



Assessing empathy in final-year medical students using the Persian version of the Jefferson Scale of Physician Empathy

Marzieh Nasiri, Mitra Amini¹, Arash Mani², Somayeh Delavari³, Mahsa Kiani¹, Mohammad Mahdi Sagheb¹, Parinaz Tabari¹

Abstract:

BACKGROUND: A doctor–patient relationship built on the concept of empathy is so essential to attain the best clinical outcomes in medicine. Since empathy has a positive role in interpersonal relationships and medical outcomes, its assessment is highly crucial. The aim of this study was to assess the empathy in last-year medical students using the Persian version of the Jefferson Scale of Physician Empathy (JSPE) and correlate empathy scores with demographic features.

MATERIALS AND METHODS: In this cross-sectional study, last-year medical students at Shiraz Medical School, Shiraz, Iran, were recruited for this study. In this research, we used the Persian version of JSPE. The validity and reliability of the Persian version of this tool were confirmed in the previous research. For the analysis of data, we employed descriptive statistics and the independent sample *t*-test.

RESULTS: One hundred and eighty-five final-year medical students were included in this study. The maximum score of the questionnaire was 140, and the total mean score of empathy was 98.15 ± 13.29 . The females' total mean score (102.05 ± 11.89) was higher than the males' score (93.57 ± 13.46). The difference between the mean score of gender and empathy was significant (P value $< .001$), but there was no significant difference between empathy and the two other demographic factors ($P > 0.05$).

CONCLUSIONS: Although physicians would gain the essential characteristics of empathy during their career, attending professors and other responsible policymakers in medical education should focus more on the factors related to physicians' empathy to train better and more professional physicians.

Keywords:

Empathy, Jefferson Scale of Physicians Empathy, medical education, medical students, physicians

Introduction

Clinicians need to possess the ability to listen to patients' narratives, in addition to having scientific and academic qualifications. This competency would improve clinicians' understanding and interpretation of patients' stories.^[1] Furthermore, the doctor–patient

relationship, which is built on the concept of empathy, is so essential to attain the best clinical outcomes in the practice of medicine.^[2] Empathy is defined as “*the ability of understanding and sharing another person's perspectives and feelings and using this understanding for guiding future action.*”^[3] This characteristic would help physicians perform critical medical processes more precisely and improve the quality of patient care.^[4]

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Nasiri M, Amini M, Mani A, Delavari S, Kiani M, Sagheb MM, *et al.* Assessing empathy in final-year medical students using the Persian version of the Jefferson Scale of Physician Empathy. *J Edu Health Promot* 2021;10:310.

Department of Psychiatry,
Shiraz Medical School,
Shiraz University of
Medical Sciences, Shiraz,
Iran, ¹Clinical Education
Research Center, Shiraz
University of Medical
Sciences, Shiraz, Iran,
²Cognitive Neuroscience
Research Center for
Psychiatry and Behavioral
Science, Shiraz University
of Medical Sciences,
Shiraz, Iran, ³Center for
Educational Research
in Medical Sciences,
School of Medicine, Iran
University of Medical
Sciences, Tehran, Iran

Address for correspondence:

Miss. Parinaz Tabari MSc,
Clinical Education
Research Center, Sina
and Sadra Hall, Neshat
Street, Shiraz, Iran.
E-mail: papiamentu@
gmail.com

Received: 28-11-2020
Accepted: 05-01-2021
Published: 31-08-2021

Expressing empathy is crucial in all health-care providers as it improves health outcomes, reduces stress, and builds trust between patients and health-care providers.^[5] The quality of performance in physicians is related to both their clinical expertise and empathetic capabilities. According to the learning objectives of the Association of American Medical Colleges for medical education, “physicians must be compassionate and empathetic in caring for patients.”^[6]

Since empathy has a positive role in interpersonal relationships and clinical outcomes,^[7] its assessment is highly essential. Some studies all over the world were done in the field of empathy in medicine. Sinclair *et al.*^[8] studied the concepts of “empathy,” “sympathy,” and “compassion” in grounded theory research. The main themes that have been extracted in the domain of empathy were “engaging suffering,” “connecting to and understanding the person,” and “emotional resonance: Putting yourself in the patient’s shoes.”

Decety and Fotopoulou^[9] investigated the impacts of empathy on clinical outcomes. They also offered two explanations (the social baseline theory and the free energy principle) related to defining empathic physicians’ positive consequences on patients.

Thirioux *et al.*^[10] investigated the differences between empathy and sympathy in the health domain. Based on this study, sympathy was defined as “feeling with,” while empathy was considered “feeling into.”

The Jefferson Scale of Physicians Empathy (JSPE) is an assessment tool specifically developed and designed for measuring empathy in physicians.^[5,11-13] Jordan and Foster^[14] used the student version of the tool to examine students’ empathy in one academic care setting. The authors declared that the tool’s internal consistency had been evaluated as acceptable in previous studies. A cross-sectional study was done by Casas *et al.*^[15] to investigate the relationship between empathy in medical students and clinical competence; they utilized the JSPE model and based on the results, Objective Structured Clinical Examination (OSCE) performance can be predicted by the JSPE score. Berg *et al.*^[16] compared self-reported empathy of medical students and patients’ evaluation of students’ empathy. The patients examined physicians’ empathy using the Jefferson Scale of Patient Perceptions of Physician Empathy (JSPPPE). The self-assessment tool for medical students was the Jefferson Scale of Empathy. The authors aimed to investigate the impact of gender and ethnicity on perceptions of empathy. They also stated that the psychometric validity of JSPPPE had been confirmed in previous research. Archer and Turner^[17] examined the appropriateness of the same tool (student version) to

assess empathy in South African undergraduate medical students; in the mentioned study, the tool’s validity for measuring this population’s empathy was confirmed. In the study of Sng *et al.*,^[18] which explored social and personal empathy determinants in medical students using the student version of the scale, the authors stated that although the tool had well internal consistency, this model is not a perfect tool based on factor analysis.

The JSPE tool has also been translated into many languages and used in different countries.^[5,12,19-22] Shariat *et al.* examined the reliability and validity of the Persian translation of JSPE for the first time.^[5]

Investigating the traits of more empathetic medical students and supporting the enhancement of empathy during medical education is highly beneficial.^[23] Since patient-centered care has been the focus of attention nowadays, medical schools have concentrated on training and analyzing empathy.^[24] The level of satisfaction in empathic physicians is high, and their vulnerability to exhaustion and depression is limited compared to other physicians.^[25] In general, assessing the deficiencies in affection and empathy among physicians can help provide more suitable training and improve the educational methodologies.^[26]

Owing to the critical role of empathy in physician–patient relation and clinical outcomes, the purpose of this study is to evaluate empathy status in final-year medical students using the Persian translation of JSPE and to correlate empathy scores with demographic features.

Materials and Methods

Study design, data gathering tool, and participants

In the present cross-sectional study, we used the Persian version of JSPE at Shiraz Medical School, Shiraz, Iran. Generally, the medical school curriculum includes 7 years of undergraduate education. Students should pass 30 months of horizontal integration of basic science courses, 12 months of introduction to medicine courses, and 40 months of clinical rotations.^[27,28] Since last-year medical students are considered physicians in Iran, we applied the mentioned questionnaire, evaluating physicians’ empathy.

The validity and reliability of the Persian version of this tool were confirmed in the previous research by Shariat *et al.* The internal consistency of the Persian version of JSPE was 0.78 and its test–retest reliability after 2 weeks was 0.92 based on the mentioned study.^[5]

This questionnaire includes 20 Likert-type items with a seven-point scale ranging from “strongly disagree” to “strongly agree”. Some items are reversed scored items,

while others are directly scored. The questionnaire's minimum score is 20 (in case all 20 items were scored one), and the maximum score is 140 (in case all 20 items were scored seven). In this research, the obtained score of empathy results from the total score of the JSPE questionnaire. Based on the census, the questionnaires were distributed to all last-year medical students ($n = 215$). In total, 185 questionnaires were answered (response rate = 86%).

Ethics approval and consent to participate

Ethical approval for this study was granted by the Ethics Committee of Shiraz University of Medical Sciences (IRB: IR.SUMS.REC.1392.4712). In addition, this research was part of a project supported by the National Agency for Strategic Research in Medical Education in Iran. Informed written consent to participate was obtained from students, and the participation in this survey was voluntary. Students' names were not mentioned in the scripts, and they were free to withdraw at any time. For maintaining the participants' anonymity, codes were assigned to each of them, and they assured that the results of the individual test scores would remain confidential.

Statistical analysis

The obtained data were analyzed using IBM SPSS Statistics Version 22.0 (IBM Corp., Armonk, NY, USA). For the analysis of data, we employed descriptive statistics. The independent sample *t*-test was also used for data analysis.

Results

One hundred and eighty-five final-year medical students were included in this study. There were 85 (45.9%) males and 100 (54.1%) females. Of them, 113 students (61.1%) were in the age group of 23–25, and 72 students (38.9%) were in the age group of 25–27. Most of the respondents (146 people, 78.9%) were single, and 39 others (21.1%) were married. The maximum score of the questionnaire was 140, and the total mean score of empathy was 98.15 ± 13.29 . Table 1 illustrates the empathy rates, considering the demographic features of the participants. The total mean of the females' score (102.05 ± 11.89) was higher than the males'

Table 1: Comparison of empathy in last-year medical students considering demographic features

Demographic features	Group	Sample size	Mean±SD	<i>t</i>	<i>P</i>
Gender	Male	85	93.57±13.46	4.545	0.001
	Female	100	102.05±11.89		
Age	23-25	113	98.72±12.37	0.821	0.413
	25-27	72	97.07±14.68		
Marital status	Single	146	97.89±12.78	0.526	0.599
	Married	39	99.15±15.20		

SD=Standard deviation

score (93.57 ± 13.46). The difference between gender and empathy was significant ($P < 0.001$), but there was no significant difference between empathy and the two other factors (age and marital status) ($P > 0.05$).

Table 2 highlights the descriptive characteristics of the aspects of the Persian translation of the JSPE in 185 last-year medical students [Table 2].

Discussion

Empathy as the core of patient care and natural human emotion is an essential issue in the doctor–patient relationship.^[11] Some studies showed that an effective patient–physician relationship was necessary as a critical component for improving health-care outcomes.^[11,29,30] This research investigates empathy status in Iranian final-year medical students using a valid and reliable Persian translation of the JSPE; we evaluated the correlation between empathy scores and demographic features. According to the previous study about the Persian version of the JSPE, this tool has acceptable reliability and validity for investigating empathy among Iranian medical students and physicians.^[5,11,31]

According to the present study results, higher empathy scores were reported in female participants than the male participants. This result is in agreement with the findings of studies by Shariat *et al.*,^[5] Suh *et al.*,^[12] Shariat and Habibi,^[31] Leombruni *et al.*,^[21] Santos *et al.*,^[32] and Park *et al.*^[19] This difference in genders may be the result of “perspective-taking,”^[31] “higher sensitivity of women in the interpersonal relationship,” and “their better understanding of patient’s emotional signals,”^[12,33] “motivational differences” rather than “simple differences of ability between men and women.”^[11] Some other reasons can be offered for gender dissimilarities in empathy. For instance, it has been proposed that women are more interested than men in emotional signals, a quality that may contribute to a better empathetic connection. The results of gender dissimilarities in empathy agree with the studies that female physicians devote more time with patients.^[2] Some other studies, including the research conducted by Benabbas,^[34] reported no significant difference in female and male participants’ empathy scores. In the study of Yeo,^[35] it has been reported that male participants’ empathy scores were higher compared to female students; this result was incompatible with the majority of previous studies in this field.

In the present study, the mean score of the JSEP in married people was higher compared to unmarried participants, which was compatible with the research performed by Shariat *et al.*;^[5] However, this relationship was not significant in the present study, and it was significant in the study of Shariat *et al.*^[5]

Table 2: Scores of last-year medical students on the Persian translation of Jefferson Scale of Physician Empathy

Items of JSPE	Mean±SD
1) My understanding of how my patients and their families feel does not influence medical or surgical treatment	4.69±1.70
2) My patients feel better when I understand their feelings	5.75±1.09
3) It is difficult for me to view things from my patients' perspectives	3.40±1.43
4) I consider understanding my patients' body language as important as verbal communication in caregiver-patient relationships	5.40±1.22
5) I try to imagine myself in my patients' shoes when providing care to them	4.82±1.38
6) Because people are different, it is difficult for me to see things from my patients' perspectives	4.45±1.30
7) I try not to pay attention to my patients' emotions in history taking or in asking about their physical health	4.94±1.54
8) Attentiveness to my patients' personal experiences does not influence treatment outcomes	4.65±3.24
9) I have a good sense of humor that I think contributes to a better clinical outcome	4.51±1.56
10) My patients value my understanding of their feelings which is therapeutic in its own right	5.50±1.01
11) Patients' illnesses can be cured only by medical or surgical treatment; therefore, emotional ties to my patients do not have a significant influence on medical or surgical outcomes	5.40±1.31
12) Asking patients about what is happening in their personal lives is not helpful in understanding their physical complaints	4.54±1.59
13) I try to understand what is going on in my patients' minds by paying attention to their nonverbal cues and body language	4.91±1.30
14) I believe that emotion has no place in the treatment of medical illness	5.29±1.47
15) Empathy is a therapeutic skill without which success in treatment is limited	4.69±1.52
16) An important component of the relationship with my patients is my understanding of their emotional status, as well as those of their families	4.95±1.29
17) I try to think like my patients in order to render better care	3.85±1.55
18) I do not allow myself to be influenced by strong personal bonds between my patients and their family members	5.40±1.28
19) I do not enjoy reading nonmedical literature or the arts	5.82±1.39
20) I believe that empathy is an important therapeutic factor in the medical or surgical treatment	5.62±3.86

SD=Standard Deviation, JSPE=Jefferson Scale of Physician Empathy

There was no correlation between empathy scores and age in the present study. The relation between empathy and age has been reported with varying results. Therefore, more studies are required to show the real association between empathy and age through samples with a broader range of ages to overcome the limitation.^[36]

Based on the results of the present research, the two highest mean scores were related to (1) "I do not enjoy reading nonmedical literature or the arts," and (2) "My patients feel better when I understand their feelings." These items are among the most critical factors that a general practitioner should consider to manage patients better medically and psychologically. Similarly, in the studies of Shariat *et al.*^[5] and Rahimi-Madiseh *et al.*^[11] (both conducted in Iran), these two items are among the highest mean scores of empathy. Also, in the study of Preusche and Wagner-Menghini,^[22] the two highest-scored items are the same as Iranian studies. In the research done by Paro *et al.*,^[20] the highest mean score of empathy was "Patients feel better when their physicians understand their feelings," which is compatible with previously mentioned studies. The two next high scored items in that study were "I believe that emotion has no place in the treatment of medical illness," and "I do not enjoy reading nonmedical literature or that of the arts" with identical means but different standard deviations. The mentioned study would also be considered the research with corroborant results based on empathy's highest mean scores.

It can be concluded that the hidden curriculum and the educational policies may be partly based on emotional interactions and understandings between physicians and patients, and the medical students/physicians are highly concentrated on the academic subjects rather than focusing on other types of studies; this may be because of the fact that their teachers encourage them to devote a lot of their time and effort on enhancing their level of information on the medicine.

The findings of this research suggest that medical students, in addition to scientific and practical aspects of medicine, should also learn the art of empathy. Since empathy is a learnable skill^[37] and medical students' skills related to empathy can be strengthened through education and training,^[38] it is possible to take steps and make medical students empathic by organizing workshops as well as developing educational topics for presentation in the course syllabus related to this subject. It is assumed that when physicians show more empathy and devote more time to patients, it increases trust between doctors and patients. This trust might consequently be the driving force behind correct treatment management and speedy patient recovery.

Addressing the empathy issue in the relationship between physician and patient is essential, and its strengthening is beneficial for both populations, increasing the satisfaction and social acceptability of physicians.^[31] One strength of this research is that studies in professionalism and specific empathy are considered

research priorities in the Eastern Mediterranean Region.^[39] Another strength is that the multidisciplinary approach of integrating medical education in the health delivery system provides a favorable environment for medical students to work in the community health-care system, leading to increasing empathy.^[40] In this study, small sample size can be considered as a limitation. Furthermore, the present research was conducted in one center, and the results may not be generalized to other settings and larger populations. Another limitation is that we evaluated the samples over a limited period and we could not compare the changes over a long period. Therefore, it is highly recommended that future studies follow-up with participants and determine the variability of empathy rates over time. In addition to the mentioned limitations, using a self-report instrument can be stated as another limitation of the present study because it may cause bias.

Conclusions

Empathy is a desirable attribute of physician and patient relationship that leads to a better quality of care and better patient satisfaction. Accordingly, the JSPE can evaluate empathy development, and its implementation helps to understand empathy epistemology. It may assist in improving the patient-physician relationship and treatment outcome. Although physicians would gain the essential characteristics of empathy during their career, attending professors and other responsible policymakers in medical education should focus more on the factors related to physicians' empathy to train better and more professional physicians.

Acknowledgment

This study was obtained from the first author's thesis of medical degree, with proposal number 3961 approved by the Deputy of Research of Shiraz University of Medical Sciences. The ethical approval for this study was granted by the Ethics Committee of Shiraz University of Medical Sciences (IRB: IR.SUMS.REC.1392.4712). Additionally, this research is part of a project supported by the National Agency for Strategic Research in Medical Education (NASR) in Iran. The authors would like to thank Dr. Mohamad Reza Hojat, Research Professor of Psychiatry and Human Behavior and Director of Jefferson Longitudinal Study, for his valuable comments on the earlier version of the manuscript. Also, we should express our sincere appreciation to Dr. Seyed Vahid Shariat for permitting us to use the Persian version of the questionnaire. The authors also appreciate all the students who participated in this study.

Financial support and sponsorship

The research deputy of Shiraz University of Medical Sciences financially supported this study.

Conflicts of interest

There are no conflicts of interest.

References

1. Charon R. The patient-physician relationship. Narrative medicine: A model for empathy, reflection, profession, and trust. *JAMA* 2001;286:1897-902.
2. Hojat M, Gonnella JS, Nasca TJ, Mangione S, Vergare M, Magee M. Physician empathy: Definition, components, measurement, and relationship to gender and specialty. *Am J Psychiatry* 2002;159:1563-9.
3. Bein T. Empathy: Some thoughtful reflections among a favorable attitude. *Intensive Care Med* 2017;43:1157-8.
4. Krishnasamy C, Ong SY, Loo ME, Thistlethwaite J. How does medical education affect empathy and compassion in medical students? A meta-ethnography: BEME Guide No. 57. *Med Teach* 2019;41:1220-31.
5. Shariat SV, Eshtad E, Ansari S. Empathy and its correlates in Iranian physicians: A preliminary psychometric study of the Jefferson Scale of Physician Empathy. *Med Teach* 2010;32:e417-21.
6. Abe K, Niwa M, Fujisaki K, Suzuki Y. Associations between emotional intelligence, empathy and personality in Japanese medical students. *BMC Med Educ* 2018;18:47.
7. Hojat M, Gonnella JS, Nasca TJ, Mangione S, Veloksi JJ, Magee M. The Jefferson Scale of Physician Empathy: Further psychometric data and differences by gender and specialty at item level. *Acad Med* 2002;77:S58-60.
8. Sinclair S, Beamer K, Hack TF, McClement S, Raffin Bouchal S, Chochinov HM, et al. Sympathy, empathy, and compassion: A grounded theory study of palliative care patients' understandings, experiences, and preferences. *Palliat Med* 2017;31:437-47.
9. Decety J, Fotopoulou A. Why empathy has a beneficial impact on others in medicine: Unifying theories. *Front Behav Neurosci* 2014;8:457.
10. Thirioux B, Birault F, Jaafari N. Empathy is a protective factor of burnout in physicians: New neuro-phenomenological hypotheses regarding empathy and sympathy in care relationship. *Front Psychol* 2016;7:763.
11. Rahimi-Madiseh M, Tavakol M, Dennick R, Nasiri J. Empathy in Iranian medical students: A preliminary psychometric analysis and differences by gender and year of medical school. *Med Teach* 2010;32:e471-8.
12. Suh DH, Hong JS, Lee DH, Gonnella JS, Hojat M. The Jefferson Scale of Physician Empathy: A preliminary psychometric study and group comparisons in Korean physicians. *Med Teach* 2012;34:e464-8.
13. Hojat M, LaNoue M. Exploration and confirmation of the latent variable structure of the Jefferson scale of empathy. *Int J Med Educ* 2014;5:73-81.
14. Jordan KD, Foster PS. Medical student empathy: Interpersonal distinctions and correlates. *Adv Health Sci Educ Theory Pract* 2016;21:1009-22.
15. Casas RS, Xuan Z, Jackson AH, Stanfield LE, Harvey NC, Chen DC. Associations of medical student empathy with clinical competence. *Patient Educ Couns* 2017;100:742-7.
16. Berg K, Blatt B, Lopreiato J, Jung J, Schaeffer A, Heil D, et al. Standardized patient assessment of medical student empathy: Ethnicity and gender effects in a multi-institutional study. *Acad Med* 2015;90:105-11.
17. Archer E, Turner R. Measuring empathy in a group of South African undergraduate medical students using the student version of the Jefferson Scale of Empathy. *Afr J Prim Health Care Fam Med* 2019;11:e1-e5.

18. Sng G, Tung J, Ping YS, Lee SS, Win MT, Hooi SC, *et al.* Complex and novel determinants of empathy change in medical students. *Korean J Med Educ* 2016;28:67-78.
19. Park KH, Roh H, Suh DH, Hojat M. Empathy in Korean medical students: Findings from a nationwide survey. *Med Teach* 2015;37:943-8.
20. Paro HB, Daud-Gallotti RM, Tibério IC, Pinto RM, Martins MA. Brazilian version of the Jefferson Scale of Empathy: Psychometric properties and factor analysis. *BMC Med Educ* 2012;12:73.
21. Leombruni P, Di Lillo M, Miniotti M, Picardi A, Alessandri G, Sica C, *et al.* Measurement properties and confirmatory factor analysis of the Jefferson Scale of Empathy in Italian medical students. *Perspect Med Educ* 2014;3:419-30.
22. Preusche I, Wagner-Menghin M. Rising to the challenge: Cross-cultural adaptation and psychometric evaluation of the adapted German version of the Jefferson Scale of Physician Empathy for Students (JSPE-S). *Adv Health Sci Educ Theory Pract* 2013;18:573-87.
23. Huang L, Thai J, Zhong Y, Peng H, Koran J, Zhao XD. The Positive Association Between Empathy and Self-Esteem in Chinese Medical Students: A Multi-Institutional Study. *Front Psychol* 2019;10:1921.
24. Light A, Gupta T, Burrows A, Nandakumar M, Daniel A, Karthikeyan S. Learning empathy: The medical student perspective. *Clin Teach* 2019;16:76-7.
25. Bernardo MO, Cecílio-Fernandes D, Costa P, Quince TA, Costa MJ, Carvalho-Filho MA. Physicians' self-assessed empathy levels do not correlate with patients' assessments. *PLoS One* 2018;13:e0198488.
26. Moreto G, Santos IS, Blasco PG, Pessini L, Lotufo PA. Assessing empathy among medical students: A comparative analysis using two different scales in a Brazilian medical school. *Educación Médica* 2018;19:162-70.
27. Nasr K. Shiraz University School of Medicine: Its foundation and development. *Arch Iran Med* 2009;12:87-92.
28. Amini M, Kojuri J, Mahbudi A, Lotfi F, Seghatoleslam A, Karimian Z, *et al.* Implementation and evolution of the horizontal integration at Shiraz Medical School. *J Adv Med Educ Prof* 2013;1:21-7.
29. Koohestani HR, Baghcheghi N. The effects of team-based learning techniques on nursing students' perception of the psycho-social climate of the classroom. *Med J Islam Repub Iran* 2016;30:437.
30. Dearnley C, Rhodes C, Roberts P, Williams P, Prenton S. Team based learning in nursing and midwifery higher education; a systematic review of the evidence for change. *Nurse Educ Today* 2018;60:75-83.
31. Shariat SV, Habibi M. Empathy in Iranian medical students: Measurement model of the Jefferson scale of empathy. *Med Teach* 2013;35:e913-8.
32. Santos MA, Grosseman S, Morelli TC, Giuliano IC, Erdmann TR. Empathy differences by gender and specialty preference in medical students: A study in Brazil. *Int J Med Educ* 2016;7:149-53.
33. Hassan S, Ibrahim MS, Hassan NG. The structural framework, implementation strategies and student' perception of team-based learning in undergraduate medical education of a medical school in Malaysia. *Education in Medicine Journal* 2018;10:53-66.
34. Benabbas R. Empathy in Iranian medical students: A comparison by age, gender, academic performance and specialty preferences. *Med J Islam Repub Iran* 2016;30:439.
35. Yeo S. Differences and changes in the empathy of Korean medical students according to gender and vocational aptitude, before and after clerkship. *Korean J Med Educ* 2019;31:343-55.
36. Hojat M. *Empathy in Patient Care: Antecedents, Development, Measurement, and Outcomes*. Springer-Verlag New York; 2007.
37. Walther J, Miller SE, Sochacka NW. A model of empathy in engineering as a core skill, practice orientation, and professional way of being. *J Eng Educ* 2017;106:123-48.
38. Wünderlich M, Schwartz C, Feige B, Lemper D, Nissen C, Voderholzer U. Empathy training in medical students-A randomized controlled trial. *Med Teach* 2017;39:1096-8.
39. Amini M, Kojuri J, Karimian Z, Lotfi F, Moghadami M, Dehghani M, *et al.* Talents for future: Report of the second national medical science olympiad in Islamic Republic of Iran. *Iran Red Crescent Med J* 2011;13(6):377-81.
40. Salehi A, Harris N, Lotfi F, Hashemi N, Kojouri J, Amini M. Reform in medical and health sciences educational system: A Delphi study of faculty members' views at Shiraz University of Medical Sciences. *East Mediterr Health J* 2014;20:151-61.