

Original Research Article

Empathy levels and their correlates among medical students at a private college in Karachi: a cross-sectional study

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ABSTRACT

Background: We aimed to measure empathy using the Jefferson Scale of Empathy–Student version (JSE-S) among undergraduate Bachelor of Medicine, Bachelor of Surgery (MBBS) students at a private medical college in Karachi and to assess its association with sex, academic year and preferred future specialty.

Methods: We conducted a cross-sectional survey at Fazaia Ruth Pfau Medical College, Karachi, during November 2024 and January 2025. We approached 343 students and, after JSE-S and demographic assessment, included 304 in the final analysis. Using multivariable linear regression, we estimated adjusted associations between JSE-S scores and sex, academic year and specialty preference.

Results: The mean JSE-S score was 104.8 (SD 12.3). After adjusting for academic year and specialty preference, female students scored 5.5 points higher than male students on the JSE-S (adjusted $\beta=5.5$; 95% CI 2.9 to 8.1; $p<0.001$). In the adjusted model, Year 2 students scored 6.1 points lower than Year 5 students (adjusted $\beta=-6.1$; 95% CI -10.2 to -2.0; $p=0.004$). Students' specialty preference showed no meaningful association with JSE-S scores ($F=1.21$; $p=0.298$).

Conclusions: Among undergraduate medical students at a private medical college in Karachi, female students scored higher than male students and Year 5 students scored higher than Year 2 students, on self-reported JSE-S empathy; preferred future specialty showed no comparable association.

Keywords: Empathy, Jefferson scale of empathy, Medical students, Pakistan, Sex differences

INTRODUCTION

Poor physician–patient communication is associated with treatment non-adherence, preventable adverse outcomes and patient dissatisfaction across health systems worldwide.¹ Patients whose physician communicated poorly were 19% more likely to be non-adherent to treatment than those whose physician communicated well; when physicians received communication training, the odds of patient adherence were 1.62 times higher than the odds among patients of untrained physicians.² Physician empathy specifically is linked to better clinical outcomes and appears to be trainable. In a cohort of 1,470 adults with chronic low back pain followed over 12 months, higher levels of physician empathy were

significantly linked to lower pain intensity ($\beta=-0.014$; 95% CI -0.022 to -0.006; $p<0.001$) and reduced back-related disability ($\beta=-0.062$; 95% CI -0.085 to -0.040; $p<0.001$), with effect sizes (Cohen's d) spanning 0.21 to 0.30 across the measured outcomes.³

A systematic review examining 18 interventions designed to enhance empathy in undergraduate medical education found that 15 of them (83%) produced statistically significant improvements in empathy, yielding a mean effect size of 0.23; the review's We also pointed out that fully randomized controlled trials were still uncommon within this body of research.⁴ Empathy scores among medical students tend to decline as training progresses, particularly during the clinical years. In a longitudinal

cohort of 456 medical students, empathy scores were stable through Year 2 but declined significantly at the end of Year 3, the first full year of clinical training, with similar patterns observed in men and women and across specialty preferences.⁵ A systematic review of 18 studies confirmed that empathy decline during training was most consistently documented during clinical years, though most studies described direction of change without a pooled effect estimate.⁶ A systematic review of 30 studies found that 14 (47%) exhibited significantly lower empathy with increasing educational years, while the remaining 16 described higher, mixed or unchanged scores; heterogeneity across studies precluded a pooled estimate.⁷ Empathy scores also vary by context and sex. Nine of 30 studies identified lower mean empathy scores in non-Western compared to Western settings and 18 of 27 studies noted higher scores in female students.⁷

Existing empathy research from Pakistan has notable methodological limitations that leave the empathy–training year relationship poorly characterized in this population. Published studies from Pakistan have been conducted in single institutions, used small samples and none followed students longitudinally across all five years of training.^{8–10}

Private and public medical colleges in Pakistan also differ structurally, which may further shape any empathy–training year association. Private institutions differ from public colleges in sex composition and teaching environment—characteristics that may modify that may modify the direction and magnitude of any empathy–training year relationship.¹¹

This study measured self-reported empathy Jefferson Scale of Empathy–Student version (JSE-S) across all five academic years at a private medical college located in Karachi, Pakistan, comparing scores by sex, academic year and specialty preference (people-oriented, technology-oriented, undecided).

METHODS

We conducted a cross-sectional study at Fazaia Ruth Pfau Medical College (FRPMC), a private medical college in Karachi, Pakistan.

The institutional review board approved this study (Approval No: FRPMC-IRB-2024-72) and each participant gave verbal informed consent after a co-investigator read a standardized information script aloud prior to data collection. We prepared this report in accordance with the STROBE (strengthening the reporting of observational studies in epidemiology) statement for cross-sectional studies.

Sampling strategy

We calculated a minimum sample size of 273, using an anticipated proportion of 50%, a confidence level of 95%

and a margin of error of 5%, with finite-population correction applied to a total enrolled population of 750 students. To account for an anticipated 15% non-response rate, We approached 343 students, allocated proportionately across all five academic years during scheduled lecture sessions.

We defined eligibility using enrollment status and questionnaire completeness: we included students currently enrolled in the MBBS program at FRPMC who were present during a scheduled lecture session at the time of questionnaire administration and we excluded questionnaires on which more than two JSE-S items (>10% of the scale) were left blank.

Of the 343 students approached, 318 returned completed questionnaires (response rate 92.7%); We removed 14 questionnaires that met the exclusion criterion, retaining 304 for analysis.

Data collection

Trained co-investigators administered the questionnaire under the principal investigator's supervision. Four co-investigator medical students distributed paper questionnaires in English during classroom sessions; participants deposited completed forms into a sealed box at the exit. We offered no incentives.

The questionnaire opened with the JSE-S, followed by items on age, sex and academic year and closed with a single item on preferred future specialty. Two research assistants independently double-entered all returned questionnaires, compared the two datasets and resolved discrepancies by referring to the original paper forms.

Variable definitions

We defined the primary outcome, self-reported empathy, using the JSE-S, a 20-item instrument scored on a 7-point Likert scale (range 20–140), where higher scores reflect a stronger orientation toward empathy. For 11 questionnaires with a single missing JSE-S item, we imputed the missing value using the mean of the student's remaining 19 items.

We also recorded age in years; sex (male, female or prefer not to say); academic year (Year 1 through Year 5); and specialty preference (people-oriented, technology-oriented or undecided).

Statistical analysis

The analysis started with descriptive statistics, presenting categorical variables through frequencies and percentages and continuous variables through means and standard deviations. We assessed the internal consistency and reliability of the JSE-S using Cronbach's alpha coefficient. Before comparing groups, We tested normality using the Shapiro–Wilk test and variance

homogeneity using Levene's test, because both Levene's test; because both assumptions were satisfied, we used parametric tests throughout parametric tests throughout. We compared mean JSE-S scores by sex using an independent samples t-test and by academic year and specialty preference using one-way ANOVA. Where the overall ANOVA was statistically significant ($p < 0.05$), We applied Tukey's honestly significant difference (HSD) post-hoc test to identify which group pairs differed.

We fitted a multivariable linear regression model including sex, academic year and specialty preference, based on their identification as JSE-S correlates in prior multi-institutional studies. We report unadjusted and adjusted beta coefficients with 95% confidence intervals as the primary evidence for group differences.

RESULTS

The JSE-S demonstrated acceptable internal consistency reliability in the study sample, with a Cronbach's alpha coefficient of 0.784. We approached 343 students; 318 returned questionnaires (response rate 92.7%). After we removed 14 forms with more than two missing JSE-S items, 304 met inclusion criteria. Of the 304 participants, 191 (62.8%) were female and 113 (37.2%) were male; no participant selected "prefer not to say." The mean age of participants was 21.46 ± 1.68 years, with similar means for female (21.41 ± 1.66) and male (21.53 ± 1.70) students. Each academic year contributed between 55 and 64 students (18.1%–21.1%). One hundred and seventy-four students (57.2%) preferred people-oriented specialties, 81 (26.6%) preferred technology-oriented specialties and 49 (16.1%) remained undecided (Table 1). The overall mean JSE-S score across all participants was 104.8 (SD 12.3).

Female students scored higher on the JSE-S than male students (unadjusted mean difference 5.5, 95% CI 2.9 to 8.1; $p < 0.001$) (Table 2). Year 5 students scored higher on the JSE-S than Year 2 students (107.4 vs 100.8; mean difference 6.6, 95% CI 1.6 to 11.6; $p = 0.018$), suggesting that lacking patient contact in the preclinical year coincided with lower empathy scores than in the final clinical year. All other pairwise year comparisons had confidence intervals that included zero, indicating no meaningful difference in empathy scores between adjacent years. (Table 3, Figure 1). Box plots show the median (red line), mean (blue), interquartile range (box), whiskers extending to the most extreme data points within $1.5 \times \text{IQR}$ and outliers beyond that range (orange

circles). The overall one-way ANOVA p value was 0.023. Post-hoc testing (Tukey HSD) identified a statistically significant difference only between Year 2 and Year 5 ($p = 0.018$).

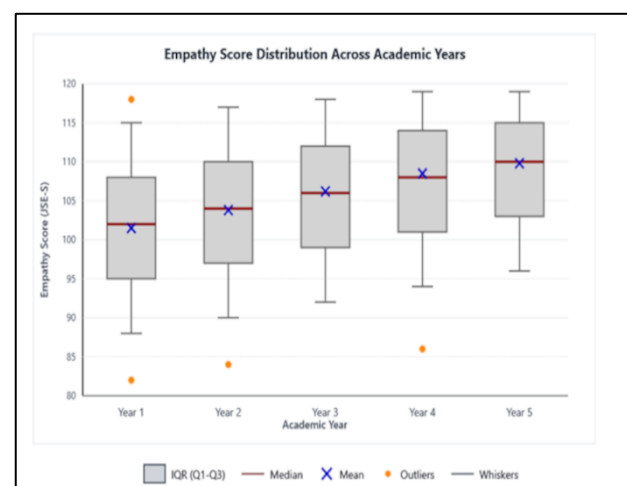


Figure 1: Distribution of JSE-S scores by academic year.

Students who preferred people-oriented, technology-oriented and undecided specialties had overlapping confidence intervals for mean JSE-S scores and the overall one-way ANOVA showed no statistically significant difference ($F = 1.21$; $p = 0.298$), indicating that stated specialty preference did not correlate with empathy scores in this sample (Table 4).

After adjusting for academic year and specialty preference, female students scored 5.5 points higher on the JSE-S than male students (95% CI 2.9 to 8.1; $p < 0.001$), confirming that the higher mean score among female students held independent of training year. After adjusting for sex and specialty preference, Year 2 students scored 6.1 points lower than Year 5 students (95% CI -10.2 to -2.0 ; $p = 0.004$), while adjusted coefficients for Years 1, 3 and 4 compared with Year 5 all had confidence intervals that included zero. Students preferring technology-oriented specialties scored 1.8 points lower than those preferring people-oriented specialties (95% CI -4.8 to 1.2 ; $p = 0.234$) and undecided students scored 0.9 points lower (95% CI -4.5 to 2.7 ; $p = 0.628$); both confidence intervals included zero, indicating that specialty preference did not independently predict empathy scores after controlling for sex and academic year (Table 5).

Table 1: Characteristics of participating medical students (n=304).

Characteristics	Categories	N	%
Age (in years), mean $\pm$ SD	21.46 $\pm$ 1.68		
Sex	Male	113	37.2
	Female	191	62.8
Academic year	Year 1	63	20.7
	Year 2	55	18.1

Continued.

Characteristics	Categories	N	%
Preferred future specialty	Year 3	59	19.4
	Year 4	64	21.1
	Year 5	63	20.7
	People-oriented*	174	57.2
	Technology-oriented†	81	26.6
	Undecided	49	16.1

*People-oriented specialties: internal medicine, pediatrics, family medicine, psychiatry. †Technology-oriented specialties: surgery, radiology, anesthesiology, pathology. Percentages may not sum to exactly 100% because of rounding.

Table 2: JSE-S scores by sex (n=304).

Sex	N	Mean score	SD	Mean difference (95% CI)	t	P value
Male	113	101.1	11.8	Reference		
Female	191	106.7	12.4	5.5 (2.9 to 8.1)	4.03	<0.001*

*Statistically significant at $p < 0.05$ (independent t-test, two-tailed).

Table 3: JSE-S scores by academic year (n=304).

Academic year	N	Mean score±SD	95% CI for mean	Post-hoc comparison vs Year 5 (Tukey HSD)
Year 1	63	104.2±12.9	101.0–107.4	P=0.412
Year 2	55	100.8±11.2	97.8–103.8	P=0.018*
Year 3	59	103.5±13.1	100.1–106.9	P=0.298
Year 4	64	105.9±12.2	102.9–108.9	P=0.824
Year 5	63	107.4±11.5	104.5–110.3	Reference
Overall ANOVA				F=2.89 p=0.023*

*Statistically significant at $p < 0.05$ (one-way ANOVA and Tukey honestly significant difference test, two-tailed). Only the pairwise difference between Year 2 and Year 5 reached statistical significance; CI: confidence interval; ANOVA: analysis of variance.

Table 4: JSE-S scores by preferred future specialty (n=304).

Preferred specialties	N	Mean score±SD	95% CI for mean
People-oriented*	174	105.4±12.5	103.5–107.3
Technology-oriented†	81	102.8±11.7	100.2–105.4
Undecided	49	104.1±13.3	100.2–108.0

*People-oriented: internal medicine, pediatrics, family medicine, psychiatry. †Technology-oriented: surgery, radiology, anesthesiology, pathology.

Table 5: Multivariable linear regression of JSE-S total score (n=304).

Variables	Adjusted β	95% CI	P value
Sex	Male		
	Female	5.5	2.9 to 8.1
Academic year (ref: year 5)			
Year 1	–2.9	–6.8 to 1.0	0.145
Year 2	–6.1	–10.2 to –2.0	0.004
Year 3	–3.6	–7.6 to 0.4	0.078
Year 4	–1.3	–5.2 to 2.6	0.514
Preferred specialty (ref: people-oriented)			
Technology-oriented	–1.8	–4.8 to 1.2	0.234
Undecided	–0.9	–4.5 to 2.7	0.628

DISCUSSION

In this cross-sectional study of 304 MBBS students at a private medical college in Karachi, female students scored 5.5 points higher on the JSE-S than male students after adjusting for academic year and specialty preference. Empathy scores were lowest in year 2 (100.8) and highest in year 5 (107.4) and preferred future specialty did not independently predict empathy scores. The 5.5-point female advantage we observed matched the direction of findings from a systematic review of 30 studies, in which 18 of 27 studies recorded higher JSE-S scores among female students.⁷ The magnitude matched the 3.9-point gap (116.2 vs 112.3) that researchers documented among 2,637 matriculates at Jefferson Medical College over eleven years and the higher female scores that researchers observed among students at Leicester medical school in the UK.^{12,13} A multicenter study of 12 Chinese medical schools showed the same direction of association and additionally identified learning environment quality as remaining associated with JSE-S scores after multivariable adjustment.¹⁴ Within Pakistan, studies from Lahore and Karachi using comparable instruments also found higher self-reported empathy among women, though Tariq et al's multicenter survey of 1,453 students across eight Pakistani schools found no statistically significant sex difference ($p=0.95$) and a Turkish study revealed a similar null result.^{8,15-17} A Swiss longitudinal study that followed students across all five medical school years found that cognitive and affective empathy both increased over time and that male students maintained parallel but consistently lower average scores than female students throughout training.¹⁸

The 6.6-point difference between Year 2 (100.8) and Year 5 (107.4) matched the direction of a Karachi cross-sectional study that also identified the lowest empathy scores among second-year students and a two-year Indian follow-up study that documented lower empathy scores during the preclinical years, coinciding with the start of clinical rotations.^{9,19} A multicohort US longitudinal study tracked sustained or slightly higher empathy scores across four years of an integrated curriculum and Carrard et al found higher cognitive empathy, affective empathy and emotion recognition scores across five Swiss medical school years, with no evidence of a Year 3 pattern.^{18,20} Contrasting findings from Thailand revealed a monotonic decline from entry and an Indian study found no significant variation across years.^{19,21} Consistent with our null specialty finding, the Andersen et al systematic review determined that only three of nine eligible studies found any association between specialty preference and JSE-S scores and a multicenter US longitudinal study also found no association.^{7,20} At least two explanations account for the pattern of lower Year 2 scores and higher Year 5 scores. The first is a training-transition explanation: Year 2 students had not yet begun patient contact which most Pakistani medical colleges, including our institution, introduce in Year 3 and scores rose in Years 3 through 5 alongside progressively greater clinical

exposure. Turkish and Nepalese studies observed a comparable non-linear trajectory that coincided with this same transition from lecture-based to clinical settings.^{17,22} The second is a cohort explanation: year 2 and year 5 students were different individuals, assessed at the same point in time and pre-existing differences in empathic disposition between cohorts rather than any training-related change may have contributed to the observed gap. These data support the training-transition hypothesis: we tracked the score pattern concurrently with the absence of patient contact and the rising pattern did not appear in US and European curricula, where patient contact begins in Year 1 a structural difference that coincides with a different pattern of scores across training years.^{5,6,13} Examination rank, seat availability and family expectations rather than vocational disposition most plausibly explain the null association between specialty preference and empathy scores among Pakistani undergraduate students, these contextual factors may have attenuated an association between empathic orientation and stated preference that is detectable in settings where students choose more freely. This study had four principal limitations. First, the cross-sectional design cannot establish temporality or the direction of association: the 6.6-point difference between Year 2 and Year 5 could reflect a genuine within-student change during training, a pre-existing cohort difference or both and the present data cannot separate these possibilities. Specifically, we cannot determine whether the absence of patient contact drove lower empathy scores or whether students with lower empathic disposition were more likely to appear in earlier training years.

Second, the sample came from a single private medical college in Karachi; private institutions in Pakistan differ from public colleges in class size, student composition and teaching environment and we do not know whether students at public institutions or in other provinces would show the same pattern.¹¹ Third, the JSE-S measured self-reported empathy rather than observed clinical behaviour and we cannot assume that scale scores correspond to actual empathic conduct during consultations.^{6,7} Fourth, we recorded specialty preference as a stated intention rather than an eventual career choice and preferences noted during undergraduate training may shift substantially before graduation.^{23,24}

CONCLUSION

The administration may introduce at least one supervised outpatient visit per week for all Year 2 students starting with the next incoming cohort, alongside structured patient-narrative or reflection sessions within the existing timetable; this constitutes a scheduling adjustment and does not require a curriculum overhaul. The Pakistan Medical and Dental Council may, at its next scheduled curriculum review, revise the minimum requirements for years 1 and 2 to specify at least one patient contact session per week, because the absence of patient contact until year 3 coincided with the lowest JSE-S scores that

this study and comparable South Asian reports recorded. The Health Services Academy or a consortium of Pakistani medical colleges could initiate a multisite longitudinal study that follows the same students from year 1 through year 5 across at least two institutions one public and one private to determine whether the cross-sectional pattern observed here reflects a true within-student change and to supply the temporality data that the present design cannot provide.

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