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Empathy variation of undergraduate medical students after early clinical contact

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Abstract

Objectives Empathetic education is very important for medical students. There is little research on the influence of early clinical practice on the development of empathy and other professionalism in medical students. The aim of this study is to compare the self-reported empathy levels of the first- and second-year undergraduate medical students before and after their early clinical contact curriculum.

Setting The study was conducted in Shanghai University of Medicine & Health Sciences, Shanghai, China.

Participants 257 undergraduate medical students participated in the study. The 154 first year students were studying in 10 community-based teaching hospitals and the 103-second year students in 3 university-affiliated hospitals.

Primary and secondary outcome measures Primary measures: The Jefferson Scale of Empathy - Students version (JSE-S) was compared between different genders, and students in different academic years before their early clinical contact

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4 course. Secondary measures: comparisons were made after they finished the
5 curriculum at one month later.
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8 **Results** 219 out of a total of 257 students responded (85.21% response rate),
9 and 214 answers were effective (135 first year and 79 second year students; 120
10 females and 94 males). No significant difference in the empathy scores before early
11 clinical contact was observed between gender and different academic years. After
12 early clinical contact, mean JSE-S score of the participants was significantly higher
13 than the mean score at the beginning of the curriculum.
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20 **Conclusions** Empathy focused training in early clinical contact can improve the
21 empathetic capacity of undergraduate medical students. Fostering empathic attitudes
22 to undergraduate medical students is necessary for their early stage of medical
23 education. Further research is needed on the long-term effects of empathy-focused
24 education in entry-level medical students.
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30 **Strengths and limitations of this study:**
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32 The results of this study reflect the positive influence of empathy education in
33 early clinical contact training for undergraduate medical students.
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36 There is no gender difference in the empathy scale of the Jefferson Scale of
37 Empathy - Students version, which increased the support for previous related studies.
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40 The interval between two self-reported questionnaires is only three weeks,
41 which may have a certain impact on the result analysis because of recent memory.
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49 **Keywords:** Empathy; Early clinical contact; Education; Undergraduate medical
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INTRODUCTION

Empathy is the ability to understand and share feelings of another ¹, include cognitive, affective, behavioral and moral dimensions ². The empathetic capacity of health care professionals plays an important role and empathy has been described as a major factor of professionalism in medicine ^{3,4}. Studies have shown that patients who trust their empathetic doctors tend to communicate well with their doctors and to provide more detailed information favorable for diagnosis and improvement of treatment compliance ^{5,6}. Empathy strengthens interactions between patients and doctors and improves doctor-patient satisfaction ⁷. High levels of empathy in health care professionals are connected to positive clinical prognosis for patients, such as reducing mental stress, improving self-awareness, and reducing anxiety and depression ^{8,9}. For tomorrow's doctors, empathy education is as important as enhancing their clinical competence ¹⁰. A systematic review showed that educational interventions can be effective in maintaining and enhancing empathy in undergraduate medical students ¹¹. Lim BT and his colleagues introduced a drama training method entitled "how to act-in-role" to enhance the empathetic communication skills of their medical students. This innovative teaching method increased not only students' self-reported empathy but also their competence in consultation skills ¹². Other training methods have also been proposed to enhance medical students' comprehension of empathy and their empathetic capacity, such as "communication skills training" ^{13,14}, "reflective writing" ^{15,16} and "motivational interviewing training" ¹⁷. While some studies showed that the empathy capacity of medical students will decline with the increase in their academic year ¹⁸⁻²⁰, others indicated that the empathy scores of students in their final year were higher as compared with first-year medical students ²¹. In addition to the changes in empathy level of different grade, gender is another very important influencing factor in the empathy ability of undergraduate medical students ²². In terms of gender differences, previous studies had some opposite results, the main reason may be the difference in

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4 the social-cultural background ²³. Moreover, as empathy level is difficult to measure,
5 the standard approach of enhancing it in medical students remains debatable ²⁴.
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8 Early clinical contact (ECC) for medical students is an important curricular
9 innovation and was found to be particularly crucial for teaching professionalism ²⁵.
10 ECC means real-patient contact in a clinical context that enhances learning of health,
11 illness and/or disease, and the role of the health professional, occurring in the early or
12 preclinical years of undergraduate education^{26,27}. Some studies showed that contact
13 with patients early in medical students' training has a positive elicit emotional
14 response that has the potential to trigger the developments of emotional maturity,
15 relational skill, and patient-centered attitudes, and promote better understanding of
16 health and illness ^{28,29}. However, there is little research on the influence of early
17 clinical contact on the development of empathy or other professional abilities in
18 medical students ³⁰.
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30 In this study, we encourage our first and second-year medical students to focus
31 on empathetic relationships between patients and doctors through our ECC
32 curriculum, and hypothesize that this early empathy focused curriculum can improve
33 their views of empathy and their empathetic capacities. First, we compared the
34 empathy levels between genders and different years of medical students after their
35 ECC course. Secondly, we analyzed the interaction between the two factors of
36 different genders and grades.
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44 **METHOD**

45 **Patient and Public Involvement**

46 No patient involved
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48 **Participants**

49 There were 154 students in the first year and 103 students in the second year that
50 took part in the ECC curriculum at the Shanghai University of Medical & Health
51 Sciences in China in July of 2018. The first-year students were studying in 10
52 community-based teaching hospitals and the second-year students in 3 of our
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university hospitals, 10-15 students in each group. After informed consent was obtained, 219 medical students completed the measurement of empathy (response rates of 87.66 % of the 1st year and 76.70% of the 2nd year students, respectively), among which 214 returned questionnaires are valid. All of our students are high school graduates, aged between 17 and 21. The basic characteristics of all participants are shown in Table 1.

Table 1 Basic characteristics of participants

Grade	Gender	All students N (%)	Age M (SD)	Participants N (%)	Response rates	Hospital
First	Females	89(57.80)	18.51(0.77)	78(57.78)	87.66 %	Community
	Males	65(42.20)	18.00(0.73)	57(42.22)		
	Total	154(100)	18.38(0.06)	135(100)		
Second	Females	55(53.40)	18.73(0.13)	42(53.16)	76.70 %	Affiliated
	Males	48(46.60)	19.00(0.15)	37(46.84)		
	Total	103(100)	18.85(0.10)	79(100)		

Measurement of Empathy

Jefferson Scale of Empathy - Students version (JSE-S), created by Hoja and colleagues³¹, was used in this study. It includes 20 items answered on a seven-point Likert-type scale (1 indicating strong disagreement and 7 strong agreement). Ten of the items are positively worded and 10 negatively worded. JSE-S was specifically developed as a self-reporting scale for assessing medical students' attitudes towards empathetic inpatient care. The original JSE-S comprises three components: perspective taking (items 2/4/5/9/10/13/15/16/17/20), compassionate care (items 1/7/8/11/12/14/18/19), and putting yourself in the patient's shoes (items 3/6). The total score was obtained by summing all items (ranging from 20 to 140), with higher scores indicating a higher level of empathy. JSE-S has received international attention from researchers and has been translated into 56 languages including Chinese, French, German, Italian, Korean^{32,33}.

Procedure

The ECC Curriculum

The ECC curriculum took at the end of the school year and was divided into two

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4 parts: one week of theoretical lecture about empathy and narrative medicine given by
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6 professor and two weeks of clinical practice that included empathy-focused training,
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8 patient interviews, and reflective narrative story-writing. We required and guided
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10 students to focus on how to care about patients, become patient-centered and make
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12 decisions with patients and other contents besides diagnosis and treatment of
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14 diseases in clinical work by doctors. In the patient interview, students are required to
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16 explore the inner world of patients and the changes in psychological and social
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18 adaptability brought by the disease to patients and their families.

20 **Two Pass JSE-S surveys**

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22 An initial JSE-S survey was done before the lectures in the first week of our ECC
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24 curriculum, the second pass was done at the end of this curriculum three weeks later.
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26 The questionnaires were powered by www.wjx.cn and anonymously collected so that
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28 students would not feel forced to participate. The platform recorded the time taken to
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30 complete the questionnaire, with the average time to complete being 4.2 minutes. If
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32 the completed time of a questionnaire was less than 2 minutes or more than 10
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34 minutes, its result was excluded from the statistical analyses, considering that
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36 extreme questionnaire completion time will affect the quality of the answers. In this
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38 study, five of 219 returned questionnaires were excluded (2 of them were completed
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40 in less than 2 minutes and 3 more than 10 minutes).

42 **Data analysis**

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44 Statistical analyses were performed using SPSS 19.0 software (SPSS Inc.,
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46 Chicago, IL, USA). All values are shown as mean \pm standard deviation. Descriptive
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48 analyses were performed for all investigated variables and a D'Agostino-Pearson
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50 chi-squared test was used for normal distribution³⁴. The Cronbach's alpha coefficient
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52 was calculated to assess the internal consistency aspect of the reliability of the
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54 questionnaire. Unpaired t-tests were utilized to compare the differences between two
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56 groups, and the analysis of variance (two-way ANOVA) was used for double factor
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58 variance analysis. Statistical significance was defined as $P < 0.05$.

RESULTS

219 of a total of 257 students completed the JSE-S questionnaire (85.21% response rate), and 214 answers were effective (135 1st year and 79 2nd year students; 120 females and 94 males) in both of the two surveys. The JSE-S scores in our study are approximately normally distributed and the internal consistency reliability of the questionnaire had a Cronbach's alpha coefficient of 0.84. No significant difference was observed between gender and different academic years before ECC ($P > 0.05$; table 2). After finishing the ECC curriculum, all the students showed a significantly higher mean score of empathy measured by the JSE-S than the beginning (Table 2), and students of the different grades showed significant statistical variation ($P = 0.001$; Table 3), but no interaction effects were found between gender and academic year ($P = 0.759$; Table 3).

Table 2 Group comparisons on scores of the JSE-S administered to 214 medical students

Variable	Subgroup	Number N (%)	Before ECC M (SD)	After ECC M (SD)	t; df	P-value
Academic year (Gender)	1st year					
	Females	78(57.78)	113.2(11.15) ^a , _b	115.4(10.48) ^{a,b}	2.95;77	0.015
	Males	57(42.22)	110.4(13.14) b	114.1(10.73) ^b	2.71;56	0.016
	Total	135(100)	111.8(11.66) b	115.1(11.02) ^b	4.52;134	0.003
	2nd year					
	Females	42(53.16)	113.7(12.60) ^a	115.7(10.32) ^a	4.08;41	0.007
	Males	37(46.84)	111.6(13.82)	118.7(09.73)	3.89;36	0.009
Total	79(100)	113.6(13.14)	118.2(14.00)	2.11;78	0.026	

Note: Values are mean \pm SD or number (%). **Abbreviations:** early clinical contact, ECC

$P > 0.05$ (a: compared between gender; b: compared between different academic years)

Table 3 Two-way ANOVA of double factor variance analysis (gender; grade)

Source of Variations	Total variation, %	F (DFn, DFd)	P-value
Interaction	0.045	F (1, 206) = 0.095	0.759
Row Factor (Gender)	0.598	F (1, 206) = 1.27	0.261
Column Factor (Grade)	2.240	F (1, 206) = 4.76	0.001

Discussion

Early clinical contact closes the gap between theory and practice. Hence, many medical schools are adjusting their curricula to provide greater vertical integration between basic and clinical subject²⁸. Clinical scenes can deepen the understanding of medical students on professional quality especially when students face the death of a patient directly³⁵; such scenes have a strong impact on the formation of empathy and other professional qualities³⁶. Hojat defined medical empathy as “a cognitive attribute that mainly includes the understanding of experiences, problems, and perspectives of patients, and the ability to communicate this understanding and an intention to help”³⁷. Empathy strengthens the relationship between patients and health professionals and improves patient-physician satisfaction³⁸. Teachers in medical universities must foster the empathetic capacity of future doctors and maintain it at a relatively high level³⁹. In some studies, self-reported measures have found that empathy declines during undergraduate medical training. A study by Mohammadreza Hojat et al. showed that the empathy scores did not change significantly during the first two years of their students; however, a significant decline was observed at the end of their third-year students⁴⁰. However, Eunice Magalhães, Ulloque MJ and their colleagues’ studies showed that the empathy lever of last year students was higher than their freshmen^{21,41}. Several other studies evaluated the levels of empathy among medical students and analyzed the differences by age, gender, and year⁴²⁻⁴⁴. In this study, the Cronbach’s alpha coefficient was 0.84; it is similar to some other studies in China^{45,46}, which indicates that JSPE-S had been

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4 internally consistent among Chinese medical students. We compared the
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6 self-reported empathy levels of two grades of undergraduate medical students before
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8 and after their ECC curriculum. The main results of this study are that there were no
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10 statistical differences between gender and academic years before the ECC. This is
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12 not consistent with other studies that indicated that female students had significantly
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14 higher average scores of empathy than the males ¹⁹, but similar to other studies
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16 ^{32,47-49}. Gender disparity might be due to “particular factors” unique to European and
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18 American medical students. In some Asian countries, there is often no statistical
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20 difference, which might be caused by different social-cultural backgrounds ^{48,49}. Our
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22 students got directly out of high school after they passed a unified selective
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24 examination. Which is essentially different from European and American medical
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26 students, who usually major in different subjects in college. Our university has a
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28 course of “Introduction to Medicine” in the first year, which helps students to think
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30 about ethics, life and death, and the history of medicine. The lack of statistical
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32 differences between different gender and academic years before the ECC in our
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34 study may result from different cultures and different sources of students addressed
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36 above.

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38 After their ECC at the end of the first and second year of study, our students
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40 showed a significantly higher mean score of empathy measured by the JSE-S than at
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42 the beginning. During the ECC, we emphasized the importance of empathy and
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44 students are required to focus on and record real cases of doctor-patient empathy in
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46 clinical learning. This suggests that students who attend empathy-focused clinical
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48 programs early in their five years of study may establish and strengthen the concept
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50 of empathy, which is a key component of medical professionalism. We have unified
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52 requirements of patient interviews and reflective writing for both first and second year
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54 students. Reflective narratives are a useful and enjoyable way of teaching medical
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56 students about empathy issues ⁵⁰. Empathy education should be emphasized as a
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58 key part of integrating patient contact early in the curriculum as it plays an important
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4 role in students' future doctor-patient relationship⁵¹. There is no interaction ($p = 0.759$)
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6 between gender and academy year, it means that there is no dependency between
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8 these two factors. This result confirms findings from other study²¹. Future studies
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10 should be using multiple forms of measurement in order to better understand the
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12 mechanisms involved in empathy changes in medical students⁵².

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14 One limitation of our study is that the valuation of empathy was constructed using
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16 only a single subjective self-reported questionnaire among undergraduate medical
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18 students. Short observation time is the second limitation, which may introduce a
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20 certain bias on the result analysis. The time interval necessary for eliminating bias in
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22 the results needs further study, and we will carry out related study in our future
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24 research.

25 26 **Conclusion**

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28 Empathy education is very important in undergraduate medical students, in order
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30 to promote the quality of the doctor-patient relationship in their future work. Early
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32 clinical contact can not only stimulate students' learning enthusiasm, also play a vital
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34 role in the formation of vocational ability. This study revealed that empathy-focused
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36 training in early clinical contact could improve the empathetic capacity of our
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38 undergraduate medical students. Empathy and other professionalism education
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40 should be carried out in junior medical students. Further research is needed on the
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42 long-term effects to conform to the early empathy education of medical students.
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45 46 **Abbreviations**

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48 **JSE-S:** Jefferson Scale of Empathy - Students version

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50 **ECC:** Early Clinical Contact

51 52 **Declarations**

53 54 **Acknowledgments**

55
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57
58 time to participate in this research. Special thanks to Dave Talbert (an English
59
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5
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13 14 **Availability of data and materials**

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16 The datasets generated and/or analyzed during the current study are not publicly
17
18 available due to privacy concerns but are available from the corresponding author on
19
20 reasonable request.

21 22 **Author contributions**

23
24 XY and HX contributed to design, data analysis and drafting. HG and XZ
25
26 contributed to critically revising the paper and agreed to be accountable for all
27
28 aspects of the work.

29 30 **Ethics approval and consent to participate**

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32 Ethics approval was granted by the Human Research Ethics Committee of
33
34 Shanghai University of Medicine & Health Sciences, research protocol number
35
36 2018/136.

37 38 **Consent for publication**

39
40 Not applicable.

41 42 **Competing interests**

43
44 The authors declare that they have no competing interests.

45 46 **References**

- 47
48
49 1. Singer T, Klimecki OM. Empathy and compassion. *Curr Biol*.
50
51 2014;24(18):R875-R878.
- 52
53 2. Heyes C. Empathy is not in our genes. *Neurosci Biobehav Rev*.
54
55 2018;95:499-507.
- 56
57 3. Kim SS, Kaplowitz S, Johnston MV. The effects of physician empathy on
58
59 patient satisfaction and compliance. *Eval Health Prof*. 2004;27(3):237-251.
60

- 1
- 2
- 3
4. Walsh S, O'Neill A, Hannigan A, Harmon D. Patient-rated physician empathy and patient satisfaction during pain clinic consultations. *Ir J Med Sci.* 2019.
- 5
- 6
- 7
8. Weilenmann S, Schnyder U, Parkinson B, Corda C, von Kanel R, Pfaltz MC. Emotion Transfer, Emotion Regulation, and Empathy-Related Processes in Physician-Patient Interactions and Their Association With Physician Well-Being: A Theoretical Model. *Front Psychiatry.* 2018;9:389.
- 9
- 10
- 11
- 12
- 13
- 14
- 15
16. Schwenk TL. Physician Well-being and the Regenerative Power of Caring. *JAMA.* 2018;319(15):1543-1544.
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
26. Ditton-Phare P, Loughland C, Duvivier R, Kelly B. Communication skills in the training of psychiatrists: A systematic review of current approaches. *Aust N Z J Psychiatry.* 2017;51(7):675-692.
- 27
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
36. Lorie A, Reiner DA, Phillips M, Zhang L, Riess H. Culture and nonverbal expressions of empathy in clinical settings: A systematic review. *Patient Educ Couns.* 2017;100(3):411-424.
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60
9. Hemmerdinger JM, Stoddart SD, Lilford RJ. A systematic review of tests of empathy in medicine. *BMC Med Educ.* 2007;7:24.
10. Han JL, Pappas TN. A Review of Empathy, Its Importance, and Its Teaching in Surgical Training. *J Surg Educ.* 2018;75(1):88-94.
11. Batt-Rawden SA, Chisolm MS, Anton B, Flickinger TE. Teaching empathy to medical students: an updated, systematic review. *Academic medicine : journal of the Association of American Medical Colleges.* 2013;88(8):1171-1177.
12. Lim BT, Moriarty H, Huthwaite M. "Being-in-role": A teaching innovation to enhance empathic communication skills in medical students. *Medical teacher.* 2011;33(12):e663-669.
13. Winefield HR, Chur-Hansen A. Evaluating the outcome of communication skill teaching for entry-level medical students: does knowledge of empathy increase? *Med Educ.* 2000;34(2):90-94.
14. Kataoka H, Iwase T, Ogawa H, et al. Can communication skills training

- 1
2
3
4 improve empathy? A six-year longitudinal study of medical students in Japan.
5
6 *Med Teach*. 2019;41(2):195-200.
- 7
8 15. Shapiro J, Rucker L, Boker J, Lie D. Point-of-view writing: A method for
9
10 increasing medical students' empathy, identification and expression of emotion,
11
12 and insight. *Educ Health (Abingdon)*. 2006;19(1):96-105.
- 13
14 16. Liao HC, Wang YH. The application of heterogeneous cluster grouping to
15
16 reflective writing for medical humanities literature study to enhance students'
17
18 empathy, critical thinking, and reflective writing. *BMC Med Educ*.
19
20 2016;16(1):234.
- 21
22 17. Ekong G, Kavookjian J, Hutchison A. Predisposition for Empathy, Intercultural
23
24 Sensitivity, and Intentions for Using Motivational Interviewing in First Year
25
26 Pharmacy Students. *Am J Pharm Educ*. 2017;81(8):5989.
- 27
28 18. Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in
29
30 empathy in medical school. *Med Educ*. 2004;38(9):934-941.
- 31
32 19. Chen DC, Kirshenbaum DS, Yan J, Kirshenbaum E, Aseltine RH.
33
34 Characterizing changes in student empathy throughout medical school. *Med*
35
36 *Teach*. 2012;34(4):305-311.
- 37
38 20. Neumann M, Edelhauser F, Tauschel D, et al. Empathy decline and its
39
40 reasons: a systematic review of studies with medical students and residents.
41
42 *Acad Med*. 2011;86(8):996-1009.
- 43
44 21. Magalhaes E, Salgueira AP, Costa P, Costa MJ. Empathy in senior year and
45
46 first year medical students: a cross-sectional study. *BMC Med Educ*.
47
48 2011;11:52.
- 49
50 22. Hojat M, DeSantis J, Shannon SC, et al. The Jefferson Scale of Empathy: a
51
52 nationwide study of measurement properties, underlying components, latent
53
54 variable structure, and national norms in medical students. *Adv Health Sci*
55
56 *Educ Theory Pract*. 2018;23(5):899-920.
- 57
58 23. Huang L, Thai J, Zhong Y, Peng H, Koran J, Zhao XD. The Positive
59
60

- 1
2
3
4 Association Between Empathy and Self-Esteem in Chinese Medical Students:
5 A Multi-Institutional Study. *Front Psychol.* 2019;10:1921.
6
7
8 24. Quince T, Thiemann P, Benson J, Hyde S. Undergraduate medical students'
9 empathy: current perspectives. *Adv Med Educ Pract.* 2016;7:443-455.
10
11 25. Goldie J, Dowie A, Cotton P, Morrison J. Teaching professionalism in the early
12 years of a medical curriculum: a qualitative study. *Med Educ.*
13 2007;41(6):610-617.
14
15 26. Dornan T, Bundy C. What can experience add to early medical education?
16 Consensus survey. *BMJ.* 2004;329(7470):834.
17
18 27. Verma M. Early clinical exposure: New paradigm in Medical and Dental
19 Education. *Contemp Clin Dent.* 2016;7(3):287-288.
20
21 28. Wilkinson TJ, Gower S, Sainsbury R. The earlier, the better: the effect of early
22 community contact on the attitudes of medical students to older people. *Med*
23 *Educ.* 2002;36(6):540-542.
24
25 29. Schei E, Knoop HS, Gismervik MN, Mylopoulos M, Boudreau JD. Stretching
26 the Comfort Zone: Using Early Clinical Contact to Influence Professional
27 Identity Formation in Medical Students. *J Med Educ Curric Dev.*
28 2019;6:2382120519843875.
29
30 30. Hayward LM, Black LL, Mostrom E, Jensen GM, Ritzline PD, Perkins J. The
31 first two years of practice: a longitudinal perspective on the learning and
32 professional development of promising novice physical therapists. *Phys Ther.*
33 2013;93(3):369-383.
34
35 31. Hojat M, Gonnella JS, Nasca TJ, Mangione S, Vergare M, Magee M. Physician
36 empathy: definition, components, measurement, and relationship to gender
37 and specialty. *Am J Psychiatry.* 2002;159(9):1563-1569.
38
39 32. Li D, Xu H, Kang M, Ma S. Empathy in Chinese eight-year medical program
40 students: differences by school year, educational stage, and future career
41 preference. *BMC Med Educ.* 2018;18(1):241.
42
43
44
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2
3
4 33. Cho E, Jeon S. The role of empathy and psychological need satisfaction in
5 pharmacy students' burnout and well-being. *BMC Med Educ*. 2019;19(1):43.
6
7
- 8 34. Cortina-Borja M. Handbook of Parametric and Nonparametric Statistical
9 Procedures, 5th edition. *J R Stat Soc a Stat*. 2012;175:829-829.
10
11
- 12 35. Kelly E, Nisker J. Medical students' first clinical experiences of death. *Med*
13 *Educ*. 2010;44(4):421-428.
14
15
- 16 36. Smith-Han K, Martyn H, Barrett A, Nicholson H. That's not what you expect to
17 do as a doctor, you know, you don't expect your patients to die." Death as a
18 learning experience for undergraduate medical students. *BMC Med Educ*.
19 2016;16:108.
20
21
- 22 37. Hojat M. Ten approaches for enhancing empathy in health and human
23 services cultures. *Journal of health and human services administration*.
24 2009;31(4):412-450.
25
26
- 27 38. Jani BD, Blane DN, Mercer SW. The role of empathy in therapy and the
28 physician-patient relationship. *Forsch Komplementmed*. 2012;19(5):252-257.
29
30
- 31 39. Stepien KA, Baernstein A. Educating for empathy. A review. *J Gen Intern Med*.
32 2006;21(5):524-530.
33
34
- 35 40. Hojat M, Vergare MJ, Maxwell K, et al. The devil is in the third year: a
36 longitudinal study of erosion of empathy in medical school. *Acad Med*.
37 2009;84(9):1182-1191.
38
39
- 40 41. Ulloque MJ, Villalba S, Varela de Villalba T, Fantini A, Quinteros S,
41 Diaz-Narvaez V. Empathy in medical students of Cordoba, Argentina. *Arch*
42 *Argent Pediatr*. 2019;117(2):81-86.
43
44
- 45 42. Hojat M, Gonnella JS. Eleven Years of Data on the Jefferson Scale of
46 Empathy-Medical Student Version (JSE-S): Proxy Norm Data and Tentative
47 Cutoff Scores. *Medical principles and practice : international journal of the*
48 *Kuwait University, Health Science Centre*. 2015;24(4):344-350.
49
50
- 51 43. O'Sullivan DM, Moran J, Corcoran P, O'Flynn S, O'Tuathaigh C, O'Sullivan AM.
52
53
54
55
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57
58
59
60

- 1
2
3
4 Medical school selection criteria as predictors of medical student empathy: a
5 cross-sectional study of medical students, Ireland. *BMJ open*.
6 2017;7(7):e016076.
7
8
9
10 44. Shariat SV, Habibi M. Empathy in Iranian medical students: measurement
11 model of the Jefferson scale of empathy. *Medical teacher*.
12 2013;35(1):e913-918.
13
14
15 45. Wen D, Ma X, Li H, Liu Z, Xian B, Liu Y. Empathy in Chinese medical students:
16 psychometric characteristics and differences by gender and year of medical
17 education. *BMC medical education*. 2013;13:130.
18
19
20
21 46. Jiang T, Wan XY, Liu YY, Li XS. [Reliability and Validity of the Jefferson Scale
22 of Physician Empathy in Chinese Medical Students]. *Sichuan Da Xue Xue Bao*
23 *Yi Xue Ban*. 2015;46(4):602-605.
24
25
26
27 47. Paro HB, Daud-Gallotti RM, Tiberio IC, Pinto RM, Martins MA. Brazilian
28 version of the Jefferson Scale of Empathy: psychometric properties and factor
29 analysis. *BMC Med Educ*. 2012;12:73.
30
31
32
33 48. Tariq N, Rasheed T, Tavakol M. A Quantitative Study of Empathy in Pakistani
34 Medical Students: A Multicentered Approach. *J Prim Care Community Health*.
35 2017;8(4):294-299.
36
37
38
39 49. Rahimi-Madiseh M, Tavakol M, Dennick R, Nasiri J. Empathy in Iranian
40 medical students: A preliminary psychometric analysis and differences by
41 gender and year of medical school. *Med Teach*. 2010;32(11):e471-478.
42
43
44
45 50. Dhaliwal U, Singh S, Singh N. Reflective student narratives: honing
46 professionalism and empathy. *Indian J Med Ethics*. 2018;3(1):9-15.
47
48
49
50 51. Pohontsch NJ, Stark A, Ehrhardt M, Kotter T, Scherer M. Influences on
51 students' empathy in medical education: an exploratory interview study with
52 medical students in their third and last year. *BMC Med Educ*. 2018;18(1):231.
53
54
55
56 52. Smith KE, Norman GJ, Decety J. The complexity of empathy during medical
57 school training: evidence for positive changes. *Med Educ*.
58
59
60

2017;51(11):1146-1159.

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	5
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6
		(b) Describe any methods used to examine subgroups and interactions	6
		(c) Explain how missing data were addressed	6
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6
		(e) Describe any sensitivity analyses	

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4
		(b) Give reasons for non-participation at each stage	4
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	7
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8
Discussion			
Key results	18	Summarise key results with reference to study objectives	7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	11

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Empathy variation of undergraduate medical students after early clinical contact

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3 **Empathy variation of undergraduate medical students after early clinical contact: A**
4 **cross-sectional study, China**
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30 **Abstract**
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32 **Objectives** Empathetic education is very important for medical students. There is little
33 research on the influence of early clinical practice on the development of empathy and other
34 professionalism in medical students. The aim of this study is to compare the self-reported
35 empathy levels of the first- and second-year undergraduate medical students before and after
36 their early clinical contact curriculum.
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42 **Setting** The study was conducted in Shanghai University of Medicine & Health
43 Sciences, Shanghai, China.
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46 **Participants** 257 undergraduate medical students participated in the study. The 154 first
47 year students were studying in 10 community-based teaching hospitals and the 103-second
48 year students in 3 university-affiliated hospitals.
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52 **Primary and secondary outcome measures** Primary measures: The Jefferson Scale of
53 Empathy - Students version (JSE-S) was compared between different genders, and students in
54 different academic years before their early clinical contact course. Secondary measures:
55 comparisons were made after they finished the curriculum at one month later.
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4 **Results** 219 out of a total of 257 students responded (85.21% response rate), and 214
5 answers were effective (135 first year and 79 second year students; 120 females and 94
6 males). No significant difference in the empathy scores before early clinical contact was
7 observed between gender and different academic years. After early clinical contact, mean
8 JSE-S score of the participants was significantly higher than the mean score at the beginning
9 of the curriculum.
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16 **Conclusions** Empathy focused training in early clinical contact can improve the
17 empathetic capacity of undergraduate medical students. Fostering empathic attitudes to
18 undergraduate medical students is necessary for their early stage of medical education.
19 Further research is needed on the long-term effects of empathy-focused education in
20 entry-level medical students.
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26 **Strengths and limitations of this study:**

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28 • We used the Jefferson Scale of Empathy - Students version as a validated instrument,
29 which with good internal consistency (Cronbach alpha 0.84).
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31 • The results of this study reflect the positive influence of empathy education in early
32 clinical contact training for undergraduate medical students.
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34 • There is no gender difference in the empathy scale of the Jefferson Scale of Empathy -
35 Students version, which increased the support for previous related studies.
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37 • The interval between two self-reported questionnaires is only three weeks, which may be
38 have a certain impact on the result analysis because of recent memory.
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49 **Keywords:** Empathy; Early clinical contact; Education; Undergraduate medical students
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INTRODUCTION

Empathy is the ability to understand and share feelings of another ¹ and includes cognitive, affective, behavioral and moral dimensions ². The empathetic capacity of health care professionals plays an important role and empathy has been described as a major factor of professionalism in medicine ^{3,4}. Studies have shown that patients who trust their empathetic doctors tend to communicate well with their doctors and to provide more detailed information favorable for diagnosis and are likely to display improved treatment compliance ^{5,6}. Empathy strengthens interactions between patient and doctor and improves doctors' satisfaction ⁷. High levels of empathy in health care professionals are connected to positive clinical prognosis for patients, such as reducing mental stress, improving self-awareness, and reducing anxiety and depression ^{8,9}.

For tomorrow's doctors, empathy education is as important as enhancing their clinical competence ¹⁰. A systematic review showed that educational interventions can be effective in maintaining and enhancing empathy in undergraduate medical students ¹¹. Lim BT and his colleagues introduced a drama training method entitled "how to act-in-role" to enhance the empathetic communication skills of their medical students. This innovative teaching method increased not only students' self-reported empathy but also their competence in consultation skills ¹². Other training methods have also been proposed to enhance medical students' comprehension of empathy and their empathetic capacity, such as "communication skills training" ^{13,14}, "reflective writing" ^{15,16} and "motivational interviewing training" ¹⁷. While some studies showed that the empathy capacity of medical students decline with increasing academic years ¹⁸⁻²⁰, others indicated that the empathy scores of students in their final year were higher as compared with first-year medical students ²¹. Gender has also been found to influence undergraduate medical students' empathy ²². Conflicting results have been found in respect of gender differences, a reason for this may be social-cultural background ²³. Moreover, as empathy level is difficult to measure, standard approach of enhancing it in medical students remains debatable ²⁴.

Early clinical contact (ECC) for medical students is an important curricular innovation

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4 and was found to be particularly crucial for teaching professionalism²⁵. ECC means
5 real-patient contact in a clinical context that enhances learning of health, illness and/or
6 disease, and the role of the health professional which occurs in the early or preclinical years
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8 of undergraduate education^{26,27}. Some studies showed that contact with patients early in
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10 medical students' training elicits a positive emotional response that has the potential to
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12 trigger the developments of emotional maturity, relational skill, and patient-centered attitudes,
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14 and promote better understanding of health and illness^{28,29}. However the impact of ECC on
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16 the development of empathy or other professional abilities in medical students remains
17
18 relatively under researched³⁰.
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22 In this study, we encourage our first and second-year medical students to focus on
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24 empathetic relationships between patients and doctors through our ECC curriculum. We
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26 sought to investigate whether ECC altered medical students' empathy and whether there were
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28 any differences in this respect in terms of gender and or academic year.
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30 **METHOD**

31 **Participants**

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33 There were 154 students in the first year and 103 students in the second year that took
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35 part in the ECC curriculum at the Shanghai University of Medical & Health Sciences in
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37 China in July of 2018. The first-year students were studying in 10 community-based teaching
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39 hospitals and the second-year students in 3 of our university hospitals, 10-15 students in each
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41 group. After informed consent was obtained, 219 medical students completed the
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43 measurement of empathy (response rates of 87.66 % of the 1st year and 76.70% of the 2nd
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45 year students, respectively), among which 214 returned questionnaires were valid. All of our
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47 students are high school graduates, aged between 17 and 21. The basic characteristics of all
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49 participants are shown in Table 1.
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Table 1 Basic characteristics of participants

Grade	Gender	All students N (%)	Age M (SD)	Participants N (%)	Response rates	Hospital
First	Females	89(57.80)	18.51(0.77)	78(57.78)	87.66 %	Community
	Males	65(42.20)	18.00(0.73)	57(42.22)		
	Total	154(100)	18.38(0.06)	135(100)		
Second	Females	55(53.40)	18.73(0.13)	42(53.16)	76.70 %	Affiliated
	Males	48(46.60)	19.00(0.15)	37(46.84)		
	Total	103(100)	18.85(0.10)	79(100)		

Measurement of Empathy

Jefferson Scale of Empathy - Students version (JSE-S), created by Hojat and colleagues³¹, was used in this study. It includes 20 items answered on a seven-point Likert-type scale (1 indicating strong disagreement and 7 strong agreement). Ten of the items are positively worded and 10 negatively worded. JSE-S was specifically developed as a self-reporting scale for assessing medical students' attitudes towards empathetic inpatient care. The original JSE-S comprises three components: perspective taking (items 2/4/5/9/10/13/15/16/17/20), compassionate care (items 1/7/8/11/12/14/18/19), and putting yourself in the patient's shoes (items 3/6). The total score was obtained by summing all items (ranging from 20 to 140), with higher scores indicating a higher level of empathy. JSE-S has received international attention from researchers and has been translated into 56 languages including Chinese, French, German, Italian, Korean^{32,33}.

Procedure

The ECC Curriculum

The ECC curriculum took place at the end of the school year and was divided into two parts: one week of theoretical lecture about empathy and narrative medicine given by a professor and two weeks of clinical practice that included empathy-focused training, patient interviews and reflective narrative story-writing. We required and guided students to focus on how to care about patients, become patient-centered and make decisions with patients and other contents besides diagnosis and treatment of diseases in clinical work by doctors. In the patient interview, students are required to explore the inner world of patients and the

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4 psychological and social changes associated with the illness experienced by the patients and
5 their families. Each student should complete interviews independently with at least 6 patients
6 and write 2 reflective narrative stories in two weeks of clinical exposure. Students just
7 following a doctor everyday and they have no responsible for the patients' diagnosis and
8 treatment.
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13 **Two Pass JSE-S surveys**

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15 An initial JSE-S survey was done before the lectures in the first week of our ECC
16 curriculum, the second pass was done at the end of this curriculum three weeks later. The
17 questionnaires were powered by www.wjx.cn and anonymously collected so that students
18 would not feel forced to participate. The platform recorded the time taken to complete the
19 questionnaire, with the average time to complete being 4.2 minutes. If the completed time of
20 a questionnaire was less than 2 minutes or more than 10 minutes, its result was excluded from
21 the statistical analyses, considering that extreme questionnaire completion time will affect the
22 quality of the answers. In this study, five of 219 returned questionnaires were excluded (2 of
23 them were completed in less than 2 minutes and 3 more than 10 minutes).
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34 **Data analysis**

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36 Statistical analyses were performed using SPSS 19.0 software (SPSS Inc., Chicago, IL,
37 USA). All values are shown as mean \pm standard deviation. Descriptive analyses were
38 performed for all investigated variables and a D'Agostino-Pearson chi-squared test was used
39 for normal distribution³⁴. The Cronbach's alpha coefficient was calculated to assess the
40 internal consistency aspect of the reliability of the questionnaire. Unpaired t-tests were
41 utilized to compare the differences between two groups, and the analysis of variance
42 (two-way ANOVA) was used for double factor variance analysis. Statistical significance was
43 defined as $P < 0.05$.
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52 **Patient and public involvement**

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RESULTS

219 of a total of 257 students completed the JSE-S questionnaire (85.21% response rate), and 214 answers were effective (135 1st year and 79 2nd year students; 120 females and 94 males) in both of the two surveys. The JSE-S scores in our study are approximately normally distributed and the internal consistency reliability of the questionnaire had a Cronbach's alpha coefficient of 0.84. No significant difference was observed between gender and different academic years before ECC ($P > 0.05$; table 2). After finishing the ECC curriculum, all the students showed a significantly higher mean score of empathy measured by the JSE-S than the beginning (Table 2), and students of the different grades showed significant statistical variation ($P = 0.001$; Table 3), but no interaction effects were found between gender and academic year ($P = 0.759$; Table 3).

Table 2 Group comparisons on scores of the JSE-S administered to 214 medical students

Variables	Subgroup	Number N (%)	Before ECC M (SD)	After ECC M (SD)	t; df	P-values
Academic year (Gender)	1st year					
	Females	78(57.78)	113.2(11.15) ^{a,b}	115.4(10.48)	2.95; 77	0.015
	Males	57(42.22)	110.4(13.14) ^b	114.1(10.73)	2.71; 56	0.016
	Total	135(100)	111.8(11.66) ^b	115.1(11.02)	4.52; 134	0.003
	2nd year					
	Females	42(53.16)	113.7(12.60) ^a	115.7(10.32)	4.08; 41	0.007
	Males	37(46.84)	111.6(13.82)	118.7(09.73)	3.89; 36	0.009
Total	79(100)	113.6(13.14)	118.2(14.00)	2.11; 78	0.026	

Note: Values are mean \pm SD or number (%). **Abbreviations:** early clinical contact, ECC
 $P > 0.05$ (a: compared between gender; b: compared between different academic years)

Table 3 Two-way ANOVA of double factor variance analysis (gender; grade)

Source of Variations	Total variation, %	F (DFn, DFd)	P-value
Interaction	0.045	F (1, 206) = 0.095	0.759
Row Factor (Gender)	0.598	F (1, 206) = 1.27	0.261
Column Factor (Grade)	2.240	F (1, 206) = 4.76	0.001

Discussion

Early clinical contact closes the gap between theory and practice. Hence, many medical

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4 schools are adjusting their curricula to provide greater vertical integration between basic and
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6 clinical subject²⁸. Clinical contact can deepen medical students' understanding of
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8 professionalism especially when students face the death of a patient directly³⁵; such scenes
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10 have a strong impact on the formation of empathy and other professional qualities³⁶. Hojat
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12 defined medical empathy as “a cognitive attribute that mainly includes the understanding of
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14 experiences, problems, and perspectives of patients, and the ability to communicate this
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16 understanding and an intention to help”³⁷. Empathy strengthens the relationship between
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18 patients and health professionals and improves patient-physician satisfaction³⁸. In some
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20 studies, self-reported measures have found that empathy declines during undergraduate
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22 medical training. Study by Mohammadreza Hojat et al. showed that the empathy scores did
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24 not change significantly during the first two years of their students, but a significant decline
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26 was observed at the end of their third-year students³⁹. However, Eunice Magalhães, Ulloque
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28 MJ and their colleagues' studies showed that the empathy level of last year students was
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30 higher than their freshmen^{21,40}.

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32 In our study, the Cronbach's alpha coefficient was 0.84; it is similar to some other
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34 studies in China^{41,42}, which indicates that JSPE-S had been internally consistent among
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36 Chinese medical students. We compared the self-reported empathy levels of two grades of
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38 undergraduate medical students before and after their ECC curriculum. The main finding of
39
40 this study was the improvement in empathy scores in all of our students after the ECC. Our
41
42 ECC curriculum includes not only empathy focused early clinical exposure of real patients
43
44 but also the theory instruction of doctor – patient empathy. During the ECC, we emphasized
45
46 the importance of empathy and students are required to focus on and record real cases of
47
48 doctor-patient empathy in clinical works. This suggests that students who attend
49
50 empathy-focused clinical programs early in their five years of study may establish and
51
52 strengthen the concept of empathy, which is a key component of medical professionalism.
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54 We have unified requirements of patient interview and reflective writing for both of first and
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56 second year students. Reflective narratives are a useful and enjoyable way to teaching
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58 medical students about empathy issues⁴³. Empathy education should be emphasized as a key
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4 part of integrating patient contact early in curriculum as it plays an important role in students'
5 future doctor-patient relationship⁴⁴. Other interesting results were that there were no
6 statistical differences between gender and academic year, and there was no interaction ($p =$
7
8 0.759) between these two factors. This is not consistent with some studies that indicated that
9
10 female students had significantly higher average scores of empathy than the males^{19,45,46}, but
11
12 similar to other studies^{32,47-49}. Gender disparity might be due to “particular factors” unique to
13
14 European and American medical students. In some Asian countries, there is often no
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16 statistical difference, which might be caused by different social-cultural backgrounds^{48,49}.
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18 Our students got directly out of high school after they passed a unified selective examination.
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20 Which is essentially different from American medical students, who usually major in
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22 different subjects in college. Our university has a course of “Introduction to Medicine” in the
23
24 first year, which helps students to think about ethics, life and death. The lack of statistical
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26 differences between different gender and academic years before the ECC in our study may
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28 result from different cultures and different sources of students addressed above. Future study
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30 should using multiple forms of measurement in order to better understand the mechanisms
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32 involved in empathy changes in medical students⁵⁰.
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36 One limitation of our study is that the valuation of empathy was constructed using only a
37
38 single subjective self-reported questionnaire among undergraduate medical students. The
39
40 self-reported empathy capacity is not always accurate and often does not correlate to the
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42 patients' assessments^{51,52}, future study should consider the patients perspectives. Short
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44 observation time is the second limitation, and self-reported scales suffer the influence of
45
46 socially desirable behavior, which means that after the training, students may become aware
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48 of what is the desirable answer in the questionnaire, which may introduce certain bias on the
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50 result analysis. The main purpose of this study is to observe the short-term impact of ECC on
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52 empathy for medical students, the time interval necessary for eliminating bias in the results
53
54 needs further study, and we will carry out related study on its long-term effects in our
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56 follow-up research.
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Conclusion

Empathy education is very important in undergraduate medical students, in order to promote the quality of the doctor-patient relationship in their future work. Early clinical contact can not only stimulate students' learning enthusiasm, also play a vital role in the formation of vocational ability. This study revealed that empathy-focused training in early clinical contact could improve the empathetic capacity of our undergraduate medical students. Empathy and other professionalism education should be carried out in junior medical students. Further research is needed on the long-term effects to conform to the early empathy education of medical students.

Abbreviations

JSE-S: Jefferson Scale of Empathy - Students version

ECC: Early Clinical Contact

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Availability of data and materials

The raw datasets generated and/or analyzed during the current study are not publicly available due to privacy concerns but are available from the corresponding author on reasonable request.

Author contributions

XY and HX contributed to design, data analysis and drafting. HG and XZ contributed to critically revising the paper and agreed to be accountable for all aspects of the work.

Ethics approval and consent to participate

Ethics approval was granted by the Human Research Ethics Committee of Shanghai University of Medicine & Health Sciences, research protocol number 2018/136.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

References

1. Singer T, Klimecki OM. Empathy and compassion. *Curr Biol*. 2014;18:R875-78.
2. Heyes C. Empathy is not in our genes. *Neurosci Biobehav Rev*. 2018;95:499-507.
3. Kim SS, Kaplowitz S, Johnston MV. The effects of physician empathy on patient satisfaction and compliance. *Eval Health Prof*. 2004;3:237-51.
4. Walsh S, O'Neill A, Hannigan A, et al. Patient-rated physician empathy and patient satisfaction during pain clinic consultations. *Ir J Med Sci*. 2019; 4:1379–84.
5. Weilenmann S, Schnyder U, Parkinson B, et al. Emotion Transfer, Emotion Regulation, and Empathy-Related Processes in Physician-Patient Interactions and Their Association With Physician Well-Being: A Theoretical Model. *Front Psychiatry*. 2018;9:389-402.
6. Schwenk TL. Physician Well-being and the Regenerative Power of Caring. *JAMA*. 2018;15:1543-44.
7. Ditton-Phare P, Loughland C, Duvivier R, et al. Communication skills in the training of psychiatrists: A systematic review of current approaches. *Aust N Z J Psychiatry*. 2017; 7:675-92.
8. Lorie A, Reiner DA, Phillips M, et al. Culture and nonverbal expressions of empathy in clinical settings: A systematic review. *Patient Educ Couns*. 2017; 3:411-24.
9. Hemmerdinger JM, Stoddart SD, Lilford RJ. A systematic review of tests of empathy in medicine. *BMC Med Educ*. 2007;7:24-32.
10. Han JL, Pappas TN. A Review of Empathy, Its Importance, and Its Teaching in

- 1
2
3
4 Surgical Training. *J Surg Educ.* 2018; 1:88-94.
5
6 11. Batt-Rawden SA, Chisolm MS, Anton B, et al. Teaching empathy to medical
7 students: an updated, systematic review. *Acad Med.* 2013; 8:1171-77.
8
9 12. Lim BT, Moriarty H, Huthwaite M. "Being-in-role": A teaching innovation to
10 enhance empathic communication skills in medical students. *Medical teacher.* 2011;
11 12:e663-69.
12
13 13. Winefield HR, Chur-Hansen A. Evaluating the outcome of communication skill
14 teaching for entry-level medical students: does knowledge of empathy increase? *Med*
15 *Educ.* 2000; 2:90-94.
16
17 14. Kataoka H, Iwase T, Ogawa H, et al. Can communication skills training improve
18 empathy? A six-year longitudinal study of medical students in Japan. *Med Teach.*
19 2019;2:195-200.
20
21 15. Shapiro J, Rucker L, Boker J, et al. Point-of-view writing: A method for increasing
22 medical students' empathy, identification and expression of emotion, and insight.
23 *Educ Health (Abingdon).* 2006;1:96-105.
24
25 16. Liao HC, Wang YH. The application of heterogeneous cluster grouping to reflective
26 writing for medical humanities literature study to enhance students' empathy, critical
27 thinking, and reflective writing. *BMC Med Educ.* 2016; 1:234-45.
28
29 17. Ekong G, Kavookjian J, Hutchison A. Predisposition for Empathy, Intercultural
30 Sensitivity, and Intentions for Using Motivational Interviewing in First Year
31 Pharmacy Students. *Am J Pharm Educ.* 2017;8:5989-6011.
32
33 18. Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in
34 medical school. *Med Educ.* 2004;9:934-41.
35
36 19. Chen DC, Kirshenbaum DS, Yan J, et al. Characterizing changes in student empathy
37 throughout medical school. *Med Teach.* 2012;4:305-11.
38
39 20. Neumann M, Edelhauser F, Tauschel D, et al. Empathy decline and its reasons: a
40 systematic review of studies with medical students and residents. *Acad Med.*
41 2011;8:996-1009.
42
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44
45
46
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48
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50
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2
3
4 21. Magalhaes E, Salgueira AP, Costa P, et al. Empathy in senior year and first year
5 medical students: a cross-sectional study. *BMC Med Educ*. 2011;11:52-59.
6
- 7
8 22. Hojat M, DeSantis J, Shannon SC, et al. The Jefferson Scale of Empathy: a
9 nationwide study of measurement properties, underlying components, latent variable
10 structure, and national norms in medical students. *Adv Health Sci Educ Theory Pract*.
11 2018;5:899-920.
12
- 13
14 23. Huang L, Thai J, Zhong Y, et al. The Positive Association Between Empathy and
15 Self-Esteem in Chinese Medical Students: A Multi-Institutional Study. *Front Psychol*.
16 2019;10:1921-30.
17
- 18
19 24. Quince T, Thiemann P, Benson J, et al. Undergraduate medical students' empathy:
20 current perspectives. *Adv Med Educ Pract*. 2016;7:443-55.
21
- 22
23 25. Goldie J, Dowie A, Cotton P, et al. Teaching professionalism in the early years of a
24 medical curriculum: a qualitative study. *Med Educ*. 2007;6:610-17.
25
- 26
27 26. Dornan T, Bundy C. What can experience add to early medical education? Consensus
28 survey. *BMJ*. 2004;7470:834-40.
29
- 30
31 27. Verma M. Early clinical exposure: New paradigm in Medical and Dental Education.
32 *Contemp Clin Dent*. 2016;3:287-88.
33
- 34
35 28. Wilkinson TJ, Gower S, Sainsbury R. The earlier, the better: the effect of early
36 community contact on the attitudes of medical students to older people. *Med Educ*.
37 2002; 6:540-42.
38
- 39
40 29. Schei E, Knoop HS, Gismervik MN, et al. Stretching the Comfort Zone: Using Early
41 Clinical Contact to Influence Professional Identity Formation in Medical Students. *J*
42 *Med Educ Curric Dev*. 2019;6:1-6.
43
- 44
45 30. Hayward LM, Black LL, Mostrom E, et al. The first two years of practice: a
46 longitudinal perspective on the learning and professional development of promising
47 novice physical therapists. *Phys Ther*. 2013; 3:369-83.
48
- 49
50 31. Hojat M, Gonnella JS, Nasca TJ, et al. Physician empathy: definition, components,
51 measurement, and relationship to gender and specialty. *Am J Psychiatry*.
52
53
54
55
56
57
58
59
60

- 2002;9:1563-69.
32. Li D, Xu H, Kang M, et al. Empathy in Chinese eight-year medical program students: differences by school year, educational stage, and future career preference. *BMC Med Educ.* 2018;11) 241-50.
33. Cho E, Jeon S. The role of empathy and psychological need satisfaction in pharmacy students' burnout and well-being. *BMC Med Educ.* 2019;1:43-55.
34. Cortina-Borja M. Handbook of Parametric and Nonparametric Statistical Procedures, 5th edition. *J R Stat Soc a Stat.* 2012;175:829-29.
35. Kelly E, Nisker J. Medical students' first clinical experiences of death. *Med Educ.* 2010;4:421-28.
36. Smith-Han K, Martyn H, Barrett A, et al. That's not what you expect to do as a doctor, you know, you don't expect your patients to die." Death as a learning experience for undergraduate medical students. *BMC Med Educ.* 2016;16:108-16.
37. Hojat M. Ten approaches for enhancing empathy in health and human services cultures. *Journal of health and human services administration.* 2009;4:412-50.
38. Jani BD, Blane DN, Mercer SW. The role of empathy in therapy and the physician-patient relationship. *Forsch Komplementmed.* 2012;5:252-57.
39. Hojat M, Vergare MJ, Maxwell K, et al. The devil is in the third year: a longitudinal study of erosion of empathy in medical school. *Acad Med.* 2009;9:1182-91.
40. Ulloque MJ, Villalba S, Varela de Villalba T, et al. Empathy in medical students of Cordoba, Argentina. *Arch Argent Pediatr.* 2019;2:81-86.
41. Wen D, Ma X, Li H, et al. Empathy in Chinese medical students: psychometric characteristics and differences by gender and year of medical education. *BMC Med Educ.* 2013;13:130-36.
42. Jiang T, Wan XY, Liu YY, et al. Reliability and Validity of the Jefferson Scale of Physician Empathy in Chinese Medical Students. *Sichuan Da Xue Xue Bao Yi Xue Ban.* 2015;4:602-05.
43. Dhaliwal U, Singh S, Singh N. Reflective student narratives: honing professionalism

- and empathy. *Indian J Med Ethics*. 2018;1:9-15.
44. Pohontsch NJ, Stark A, Ehrhardt M, et al. Influences on students' empathy in medical education: an exploratory interview study with medical students in their third and last year. *BMC Med Educ*. 2018;1:231-40.
45. O'Sullivan DM, Moran J, Corcoran P, et al. Medical school selection criteria as predictors of medical student empathy: a cross-sectional study of medical students, Ireland. *BMJ Open*. 2017;7:e016076. doi:10.1136/bmjopen-2017-016076.
46. Hojat M, Gonnella JS. Eleven Years of Data on the Jefferson Scale of Empathy-Medical Student Version (JSE-S): Proxy Norm Data and Tentative Cutoff Scores. *Med Princ Pract*. 2015;4:344-50.
47. Paro HB, Daud-Gallotti RM, Tiberio IC, et al. Brazilian version of the Jefferson Scale of Empathy: psychometric properties and factor analysis. *BMC Med Educ*. 2012;12:73-80.
48. Tariq N, Rasheed T, Tavakol M. A Quantitative Study of Empathy in Pakistani Medical Students: A Multicentered Approach. *J Prim Care Community Health*. 2017;4:294-99.
49. Rahimi-Madiseh M, Tavakol M, Dennick R, et al. Empathy in Iranian medical students: A preliminary psychometric analysis and differences by gender and year of medical school. *Med Teach*. 2010;11:e471-78.
50. Smith KE, Norman GJ, Decety J. The complexity of empathy during medical school training: evidence for positive changes. *Med Educ*. 2017;11:1146-59.
51. Eva KW, Regehr G. Self-assessment in the health professions: a reformulation and research agenda. *Acad Med*. 2005;10 Suppl:S46-54.
52. Bernardo MO, Cecilio-Fernandes D, Lima ARA, et al. Investigating the relation between self-assessment and patients' assessments of physicians-in-training empathy: a multicentric, observational, cross-sectional study in three teaching hospitals in Brazil. *BMJ Open*. 2019;6:e029356. doi:10.1136/bmjopen-2019-029356.

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	4-5
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6
		(b) Describe any methods used to examine subgroups and interactions	6
		(c) Explain how missing data were addressed	6
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6
		(e) Describe any sensitivity analyses	

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	7
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Empathy variation of undergraduate medical students after early clinical contact: A cross-sectional study, China

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Secondary Subject Heading:	Medical education and training, Ethics, Medical management
Keywords:	MEDICAL EDUCATION & TRAINING, MEDICAL ETHICS, EDUCATION & TRAINING (see Medical Education & Training)

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3 **Empathy variation of undergraduate medical students after early clinical contact: A**
4 **cross-sectional study, China**
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30 **Abstract**

31
32 **Objectives** Empathetic education is very important for medical students. There is little
33 research on the influence of early clinical practice on the development of empathy and other
34 professionalism in medical students. The aim of this study is to compare the self-reported
35 empathy levels of the first- and second-year undergraduate medical students before and after
36 their early clinical contact curriculum.
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42 **Setting** The study was conducted in Shanghai University of Medicine & Health
43 Sciences, Shanghai, China.
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47 **Participants** 257 undergraduate medical students participated in the study. The 154 first
48 year students were studying in 10 community-based teaching hospitals and the 103-second
49 year students in 3 university-affiliated hospitals.
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53 **Primary and secondary outcome measures** Primary measures: The Jefferson Scale of
54 Empathy - Students version (JSE-S) was compared between different genders, and students in
55 different academic years before their early clinical contact course. Secondary measures:
56 comparisons were made after they finished the curriculum at three weeks later.
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4 **Results** 219 out of a total of 257 students responded (85.21% response rate), and 214
5 answers were effective (135 first year and 79 second year students; 120 females and 94
6 males). No significant difference in the empathy scores before early clinical contact was
7 observed between gender and different academic years. After early clinical contact, mean
8 JSE-S score of the participants was significantly higher than the mean score at the beginning
9 of the curriculum.
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16 **Conclusions** Empathy focused training in early clinical contact can improve the
17 empathetic capacity of undergraduate medical students. Fostering empathic attitudes to
18 undergraduate medical students is necessary for their early stage of medical education.
19 Further research is needed on the long-term effects of empathy-focused education in
20 entry-level medical students.
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23 24 25 26 **Strengths and limitations of this study:**

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28 • We used the Jefferson Scale of Empathy - Students version as a validated instrument,
29 which with good internal consistency (Cronbach alpha 0.84).
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32 • The results of this study reflect the positive influence of empathy education in early
33 clinical contact training for undergraduate medical students.
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36 • There is no gender difference in the empathy scale of the Jefferson Scale of Empathy -
37 Students version, which increased the support for previous related studies.
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40 • The interval between two self-reported questionnaires is only three weeks, which may be
41 have a certain impact on the result analysis because of recent memory.
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49 **Keywords:** Empathy; Early clinical contact; Education; Undergraduate medical students
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INTRODUCTION

Empathy is the ability to understand and share feelings of another ¹ and includes cognitive, affective, behavioral and moral dimensions ². The empathetic capacity of health care professionals plays an important role and empathy has been described as a major factor of professionalism in medicine ^{3,4}. Studies have shown that patients who trust their empathetic doctors tend to communicate well with their doctors and to provide more detailed information favorable for diagnosis and are likely to display improved treatment compliance ^{5,6}. Empathy strengthens interactions between patient and doctor and improves doctors' satisfaction ⁷. High levels of empathy in health care professionals are connected to positive clinical prognosis for patients, such as reducing mental stress, improving self-awareness, and reducing anxiety and depression ^{8,9}.

For tomorrow's doctors, empathy education is as important as enhancing their clinical competence ¹⁰. A systematic review showed that educational interventions can be effective in maintaining and enhancing empathy in undergraduate medical students ¹¹. Lim BT and his colleagues introduced a drama training method entitled "how to act-in-role" to enhance the empathetic communication skills of their medical students. This innovative teaching method increased not only students' self-reported empathy but also their competence in consultation skills ¹². Other training methods have also been proposed to enhance medical students' comprehension of empathy and their empathetic capacity, such as "communication skills training" ^{13,14}, "reflective writing" ^{15,16} and "motivational interviewing training" ¹⁷. While some studies showed that the empathy capacity of medical students decline with increasing academic years ¹⁸⁻²⁰, others indicated that the empathy scores of students in their final year were higher as compared with first-year medical students ²¹. Gender has also been found to influence undergraduate medical students' empathy ²². Conflicting results have been found in respect of gender differences, a reason for this may be social-cultural background ²³. Moreover, as empathy level is difficult to measure, standard approach of enhancing it in medical students remains debatable ²⁴.

Early clinical contact (ECC) for medical students is an important curricular innovation

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4 and was found to be particularly crucial for teaching professionalism²⁵. ECC means
5 real-patient contact in a clinical context that enhances learning of health, illness and/or
6 disease, and the role of the health professional which occurs in the early or preclinical years
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8 of undergraduate education^{26,27}. Some studies showed that contact with patients early in
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10 medical students' training elicits a positive emotional response that has the potential to
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12 trigger the developments of emotional maturity, relational skill, and patient-centered attitudes,
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14 and promote better understanding of health and illness^{28,29}. However the impact of ECC on
15
16 the development of empathy or other professional abilities in medical students remains
17
18 relatively under researched³⁰.

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22 In this study, we encourage our first and second-year medical students to focus on
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24 empathetic relationships between patients and doctors through our ECC curriculum. We
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26 sought to investigate whether ECC altered medical students' empathy and whether there were
27
28 any differences in this respect in terms of gender and or academic year.

30 **METHOD**

31 **Participants**

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34 There were 154 students in the first year and 103 students in the second year that took
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36 part in the ECC curriculum at the Shanghai University of Medical & Health Sciences in
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38 China in July of 2018. The first-year students were studying in 10 community-based teaching
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40 hospitals and the second-year students in 3 of our university hospitals, 10-15 students in each
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42 group. After informed consent was obtained, 219 medical students completed the
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44 measurement of empathy (response rates of 87.66 % of the 1st year and 76.70% of the 2nd
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46 year students, respectively), among which 214 returned questionnaires were valid. All of our
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48 students are high school graduates, aged between 17 and 21. The basic characteristics of all
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50 participants are shown in Table 1.

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Table 1 Basic characteristics of participants

Grade	Gender	All students N (%)	Age M (SD)	Participants N (%)	Response rates	Hospital
First	Females	89(57.80)	18.51(0.77)	78(57.78)	87.66 %	Community
	Males	65(42.20)	18.00(0.73)	57(42.22)		
	Total	154(100)	18.38(0.06)	135(100)		
Second	Females	55(53.40)	18.73(0.13)	42(53.16)	76.70 %	Affiliated
	Males	48(46.60)	19.00(0.15)	37(46.84)		
	Total	103(100)	18.85(0.10)	79(100)		

Measurement of Empathy

Jefferson Scale of Empathy - Students version (JSE-S), created by Hojat and colleagues³¹, was used in this study. It includes 20 items answered on a seven-point Likert-type scale (1 indicating strong disagreement and 7 strong agreement). Ten of the items are positively worded and 10 negatively worded. JSE-S was specifically developed as a self-reporting scale for assessing medical students' attitudes towards empathetic inpatient care. The original JSE-S comprises three components: perspective taking (items 2/4/5/9/10/13/15/16/17/20), compassionate care (items 1/7/8/11/12/14/18/19), and putting yourself in the patient's shoes (items 3/6). The total score was obtained by summing all items (ranging from 20 to 140), with higher scores indicating a higher level of empathy. JSE-S has received international attention from researchers and has been translated into 56 languages including Chinese, French, German, Italian, Korean^{32,33}.

Procedure

The ECC Curriculum

The ECC curriculum took place at the end of the school year and was divided into two parts: one week of theoretical lecture about empathy and narrative medicine given by a professor and two weeks of clinical practice that included empathy-focused training, patient interviews and reflective narrative story-writing. We required and guided students to focus on how to care about patients, become patient-centered and make decisions with patients and other contents besides diagnosis and treatment of diseases in clinical work by doctors. In the patient interview, students were required to explore the inner world of patients and the

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4 psychological and social changes associated with the illness experienced by the patients and
5 their families. Each student should complete interviews independently with at least 6 patients
6 and wrote 2 reflective narrative stories in two weeks of clinical exposure. Students shadowed
7 a doctor everyday and they have no responsible for the patients' diagnosis and treatment.
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11 **Two Pass JSE-S surveys**

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13 An initial JSE-S survey was done before the lectures in the first week of our ECC
14 curriculum, the second pass was done at the end of this curriculum three weeks later. The
15 questionnaires were powered by www.wjx.cn and anonymously collected so that students
16 would not feel forced to participate. The platform recorded the time taken to complete the
17 questionnaire, with the average time to complete being 4.2 minutes. If the completed time of
18 a questionnaire was less than 2 minutes or more than 10 minutes, its result was excluded from
19 the statistical analyses, considering that extreme questionnaire completion time will affect the
20 quality of the answers. In this study, five of 219 returned questionnaires were excluded (2 of
21 them were completed in less than 2 minutes and 3 more than 10 minutes).
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32 **Data analysis**

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34 Statistical analyses were performed using SPSS 19.0 software (SPSS Inc., Chicago, IL,
35 USA). All values are shown as mean \pm standard deviation. Descriptive analyses were
36 performed for all investigated variables and a D'Agostino-Pearson chi-squared test was used
37 for normal distribution³⁴. The Cronbach's alpha coefficient was calculated to assess the
38 internal consistency aspect of the reliability of the questionnaire. Unpaired t-tests were
39 utilized to compare the differences between two groups, and the analysis of variance
40 (two-way ANOVA) was used for double factor variance analysis. Statistical significance was
41 defined as $P < 0.05$.
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50 **Patient and public involvement**

51 No patient involved.
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RESULTS

219 of a total of 257 students completed the JSE-S questionnaire (85.21% response rate), and 214 answers were effective (135 1st year and 79 2nd year students; 120 females and 94 males) in both of the two surveys. The JSE-S scores in our study are approximately normally distributed and the internal consistency reliability of the questionnaire had a Cronbach's alpha coefficient of 0.84. No significant difference was observed between gender and different academic years before ECC ($P > 0.05$; table 2). After finishing the ECC curriculum, all the students showed a significantly higher mean score of empathy measured by the JSE-S than the beginning (Table 2), and students of the different grades showed significant statistical variation ($P = 0.001$; Table 3), but no interaction effects were found between gender and academic year ($P = 0.759$; Table 3).

Table 2 Group comparisons on scores of the JSE-S administered to 214 medical students

Variables	Subgroup	Number N (%)	Before ECC M (SD)	After ECC M (SD)	t; df	P-values
Academic year (Gender)	1st year					
	Females	78(57.78)	113.2(11.15) ^{a,b}	115.4(10.48)	2.95; 77	0.015
	Males	57(42.22)	110.4(13.14) ^b	114.1(10.73)	2.71; 56	0.016
	Total	135(100)	111.8(11.66) ^b	115.1(11.02)	4.52; 134	0.003
	2nd year					
	Females	42(53.16)	113.7(12.60) ^a	115.7(10.32)	4.08; 41	0.007
	Males	37(46.84)	111.6(13.82)	118.7(09.73)	3.89; 36	0.009
Total	79(100)	113.6(13.14)	118.2(14.00)	2.11; 78	0.026	

Note: Values are mean \pm SD or number (%). **Abbreviations:** early clinical contact, ECC

$P > 0.05$ (a: compared between gender; b: compared between different academic years)

Table 3 Two-way ANOVA of double factor variance analysis (gender; grade)

Source of Variations	Total variation, %	F (DFn, DFd)	P-value
Interaction	0.045	F (1, 206) = 0.095	0.759
Row Factor (Gender)	0.598	F (1, 206) = 1.27	0.261
Column Factor (Grade)	2.240	F (1, 206) = 4.76	0.001

Discussion

Early clinical contact closes the gap between theory and practice. Hence, many medical schools are adjusting their curricula to provide greater vertical integration between basic and clinical subject²⁸. Clinical contact can deepen medical students' understanding of professionalism especially when students face the death of a patient directly³⁵; such scenes have a strong impact on the formation of empathy and other professional qualities³⁶. Hojat defined medical empathy as “a cognitive attribute that mainly includes the understanding of experiences, problems, and perspectives of patients, and the ability to communicate this understanding and an intention to help”³⁷. Empathy strengthens the relationship between patients and health professionals and improves patient-physician satisfaction³⁸. In some studies, self-reported measures have found that empathy declines during undergraduate medical training. Study by Mohammadreza Hojat et al. showed that the empathy scores did not change significantly during the first two years of their students, but a significant decline was observed at the end of their third-year students³⁹. However, Eunice Magalhães, Ulloque MJ and their colleagues' studies showed that the empathy level of last year students was higher than their freshmen^{21,40}.

In our study, the Cronbach's alpha coefficient was 0.84; it is similar to some other studies in China^{41,42}, which indicates that JSPE-S had been internally consistent among Chinese medical students. We compared the self-reported empathy levels of two grades of undergraduate medical students before and after their ECC curriculum. The main finding of this study was the improvement in empathy scores in all of our students after the ECC. Our ECC curriculum includes not only empathy focused early clinical exposure of real patients but also the theory instruction of doctor – patient empathy. During the ECC, we emphasized the importance of empathy and students were required to focus on and record real cases of doctor-patient empathy in clinical works. This suggests that students who attend empathy-focused clinical programs early in their five years of study may establish and strengthen the concept of empathy, which is a key component of medical professionalism. We have unified the requirements of the patient interview and reflective writing for both of

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4 first and second year students. Reflective narratives are a useful and enjoyable way to
5 teaching medical students about empathy issues⁴³. Empathy education should be emphasized
6 as a key part of integrating patient contact early in curriculum as it plays an important role in
7 students' future doctor-patient relationship⁴⁴. Other interesting results were that there were no
8 statistical differences between gender and academic year, and there was no interaction ($p =$
9 0.759) between these two factors. This is not consistent with some studies that indicated that
10 female students had significantly higher average scores of empathy than the males^{19,45,46}, but
11 similar to other studies^{32,47-49}. Gender disparity might be due to "particular factors" unique to
12 European and American medical students. In some Asian countries, there is often no
13 statistical difference, which might be caused by different social-cultural backgrounds^{48,49}.
14 Our students come directly from high school after passing a unified selective examination.
15 Which is essentially different from American medical students, who usually major in
16 different subjects in college. Our university has a course of "Introduction to Medicine" in the
17 first year, which helps students to think about ethics, life and death. The lack of statistical
18 differences between different gender and academic years before the ECC in our study may
19 result from different cultures and different sources of students addressed above. Future
20 research should use multiple forms of measurement in order to better understand the
21 mechanisms involved in empathy changes in medical students⁵⁰.

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40 One limitation of our study is that empathy was constructed using only a single
41 subjective self-reported questionnaire among undergraduate medical students. The
42 self-reported empathy capacity is not always accurate and often does not correlate to the
43 patients' assessments^{51,52}, future research should consider the patients' perspectives as well.
44 Short observation time is the second limitation, and self-reported scales suffer the influence
45 of socially desirable behavior, which means that after the training, students may become
46 aware of what is the desirable answer in the questionnaire, which may introduce certain bias
47 on the result analysis. The main purpose of this study was to observe the short-term impact of
48 the ECC on medical students' empathy, the time interval necessary for eliminating bias in the
49 results needs further study, and we will carry out related study on its long-term effects in our
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4 follow-up research.

5 6 **Conclusion**

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8 Empathy education is very important in undergraduate medical students, in order to
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10 promote the quality of the doctor-patient relationship in their future work. Early clinical
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12 contact can not only stimulate students' learning enthusiasm, also play a vital role in the
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14 formation of vocational ability. This study revealed that empathy-focused training in early
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16 clinical contact could improve the empathetic capacity of our undergraduate medical
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18 students. Empathy and other professionalism education should be carried out in junior
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20 medical students. Further research is needed on the long-term effects to conform to the early
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22 empathy education of medical students.
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24 25 **Abbreviations**

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28 **JSE-S:** Jefferson Scale of Empathy - Students version

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31 **ECC:** Early Clinical Contact

32 33 **Acknowledgments**

34
35 The authors would like to thank our medical students who willingly gave of their time to
36
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38
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40
41 of this paper.
42

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47
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49 50 **Availability of data and materials**

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52 The raw datasets generated and/or analyzed during the current study are not publicly
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54 available due to privacy concerns but are available from the corresponding author on
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56 reasonable request.

57 58 **Author contributions**

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60 XY and HX contributed to design, data analysis and drafting. HG and XZ contributed to

critically revising the paper and agreed to be accountable for all aspects of the work.

Ethics approval and consent to participate

Ethics approval was granted by the Human Research Ethics Committee of Shanghai University of Medicine & Health Sciences, research protocol number 2018/136.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

References

1. Singer T, Klimecki OM. Empathy and compassion. *Curr Biol*. 2014;18:R875-78.
2. Heyes C. Empathy is not in our genes. *Neurosci Biobehav Rev*. 2018;95:499-507.
3. Kim SS, Kaplowitz S, Johnston MV. The effects of physician empathy on patient satisfaction and compliance. *Eval Health Prof*. 2004;3:237-51.
4. Walsh S, O'Neill A, Hannigan A, et al. Patient-rated physician empathy and patient satisfaction during pain clinic consultations. *Ir J Med Sci*. 2019; 4:1379–84.
5. Weilenmann S, Schnyder U, Parkinson B, et al. Emotion Transfer, Emotion Regulation, and Empathy-Related Processes in Physician-Patient Interactions and Their Association With Physician Well-Being: A Theoretical Model. *Front Psychiatry*. 2018;9:389-402.
6. Schwenk TL. Physician Well-being and the Regenerative Power of Caring. *JAMA*. 2018;15:1543-44.
7. Ditton-Phare P, Loughland C, Duvivier R, et al. Communication skills in the training of psychiatrists: A systematic review of current approaches. *Aust N Z J Psychiatry*. 2017; 7:675-92.
8. Lorie A, Reiner DA, Phillips M, et al. Culture and nonverbal expressions of empathy in clinical settings: A systematic review. *Patient Educ Couns*. 2017; 3:411-24.
9. Hemmerdinger JM, Stoddart SD, Lilford RJ. A systematic review of tests of empathy in medicine. *BMC Med Educ*. 2007;7:24-32.

10. Han JL, Pappas TN. A Review of Empathy, Its Importance, and Its Teaching in Surgical Training. *J Surg Educ.* 2018; 1:88-94.
11. Batt-Rawden SA, Chisolm MS, Anton B, et al. Teaching empathy to medical students: an updated, systematic review. *Acad Med.* 2013; 8:1171-77.
12. Lim BT, Moriarty H, Huthwaite M. "Being-in-role": A teaching innovation to enhance empathic communication skills in medical students. *Med Teach.* 2011; 12:e663-69.
13. Winefield HR, Chur-Hansen A. Evaluating the outcome of communication skill teaching for entry-level medical students: does knowledge of empathy increase? *Med Educ.* 2000; 2:90-94.
14. Kataoka H, Iwase T, Ogawa H, et al. Can communication skills training improve empathy? A six-year longitudinal study of medical students in Japan. *Med Teach.* 2019;2:195-200.
15. Shapiro J, Rucker L, Boker J, et al. Point-of-view writing: A method for increasing medical students' empathy, identification and expression of emotion, and insight. *Educ Health (Abingdon).* 2006;1:96-105.
16. Liao HC, Wang YH. The application of heterogeneous cluster grouping to reflective writing for medical humanities literature study to enhance students' empathy, critical thinking, and reflective writing. *BMC Med Educ.* 2016; 1:234-45.
17. Ekong G, Kavookjian J, Hutchison A. Predisposition for Empathy, Intercultural Sensitivity, and Intentions for Using Motivational Interviewing in First Year Pharmacy Students. *Am J Pharm Educ.* 2017;8:5989-6011.
18. Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in medical school. *Med Educ.* 2004;9:934-41.
19. Chen DC, Kirshenbaum DS, Yan J, et al. Characterizing changes in student empathy throughout medical school. *Med Teach.* 2012;4:305-11.
20. Neumann M, Edelhauser F, Tauschel D, et al. Empathy decline and its reasons: a systematic review of studies with medical students and residents. *Acad Med.*

- 2011;8:996-1009.
21. Magalhaes E, Salgueira AP, Costa P, et al. Empathy in senior year and first year medical students: a cross-sectional study. *BMC Med Educ*. 2011;11:52-59.
 22. Hojat M, DeSantis J, Shannon SC, et al. The Jefferson Scale of Empathy: a nationwide study of measurement properties, underlying components, latent variable structure, and national norms in medical students. *Adv Health Sci Educ Theory Pract*. 2018;5:899-920.
 23. Huang L, Thai J, Zhong Y, et al. The Positive Association Between Empathy and Self-Esteem in Chinese Medical Students: A Multi-Institutional Study. *Front Psychol*. 2019;10:1921-30.
 24. Quince T, Thiemann P, Benson J, et al. Undergraduate medical students' empathy: current perspectives. *Adv Med Educ Pract*. 2016;7:443-55.
 25. Goldie J, Dowie A, Cotton P, et al. Teaching professionalism in the early years of a medical curriculum: a qualitative study. *Med Educ*. 2007;6:610-17.
 26. Dornan T, Bundy C. What can experience add to early medical education? Consensus survey. *BMJ*. 2004;7470:834-40.
 27. Verma M. Early clinical exposure: New paradigm in Medical and Dental Education. *Contemp Clin Dent*. 2016;3:287-88.
 28. Wilkinson TJ, Gower S, Sainsbury R. The earlier, the better: the effect of early community contact on the attitudes of medical students to older people. *Med Educ*. 2002; 6:540-42.
 29. Schei E, Knoop HS, Gismervik MN, et al. Stretching the Comfort Zone: Using Early Clinical Contact to Influence Professional Identity Formation in Medical Students. *J Med Educ Curric Dev*. 2019;6:1-6.
 30. Hayward LM, Black LL, Mostrom E, et al. The first two years of practice: a longitudinal perspective on the learning and professional development of promising novice physical therapists. *Phys Ther*. 2013; 3:369-83.
 31. Hojat M, Gonnella JS, Nasca TJ, et al. Physician empathy: definition, components,

- 1
2
3
4 measurement, and relationship to gender and specialty. *Am J Psychiatry*.
5 2002;9:1563-69.
6
7
8 32. Li D, Xu H, Kang M, et al. Empathy in Chinese eight-year medical program students:
9 differences by school year, educational stage, and future career preference. *BMC Med*
10 *Educ*. 2018;11) 241-50.
11
12
13 33. Cho E, Jeon S. The role of empathy and psychological need satisfaction in pharmacy
14 students' burnout and well-being. *BMC Med Educ*. 2019;1:43-55.
15
16
17 34. Cortina-Borja M. Handbook of Parametric and Nonparametric Statistical Procedures,
18 5th edition. *J R Stat Soc a Stat*. 2012;175:829-29.
19
20
21 35. Kelly E, Nisker J. Medical students' first clinical experiences of death. *Med Educ*.
22 2010;4:421-28.
23
24
25 36. Smith-Han K, Martyn H, Barrett A, et al. That's not what you expect to do as a doctor,
26 you know, you don't expect your patients to die." Death as a learning experience for
27 undergraduate medical students. *BMC Med Educ*. 2016;16:108-16.
28
29
30 37. Hojat M. Ten approaches for enhancing empathy in health and human services
31 cultures. *J Health Hum Serv Adm*. 2009;4:412-50.
32
33
34 38. Jani BD, Blane DN, Mercer SW. The role of empathy in therapy and the
35 physician-patient relationship. *Forsch Komplementmed*. 2012;5:252-57.
36
37
38 39. Hojat M, Vergare MJ, Maxwell K, et al. The devil is in the third year: a longitudinal
39 study of erosion of empathy in medical school. *Acad Med*. 2009;9:1182-91.
40
41
42 40. Ulloque MJ, Villalba S, Varela de Villalba T, et al. Empathy in medical students of
43 Cordoba, Argentina. *Arch Argent Pediatr*. 2019;2:81-86.
44
45
46 41. Wen D, Ma X, Li H, et al. Empathy in Chinese medical students: psychometric
47 characteristics and differences by gender and year of medical education. *BMC Med*
48 *Educ*. 2013;13:130-36.
49
50
51 42. Jiang T, Wan XY, Liu YY, et al. Reliability and Validity of the Jefferson Scale of
52 Physician Empathy in Chinese Medical Students. *Sichuan Da Xue Xue Bao Yi Xue*
53 *Ban*. 2015;4:602-05.
54
55
56
57
58
59
60

- 1
2
3
4 43. Dhaliwal U, Singh S, Singh N. Reflective student narratives: honing professionalism
5 and empathy. *Indian J Med Ethics*. 2018;1:9-15.
6
7
8 44. Pohontsch NJ, Stark A, Ehrhardt M, et al. Influences on students' empathy in medical
9 education: an exploratory interview study with medical students in their third and last
10 year. *BMC Med Educ*. 2018;1:231-40.
11
12
13 45. O'Sullivan DM, Moran J, Corcoran P, et al. Medical school selection criteria as
14 predictors of medical student empathy: a cross-sectional study of medical students,
15 Ireland. *BMJ Open*. 2017;7:e016076. doi:10.1136/bmjopen-2017-016076.
16
17
18 46. Hojat M, Gonnella JS. Eleven Years of Data on the Jefferson Scale of
19 Empathy-Medical Student Version (JSE-S): Proxy Norm Data and Tentative Cutoff
20 Scores. *Med Princ Pract*. 2015;4:344-50.
21
22
23 47. Paro HB, Daud-Gallotti RM, Tiberio IC, et al. Brazilian version of the Jefferson Scale
24 of Empathy: psychometric properties and factor analysis. *BMC Med Educ*.
25 2012;12:73-80.
26
27
28 48. Tariq N, Rasheed T, Tavakol M. A Quantitative Study of Empathy in Pakistani
29 Medical Students: A Multicentered Approach. *J Prim Care Community Health*.
30 2017;4:294-99.
31
32
33 49. Rahimi-Madiseh M, Tavakol M, Dennick R, et al. Empathy in Iranian medical
34 students: A preliminary psychometric analysis and differences by gender and year of
35 medical school. *Med Teach*. 2010;11:e471-78.
36
37
38 50. Smith KE, Norman GJ, Decety J. The complexity of empathy during medical school
39 training: evidence for positive changes. *Med Educ*. 2017;11:1146-59.
40
41
42 51. Eva KW, Regehr G. Self-assessment in the health professions: a reformulation and
43 research agenda. *Acad Med*. 2005;10 Suppl:S46-54.
44
45
46 52. Bernardo MO, Cecilio-Fernandes D, Lima ARA, et al. Investigating the relation
47 between self-assessment and patients' assessments of physicians-in-training empathy:
48 a multicentric, observational, cross-sectional study in three teaching hospitals in
49 Brazil. *BMJ Open*. 2019;6:e029356. doi:10.1136/bmjopen-2019-029356.
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For peer review only

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	4-5
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6
		(b) Describe any methods used to examine subgroups and interactions	6
		(c) Explain how missing data were addressed	6
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6
		(e) Describe any sensitivity analyses	

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Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	7
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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3 **Empathy variation of undergraduate medical students after early clinical contact: A**
4 **cross-sectional study in China**
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30 **Abstract**
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32 **Objectives** Empathy education is very important for medical students. There is little
33 research on the influence of early clinical practice on the development of empathy and other
34 aspects of professionalism in medical students. The aim of this study was to compare the
35 self-reported empathy levels of first- and second-year undergraduate medical students before
36 and after their early clinical contact curriculum.
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42 **Setting** The study was conducted at Shanghai University of Medicine & Health Sciences,
43 Shanghai, China.
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46 **Participants** A total of 257 undergraduate medical students participated in the study.
47 The 154 first-year students were studying in 10 community-based teaching hospitals, and the
48 103 second-year students were studying in 3 university-affiliated hospitals.
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52 **Primary and secondary outcome measures** Primary measures: The Jefferson Scale of
53 Empathy - Student version (JSE-S) was compared between students of different sexes and in
54 different academic years before their early clinical contact course. Secondary measures:
55 comparisons were made after they finished the curriculum three weeks later.
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4 **Results** A total of 219 out of 257 students responded (85.21% response rate), and 214
5 answers could be analysed (135 first-year and 79 second-year students; 120 females and 94
6 males). No significant differences in the empathy scores before early clinical contact were
7 observed between students of different sexes and in different academic years. After early
8 clinical contact, the mean JSE-S score of the participants was significantly higher than the
9 mean score at the beginning of the curriculum.
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16 **Conclusions** Empathy-focused training during early clinical contact can improve the
17 empathetic capacity of undergraduate medical students. Fostering empathetic attitudes among
18 undergraduate medical students is necessary for the early stage of their medical education.
19 Further research is needed on the long-term effects of empathy-focused education in
20 entry-level medical students.
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26 **Strengths and limitations of this study:**

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28 • We used the Jefferson Scale of Empathy - Student version as a validated instrument,
29 which has good internal consistency (Cronbach alpha 0.84).
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31 • We compared the changes in empathy in undergraduate medical students in different
32 grades after early clinical practice in community hospitals and university-affiliated hospitals.
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34 • The interval between the two self-reported questionnaires was only three weeks, which
35 may have affected the results because of influence of recent memory.
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45 **Keywords:** Empathy; Early clinical contact; Education; Undergraduate medical students
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INTRODUCTION

Empathy is the ability to understand and share feelings of another ¹ and has cognitive, affective, behavioural and moral dimensions ². The empathetic capacity of health care professionals is important to patient' satisfaction and compliance, and empathy has been described as a major aspect of professionalism in medicine ^{3,4}. Studies have shown that patients trust empathetic doctors; tend to communicate well with those doctors; provide more detailed information, facilitating diagnosis; and are likely to display improved treatment compliance ^{5,6}. Empathy strengthens interactions between patients and doctors and improves doctors' satisfaction levels ⁷. High levels of empathy in health care professionals are connected to positive clinical prognoses for patients, by reducing mental stress, improving self-awareness, and reducing anxiety and depression ^{8,9}.

For future doctors, education about empathy is as important as enhancing their clinical competence ¹⁰. A systematic review showed that educational interventions can be effective at maintaining and enhancing empathy in undergraduate medical students ¹¹. Lim et al introduced a drama-based training method entitled "How to Act in a Role" to enhance the empathetic communication skills of their medical students. This innovative teaching method increased not only students' self-reported empathy but also their competency with regard to consultation skills ¹². Other training methods have also been proposed to enhance medical students' comprehension of empathy and their empathetic capacity, such as "communication skills training" ^{13,14}, "reflective writing" ^{15,16} and "motivational interviewing training" ¹⁷. While some studies showed that the empathetic capacity of medical students declined with increasing academic years ¹⁸⁻²⁰, others indicated that the empathy scores of students in their final year were higher than those of first-year medical students ²¹. Sex has also been found to influence undergraduate medical students' empathy ²². Conflicting results have been found with respect to sex-based differences; a reason for this may be the social-cultural background of the students being investigated ²³. Moreover, as empathy level is difficult to measure, the standard approach to enhancing empathy in medical students remains debatable ²⁴.

Early clinical contact (ECC) for medical students is an important curricular innovation

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4 and has been found to be particularly crucial for teaching professionalism²⁵. ECC means
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6 real-patient contact in a clinical context that enhances the students' understanding of illness
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8 and the role of the health professional and that occurs in the early or preclinical years of
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10 undergraduate education^{26,27}. Some studies showed that contact with patients early in medical
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12 students' training elicits a positive emotional response that has the potential to trigger the
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14 development of emotional maturity, relational skills, and patient-centred attitudes and to
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16 promote a better understanding of health and illness^{28,29}. However, the impact of ECC on the
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18 development of empathy or other professional abilities in medical students remains relatively
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20 under-researched³⁰.

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22 In this study, we encouraged our first- and second-year medical students to focus on
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24 empathetic relationships between patients and doctors through our ECC curriculum. We
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26 sought to investigate whether ECC altered medical students' empathy and whether there were
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28 any differences in this respect in terms of sex and/or academic year.

30 **METHODS**

31 **Participants**

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33 There were 154 students in the first year and 103 students in the second year who took
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35 part in the ECC curriculum at the Shanghai University of Medical & Health Sciences in
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37 China in July 2018. The first-year students were studying in 10 community-based teaching
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39 hospitals, and the second-year students were studying in 3 of our university hospitals, with
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41 10-15 students in each group. After informed consent was obtained, 219 medical students
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43 completed the measurement of empathy (response rates of 87.66% of the 1st year and 76.70%
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45 of the 2nd year students, respectively). In total, 214 returned questionnaires were valid. All of
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47 our students are high school graduates, aged between 17 and 21 years. The basic
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49 characteristics of all participants are shown in Table 1.
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Table 1 Basic characteristics of participants

Year	Sex	All students N (%)	Age M (SD)	Participants N (%)	Response rates	Hospital
First	Females	89(57.80)	18.51(0.77)	78(57.78)	87.66%	Community
	Males	65(42.20)	18.00(0.73)	57(42.22)		
	Total	154(100)	18.38(0.06)	135(100)		
Second	Females	55(53.40)	18.73(0.13)	42(53.16)	76.70%	University-affiliated
	Males	48(46.60)	19.00(0.15)	37(46.84)		
	Total	103(100)	18.85(0.10)	79(100)		

Measurement of empathy

The Jefferson Scale of Empathy - Student version (JSE-S), created by Hojat and colleagues³¹, was used in this study. It includes 20 items answered on a seven-point Likert-type scale (1 indicating strong disagreement and 7 indicating strong agreement). Ten of the items are positively worded, and 10 are negatively worded. The JSE-S was specifically developed as a self-reporting scale for assessing medical students' attitudes towards empathetic inpatient care. The original JSE-S comprises three components: perspective taking (items 2/4/5/9/10/13/15/16/17/20), compassionate care (items 1/7/8/11/12/14/18/19), and putting yourself in the patient's shoes (items 3/6). The total score was obtained by summing all items (total scores range from 20 to 140), with higher scores indicating a higher degree of empathy. JSE-S has received international attention from researchers and has been translated into 56 languages, including Chinese, French, German, Italian, and Korean^{32,33}.

Procedure

ECC curriculum

The ECC curriculum was administered at the end of the school year and was divided into two parts: one week of theoretical lectures about empathy and narrative medicine given by a professor and two weeks of clinical practice that included empathy-focused training, patient interviews and reflective narrative story writing. We required and guided students to focus on how to care about patients, become patient-centred and make decisions with consideration given to patients and other aspects beyond the clinical diagnosis and treatment of diseases by doctors. In the patient interview, students were required to explore the inner world of patients

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4 and the psychological and social changes associated with the illness experienced by the
5 patients and their families. Each student completed interviews independently with at least 6
6 patients and wrote 2 reflective narrative stories during the two weeks of clinical exposure.
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8 Students shadowed a doctor every day, and they were not responsible for the patients'
9 diagnoses and treatments.
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13 14 **Two JSE-S surveys**

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16 An initial JSE-S survey was administered before the lectures in the first week of our ECC
17 curriculum, and the second survey was administered at the end of this curriculum three weeks
18 later. The questionnaires were powered by www.wjx.cn and anonymously collected so that
19 students would not feel forced to participate. The platform recorded the time taken to
20 complete the questionnaire, with the average time to complete being 4.2 minutes. If the
21 completion time of a questionnaire was less than 2 minutes or more than 10 minutes, its result
22 was excluded from the statistical analyses, because completion times on either end of the
23 spectrum affect the quality of the answers. In this study, five of 219 returned questionnaires
24 were excluded (2 of them were completed in less than 2 minutes and 3 in more than 10
25 minutes).
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36 **Data analysis**

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38 Statistical analyses were performed using SPSS 19.0 software (SPSS Inc., Chicago, IL,
39 USA). All values are shown as the means \pm standard deviations. Descriptive analyses were
40 performed for all investigated variables, and a D'Agostino-Pearson chi-squared test was used
41 for normally distributed variables³⁴. The Cronbach's alpha was calculated to assess the
42 internal consistency of the questionnaire. Unpaired t-tests were utilized to compare the
43 differences between two groups, and analysis of variance (two-way ANOVA) was used for
44 two-factor variance analysis. Statistical significance was defined as $P < 0.05$.
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52 **Patient and public involvement**

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54 No patients were involved.
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RESULTS

A total of 219 of the 257 students completed the JSE-S questionnaire (85.21% response rate), and 214 answers were analysed (135 1st year and 79 2nd year students; 120 females and 94 males) for both surveys. The JSE-S scores in our study were approximately normally distributed, and the Cronbach's alpha of the questionnaire was 0.84. No significant differences were observed between students of different sexes and in different academic years before the ECC curriculum ($P > 0.05$; Table 2). After finishing the ECC curriculum, all the students showed a significantly higher mean empathy score as measured by the JSE-S than the score for the whole sample population before the course (Table 2). There was a significant difference between students in different grades ($P = 0.001$; Table 3), but there was no interaction effect between sex and academic year ($P = 0.759$; Table 3).

Table 2 Group comparisons of scores on the JSE-S administered to 214 medical students

Variables	Subgroup	Number N (%)	Before ECC M (SD)	After ECC M (SD)	t; df	P-values
	1st year					
Academic year (sex)	Females	78(57.78)	113.2(11.15) ^{a,b}	115.4(10.48)	2.95; 77	0.015
	Males	57(42.22)	110.4(13.14) ^b	114.1(10.73)	2.71; 56	0.016
	Total	135(100)	111.8(11.66) ^b	115.1(11.02)	4.52; 134	0.003
	2nd year					
	Females	42(53.16)	113.7(12.60) ^a	115.7(10.32)	4.08; 41	0.007
	Males	37(46.84)	111.6(13.82)	118.7(09.73)	3.89; 36	0.009
	Total	79(100)	113.6(13.14)	118.2(14.00)	2.11; 78	0.026

Note: Values are the mean \pm SD or number (%). **Abbreviations:** early clinical contact, ECC
 $P > 0.05$ (a: compared between sexes; b: compared between different academic years)

Table 3 Two-way ANOVA of two-factor variance analysis (sex; grade)

Source of variation	Total variation, %	F (DFn, DFd)	P-value
Interaction	0.045	F (1, 206) = 0.095	0.759
Row factor (sex)	0.598	F (1, 206) = 1.27	0.261
Column factor (grade)	2.240	F (1, 206) = 4.76	0.001

Discussion

ECC closes the gap between theory and practice. Hence, many medical schools are adjusting their curricula to provide greater vertical integration between basic and clinical subjects²⁸. Clinical contact can deepen medical students' understanding of professionalism, especially when students face the death of a patient directly³⁵; such scenes have a strong impact on the formation of empathy and other professional qualities³⁶. Hojat defined medical empathy as “a cognitive attribute that mainly includes the understanding of experiences, problems, and perspectives of patients, and the ability to communicate this understanding and an intention to help”³⁷. Empathy strengthens the relationship between patients and health professionals and improves patient-physician satisfaction³⁸. In some studies, self-reported measures have found that empathy declines during undergraduate medical training. A study by Hojat et al. showed that the empathy scores did not change significantly during the first two years among their students, but a significant decline was observed at the end of their third year³⁹. However, studies by Eunice and Ulloque et al. showed that the empathy level of last-year students was higher than that of freshmen^{21,40}.

In our study, the Cronbach's alpha was 0.84, which is similar to the findings in some other studies in China^{41,42} and indicates that the JSPE-S is internally consistent among Chinese medical students. We compared the self-reported empathy levels of two grades of undergraduate medical students before and after the ECC curriculum. The main finding of this study was the improvement in empathy scores in all of our students after ECC. Our ECC curriculum includes not only empathy-focused early clinical exposure to real patients but also theoretical instruction regarding doctor-patient empathy. During ECC, we emphasize the importance of empathy, and students are required to focus on and record real cases of doctor-patient empathy in clinical practice. This suggests that students who attend empathy-focused clinical programmes early in their five years of study may establish and strengthen their empathy, which is a key component of medical professionalism. We have unified the requirements for the patient interview and reflective writing for both first- and second-year students. Reflective narratives are a useful and enjoyable way to teach medical

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4 students about issues pertaining to empathy⁴³. Empathy education should be emphasized as a
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6 key part of the early integration of patient contact into the curriculum, as it plays an important
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8 role in students' future doctor-patient relationships⁴⁴. Other interesting results were that there
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10 were no significant differences between students of different sexes and in different academic
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12 years, and there was no interaction ($p = 0.759$) between these two factors. This is not
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14 consistent with the findings of some studies that indicated that female students had
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16 significantly higher average empathy scores than males^{19,45,46} but similar to the results of
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18 other studies^{32,47-49}. The sex-based disparity might be due to "particular factors" unique to
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20 European and American medical students. In some Asian countries, there is often no
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22 significant difference, which might be caused by the different social-cultural background^{48,49}.
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24 Our students come directly from high school after passing a unified selective examination.
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26 This is essentially different from American medical students, who usually major in different
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28 subjects in college. Our university has a course called "Introduction to Medicine" in the first
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30 year, which helps students think about ethics, life and death. The lack of significant
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32 differences between different sexes and academic years before ECC in our study may result
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34 from different cultures and different sources of students, as addressed above. Future research
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36 should use multiple forms of measurement to better understand the mechanisms involved in
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38 empathy changes in medical students⁵⁰.
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41 One limitation of our study is that empathy was constructed using only a single
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43 subjective self-reported questionnaire among undergraduate medical students. Self-reported
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45 empathetic capacity is not always accurate and often does not correlate with the patients'
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47 assessments^{51,52}; future research should consider the patients' perspectives as well. A short
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49 observation time is the second limitation, and self-reported scales are influenced by the
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51 perception of socially desirable behaviour, which means that after the training, students may
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53 have become aware of what were the desirable answers on the questionnaire, which may have
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55 introduced bias. The main purpose of this study was to observe the short-term impact of ECC
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57 on medical students' empathy. The time interval necessary for eliminating bias in the results
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59 needs further study, and we will carry out related studies on the long-term effects in our
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4 follow-up research.

5 6 **Conclusion**

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8 Empathy education is very important for undergraduate medical students to promote the
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10 quality of the doctor-patient relationship in their future work. ECC can not only stimulate
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12 students' enthusiasm for learning but also play a vital role in the formation of vocational
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14 ability. This study revealed that empathy-focused training during ECC could improve the
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16 empathetic capacity of our undergraduate medical students. Empathy and other aspects of
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18 professionalism should be taught to junior medical students. Further research is needed on the
19
20 long-term effects of early empathy education in medical students.
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22 23 **Abbreviations**

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26 **JSE-S:** Jefferson Scale of Empathy - Student version

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29 **ECC:** Early clinical contact

30 31 **Acknowledgements**

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34
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38
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47

48 49 **Availability of data and materials**

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51 The raw datasets generated and/or analysed during the current study are not publicly
52
53 available due to privacy concerns but are available from the corresponding author upon
54
55 reasonable request.

56 57 **Author contributions**

58
59 XY and HX contributed to the design, data analysis and drafting of the study. HG and
60
XZ contributed to critically revising the paper and agreed to be accountable for all aspects of

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4 the work.

5 6 **Ethics approval and consent to participate**

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8 Ethics approval was granted by the Human Research Ethics Committee of Shanghai
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10 University of Medicine & Health Sciences, research protocol number 2018/136.

11 12 **Consent for publication**

13
14 Not applicable.

15 16 **Competing interests**

17
18 The authors declare that they have no competing interests.

19 20 **References**

- 21
22 1. Singer T, Klimecki OM. Empathy and compassion. *Curr Biol*. 2014;18:R875-78.
- 23
24 2. Heyes C. Empathy is not in our genes. *Neurosci Biobehav Rev*. 2018;95:499-507.
- 25
26 3. Kim SS, Kaplowitz S, Johnston MV. The effects of physician empathy on patient
27
28 satisfaction and compliance. *Eval Health Prof*. 2004;3:237-51.
- 29
30 4. Walsh S, O'Neill A, Hannigan A, et al. Patient-rated physician empathy and patient
31
32 satisfaction during pain clinic consultations. *Ir J Med Sci*. 2019; 4:1379–84.
- 33
34 5. Weilenmann S, Schnyder U, Parkinson B, et al. Emotion Transfer, Emotion
35
36 Regulation, and Empathy-Related Processes in Physician-Patient Interactions and
37
38 Their Association With Physician Well-Being: A Theoretical Model. *Front*
39
40 *Psychiatry*. 2018;9:389-402.
- 41
42 6. Schwenk TL. Physician Well-being and the Regenerative Power of Caring. *JAMA*.
43
44 2018;15:1543-44.
- 45
46 7. Ditton-Phare P, Loughland C, Duvivier R, et al. Communication skills in the training
47
48 of psychiatrists: A systematic review of current approaches. *Aust N Z J Psychiatry*.
49
50 2017; 7:675-92.
- 51
52 8. Lorie A, Reiner DA, Phillips M, et al. Culture and nonverbal expressions of empathy
53
54 in clinical settings: A systematic review. *Patient Educ Couns*. 2017; 3:411-24.
- 55
56 9. Hemmerdinger JM, Stoddart SD, Lilford RJ. A systematic review of tests of empathy
57
58 in medicine. *BMC Med Educ*. 2007;7:24-32.
- 59
60

10. Han JL, Pappas TN. A Review of Empathy, Its Importance, and Its Teaching in Surgical Training. *J Surg Educ.* 2018; 1:88-94.
11. Batt-Rawden SA, Chisolm MS, Anton B, et al. Teaching empathy to medical students: an updated, systematic review. *Acad Med.* 2013; 8:1171-77.
12. Lim BT, Moriarty H, Huthwaite M. "Being-in-role": A teaching innovation to enhance empathic communication skills in medical students. *Med Teach.* 2011; 12:e663-69.
13. Winefield HR, Chur-Hansen A. Evaluating the outcome of communication skill teaching for entry-level medical students: does knowledge of empathy increase? *Med Educ.* 2000; 2:90-94.
14. Kataoka H, Iwase T, Ogawa H, et al. Can communication skills training improve empathy? A six-year longitudinal study of medical students in Japan. *Med Teach.* 2019;2:195-200.
15. Shapiro J, Rucker L, Boker J, et al. Point-of-view writing: A method for increasing medical students' empathy, identification and expression of emotion, and insight. *Educ Health (Abingdon).* 2006;1:96-105.
16. Liao HC, Wang YH. The application of heterogeneous cluster grouping to reflective writing for medical humanities literature study to enhance students' empathy, critical thinking, and reflective writing. *BMC Med Educ.* 2016; 1:234-45.
17. Ekong G, Kavookjian J, Hutchison A. Predisposition for Empathy, Intercultural Sensitivity, and Intentions for Using Motivational Interviewing in First Year Pharmacy Students. *Am J Pharm Educ.* 2017;8:5989-6011.
18. Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in medical school. *Med Educ.* 2004;9:934-41.
19. Chen DC, Kirshenbaum DS, Yan J, et al. Characterizing changes in student empathy throughout medical school. *Med Teach.* 2012;4:305-11.
20. Neumann M, Edelhauser F, Tauschel D, et al. Empathy decline and its reasons: a systematic review of studies with medical students and residents. *Acad Med.*

- 2011;8:996-1009.
21. Magalhaes E, Salgueira AP, Costa P, et al. Empathy in senior year and first year medical students: a cross-sectional study. *BMC Med Educ*. 2011;11:52-59.
 22. Hojat M, DeSantis J, Shannon SC, et al. The Jefferson Scale of Empathy: a nationwide study of measurement properties, underlying components, latent variable structure, and national norms in medical students. *Adv Health Sci Educ Theory Pract*. 2018;5:899-920.
 23. Huang L, Thai J, Zhong Y, et al. The Positive Association Between Empathy and Self-Esteem in Chinese Medical Students: A Multi-Institutional Study. *Front Psychol*. 2019;10:1921-30.
 24. Quince T, Thiemann P, Benson J, et al. Undergraduate medical students' empathy: current perspectives. *Adv Med Educ Pract*. 2016;7:443-55.
 25. Goldie J, Dowie A, Cotton P, et al. Teaching professionalism in the early years of a medical curriculum: a qualitative study. *Med Educ*. 2007;6:610-17.
 26. Dornan T, Bundy C. What can experience add to early medical education? Consensus survey. *BMJ*. 2004;7470:834-40.
 27. Verma M. Early clinical exposure: New paradigm in Medical and Dental Education. *Contemp Clin Dent*. 2016;3:287-88.
 28. Wilkinson TJ, Gower S, Sainsbury R. The earlier, the better: the effect of early community contact on the attitudes of medical students to older people. *Med Educ*. 2002; 6:540-42.
 29. Schei E, Knoop HS, Gismervik MN, et al. Stretching the Comfort Zone: Using Early Clinical Contact to Influence Professional Identity Formation in Medical Students. *J Med Educ Curric Dev*. 2019;6:1-6.
 30. Hayward LM, Black LL, Mostrom E, et al. The first two years of practice: a longitudinal perspective on the learning and professional development of promising novice physical therapists. *Phys Ther*. 2013; 3:369-83.
 31. Hojat M, Gonnella JS, Nasca TJ, et al. Physician empathy: definition, components,

- 1
2
3
4 measurement, and relationship to gender and specialty. *Am J Psychiatry*.
5 2002;9:1563-69.
6
7
8 32. Li D, Xu H, Kang M, et al. Empathy in Chinese eight-year medical program students:
9 differences by school year, educational stage, and future career preference. *BMC Med*
10 *Educ*. 2018;11) 241-50.
11
12
13 33. Cho E, Jeon S. The role of empathy and psychological need satisfaction in pharmacy
14 students' burnout and well-being. *BMC Med Educ*. 2019;1:43-55.
15
16
17 34. Cortina-Borja M. Handbook of Parametric and Nonparametric Statistical Procedures,
18 5th edition. *J R Stat Soc a Stat*. 2012;175:829-29.
19
20
21 35. Kelly E, Nisker J. Medical students' first clinical experiences of death. *Med Educ*.
22 2010;4:421-28.
23
24
25 36. Smith-Han K, Martyn H, Barrett A, et al. That's not what you expect to do as a doctor,
26 you know, you don't expect your patients to die." Death as a learning experience for
27 undergraduate medical students. *BMC Med Educ*. 2016;16:108-16.
28
29
30 37. Hojat M. Ten approaches for enhancing empathy in health and human services
31 cultures. *J Health Hum Serv Adm*. 2009;4:412-50.
32
33
34 38. Jani BD, Blane DN, Mercer SW. The role of empathy in therapy and the
35 physician-patient relationship. *Forsch Komplementmed*. 2012;5:252-57.
36
37
38 39. Hojat M, Vergare MJ, Maxwell K, et al. The devil is in the third year: a longitudinal
39 study of erosion of empathy in medical school. *Acad Med*. 2009;9:1182-91.
40
41
42 40. Ulloque MJ, Villalba S, Varela de Villalba T, et al. Empathy in medical students of
43 Cordoba, Argentina. *Arch Argent Pediatr*. 2019;2:81-86.
44
45
46 41. Wen D, Ma X, Li H, et al. Empathy in Chinese medical students: psychometric
47 characteristics and differences by gender and year of medical education. *BMC Med*
48 *Educ*. 2013;13:130-36.
49
50
51 42. Jiang T, Wan XY, Liu YY, et al. Reliability and Validity of the Jefferson Scale of
52 Physician Empathy in Chinese Medical Students. *Sichuan Da Xue Xue Bao Yi Xue*
53 *Ban*. 2015;4:602-05.
54
55
56
57
58
59
60

- 1
2
3
4 43. Dhaliwal U, Singh S, Singh N. Reflective student narratives: honing professionalism
5 and empathy. *Indian J Med Ethics*. 2018;1:9-15.
6
7
8 44. Pohontsch NJ, Stark A, Ehrhardt M, et al. Influences on students' empathy in medical
9 education: an exploratory interview study with medical students in their third and last
10 year. *BMC Med Educ*. 2018;1:231-40.
11
12
13 45. O'Sullivan DM, Moran J, Corcoran P, et al. Medical school selection criteria as
14 predictors of medical student empathy: a cross-sectional study of medical students,
15 Ireland. *BMJ Open*. 2017;7:e016076. doi:10.1136/bmjopen-2017-016076.
16
17
18 46. Hojat M, Gonnella JS. Eleven Years of Data on the Jefferson Scale of
19 Empathy-Medical Student Version (JSE-S): Proxy Norm Data and Tentative Cutoff
20 Scores. *Med Princ Pract*. 2015;4:344-50.
21
22
23 47. Paro HB, Daud-Gallotti RM, Tiberio IC, et al. Brazilian version of the Jefferson Scale
24 of Empathy: psychometric properties and factor analysis. *BMC Med Educ*.
25 2012;12:73-80.
26
27
28 48. Tariq N, Rasheed T, Tavakol M. A Quantitative Study of Empathy in Pakistani
29 Medical Students: A Multicentered Approach. *J Prim Care Community Health*.
30 2017;4:294-99.
31
32
33 49. Rahimi-Madiseh M, Tavakol M, Dennick R, et al. Empathy in Iranian medical
34 students: A preliminary psychometric analysis and differences by gender and year of
35 medical school. *Med Teach*. 2010;11:e471-78.
36
37
38 50. Smith KE, Norman GJ, Decety J. The complexity of empathy during medical school
39 training: evidence for positive changes. *Med Educ*. 2017;11:1146-59.
40
41
42 51. Eva KW, Regehr G. Self-assessment in the health professions: a reformulation and
43 research agenda. *Acad Med*. 2005;10 Suppl:S46-54.
44
45
46 52. Bernardo MO, Cecilio-Fernandes D, Lima ARA, et al. Investigating the relation
47 between self-assessment and patients' assessments of physicians-in-training empathy:
48 a multicentric, observational, cross-sectional study in three teaching hospitals in
49 Brazil. *BMJ Open*. 2019;6:e029356. doi:10.1136/bmjopen-2019-029356.
50
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For peer review only

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	4-5
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6
		(b) Describe any methods used to examine subgroups and interactions	6
		(c) Explain how missing data were addressed	6
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6
		(e) Describe any sensitivity analyses	

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Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	7
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7
Discussion			
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.