alberti, 2022; Konrath et al., 2011).

The evolution of empathy levels among medical students has been the focus of extensive research, leading to the development of educational interventions aimed at maintaining or enhancing empathy within this population (Hojat et al., 2009). However, few studies have assessed initial differences in empathy among first-year students or examined the relationship between empathy levels and students' choice of study field. In this context, Sobczak et al. (2021) found a statistically significant, albeit modest, difference in empathy between students in health-related professions and those enrolled in non-health programmes, particularly in the social and behavioural sciences.

Similarly, Santos et al. (2023) demonstrated that health students exhibit higher overall levels of empathy, particularly in its emotional component—compared to students in the exact sciences, who tend to display a more cognitively oriented empathy. This perspective is further enriched by the work of Yang et al. (2023), who emphasise how the empathic dimension can foster students' engagement in scientific experiences and stimulate their emotional and cognitive involvement in understanding the phenomena under study.

Despite these contributions, the literature remains limited with regard to the systematic comparison of empathy levels among students from different disciplines, whether related or unrelated to health.

In this context, the objective of the present study is to compare the empathy levels of first-year students enrolled in health programmes and those in non-health fields. It also aims to compare empathy levels across various health disciplines, including medicine, dentistry, physiotherapy, psychology, and animal health. In a second phase, the study will seek to identify factors that may influence empathy levels across these different groups of students.

2. Methods

2.1. Study design and setting

This cross-sectional study was jointly conducted at three French-speaking Belgian universities: Université Libre de Bruxelles (ULB), Université Catholique de Louvain (UCL), and Université de Liège (ULiège). This interuniversity comparative observational study assessed empathy levels among first-year undergraduate students at the beginning of the 2023–2024 academic year. The study was approved by the Liège Hospital and University Ethics Committee (707) under reference number 2023/177.

2.2. Participants

2.2.1. Eligibility criteria

Inclusion criteria: first-year (BA1) French-speaking undergraduate students from various faculties, duly enrolled at one of the participating universities and having completed the entire questionnaire.

Exclusion criteria: students repeating the first year of the same programme or those who provided only partial responses to the questionnaire.

2.2.2. Recruitment and grouping

Out of a total of 6828 students enrolled across the different programmes, 1743 returned a complete and valid questionnaire, representing a response rate of 25.53%. Participation was voluntary and anonymous. Participants were provided with full information about the study's objectives and procedures before giving informed consent.

Students included in the study were divided into the following subgroups:

Group 1: Health – Physiotherapy: students in physiotherapy

Group 2: Health – Medicine/Dentistry: students in medicine or dentistry

Group 3: Mental health: students in psychology

Group 4: Animal health: students in veterinary medicine

Group 5: Non-health: students in applied sciences, management sciences, philosophy, and literature.

2.3. Variables

The variables measured in this study included empathy levels, age, gender, nationality, native language, field of study, level of higher education, and participation in communication and/or empathy training.

2.4. Data sources and measurement

2.4.1. Data collection procedures

The experimental phase of the study took place between September 2023 and the end of October 2023, corresponding to the beginning of the academic year at the three participating Belgian universities.

To facilitate data collection, several methods were employed: in lecture halls, where students were invited to complete the questionnaire using a QR code; through virtual notice boards; and by sharing the survey link via first-year student social media groups. Paper versions were also distributed when online access was unavailable. Throughout the process, student anonymity was strictly maintained.

Data collection was carried out using the secure LimeSurvey platform, which complies with data anonymity standards.

2.4.2. Questionnaire structure

Data were collected using a structured questionnaire, fully written in French and composed of five main sections.

The first section provided general information about the study as well as an informed consent form.

The second section, devoted to sociodemographic data collection, aimed to gather basic information such as age, gender, academic background, prior training in communication or empathy, and professional experience in the healthcare sector.

The third section consisted of two self-assessment questions measuring, via numerical rating scales, the students' perceived empathy levels:

“On a scale from 0 (not at all) to 10 (extremely), how important do

you consider empathy to be for your future profession?"

"On a scale from 0 (not at all) to 10 (extremely), to what extent do you consider yourself to be an empathic person?"

The fourth section focused on the Interpersonal Reactivity Index (IRI), which assesses empathy by breaking it down into four distinct yet interrelated dimensions. Internal consistency was good in our sample ($\alpha = 0.86$).

The IRI was chosen to address the first objective of the study: to provide an overview of empathy levels among first-year students from various disciplines. This instrument has strong psychometric foundations, good reliability, and measures both the cognitive and emotional components of empathy (Loza & Hétu, n.d.; Wang et al., 2020). We used the validated French version by Braun et al. (2015), which demonstrates satisfactory internal consistency, a factor structure consistent with the original four-factor model, and acceptable convergent and discriminant validity (Braun et al., 2015; Gaggero et al., 2025).

The IRI consists of 28 items divided into four subscales, each reflecting a specific component of empathy: perspective-taking, fantasy, empathic concern, and personal distress. Each item is rated on a five-point Likert scale ranging from 1 ("Does not describe me well") to 5 ("Describes me very well"). The total score is obtained by summing the subscale scores, with reverse scoring applied to items 3, 4, 7, 12, 13, 14, 15, 18, and 19. The global IRI score ranges from 28 to 140, with higher scores indicating greater levels of empathy (Davis, 2011).

The fifth section was dedicated to the Jefferson Scale of Empathy – Health Professions Student version (JSE-HPS), also known as the Jefferson Empathy Scale. Internal consistency was acceptable in our sample ($\alpha = 0.79$). We used the JSE-HPS with permission from Thomas Jefferson University to address the study's second objective: to compare empathy levels across different health disciplines.

This instrument, designed specifically for healthcare professionals and students enrolled in health-related programmes, measures empathy within a clinical context (Hojat et al., 2002) and has demonstrated validity and reliability across various cultural and academic settings (Liu et al., 2025).

The questionnaire comprises twenty items divided into three subcomponents: ten items assess perspective-taking ability, eight evaluate compassion, and two explore the clinician's capacity to perceive situations from the patient's point of view. Responses are scored on a seven-point Likert scale ranging from 1 ("Strongly disagree") to 7 ("Strongly agree"). The total score is obtained by summing all item scores, with reverse scoring applied to items 1, 3, 6, 7, 8, 11, 12, 14, 18, and 19.

2.5. Statistical methods

Data management and analysis were performed using R (version 4.2.3) and Jamovi (version 2.3.21.0).

We used ANOVA F-tests to compare empathy scores between groups. We conducted separate analysis for IRI and Jefferson scores. Since our sample sizes were large in both the Interpersonal Reactivity Index (IRI) ($n = 1743$) and the Jefferson Scale of Physician Empathy (JSPE-HPS) ($n = 1164$), we opted for a parametric ANOVA without formally testing the normality assumption. When Levene's test showed heterogeneity of variances, we used Welch's ANOVA and further investigated significant group differences using the Games-Howell procedure. When Levene's test showed homogeneity of variances, we used the classic ANOVA to compare scores between groups, followed by Tukey's HSD test for post-hoc analysis. We also calculated effect sizes via epsilon squared (ε^2) for Welch's ANOVA and omega squared (ω^2) for ANOVA.

We used multiple linear regression to assess associations between students' characteristics and empathy scores. We first included all the potential candidate independent variables in the model. Then, we used a stepwise algorithm base on the Akaike Information Criterion (AIC) to select the best model according to this criterion.

We conducted a Spearman correlational analysis to examine the relationship between the two self-report questions. Correlational Pearson analyses were performed to examine the associations between total scores and subdimensions of the Interpersonal Reactivity Index (IRI) and the Jefferson Scale of Physician Empathy (JSPE-HPS) total score.

The statistical significance level was set at 0.05.

To assess the statistical power of the analysis, the observed effect size was converted into Cohen's f using the following formula: $f = \sqrt{(\varepsilon^2/(1 - \varepsilon^2))}$.

3. Results

3.1. Participants

The total number of subjects meeting the inclusion and exclusion criteria and completed the questionnaire was 1743 (Fig. 1).

3.2. Descriptive data

The results of the descriptive analysis of our population, presented in Table 1, show a greater representation of female subjects compared to males across all groups, except for the Animal Health group. Most participants were 18 years old, Belgian nationals, of Caucasian origin, with French as their mother tongue. Most participants had never attended training sessions on communication and empathy, except in the "Medicine-Dentistry" group, where the majority had previously participated in such training (52.5% for communication training and 77% for empathy training).

3.3. Main results

3.3.1. Self-perceived evaluation

The correlational analysis was conducted to examine the relationship between two aspects of self-perceived empathy: the importance attributed to empathy in the practice of one's future profession (AUTO1) and the personally perceived level of empathy (AUTO2). The results revealed a moderate and highly significant positive correlation between these two variables, $r\,(1796) = 0.35$, $p < 0.001$. This indicated that the more participants consider empathy to be important for their future profession, the more they perceive themselves as empathic. This relationship was also confirmed by a Spearman correlation ($\rho = 0.30$, $p < 0.001$).

The contingency χ^2 test was also significant, $\chi^2\,(100, N = 1798) = 695$, $p < 0.001$. The contingency coefficient ($C = 0.53$) and Cramer's V ($V = 0.20$) confirmed the existence of a relationship of moderate strength.

3.3.2. Descriptive statistics

The means, standard deviations, and sample sizes of the empathy scores for each student group are presented in Table 2 for the IRI and in Table 4 for the Jefferson Scale.

3.3.3. IRI

As seen in Table 3, a Welch's ANOVA revealed significant differences between student groups with respect to the total empathy score measured by the IRI $p < 0.01$). The large effect size ($\varepsilon^2 = 0.18$) indicated that 18% of the variance of the total empathy score (IRI) can be explained by the student's field of study. Post hoc analysis demonstrated that students in the "Mental health" group had significantly higher than the other groups ($p < 0.01$) (see Table 3). Besides, Health students scored significantly higher than Physiotherapy students ($p < 0.01$) and then students whose studies were not related to health ($p = 0.04$).

Significant differences were also observed for each IRI dimension namely "Perspective Taking" ($p < 0.01$, $\varepsilon^2 = 0.09$), "Fantasy" ($p < 0.01$, $\varepsilon^2 = 0.16$), "Empathic Concern" ($p < 0.01$, $\varepsilon^2 = 0.1$), and "Personal Distress" ($p < 0.01$, $\varepsilon^2 = 0.13$) (see Table 2). Again, mental health students scored higher than most groups on each subscale.

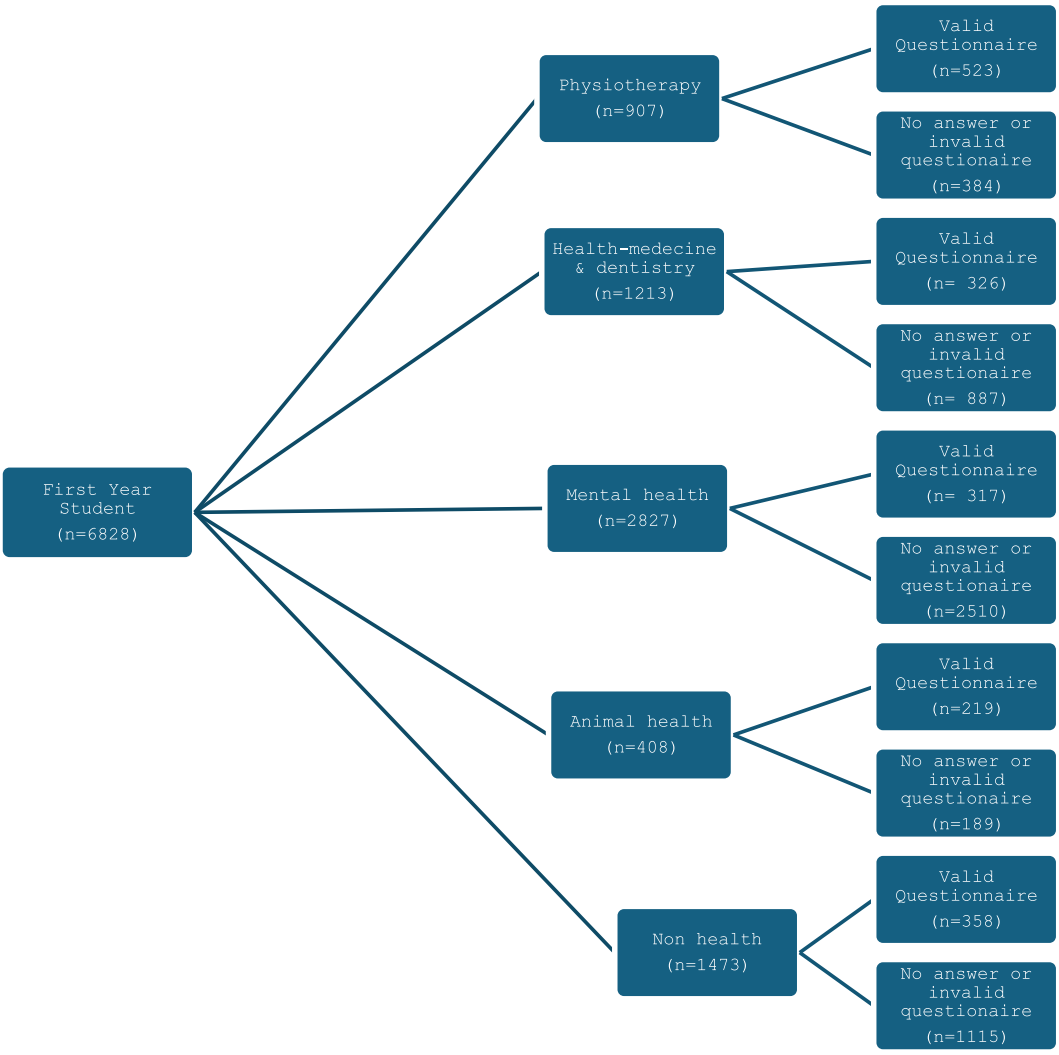

Fig. 1. Organizational chart.

3.3.4. JSPE-HPS

Welch's ANOVA showed significant differences between groups for the total scores ($p < 0.01$, $\varepsilon^2 = 0.04$) as well as for the "Compassionate Care" subscale ($p < 0.01$, $\varepsilon^2 = 0.07$). No significant differences were observed for the "Perspective Taking" subscale ($p = 0.054$, $\varepsilon^2 = 0.005$), while a very small effect was found for the "Standing in the Patient's Shoes" subscale ($\omega^2 = 0.006$). Post hoc analysis showed Physiotherapy students had a significantly lower total score than Health and Mental health students ($p < 0.01$). This difference was also observed for the "Compassionate Care" dimension ($p < 0.01$) see Table 5.

For the IRI, the observed effect size was $\varepsilon^2 = 0.18$ due to unequal group sizes, the harmonic mean of the sample sizes was used ($n = 323$).

For the JPS-HPS, the observed effect size was $\varepsilon^2 = 0.04$, and the harmonic mean of the group sizes was $n = 368$.

The corresponding parameters were entered into the pwr.anova.test () function in R, which indicated, for each of the two scales, an estimated statistical power of 1.00 for a significance level set at 0.05.

These results indicate that the analyses had maximal power to detect the observed effects for each scale.

3.3.5. Linear regression

The results of linear regression analysis based on total IRI and Jefferson scores are presented in Tables 6 and 7, respectively.

As shown in Table 6, the total empathy score (IRI) was significantly associated with the gender, age, and field of study of participants in both the full and reduced models. However, both models only explained about 20% of the variance in the total empathy score (IRI).

In the full model, the Total Empathy Score (JSPE-HPS) was significantly associated with the gender, age, and field of study of the participants, as well as their communication background and nationality. In the scaled-down model, it was significantly influenced by the age, gender, field of study, nationality and communication training of the participants. However, both models explained less than 10% of the variance in the total empathy score (JSPE-HPS).

3.3.6. Correlational analysis

Pearson's correlation analyses were conducted to examine the relationships between the total scores and subdimensions of the IRI and JSPE-HPS. A moderate positive correlation was observed between the total IRI score and the total JSPE-HPS score ($r = 0.37$, $p < 0.001$), indicating that higher levels of general empathy are associated with higher levels of empathy in clinical contexts. The total JSPE-HPS score was positively correlated with Empathic Concern ($r = 0.345$, $p < 0.001$), Fantasy ($r = 0.327$, $p < 0.001$), and Perspective Taking ($r = 0.288$, $p < 0.001$). These results demonstrated correlation between the emotional and cognitive aspects of general empathy and those mobilized within the care relationship. Conversely, Personal Distress showed a weak correlation with the total JSPE-HPS score ($r = 0.076$, $p = 0.008$), suggesting

Table 1
Sociodemographic characteristics of participants by field of study ($n = 1786$).

Variable	Modality	Total	Health (physio)	Health (med-dentist)	Mental health	Animal health	No health
AGE (years)		18.78 ± 2.51 (n = 1786)	18.84 ± 2.09 (n = 524)	18.49 ± 1.87 (n = 326)	19.25 ± 3.99 (n = 316)	18.61 ± 2.21 (n = 218)	18.67 ± 2.06 (n = 402)
Sex	Female	1158 (64.8%)	271 (51.7%)	229 (70.2%)	272 (86.1%)	178 (81.7%)	208 (51.7%)
	Male	616 (34.5%)	252 (48.1%)	97 (29.8%)	39 (12.3%)	40 (18.3%)	188 (46.8%)
	Other	12 (0.7%)	1 (0.2%)	0 (0.0%)	5 (1.6%)	0 (0.0%)	6 (1.5%)
Nationality	Belgian	1355 (75.9%)	331 (63.2%)	266 (81.6%)	256 (81.0%)	164 (75.2%)	338 (84.1%)
	French	318 (17.8%)	169 (32.3%)	38 (11.7%)	33 (10.4%)	44 (20.2%)	34 (8.5%)
	Other	101 (5.7%)	22 (4.2%)	22 (6.7%)	23 (7.3%)	7 (3.2%)	27 (6.7%)
	Luxembourgeoise	12 (0.7%)	2 (0.4%)	0 (0.0%)	4 (1.3%)	3 (1.4%)	3 (0.7%)
First language	French	1635 (91.5%)	488 (93.1%)	295 (90.5%)	283 (89.6%)	205 (94.0%)	364 (90.5%)
	Other	125 (7.0%)	29 (5.5%)	28 (8.6%)	31 (9.8%)	7 (3.2%)	30 (7.5%)
	German	10 (0.6%)	2 (0.4%)	1 (0.3%)	0 (0.0%)	1 (0.5%)	6 (1.5%)
	English	10 (0.6%)	3 (0.6%)	2 (0.6%)	1 (0.3%)	2 (0.9%)	2 (0.5%)
	Dutch	6 (0.3%)	2 (0.4%)	0 (0.0%)	1 (0.3%)	3 (1.4%)	0 (0.0%)
Ethnicity	Caucasian	1488 (83.3%)	446 (85.1%)	234 (71.8%)	259 (82.0%)	210 (96.3%)	339 (84.3%)
	African	177 (9.9%)	57 (10.9%)	50 (15.3%)	31 (9.8%)	4 (1.8%)	35 (8.7%)
	Asian	63 (3.5%)	12 (2.3%)	25 (7.7%)	8 (2.5%)	1 (0.5%)	17 (4.2%)
	Other	58 (3.2%)	9 (1.7%)	17 (5.2%)	18 (5.7%)	3 (1.4%)	11 (2.7%)
Higher education	No	1317 (73.7%)	349 (66.6%)	242 (74.2%)	242 (76.6%)	184 (84.4%)	300 (74.6%)
	Yes	469 (26.3%)	175 (33.4%)	84 (25.8%)	74 (23.4%)	34 (15.6%)	102 (25.4%)
Communication training	No	1422 (79.6%)	441 (84.2%)	155 (47.5%)	283 (89.6%)	196 (89.9%)	347 (86.3%)
	Yes	364 (20.4%)	83 (15.8%)	171 (52.5%)	33 (10.4%)	22 (10.1%)	55 (13.7%)
Empathy training	No	1376 (77.0%)	435 (83.0%)	75 (23.0%)	289 (91.5%)	206 (94.5%)	371 (92.3%)
	Yes	410 (23.0%)	89 (17.0%)	251 (77.0%)	27 (8.5%)	12 (5.5%)	31 (7.7%)

Table 2
Descriptive statistics of empathy scores on the IRI (total and subscales) across student groups.

Score/dimension	Group	n	Mean (sd)
Total	Non-health students	358	93.73 (15.22)
	Physiotherapy students	523	91.55 (13.88)
	Health sciences students	326	96.79 (13.22)
	Animal health students	219	94.27 (14.43)
	Mental health students	317	103.37 (12.78)
Perspective Taking	Non-health students	358	23.96 (4.93)
	Physiotherapy students	523	24.27 (4.77)
	Health sciences students	326	25.98 (4.05)
	Animal health students	219	23.64 (5.16)
	Mental health students	317	26.02 (4.53)
Fantasy	Non-health students	358	24.66 (5.78)
	Physiotherapy students	523	22.56 (5.80)
	Health sciences students	326	24.98 (5.99)
	Animal health students	219	24.31 (5.94)
	Mental health students	317	27.26 (5.22)
Empathic Concern	Non-health students	358	25.44 (5.23)
	Physiotherapy students	523	26.76 (4.43)
	Health sciences students	326	28.07 (4.31)
	Animal health students	219	26.49 (4.83)
	Mental health students	317	28.50 (4.40)
Personal Distress	Non-health students	358	19.68 (5.85)
	Physiotherapy students	523	17.93 (5.10)
	Health sciences students	326	17.75 (5.00)
	Animal health students	219	19.83 (5.43)
	Mental health students	317	21.60 (5.75)

Sd: standard deviation.

that this self-focused emotional dimension is only marginally related to professional empathy.

Furthermore, the subdimensions within each instruments were significantly correlated with one another. The JSPE-HPS subscales showed very high correlations (for example, $r = 0.868$ between Perspective Taking and the total score), whereas the IRI subscales exhibited correlations ranging from moderate to strong (r values between 0.272 and 0.768, $p < 0.001$).

Finally, a significant correlation was observed between the "Perspective Taking" subdimension of the IRI and that of the Jefferson Scale ($r = 0.33$, $p < 0.001$), highlighting the closeness of the cognitive components of empathy assessed by the two instruments.

Table 3
Welch test statistics and effect sizes for empathy scores (total and subscales) on the IRI.

Score/dimension	Test statistic	p-Value	Effect size	95% CI	Interpretation
Total	Welch F (4, 771.14) = 42.68	<0.01	$\varepsilon^2 = 0.18$	[0.14, 1.00]	Large effect
Perspective Taking	Welch F (4, 769.14) = 19.24	<0.01	$e^2 = 0.09$	[0.05, 1.00]	Medium effect
Fantasy	Welch F (4, 771.27) = 37.02	<0.01	$\varepsilon^2 = 0.16$	[0.12, 1.00]	Large effect
Empathic Concern	Welch F (4, 766.76) = 22.79	<0.01	$\varepsilon^2 = 0.10$	[0.07, 1.00]	Medium effect
Personal Distress	Welch F (4, 766.01) = 29.34	<0.01	$e^2 = 0.13$	[0.09, 1.00]	Medium effect

CI: confidence interval.

4. Discussion

Although numerous studies have examined empathy, particularly its assessment among healthcare professionals, few have compared students from different medical disciplines, and none have compared empathy levels of first-year students in medicine, dentistry, physiotherapy, and psychology with those of students enrolled in non-health-related fields.

The total scores obtained on the IRI questionnaire indicate significantly higher levels of empathy among students in the Health (Medicine–Dentistry) and Mental Health groups in our study compared to their peers in non-health-related domains ($p = 0.001$), suggesting that the appeal of healthcare professions may be influenced by individuals' perceived empathy. Furthermore, analysis of the IRI subscale scores also revealed significantly higher empathy scores for students in the Mental Health group relative to the other groups. These findings corroborate the conclusions of Hojat et al. (2020) and Sobczak et al. (2021), who reported that students choosing behavioural and social sciences associated with psychology tend to exhibit the highest levels of empathy.

Table 4
Descriptive statistics of empathy scores on the JSPE-HPS (total and subscales) across Student groups.

Score/dimension	Group	n	Mean (sd)
Total	Physiotherapy students	523	105.09 (13.97)
	Health sciences students	324	109.97 (11.77)
	Mental health students	317	109.07 (11.38)
Perspective Taking	Physiotherapy students	523	53.91 (8.37)
	Health sciences students	326	54.95 (7.11)
	Mental health students	317	55.12 (7.4)
Compassionate Care	Physiotherapy students	523	42.02 (7.17)
	Health sciences students	326	45.38 (5.95)
	Mental health students	317	44.43 (5.42)
Standing in the Patient's Shoes	Physiotherapy students	523	9.15 (2.59)
	Health sciences students	326	9.65 (2.6)
	Mental health students	317	9.52 (2.36)

Sd: standard deviation.

Table 5
Welch's ANOVA and ANOVA test statistics and effect sizes for empathy scores (total and subscales) on the JSPE-HPS.

Score/dimension	Test statistic	p-Value	Effect size	95% CI	Interpretation
Total	Welch F (2, 725.15) = 17.24	<0.01	e^2 = 0.04	[0.02, 1.00]	Small effect
Perspective Taking	Welch F (2, 716.98) = 2.94	0.054	e^2 = 0.005	[0.00, 1.00]	Very small effect
Compassionate Care	Welch F (2, 731.9) = 29.43	<0.01	ε^2 = 0.07	[0.04, 1.00]	Medium effect
Standing in the Patient's Shoes	F (2, 1161) = 4.3	0.01	ω^2 = 0.006	[0.00, 1.00]	Very small effect

Post hoc power analysis for the two scales.

Nevertheless, medical and dental students obtained significantly higher IRI scores than physiotherapy students (median = 98.5, IQR = 17). The literature remains limited regarding comparisons of empathy levels between physiotherapy students and those studying medicine, dentistry, psychology, or other health professions. However, a study by Demoulin et al. (2023) on a sample of master's students in physiotherapy, medicine, and psychology demonstrated a significant difference in empathy scores, with psychology students scoring higher than the other two groups.

The significantly lower physiotherapy students' scores, compared to students in other health programmes, on the *Personal Distress* subscale, indicating reduced emotional sensitivity, could contribute to preventing emotional contagion, an effect that could, in turn, protect students and positively influence various components of the therapeutic alliance (Rodriguez, 2022).

The results obtained with the JSE-HPS questionnaire further support these observations, highlighting significant group differences in total scores and the *Compassionate Care* subdimension. Physiotherapy students again displayed significantly lower scores than their counterparts in the Health and Mental Health groups, suggesting a less pronounced relational empathy in the early years of their training. Conversely, no notable difference was observed for the *Perspective Taking* component, indicating that the cognitive dimension of empathy, linked to understanding the patient's viewpoint, is relatively homogeneous across programmes. These findings are consistent with the literature showing that affective and behavioural dimensions of empathy vary more according to professional or training context than the cognitive component (Givron & Desseilles, 2020; Hojat et al., 2020).

Table 6
Coefficients of complete and reduced multiple linear regression models evaluating the effects of participants' characteristics on their total empathy score (IRI).

Variables	N	Complete model		Reduced model	
		Coefficients (95% CI)	P-value	Coefficients (95% CI)	P-value
All participants	1743				
Interoception		88.92 (79.08; 98.77)	<0.001	89.08 (79.46; 98.71)	<0.001
Age		0.38 (0.098; 0.66)	0.008	0.32 (0.07; 0.57)	0.013
Sex			<0.001		<0.001
Other	11	1		1	
Female	1132	1.29 (−6.54; 9.11)		1.73 (−6.07; 9.54)	
Male	600	−9.19 (−17.06; −1.32)		−8.74 (−16.59; −0.89)	
Study domain			<0.001		<0.001
Other	358	1		1	
Physiotherapy	523	−2.95 (−4.84; −1.06)		−2.73 (−4.57; −0.89)	
Health	326	−0.33 (−2.73; 2.07)		−0.11 (−2.48; 2.26)	
Animal health	219	−2.85 (−5.16; −0.55)		−2.86 (−5.12; −0.6)	
Mental health	317	5.37 (3.29; 7.45)		5.58 (3.54; 7.63)	
Professional experience			0.17		0.13
No	903	1		1	
Yes	840	−0.89 (−2.18; 0.39)		−0.98 (−2.26; 0.29)	
Empathy training			0.15		0.075
No	1339	1		1	
Yes	404	1.56 (−0.55; 3.67)		1.70 (−0.17; 3.56)	
Nationality			0.08		0.11
Other	95	1		1	
Belgian	1337	2.45 (−0.29; 5.19)		2.43 (−0.30; 5.16)	
French	300	4.01 (0.89; 7.13)		3.78 (0.70; 6.87)	
Luxembourger	11	2.83 (−5.36; 11.03)		2.92 (−5.27; 11.11)	
University			0.56		
UCL	530	1			
ULB	359	0.13 (−1.67; 1.94)			
Uliège	854	−0.66 (−2.19; 0.87)			
Higher education			0.25		
No	1287	1			
Yes	456	−0.97 (−2.62; 0.68)			
Communication training			0.63		
No	1386	1			
Yes	357	0.46 (−1.43; 2.35)			
R square		0.20		0.19	

CI: confidence interval.

Linear regression analyses indicated that empathy scores (IRI and Jefferson) were significantly influenced by sociodemographic variables such as gender, age, and field of study, as well as nationality and communication training in the case of the Jefferson score. Although the models accounted for only a modest proportion of variance (approximately 20% for the IRI and less than 10% for the Jefferson scale), certain

Table 7
Coefficients of complete and reduced multiple linear regression models evaluating the effects of participants' characteristics on their total empathy score (JSPE-HPS).

Variables	N	Complete model		Reduced model	
		Coefficients (95% CI)	P-value	Coefficients (95% CI)	P-value
All participants	1164				
Interoception		103.70 (91.73; 115.67)	<0.001	103.57 (91.67; 115.47)	<0.001
Age		0.43 (0.13; 0.73)	0.005	0.43 (0.13; 0.73)	0.005
Sex			0.004		0.004
Other	6	1		1	
Female	771	−5.48 (−15.46; 4.50)		−5.43 (−15.39; 4.53)	
Male	387	−8.02 (−18.09; 2.04)		−7.97 (−18; 2.07)	
Study domain			<0.001		<0.001
Physiotherapy	523	1		1	
Health	324	5.47 (3.34; 7.59)		5.36 (3.45; 7.27)	
Mental health	317	4.69 (2.78; 6.60)		4.72 (2.83; 6.61)	
Higher education			0.11		0.11
No	831	1		1	
Yes	333	−1.52 (−3.39; 0.34)		−1.52 (−3.38; 0.35)	
Communication training			0.04		0.03
No	877	1		1	
Yes	287	2.16 (0.07; 4.24)		2.03 (0.20; 3.86)	
Nationality			<0.001		<0.001
Other	66	1		1	
Belgian	852	−1.25 (−4.35; 1.86)		−1.23 (−4.33; 1.87)	
French	240	5.88 (2.40; 9.35)		5.89 (2.44; 9.35)	
Luxembourger	6	−7.74 (−18.07; 2.6)		−7.69 (−18.01; 2.63)	
University			0.08		0.07
UCL	439	1		1	
ULB	279	−2.12 (−4.02; −0.23)		−2.13 (−4.02; −0.23)	
ULiège	446	−1.26 (−2.94; 0.41)		−1.28 (−2.94; 0.38)	
Empathy training			0.81		
No	800	1			
Yes	364	−0.28 (−2.51; 1.96)			
Professional experience			0.97		
No	574	1			
Yes	590	−0.03 (−1.52; 1.46)			
R square		0.099		0.099	

CI: confidence interval.

factors appear relevant in explaining the differences observed between health-related disciplines. For example, the lower empathy scores among physiotherapy students may be partly explained by the lack of prior communication training. Indeed, the majority of medical (52.5%) and dental (77%) students in our sample had received training in communication and empathy, often as part of their preparation for the Belgian medical school entrance examination, which was not the case for physiotherapy students.

Regression analysis also showed that students who had received communication training scored, on average, two points higher on the JSE-HPS scale than those who had not. It should be noted that this scale measures exclusively the cognitive component of empathy, whereas the IRI assesses both emotional and cognitive dimensions.

Cognitive empathy, defined as the ability to understand others' feelings and adopt the patient's perspective, is not an innate skill; it is learned and develops over time (Givron & Desseilles, 2020). It therefore appears particularly sensitive to targeted communication training (Yuen et al., 2023), which may explain the effects observed in our regression model for the JSE-HPS.

Another potential explanation for the lower scores of the Physiotherapy group is the substantially higher proportion of women in the Mental Health (86.1%) and Health (Medicine, Dentistry) (70.2%) programmes compared to the Physiotherapy Health programme (51.8%). In our study, 64% of participants were women, who obtained markedly higher mean IRI scores than men (mean = 99.5, SD = 13.5 vs. 87.9, SD = 13.2, respectively). These results align with multiple linear regression findings, which indicate that student gender had a statistically significant effect on empathy scores for both the IRI ($p < 0.001$) and the Jefferson scale ($p = 0.004$).

These results are consistent with what has been reported in the literature. Indeed, previous studies generally indicate higher levels of empathy among women (Hernández-Xumet et al., 2023; Hojat et al., 2020), sometimes specifically regarding to emotional empathy (Elkin et al., 2021). Various explanations have been proposed to account for sex differences in empathy. Some researchers have suggested that gender gaps in self-reported empathy may be attributable to differences in general emotional reactivity (Voultsos et al., 2022). In this context, the use of self-assessment methods might activate feminine gender norms, encouraging women to respond in a more empathetic manner.

Others highlight that women tend to be more sensitive to emotional cues than men and demonstrate greater interest in patients' family and social lives, fostering deeper understanding and more empathic relationships (Andersen et al., 2020). Moreover, Christov-Moore et al. (2014) have highlighted recent studies on sex differences in the ability to recognise emotional expressions via body language, showing that women are often faster and more accurate than men in this recognition. Decety (2011) emphasises that empathy analysis must consider the coexistence of neurobiological and evolutionary mechanisms; historically, women traditionally provided care while men focused more on survival.

Despite the well-documented trend that female students tend to demonstrate higher empathy than their male counterparts, this observation remains controversial and has been questioned by some researchers (Voultsos et al., 2022).

Another controversy concerns the IRI and Jefferson empathy scales. The simultaneous use of the Interpersonal Reactivity Index (IRI) and the Jefferson Scale of Physician Empathy (JSE-HPS) has sometimes been criticised in the literature due to their different conceptual orientations: the IRI assesses general empathy, including cognitive and emotional dimensions, whereas the JSE-HPS focuses on professional empathy in the healthcare context (Hojat et al., 2002). Our empirical findings, however, provide insight into this debate.

On one hand, correlational analyses show a moderate and significant positive association between the total scores of the two instruments ($r = 0.37$, $p < 0.001$), as well as between several corresponding subdimensions: *Perspective Taking* (IRI) and *Perspective Taking* – Jefferson ($r = 0.33$, $p < 0.001$), *Empathic Concern* (IRI) and *Compassionate Care* (JSPE) ($r = 0.345$, $p < 0.001$). These findings indicate modest convergence between general and professional empathy.

Nevertheless, the combined use of both scales provides a more comprehensive and nuanced view of empathy, integrating both general and professional dimensions, while recognising that some more introspective emotional components do not necessarily translate into the patient-care context. This approach helps mitigate biases associated with unidimensional assessment of empathy.

Our results suggest that variability in empathy levels is influenced by

numerous factors beyond those examined in this study. Several studies have demonstrated, for example, a significant relationship between empathy and self-esteem among medical and physiotherapy students (Desai & Jhala, 2024; Huang et al., 2019), suggesting that high self-esteem may positively influence extraverted behaviours and communication. Others have identified associations between personality traits and empathy (Guilera et al., 2019), noting that open, flexible, and highly attentive individuals tend to exhibit higher levels of empathy than those who may be more introverted or anxious.

This high power indicates that the sample size and effect magnitude observed ($\varepsilon^2 = 0.18$ for the IRI) were sufficient to reliably detect significant differences between groups, with an almost negligible risk of Type II error. The differences observed between students from various disciplines, particularly the higher scores in the Mental Health group and the lower scores in the Physiotherapy group, can therefore be considered statistically robust and reliable. These results strengthen the internal validity of the ANOVA analyses and comparisons performed, while consolidating the interpretation of measured empathy levels.

Several potential biases were identified. Firstly, a non-response bias may have been present, although efforts were made to minimise it through follow-up reminders during lectures and via student platforms. Nevertheless, it is possible that students who were more sensitive to the concept of empathy were more inclined to participate in the study.

A selection bias should also be noted, related to the substantial imbalance in the sample in terms of gender, prior training, and field of study. The use of Welch's ANOVA, which is appropriate for unequal variances, combined with Games-Howell post hoc comparisons, enhanced the robustness of the between-group analyses. Linear regression models, controlling for age, gender, field of study, nationality, and communication training, helped isolate the specific effects of each variable on total empathy scores (IRI and JSE-HPS).

Effect size estimates (ε^2, ω^2) and their conversion to Cohen's f for post hoc analyses provided a measure of the strength of the observed relationships and ensured high statistical power ($p = 1.00$), reinforcing the internal validity of the results. Finally, the convergence between self-assessment and the scores of both empathy instruments further supports the methodological consistency of the study.

These various statistical analyses contribute to mitigating selection bias; however, residual biases related to voluntary participation and unmeasured factors cannot be completely excluded.

5. Conclusion

This study, conducted among 1743 first-year students from three Belgian universities, highlights significant differences in empathy levels according to field of study. Students in the Mental Health group obtained the highest IRI scores, particularly for affective dimensions (*Empathic Concern* and *Personal Distress*), whereas students in Medicine and Dentistry exhibited intermediate levels. Physiotherapy and non-health students showed the lowest scores.

Using the JSE-HPS, similar differences were observed, particularly in the *Compassionate Care* dimension.

Multivariate analyses demonstrated that field of study, gender, and age significantly influenced empathy, whereas communication training and nationality had a more limited effect. Finally, the positive correlation between IRI and JSE-HPS scores confirms a partial convergence between general empathy and clinical empathy.

CRediT authorship contribution statement

Sabine Michiels: Writing – original draft, Visualization. **Jennifer Foucart:** Writing – review & editing, Methodology, Conceptualization. **Malko Ibrahim:** Formal analysis. **Laurent Pitance:** Methodology, Conceptualization. **Céline Mathy:** Writing – review & editing, Methodology. **Christophe Demoulin:** Writing – review & editing, Methodology, Conceptualization.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the author(s) utilised ChatGPT/OpenAI to verify the English translation of the article and to create the descriptive analysis table. After using this tool/service, the author(s) reviewed and edited the content as necessary and take full responsibility for the published article's content.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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