Does empathy change during medical education? – A meta analysis.

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ABSTRACT
Purpose: The aim of this meta-analysis was to synthesize the existing evidence examining how empathy changes during undergraduate medical education and assess whether different types of measures produce different results.
Method: Three electronic bibliographic databases were last searched on 28 November 2018. Quantitative studies including a measure of empathy in medical undergraduate students and a comparison of the results among the different years of study were included. All analyses were guided by Lipsey and Wilson and conducted using Comprehensive MetaAnalysis software.
Results: The overall sample size for the twelve studies (n ¼ 12) was 4906 participants. Results indicate a significant effect (g ¼ 0.487, SE ¼ 0.113, 95% CI¼ 0.265, 0.709), suggesting that there is moderate evidence that empathy scores changed.
Studies using the Jefferson's Scale for Physician Empathy (JSPE) reported higher effect sizes (g ¼ 0.834, SE ¼ 0.219, 95% CI ¼ 0.406, 1.263), while the effect size for studies using other scales was smaller and non-significant (g ¼ 0.099, SE ¼ 0.052, 95% CI ¼ 0.003, 0.201).
Conclusions: This review indicated significant evidence that self-ratings of empathy changed across the years of medical education. However, we need to be cautious because this effect was only significant when empathy was assessed using
the JSPE.

Introduction

Empathy has been defined as "a cognitive attribute" that includes "the understanding of the experiences, problems and perspectives of the patient [1,2] and the ability to communicate this understanding and intention to help" [3-5]. Empathy is regarded as being crucial to the development of the therapeutic relationship and has been linked to patient enablement [6-9]. Moreover, empathy is considered an essential prerequisite for effective medical care and a holistic understanding of the patient's perspective [10-12]. High levels of empathy in nursing and medical practice have been associated with favorable patient outcomes, such as reduced psychological stress, and fewer complication rates [13,14]. The use of empathy can also enhance diagnostic accuracy [15-17].

Empathy in medical education

As a result of its fundamental role in medical care, empathy is considered a basic skill for medical education [18-20]. To highlight its importance, Cowley argued that “medical schools need students who are better able to understand their patients and can therefore apply the most appropriate treatment” [21]. Similarly, the Association of American Medical Colleges states that empathy should be an essential objective in undergraduate education[22].

However despite the role of empathy in patient outcomes, and its importance for medical education, the majority of studies examining empathy during undergraduate education have mainly focused on nurses. For example, Lauder found no significant differences in empathy levels between nursing students in the first, second, and third year of their studies [23]. Similarly, no significant differences were found by Lovan and Wilson in a sample of American nursing students assessed at the end of the degree course compared with nursing students at the beginning of the course [24]. A study conducted in Australia by McKenna et al. showed satisfactory levels of empathy among nursing students and no significant differences with regard to age, gender and year of study [25].

In contrast, studies examining the empathy of medical students are rare and show contradictory results. For example, recent studies conducted in the US, showed a significant reduction in empathy during medical education [26,27]. A systematic review conducted by Neumann et al. [26] showed that empathy declines during medical education, and residency training compromising development of professionalism and quality of care. As possible reasons for the change in empathy during medical education, studies have suggested the role of program structure, clinical learning environment, student selection, and cultural influences, as well as student age, gender, and background[28]. Early findings in longitudinal clinical training programs, where students spend at least 6 months with the same clinical supervisor and have the ability to see the same patients over a period of time, suggest that this type of program structure for clinical learning may decrease the trend to lower empathy scores [29,30]. A number of studies have suggested that a reduction in empathy among students is related to exposure to patients and the clinical setting, a reduction that is more pronounced during the final years[31].

However other studies do not show the same trend towards a reduction of empathy during medical education. For example, in the study of Zeldow and Daugherty, no change was reported in empathy scores from the first to the last years of undergraduate medical training [32]. Similarly, in the study of Costa et al, conducted in Portugal empathy scores remained the same across the years of undergraduate medical education [33]. A multi-centre study among 22 Brazilian medical schools showed that students maintained their empathic disposition throughout medical school [34].

Consequently it is important to examine reliably whether and how empathy changes through the years of medical education. Therefore, the overarching aim of the review was to synthesize the existing evidence examining how empathy changes during undergraduate medical education.

Method

This review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA) guidelines (see Table 1).

Search strategy

Three electronic bibliographic databases were last searched on 06/04/2017, (Table 2) along with reference searching of all eligible articles. Both terms and keywords were used in a multi-field search, based on terms commonly used within systematic reviews in the fields of empathy in medical education.

Study selection

A flow chart documenting the selection process can be viewed in Fig. 1. After duplicates were removed, titles were screened for eligibility against the following criteria:

Inclusion Criteria: Cross-sectional and longitudinal studies that were published and included a measure of empathy in medical undergraduate students and a comparison of the results among the different years of study, were included. No restrictions on the year of publication were imposed, but only articles written or translated into English were eligible.
Exclusion criteria Qualitative studies, review articles, editorials, letters, conference abstracts, books, theses and opinions were excluded. Studies that included students from other healthcare professions were excluded. Furthermore, studies in which a workshop or seminar took place before the assessment of empathy were also excluded.

Study Selection

Study selection was completed in two stages. First all titles and abstracts were screened, and second the full text articles were evaluated against the eligibility criteria. The title and abstract selection was conducted by VS and EP, who both completed the full text screening. Inter-rater reliability was k= 0. 92.

Data extraction

An Excel data extraction form was developed and initially piloted in 3 randomly selected studies. The following descriptive information was extracted from the studies:

- Publication information: authors, year
- Study: research design, sampling method
- Setting: country, health care setting (primary/hospital care)
- Participants: Gender, age, year of study
- Dependent variable: Measure of empathy
- Associations: Mean differences in empathy scores

Quality assessment

Quality assessment was performed based on the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies [35].The tool contains 8 criteria scored on a 3-point scale, corresponding to poor, fair, or good quality. Further details about the quality assessment tool and the results of the selected articles can be found in table 3 and table 4, respectively.

Analysis

The meta-analyzes were guided by Lipsey and Wilson [36]and conducted using Comprehensive Meta-Analysis software [37]. In deriving effect sizes and confidence intervals, random-effects models were used. Random-effects models assume variation in effect sizes between studies is due to both sampling error and true random variance arising from differences between studies in terms of their procedures and settings (as opposed to only sampling error stipulated in a fixed effect model). In comparison to fixed-effects models, then, random-effects models are generally considered to be preferable and allow generalization beyond the set of studies examined to future studies [38].

The effect size reported is the average of the reported effect sizes. This is a commonly used strategy to ensure that effect sizes in the analyzes are independent and avoids artificial inflation of sample size, distortion of standard error estimates, and overrepresentation of studies that include multiple effect sizes [36]. Cohen's recommendations for small, medium, and large effect sizes were then used to guide interpretation of effects (d = .10, .30, and .50) [39].Statistical significance is indicated by the 95% confidence intervals excluding zero (p <.05).

Moderation Analysis

The following moderators were examined as possible reasons for heterogeneity. Design (longitudinal vs cross-sectional), empathy measure (Jefferson's Scale for Physician Empathy vs other), cultural context (North vs South).

Moderation was assessed by calculating the degree of inconsistency in the observed relationship across studies (I^2). This index is interpreted as the percentage of total variation across studies due to "true" heterogeneity rather than sampling error [40].As I^2 increases, the level of true heterogeneity increases (0% to 100%). Values of 25%, 50%, and 75% have been identified as low, medium and high levels of heterogeneity [40].

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Results

Table 5 provides a detailed summary of all the reviewed studies. Eight studies were included in the review. The overall sample size for the eight studies was 1.984 participants, 1.163 men and 821 women. Four studies (n=4) used the Jefferson's Scale for Physician Empathy (JSPE) to assess empathy. Alternative measures were: The Balanced Emotional Empathy Scale (BEES), the Reading the Mind in the Eyes test (RME-R test), the Empathy Quotient (EQ) scale and the Interpersonal Reactivity Index: IRI-EC (affective empathy) and IRI-PT (cognitive empathy).
Three studies were conducted in the US, while the remaining five were conducted in Ethiopia, India, Malaysia, Pakistan, and Portugal. Five studies (n=5) utilised a cross-sectional design, and three (n=3) studies were longitudinal.

Main Meta-Analysis: Change in empathy scores over time

The magnitude of Hedges' g may be interpreted using Cohen's (1977) convention as small (0.2), medium (0.5), and large (0.8) Overall results indicate a small effect (g = -0.148, SE = 0.065, 95% CI = -0.276, -0.020), suggesting that there is not significant evidence that empathy scores changed. At the individual study level, three studies found a significant decline in empathy scores at the end of the third year, which persisted until graduation [41-43] the other three studies found no significant difference in the levels of empathy between the first and the last year medical students [44-46]; only two studies found that the empathy measures of senior year students were higher than the scores of first year students [47,48].

Sub-group Analysis: Design, Measure and Context

The meta-analysis indicated significant heterogeneity with the I-squared = 89.989 , suggesting that moderation analysis was appropriate.
In terms of research design……
…………………………………….

Publication Bias

In order to assess publication bias (the 'file-drawer' problem) we adopted a number of strategies. We examined the fail-safe number (fail-safe N) for each effect size. The fail-safe number indicates the number of non-significant, unpublished, or missing studies with a mean effect size of zero that would need to exist in order to change the statistical significance of the observed effect size to a non-significant level (here, p = .05). We also inspected funnel plots (a scatterplot of effect sizes against the reciprocal of its standard error).

Rosenthal [49]recommended that the fail-safe number should be greater than $5k + 10$, where k equals the number of observed effect sizes. In the present analysis the fail-safe N.

Discussion

This review shows little or no change in self-ratings of empathy that can be convincingly attributed to medical education training. Results do not support the conclusion of previous studies that there is a serious decline in empathy due to medical education.

In addition, this review showed that a larger decrease is observed when studies used the Jefferson Scale, adopted a longitudinal design, or were conducted in Northern cultural contexts.

In terms of the difference in the effect sizes according to the empathy measure, the Jefferson Scale of Physician Empathy was originally developed to measure the orientation of medical students toward physician empathy in patient-care situations [50]**.** Hoyat et al. examined the associations between scores on two of the three instruments: Interpersonal Reactivity Index (IRI), Empathy Quotient (EQ) and Jefferson's Scale for Physician Empathy (JSPE) and reported r= 0.41 for n= 193 medical students and r= 0.40 for n= 41 residents [51]. Not only do these correlations raise doubts about whether the instruments measure the same construct, they also bring into question the validity of using either of these instruments to assess the change in empathy throughout medical education given the low to moderate inter instrument reliabilities [52].

In reality none of the empathy instruments have been validated with patients' perceptions, or expert ratings. In fact, self-ratings of empathy have been shown to differ from real or standardized patient ratings and that both differ from ratings by a trained expert [53]. Results indicate that before we proceed in assessing changes in empathy during medical education, we need to examine the associations of self-report empathy instruments with real or simulated patients' assessments, or caregiver empathy in actual or simulated clinical encounters [54]. It seems reasonable that self- reports of empathy might decline for a number of reasons that have nothing to do with the patient's experience of empathic concern and effective clinical care. The fundamental problem here is that self-report empathy instruments suffer from the same biases of all self assessments [53,54].

Empathy is an important consideration in medical practice and the care of patients. However the operationalization of empathy, needs further elaboration [54,55].

In terms of the different effect size among cultural contexts, Morling and Lamoreaux have reported that cultural products that come from Western cultures (mostly the United States) are more individualistic, and less collectivistic, than cultural products that come from collectivistic cultures (including Korea, Japan, China, and Mexico)[56]. In this review there was a larger decline of empathy during medical education in North cultural settings, mainly in the studies that were conducted in the US. Integrating cultural issues at the undergraduate levels can help doctors-in-training to have a better understanding of cultural issues in clinical settings later on [57].

Another concern about these studies was the study design. The effect size for the cross-sectional studies was larger than the longitudinal studies (longitudinal: -0.067, cross-sectional: -0.202). Obviously the longitudinal studies are statistically important and their results about empathy studies are more articulate.

Table 1: PRISMA statement

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	#1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	#2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	#1
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	#2
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	#2
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	#3
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	#3

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	#3
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	#3
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	#4
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	#4

Section/topic	**#**	**Checklist item**	**Reported on page #**
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	#5
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	#4
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	

Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit:**www.prisma-statement.org**.

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able 2. Electronic databases searched and number of results.

Database	Papers Identified
PubMed	898
Web of Science	707
Psyinfo	224
Total	**1829**

Fig 1. Flow chart documenting the screening process

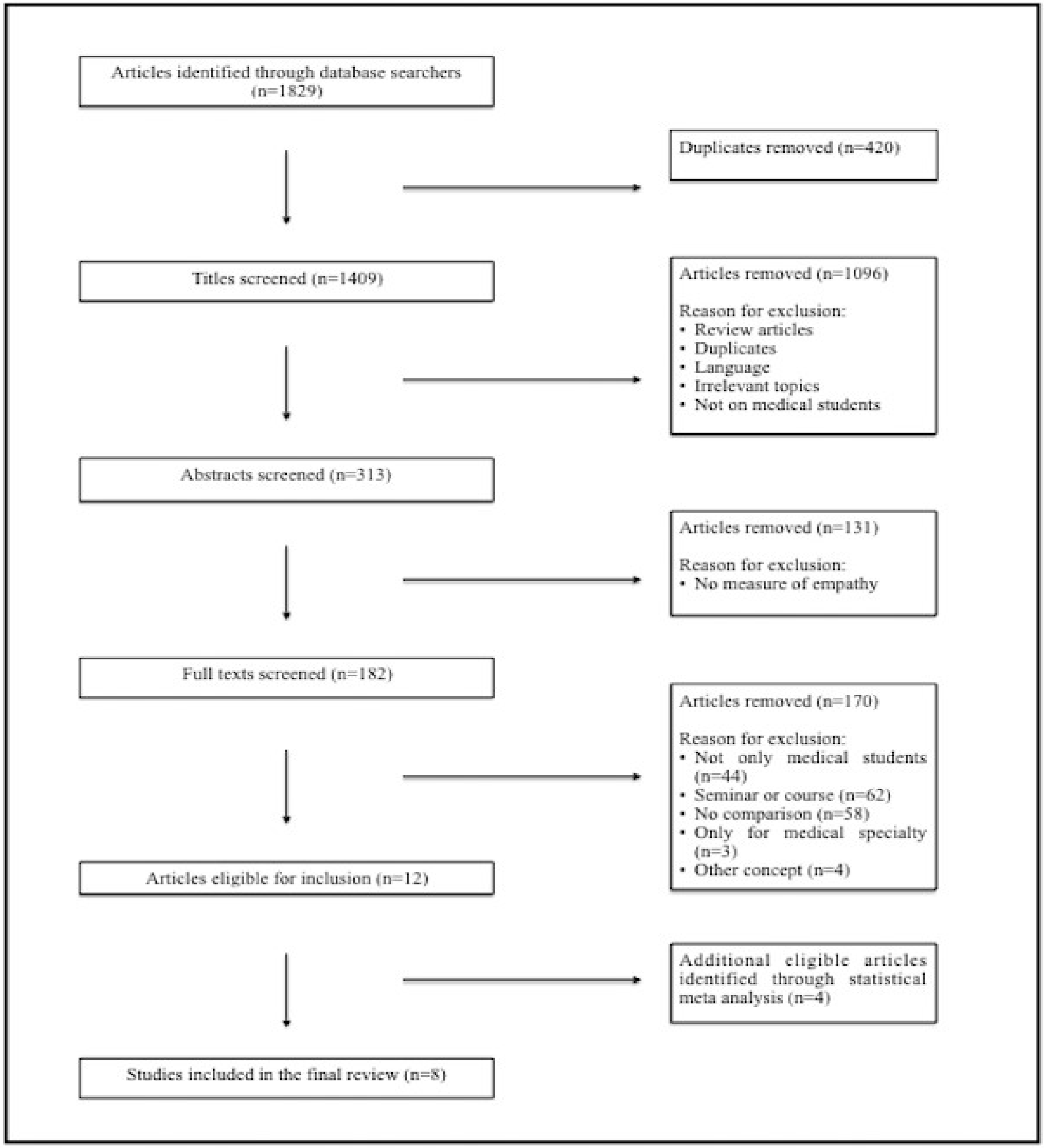

Table 3: Quality Assessment Tool

Criteria	Yes	No	Other (CD, NR, NA)*
1. Is the review based on a focused question that is adequately formulated and described?	✓		
2. Were eligibility criteria for included and excluded studies predefined and specified?	✓		
3. Did the literature search strategy use a comprehensive, systematic approach?	✓		
4. Were titles, abstracts, and full-text articles dually and independently reviewed for inclusion and exclusion to minimize bias?	✓		
5. Was the quality of each included study rated independently by two or more reviewers using a standard method to appraise its internal validity?	✓		
6. Were the included studies listed along with important characteristics and results of each study?	✓		
7. Was publication bias assessed?	✓		
8. Was heterogeneity assessed?	✓		

Table 4: Methodological Appraisal

Author(s)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Total
Bangash et al [46]	1	0	1	1	1	1	1	1	67-100%
Dehning et al [48]	1	1	1	1	1	1	1	1	67-100%
Hojat et al [42]	1	0	1	1	1	1	1	1	67-100%
Magalhães et al [47]	1	1	1	1	1	1	1	1	67-100%
Newton et al [44]	1	0	1	1	1	1	1	1	67-100%
Quince et al [45]	1	0	1	1	1	1	1	1	67-100%
Shashikumar et al [41]	1	0	1	1	1	1	1	1	67-100%
Williams et al [43]	1	1	1	1	1	1	1	1	67-100%

Methodological Appraisal Score
Scoring: Total score divided by total number, multiplied by 100.
Low: 0 – 33 %,   Medium: 34 – 66 %, High: 67 – 100 %

Table 5. Summary of the articles								
Author(s)	**Year**	**Location**	**Study Design**	**Study Population**	**Response Rate**	**Sample size and characteristics**	**Empathy measure**	**Results**

Bangash et al.[46]	2013	Karachi, Pakistan.	Cross-sectional study	Medical students from the first and fifth year.	88%	n= 171 Male= 64 Female= 107 Average age: Not reported	Empathy Quotient (EQ) scale	82.67% of fifth year students and 80.21% of first years showing average or above average levels of empathy. Female mean scores were 42±9.60 while males were 38.7±9.358 (P=0.03).No significant difference in the levels of empathy between the first and fifth year medical students.

Dehning et al.[48]	2012	Ethiopia	Cross – sectional study	Medical students from the first and final year.	Not reported	n= 237 Male=207 Female=30 The mean age of first year and final year students was 19.3 ± 1.1 and 24.0 ± 1.4 years respectively	The Balanced Emotional Empathy Scale (BEES) and the Reading the Mind in the Eyes test (RME-R test)	First year students have scored 40.6 ± 23.8 while final year students scored 41.5 ± 20.8 mean in the BEES measuring emotional empathy score. This difference was not statistically significant Final year students had significantly higher mean cognitive empathy score (17.8 ± 4.5) than first year students (14.4 ± 4.8). Males scored lower cognitive($\beta = -2.5$)and emotional empathy ($\beta = -12.0$)

Hojat et al [42]	2009	Philadelphia, US	Longitudinal study	Medical students who entered Jefferson Medical College in 2002 and 2004.	Not reported	n=456 Male=230 Female=226 Year 1: 399 Year 2: 375 Year 3: 339 Year 4: 356 Average age: Not reported	Jefferson Scale of Physician Empathy	Empathy scores did not change significantly during the first two years of medical school. A significant decline in empathy scores was observed at the end of the third year which persisted until graduation. Findings were similar for the matched cohort (n = 121) and for the rest of the sample (unmatched cohort, n = 335). Patterns of decline in empathy scores were similar for men and women

Magalhães et al [47]	2011	Portugal	Cross sectional	Medical students from first and last year.	92%	n=476 First year:356 Last year:120 Male=155 Female=321 Average age: Not reported	Jefferson Scale of Physician Empathy	The empathy scores of students in the final year were higher as compared to first year students ($F (1,387) = 19.33$, $p < .001$, $\eta_p^2 = 0.48$; $\pi = 0.99$). Female students had higher empathy scores than male students ($F (1,387) = 8.82$, $p < .01$, $\eta_p^2 = 0.23$; $\pi = 0.84$).

Newton et al [44]	2008	Arkansas, US	Longitudinal study (four cohorts)	Medical students from four classes, 2001-2004	Not reported	n=419 (108; of the class graduated in 2001, 109; of the class graduated in 2002, 98; of the class graduated in 2003, and 104; of the class graduated in 2004). Male=789 Female=522 Average age: Not reported	The Balanced Emotional Empathy Scale (BEES),	There were no significant differences in students' empathy scores as they began medical school.As anticipated from the gender-sensitive BEES, the women always had significantly higher BEES scores than the men (P _ .001).

Quince et al [45]	2011	Cambridge, UK	Longitudinal study	Medical students from core science and clinical, 2007-2010.	Not reported	n=1111 (core science) Year 1: 664 (F:52.8%) Year 2:325 (F:54.9%) Year 3:199 (F:56.6%) n=542 (clinical) Year 4:343 (F:54.5%) Year 5:199 (F:59.1%) Year 6:133 (F:65.4%) Average age: 18years	Interpersonal Reactivity Index: IRI-EC (affective empathy) and IRI-PT (cognitive empathy).	Women displayed statistically significant higher mean scores than men for affective empathy in all 6 years of medical training and for cognitive empathy in 4 out of 6 years Neither men nor women showed any change in cognitive empathy during the course. Neither men nor women appear to become meaningfully less empathetic during medical education.

Shashikumar et al.[41]	2013	India	Cross sectional	Medical students from 1^{st} - 9^{th} semester	100%	n= 488 Male= 380 Female=108 Average age: Not reported	The Jefferson's scale for physician empathy	The study revealed highest empathy at entry level and a significant fall by seventh semester (p ¼ 0.002). Female students had significantly higher empathy levels than male students (p ¼ 0.012) across all semesters. The variance in empathy scores according specialty chosen is not statistically significant (p ¼ 0.2468).

Williams et al.[43]	2015	Malaysia	Cross Sectional	Fist year and second year medical students	Not reported	n=193 Year 1:122 Year 2:71. Female= 55.7% Average age: The median age for year 1 students was 20 (range 17-20) as was for year 2 students (range 18-30).	The Jefferson's scale for physician empathy	The mean empathy score for first year students was 112.1 (SD=10.7). This was statistically higher with moderate effect size than second year students 108.8 (SD=10.4) ($p<0.038$; $d=0.31$). The decline in empathy levels from first year to second year was seen both males (M=110.5 versus M=109.2; $p=0.07$) and females (M=114.0 versus M=108.1; $p=0.64$) though not statistically significant

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