Correlates and Changes in Empathy and Attitudes Toward Interprofessional Collaboration in Osteopathic Medical Students

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Context: Many studies have reported a decline in empathy as allopathic medical students progress through medical school. Data are needed to compare the pattern of changes in empathy in osteopathic and allopathic medical students. Also, it is important to investigate the associations between measures of empathy and attitudes toward interprofessional collaboration, which are among major elements of professionalism in medicine.

Objectives: (1) To investigate correlations between empathy and interprofessional collaboration in osteopathic medical students; (2) to examine differences in empathy and interprofessional collaboration scores by sex, class year, and specialty interest; and (3) to compare empathy scores by class year between osteopathic and allopathic medical students.

Design: Correlational and comparative study.

Setting: Ohio University Heritage College of Osteopathic Medicine.

Participants: Osteopathic medical students enrolled in academic year 2011-2012.

Main Outcome Measures: The Jefferson Scale of Empathy (JSE) and the Jefferson Scale of Attitudes toward Physician-Nurse Collaboration (JSAPNC) scores.

Results: Student respondents (N=373) included 197 women (53%) and 176 men (47%). Significant correlation was found between scores on the JSE and JSAPNC (r=0.42, P<.01). Women scored higher than men on the JSE (mean scores, 117.1 and 111.9, respectively; $F_{1,371}$=19.6, P<.01) and the JSAPNC (mean scores, 50.1 and 48.7, respectively; $F_{1,371}$=6.5, P<.01). No statistically significant difference on the scores of the 2 scales was observed among students who planned to pursue "people-oriented" specialties (150 [40%]) compared with those interested in "technology/procedure-oriented" specialties (170 [45%]). No statistically significant change in empathy scores was found in different class years of the osteopathic medical students. Comparisons of empathy scores with allopathic medical students showed no significant difference in the first and second years, but osteopathic medical students had a higher mean empathy score (M=114.4) than their allopathic counterparts (M=110.9) in the third year (t_{158}=2.31, P<.05), and their empathy scores remained high, although not statistically significant, in the fourth year of osteopathic medical school.

Conclusion: The decline in empathy that is often reported among allopathic medical students was not observed. The present study can serve as a step toward further longitudinal research on the development of empathy and attitudes toward teamwork among osteopathic medical students.

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The past decade has witnessed increasing calls for health care to be evidence based and founded on healing relationships fostered through compassion, empathy, teamwork, collaboration, and responsiveness to the needs, values, and preferences of the patient.[1] Research suggests that empathic engagement in patient care can lead to positive clinical outcomes.[2,3] Veloski and Hojat[4] described empathy and interprofessional collaboration as major elements of professionalism in medicine,[4] and they should be considered core elements of patient-centered care.

More than 10 years of studies on empathy in allopathic medical students and physicians indicate that empathy tends to erode during medical school[5-11] and in residency training.[12,13] Furthermore, higher empathy scores have been linked to better ratings of clinical competence in core medical school clerkships,[14] sex (being female),[14-17] and interest in primary care specialties that often require first-encounter and long-term face-to-face interaction with patients.[15,17]

The distinction between allopathic and osteopathic medicine continues to be debated.[18-20] The differences in training are becoming diluted: accreditation standards and curricula of osteopathic medical (ie, DO) schools now closely resemble those of allopathic medical (ie, MD) schools, and the majority of DO graduates train in programs certified by the Accreditation Council for Graduate Medical Education.[21,22] Despite growing similarities, some concrete distinctions remain between the 2 systems. For example, in osteopathic medical schools a substantial amount of instructional time is devoted to osteopathic manipulative treatment (OMT), which supports "hands-on" engagement with the patient.[23]

In addition, Chen and Mullan[20] reported that DO graduates are more likely than MD graduates to pursue primary care specialties, which is a career choice demonstrated to correlate with empathy.[15,17,24] Likewise, Fordyce et al[25] explored how DOs are more likely to treat underserved populations. Considering the distinctive features of osteopathic medical education, it would seem reasonable to ask whether variations in empathy among osteopathic medical students are different from those reported for allopathic medical students and whether students' experience with OMT could potentially influence their capacity for empathy in the context of patient care. With the exception of a cross-sectional study by Kimmelman et al that was published in 2012,[31] there is virtually no empirical research on empathy in osteopathic medical students and physicians compared with those of allopathic medical students and physicians, both in the United States[5-17] and abroad.[26-30]

We designed the present cross-sectional study to (1) investigate correlations between empathy and interprofessional collaboration scores in osteopathic medical students, (2) examine differences in empathy and interprofessional collaboration scores by sex, year in medical school, and specialty interest, and (3) compare empathy scores by class year between osteopathic and allopathic medical students.

Methods

Participants

Research participants were students in years 1 to 4 of medical school at the Ohio University Heritage College of Osteopathic Medicine (OU-HCOM).

Instruments

The Jefferson Scale of Empathy (JSE) was used. This scale is a validated instrument used to measure empathy in the context of medical education and patient care.[15,16,24] Hojat et al[14] developed the JSE based on an extensive review of the literature, and they designed it to assess empathy as a cognitive attribute of a physician: Can he or she understand patients' experiences, concerns, and perspectives, and does he or she have the capacity to communicate this understanding and an intention to help?[8,24,32,34] The JSE includes 20 items, each answered on a 7-point Likert scale (1 indicating "strongly disagree" and 7 indicating "strongly agree").

On the JSE, the total possible scores range from 20 to 140. A higher score indicates more empathic orientation toward patient care. An example of an item on the JSE is as follows: "It is difficult for a physician to view things from patients' perspectives." Evidence in support of the psychometrics of the JSE has been reported in studies in the United States and abroad.[15,16,24,26-30,35-41] The JSE is a widely used and researched instrument in medical education research[42]; it has been translated into 42 languages to date and is used in more than 60 countries.[33] Completion of this brief scale takes 5 to 10 minutes. More information about the JSE can be found at http://www.jefferson.edu/jmc/crmehc/jse.html.

The Jefferson Scale of Attitudes toward Physician-Nurse Collaboration (JSAPNC) was used as an indicator of orientation toward interprofessional collaboration and teamwork. The 15 items in the JSAPNC are answered on a 4-point Likert-type scale (1 indicating "strongly disagree" and 4 indicating "strongly agree"). On the JSAPNC, the total possible scores range from 15 to 60. A higher score reflects a more positive attitude toward collaborative relationships. An example of an item on the JSAPNC is as follows: "Nurses should clarify a physician's order when they feel that it might have the potential for detrimental effects on the patient." Evidence in support of the psychometrics of this scale has been reported in the United States and abroad.[43-49] The JSAPNC can be completed in approximately 5 minutes.

Demographic information (including sex and age [<22, 22-24, 25-27, 28-30, 31-33, 34-36, >36 years]), year in medical school, and specialty interest were also solicited. We identified 3 specialty interest groups: "people oriented" (ie, family medicine, general internal medicine, pediatrics, and psychiatry), "technology/procedure oriented" (ie, hospital-based specialties [anesthesiology, pathology, radiology] and surgical specialties), and "other." The final group included those who were planning to pursue other specialties or who were undecided or interested in more than 1 specialty.

Procedures

The institutional review boards of OU-HCOM and Thomas Jefferson University approved the study protocol. The study was undertaken in the 2011-2012 academic year.

First-, second-, and third-year medical student participants completed paper-and-pencil surveys, which were administered as follows: first, students were informed that their participation was optional and unrelated to academic performance and invited to either decline or participate by signing the consent form. After obtaining informed consent, members of the research team or administrative staff distributed the survey instruments and a brief demographic form (including a set of questions about a student's history with and interest in osteopathic medicine) to participants at the end of a regularly scheduled lecture. Fourth-year students completed an identical online version of the survey in which all of the informed consent information was displayed on the survey's welcome screen. Students were then prompted to type their names into a form and check a box either affirming or denying their consent.

Participants were given the option of turning in the surveys immediately after completion or returning them via campus mail using a preaddressed envelope. Research staff emphasized that participation was voluntary and had no bearing on students' academic performance. To preserve confidentiality, each survey contained a random identification number instead of participants' names. Signed consent forms and a document that matched participant names to their random identification numbers were stored in a locked filing cabinet separate from the completed surveys. Students' responses were transferred into a spreadsheet and each participant's name and other identifying information was replaced with a random identification number to preserve anonymity.

Because fourth-year students were completing rotations off-site at various locations, this cohort of students was invited via e-mail to complete the surveys online

through Survey Monkey. On completion of the online survey, fourth-year participants were given a random 4-digit code to make their responses anonymous. If no reply was received, 2 follow-up e-mails were sent to the students, each 1 week apart.

Researchers retained the master key that matched participants' identification codes to participants' identities. Data sent to Jefferson Medical College for analysis contained only the random identification code. Scores were calculated separately for each scale. Students were required to have completed both scales' items before their scores were calculated.

To compare the empathy scores from the present study with those from a study on allopathic medical students, we used data reported by Chen et al[6] in a cross-sectional study at Boston University School of Medicine. To our knowledge, theirs was the only cross-sectional study with US allopathic medical students in which the JSE was used, with mean scores adjusted for sex, age, educational debt, and career preference. To obtain comparison data, we asked Dr Chen to provide us with unadjusted JSE means and standard deviations, which he subsequently sent to us (Daniel Chen, MD, e-mail communication, July 6, 2012).

Statistical Analyses

The relationships among the 2 scales were examined using the Pearson product-moment correlation coefficient. We used the χ^2 test to assess the associations between discrete variables (eg, sex and class year). We used the *t* test, multivariate analysis of variance (MANOVA), and univariate analysis of variance (ANOVA) to compare the scores of the 2 scales by sex, year in medical school, and specialty interest. We performed all statistical analyses using SAS version 9.3 for Windows (SAS Institute). We used the 2-tailed *t* test for independent groups to compare the findings from our study with findings from the study by Chen et al. We considered *P* values of .05 or less to be statistically significant.

Results

The students who responded to the survey (N=373) included 197 women (53%) and 176 men (47%). Of the total respondents, 109 (29%) were in their first year, 94 (25%) in their second year, 101 (27%) in their third year, and 69 (18%) in their fourth year. The most common age categories for the sample were 22 to 24 years (157 participants [42%]) and 28 to 30 years (168 participants [45%]). Total number of students in the first, second, third, and fourth year were 120, 118, 116, and 118, respectively. Thus, the sample with complete data represented 91%, 80%, 87%, and 58% response rates in the first, second, third, and fourth years, respectively. The response rate of the entire sample was 79%. Frequency and percentage distributions of the participating sample by sex and class year are presented in *Table 1*. We found no significant association between sex and class year in medical school, meaning that sex proportions in different years were not significantly different ($\chi^2_3=3.0$, $P=.38$).

Correlations Between the JSE and JSAPNC

The correlation coefficient between scores of the JSE and JSAPNC was statistically significant ($r=0.42$, $P<.01$). Cronbach α reliability coefficients for the total sample were .84 (JSE) and .84 (JSAPNC).

Table 1.
Sex of 373 Osteopathic Medical Students by Class Year During the 2011-2012 Academic Year[a]

Class Year	n	Sex, No. (%)	
		Men	Women
First	109	58 (53)	51 (47)
Second	94	40 (43)	54 (57)
Third	101	44 (44)	57 (56)
Fourth	69	34 (49)	35 (51)
Total	**373**	**176 (47)**	**197 (53)**

[a] Data are from the Ohio University Heritage College of Osteopathic Medicine. $\chi^2_3=3.0$, $P=.38$.

Comparisons by Sex

Means and standard deviations of the 2 scales for men and women and summary results of statistical analyses are reported in *Table 2*. Results of MANOVA showed significant differences between men and women (Wilks $\lambda=0.94$, $P<.01$). As shown in *Table 2*, ANOVA indicated that women scored significantly higher than men on the JSE (mean scores, 117.1 and 111.9, respectively; $F_{1,371}=19.6$, $P<.01$). The same pattern of sex difference was observed on scores on the JSAPNC (mean scores, 50.1 and 48.7 for women and men, respectively; $F_{1,371}=6.5$, $P<.01$).

Table 2.
Scores on the JSE and the JSAPNC by Sex, Specialty Interest, and Class Year for 373 Osteopathic Medical Students During the 2011-2012 Academic Year

Groups	n	Score,[a] mean (SD)	
		JSE	JSAPNC
Sex[b]			
Men	197	111.9 (11.0)	48.7 (5.6)
Women	176	117.1 (11.4)	50.1 (5.0)
Specialty Interest[c]			
People oriented	150	115.8 (10.7)	49.9 (5.5)
Technology/procedure oriented	170	114.1 (12.1)	49.0 (5.1)
Other	53	113.3 (12.0)	49.9 (5.7)
Class Year[d]			
First	109	113.6 (11.7)	50.2 (4.8)
Second	94	116.7 (12.2)	50.7 (4.8)
Third	101	114.4 (11.2)	48.5 (5.7)
Fourth	69	113.9 (10.5)	48.2 (5.8)

[a] The Jefferson Scale of Empathy (JSE) contained 20 items with a range of responses from 1 to 7 (total possible scores ranged from 20 to 140). The Jefferson Scale of Attitudes toward Physician-Nurse Collaboration (JSAPNC) contained 15 items with a range of responses from 1 to 4 (total possible scores ranged from 15 to 60).
[b] Statistical measures were as follows: Wilks $\lambda=0.94$, $P<.01$; for JSE, univariate $F_{1,371}=19.6$, $P<.01$; for JSAPNC, univariate $F_{1,371}=6.5$, $P<.01$.
[c] "People-oriented" specialties included family medicine, general internal medicine, pediatrics, and psychiatry. Specialties that are "technology/procedure oriented' included hospital-based specialties (eg, anesthesiology, pathology, radiology) and surgical specialties. Student physicians who were planning to pursue other specialties, who were undecided, or who were interested in more than 1 specialty were included in the "other" category. Wilks $\lambda=0.99$ (not statistically significant).
[d] Statistical measures were as follows: Wilks $\lambda=0.95$, $P<.01$; for JSE, univariate $F_{3,369}=1.36$, $P=.25$ (not statistically significant); for JSAPNC, univariate $F_{2,369}=4.97$, $P<.01$.

Abbreviation: SD, standard deviation.

Comparisons by Class Year

Scores of the 2 scales for students in different class years were compared. Means and standard deviations and summary results of MANOVA are reported in *Table 2*.

Results of MANOVA indicated significant differences among students in different class years (Wilks $\lambda=0.95$, $P<.01$). Univariate ANOVA showed no significant differences on the JSE scores among students in different class years ($F_{3,369}=1.36$, $P=.25$). However, differences were statistically significant on scores of the JSAPNC ($F_{3,369}=4.97$, $P<.01$). The Duncan post hoc mean comparison test indicated that the mean scores on this scale were significantly lower for students in years 3 and 4 compared with those in years 1 and 2.

Comparisons by Specialty Interest

Of the participants, 150 (40%) were interested in people-oriented specialties and 170 (46%) were interested in technology/procedure-oriented specialties. Fifty-three students (14%) were in the "other" category for specialty interest.

Comparisons of these groups on the 2 scales and summary results of statistical analyses are reported in *Table 2*. Results of MANOVA did not show any statistically significant difference on any of the 2 scales among the 3 specialty interest groups (Wilks $\lambda=0.99$, $P=.29$).

Osteopathic-Allopathic Comparisons on Empathy Scores

The means and standard deviations of the JSE by class year in osteopathic and allopathic medical schools are presented in *Table 3*. Mean empathy score for different years at OU-HCOM were compared with those from the cross-sectional study of allopathic medical students at

Table 3.
Comparison of JSE Scores[a] for Osteopathic (OU-HCOM) and Allopathic (BUSOM) Medical Students

	Osteopathic (OU-HCOM)		Allopathic (BUSOM)			
Class Year	Score	n	Score	n	*t* Test	*P* Value[b]
First	113.6 (11.7)	109	111.8 (12.6)	179	1.2	.16
Second	116.7 (12.2)	94	115.7 (10.4)	142	0.67	.50
Third	114.4 (11.2)	101	110.9 (11.0)	115	2.31	.02
Fourth	113.9 (10.5)	69	110.7 (12.8)	91	1.7	.09

[a] The Jefferson Scale of Empathy (JSE) contained 20 items with a range of responses from 1 to 7 (total possible scores ranging from 20 to 140). Scores are presented as mean (standard deviation). In their published article, Chen et al[6] reported the JSE mean scores adjusted for sex, age, educational debt, and career preference of allopathic medical students. For the present study, unadjusted mean scores and standard deviations from Chen et al were used (Daniel Chen, MD, e-mail communication, July 6, 2012).
[b] Two-tailed *t* tests were used for all *P* values.

Abbreviations: BUSOM, Boston University School of Medicine; OU-HCOM, Ohio University Heritage College of Osteopathic Medicine.

Boston University School of Medicine.[6] As described previously, we used the unadjusted means and standard deviations from Chen et al[6] for comparison purposes.

For each year, we compared mean scores on empathy between the 2 schools by using the *t* test for independent samples (*Table 3*). There were no statistically significant differences in empathy scores between students at the 2 schools in years 1 and 2. In year 3, however, mean empathy scores were significantly higher among osteopathic medical students compared with allopathic medical students (114.4 vs 110.9, respectively; $t_{158}=2.31$, $P<.05$). Although in year 4, mean JSE score for OU-HCOM was larger than that for Boston University, the difference was insignificant ($P=.09$).

Comment

To our knowledge, the present study is the first to examine relationships and correlates in empathy and attitudes toward interprofessional collaboration in osteopathic medical students. Our findings are consistent with the findings of Ward et al,[37] in which a significant correlation was observed between scores of the JSE and JSAPNC in nursing students.

Interprofessional collaboration scores were significantly higher in the first 2 years of medical school, but because of the cross-sectional design of our study, we cannot be certain that these differences were a result of the nature of medical education curricula or specific experiences in osteopathic medical school. Future research should explore reasons for such changes in longitudinal study designs.

Factors that influence teamwork—or what now is more frequently described as interprofessionalism—are still poorly understood, and the relationship between empathy and interprofessionalism has not been rigorously examined. Such relationships should be of interest, especially given the growing prominence of the notion that values and ethics should form a core competency for interprofessional education.[50] An expert panel[50] has suggested that optimal interprofessional collaboration occurs in a setting where each party shares a common set of

values such as altruism and caring. Thus, it is logical that empathy would be an important determinate of such collaboration.

Consistent with previous research findings, we found higher empathy scores among women than men. In addition to social learning, women's abilities in interpersonal skills[52] and their more accurate perceptions of emotional states of others[53] may partially explain these sex-based differences.[24]

We found no significant difference on scores of empathy and attitudes toward teamwork between students who planned to pursue people-oriented specialties and those interested in technology/procedure-oriented specialties. This result is not in agreement with most of the findings in allopathic medical students in which students interested in people-oriented specialties obtained a higher mean empathy score than those who were interested in technology/procedure-oriented specialties.[15,17]

Of great interest in our cross-sectional study was our finding that there was no difference in empathy across the 4 class years of osteopathic medical students, which contradicts the findings of comparably designed cross-sectional studies in allopathic schools,[6] as well as a more robust longitudinal study of empathy in allopathic medical students.[8] Allopathic-oriented studies demonstrated erosion of empathy starting at year 3, whereas our findings indicated no such erosion. Our findings are also supported by the results of a cross-sectional study of osteopathic medical students at a different institution.[31]

To explain why students chose the discipline of osteopathic medicine, we noticed 2 potential contributing factors in approximately half (53%) of the respondents: (1) before attending osteopathic medical school, a member of his or her family was treated by a DO, and (2) he or she had a mentor relationship with a DO (47%). Whereas 12% of students in our sample reported receiving OMT before attending osteopathic medical school, this experience was a statistically significant predictor of higher empathy scores and more positive attitudes toward integrative medicine. Although to our knowledge no comparable data are available for allopathic medical students on these questions, it would be interesting to compare differences in responses of allopathic and osteopathic medical students in a future study.

The notion that osteopathic medicine and osteopathic medical training are in some way more holistic has been criticized given the ongoing emphasis of the allopathic medical community on primary care and patient centeredness.[19] Nonetheless, could some aspect of osteopathic medical training have an effect on the durability of empathy? Because osteopathic and allopathic educational programs are largely similar,[21] it is intriguing to speculate that the intensive experience with osteopathic manipulative medicine in the first 2 years—the most distinctive aspect of osteopathic medical education—may in some way contribute to sustained patterns of empathy. Perhaps such hands-on training brings osteopathic physicians closer to their patients in a physical sense or has some effect on their patient interaction style. Carey et al[55] compared patterns of patient interaction between osteopathic and allopathic primary care physicians for matched diagnosis using a standardized instrument. Patients were able to discern osteopathic physicians from allopathic physicians by means of the former's verbal interactions, including more frequent discussions of the patient's emotional state.

More speculative but intriguing is the possibility that the relationship between empathy and OMT is more fundamental and may influence students' empathy throughout their osteopathic medical training and possibly beyond. For example, to properly provide effective OMT, one must learn how to interact by touch therapeutically with the intent to provide comfort and help. Furthermore, as part of this dynamic interaction, one must further learn how to be touched in the same way and learn to converse with the patient to earn the privilege to influence his or her health. Such interaction between OMT and empathy certainly deserves further investigation.

The issue of empathy erosion has been documented elsewhere[6-9,11-13] and is not a trivial matter; denial of this

phenomenon is certainly not constructive.[54] The cross-sectional nature of the present study precludes definitive conclusions about changes in empathy in different class years. The potential effects of training in osteopathic manipulative medicine, as well as role modeling derived from the apprentice model of osteopathic clinical training, deserve further investigation.

The differences in empathy between osteopathic and allopathic medical students may be plausibly attributed to selection factors: in other words, more empathic applicants choose to study osteopathic medicine. The data in the present study, however, do not support this speculation. We found no significant differences in empathy scores between allopathic and osteopathic medical students in years 1 and 2 of medical school (*Table 3*). These findings strengthen the possibility that a foundation in osteopathic medical education may buffer or protect empathy during years 3 and 4, the most taxing time of undergraduate medical education. Osteopathic and allopathic medical students in the present study and in the study by Chen et al,[6] respectively, demonstrated equivalent levels of empathy until year 3. After year 3, only the allopathic students demonstrated erosion compared with both their second-year allopathic counterparts and the third-year osteopathic medical students of our sample.

Limitations

The single-institution feature of this study does not allow for generalization of the findings to a broader population of osteopathic medical students, thus jeopardizing the external validity of our findings. We view our findings as preliminary and urge caution in interpretation. A multi-institutional scope with representative samples of both osteopathic and allopathic medical students is needed to allow for generalization of the findings. Also, the validity of cross-sectional studies in examining changes is limited due to the possibility of baseline differences among students in different classes. A longitudinal study of cohorts would be ideal for studying changes over time. We are currently undertaking a longitudinal study to examine changes in empathy and interprofessional collaboration among osteopathic medical students that should provide more definitive results.

Conclusion

Despite the aforementioned limitations, the finding that empathy in osteopathic medical students does not erode during medical school is interesting and deserves further scrutiny. Future researchers should investigate and isolate the factors that contribute to the differences we observed between osteopathic and allopathic medical students: applicant self-selection, medical school admissions process, medical school curriculum, or contrasting systems of role modeling, or a combination of these and other factors. Studying changes in empathy and attitudes toward teamwork is critically important given the current trend in the professional development of physicians, which places great emphasis on professionalism and patient-centered care.

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(continued)

References

1. Greiner AC, Knebel E, Committee on the Health Professions Education Summit. *Health Profession Education: A Bridge to Quality*. Washington DC: National Academies Press; 2003.
2. Hojat M, Louis DZ, Markham FW, Wender R, Rabinowitz C, Gonnella JS. Physicians' empathy and clinical outcomes for diabetic patients. *Acad Med.* 2011;86(3):359-364. doi:10.1097/ACM.0b013e3182086fe1.
3. Del Canale S, Louis DZ, Maio V, et al. The relationship between physician empathy and disease complications: an empirical study of primary care physicians and their diabetic patients in Parma, Italy. *Acad Med.* 2012;87(9):1243-1249.
4. Veloski JJ, Hojat M. Measuring specific elements of professionalism: empathy, teamwork, and lifelong learning. In: Stern DT, ed. *Measuring Medical Professionalism.* Oxford, UK: Oxford University Press; 2006:117-145.
5. Austin EJ, Evans P, Magnus B, O'Hanlon K. A preliminary study of empathy, emotional intelligence and examination performance in MBChB students. *Med Educ.* 2007;41(7):684-689.
6. Chen D, Lew R, Hershman W, Orlander J. A cross-sectional measurement of medical student empathy [published online July 26, 2007]. *J Gen Intern Med.* 2007;22(10):1434-1438.
7. Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in medical school. *Med Educ.* 2004;38(9):934-941.
8. 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;84(9):1182-1191. doi:10.1097/ACM.0b013e3181b17e55.
9. Newton BW, Barber L, Clardy J, Cleveland E, O'Sullivan P. Is there hardening of the heart during medical education? *Acad Med.* 2008;83(3):244-249. doi:10.1097/ACM.0b013e3181637837.
10. Stratton TD, Saunders JA, Elam CL. Changes in medical students' emotional intelligence: an exploratory study. *Teach Learn Med.* 2008;20(3):279-284. doi:10.1080/10401330802199625.
11. Neumann M, Edehäuser F, Tauschel D, et al. Empathy decline and its reasons: a systematic review of studies with medical students and residents. *Acad Med.* 2011;86(8):996-1009. doi:10.1097/ACM.0b013e318221e615.
12. Bellini LM, Shea JA. Mood change and empathy decline persist during three years of internal medicine training. *Acad Med.* 2005;80(2):164-167.
13. Mangione S, Kane GC, Caruso JW, Gonnella JS, Nasca TJ, Hojat M. Assessment of empathy in different years of internal medicine training. *Med Teach.* 2002;24(4):370-373.
14. Hojat M, Gonnella JS, Mangione S, et al. Empathy in medical students as related to academic performance, clinical competence and gender. *Med Educ.* 2002;36(6):522-527.
15. 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(9):1563-1569.
16. Hojat M, Mangione S, Nasca TJ, et al. The Jefferson Scale of Physician Empathy: development and preliminary psychometric data. *Educ Psychol Meas.* 2001;61(2):349-365.
17. Hojat M, Gonnella JS, Nasca TJ, Mangione S, Veloski 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(10 suppl):S58-S60.
18. Hahn MB. Foreword: osteopathic medicine and medical education in the 21st century. *Acad Med.* 2009;84(6):699-700. doi:10.1097/ACM.0b013e3181a406cb.
19. Cohen JJ. The separate osteopathic medical education pathway: isn't it time we got our acts together [Point-Counterpoint]? *Acad Med.* 2009;84(6):696. doi:10.1097/ACM.0b013e3181a3ddaa.
20. Chen C, Mullan F. The separate osteopathic medical education pathway: uniquely addressing national needs [Point-Counterpoint]. *Acad Med.* 2009;84(6):695. doi:10.1097/ACM.0b013e3181a3dd28.
21. Gevitz N. The transformation of osteopathic medical education. *Acad Med.* 2009;84(6):701-716. doi:10.1097/ACM.0b013e3181a4049e.
22. Reed K. Osteopathic medical graduates in ACGME residencies: another way to embrace the osteopathic philosophy [Point-Counterpoint]. *Acad Med.* 2009;84(6):698. doi:10.1097/ACM.0b013e3181a43b4a.
23. Licciardone JC, Clearfield MB, Guillory VJ. Clinical practice characteristics of osteopathic and allopathic primary care physicians at academic health centers: results from the National Ambulatory Medical Care Survey. *Acad Med.* 2009;84(6):744-750. doi:10.1097/ACM.0b013e3181a424fc.
24. Hojat M. *Empathy in Patient Care: Antecedents, Development, Measurement, and Outcomes*. New York, NY: Springer; 2007.
25. Fordyce MA, Doescher MP, Chen FM, Hart G. Osteopathic physicians and international medical graduates in the rural primary care physician workforce. *Family Med.* 2012;44(6):396-403.
26. Alcorta-Garza A, González-Guerrero JF, Tavitas-Herrera SE, Rodríguez-Lara FJ, Hojat M. Validación de la Escala de Empatía Medca de Jefferson en estudiantes de medicina Mexicanos. *Salud Mental.* 2005;28(5):57-63.
27. Di Lillo M, Cicchetti A, Lo Scalzo, A, Taroni F, Hojat M. The Jefferson Scale of Physician Empathy: preliminary psychometrics and group comparisons in Italian physicians. *Acad Med.* 2009;84(9):1198-1202. doi:10.1097/ACM.0b013e3181b17b3f.
28. Kataoka H, Koide N, Ochi K, Hojat M, Gonnella JS. Measurement of empathy among Japanese medical students: psychometrics and score differences by gender and level of medical education. *Acad Med.* 2009;84(9):1192-1197. doi:10.1097/ACM.0b013e3181b180d4.
29. Roh MS, Hahm BJ, Lee DH, Suh DH. Evaluation of empathy among Korean medical students: a cross-sectional study using the Korean version of the Jefferson Scale of Physician Empathy. *Teach Learn Med.* 2010;22(3):167-171. doi:10.1080/10401334.2010.488191.
30. Suh DH, Hong JS, Lee DH, Gonnella JS, Hojat M. The Jefferson Scale of Physician Empathy: a preliminary psychometric study and group differences in Korean physicians [published online March 21, 2012]. *Med Teach.* 2012:34(6):e464-e468. doi:10.3109/0142159X.2012.668632.

31. Kimmelman M, Giacobbe J, Faden J, Kumar G, Pinckney CC, Steer R. Empathy in osteopathic medical students: a cross-sectional analysis. *J Am Osteopath Assoc*. 2012;112(6):347-355.

32. Hojat M. Ten approaches for enhancing empathy in health and human services cultures. *J Health Hum Serv Adm*. 2009;31(4):412-450.

33. Hojat M. Guiding medical students toward empathetic patient care. *AAMC Reporter*. June 2012. https://www.aamc.org/newsroom/reporter/june2012/285314/viewpoint.html. June 10, 2013.

34. Hojat M, Gonnella JS, Mangione S, Nasca TJ, Magee M. Physician empathy in medical education and practice: experience with the Jefferson Scale of Physician Empathy. *Semin Integrative Med*. 2003;1(1):25-41. doi:10.1016/S1543-1150(03)00002-4.

35. Hojat M, Mangione S, Nasca TJ, Gonnella JS, Magee M. Empathy scores in medical school and ratings of empathic behavior 3 years later. *J Socl Psychol*. 2005;145(6):663-672.

36. Hojat M, Mangione S, Kane G, Gonnella JS. Relationships between scores of the Jefferson Scale of Physician Empathy (JSPE) and the Interpersonal Reactivity Index (IRI). *Med Teach*. 2005;27(7):625-628.

37. Ward J, Schaal M, Sullivan J, Bowen ME, Erdmann JB, Hojat M. Reliability and validity of the Jefferson Scale of Empathy in undergraduate nursing students. *J Nurs Meas*. 2009;17(1):73-88.

38. Fields SK, Mahan P, Tillman P, Harris J, Maxwell K, Hojat M. Measuring empathy in healthcare profession students using the Jefferson Scale of Physician Empathy: health provider–student version. *J Interprof Care*. 2011;25(4):287-293. doi:10.3109/13561820.2011.566648.

39. Hojat M, Fields SK, Gonnella JS. Empathy: an NP/MD comparison. *Nurse Pract*. 2003;28(4):45-47.

40. Sherman JJ, Cramer A. Measurement of changes in empathy during dental school. *J Dent Educ*. 2005;69(3):338-345.

41. Kataoka HU, Koide N, Hojat M, Gonnella JS. Measurement and correlates of empathy among female Japanese physicians. *BMC Med Educ*. 2012;12:48. doi:10.1186/1472-6920-12-48.

42. Colliver JA, Conlee MJ, Verhulst SJ, Dorsey JK. Rebuttals to critics of studies of decline on empathy [letter]. *Acad Med*. 2010;85(12):1813-1814. doi:10.1097/ACM.0b013e3181faa3ed.

43. Hojat M, Herman MW. Developing an instrument to measure attitudes toward nurses: preliminary psychometric findings. *Psychol Rep*. 1985;56(2):571-579.

44. Hojat M, Fields SK, Rattner SL, et al. Attitudes toward physician-nurse alliance: comparisons of medical and nursing students. *Acad Med*. 1997;72(10 suppl 1):S1-S3.

45. Hojat M, Fields SK, Veloski JJ, Griffiths M, Cohen MJ, Plumb JD. Psychometric properties of an attitude scale measuring physician-nurse collaboration. *Eval Health Prof*. 1999;22(2):208-220.

46. Ward J, Cody J, Schaal M, Hojat M. The empathy enigma: an empirical study of decline in empathy among undergraduate nursing students. *J Prof Nurs*. 2012;28(1):34-40. doi:10.1016/j.profnurs.2011.10.007.

47. Ward J, Schaal M, Sullivan J, Bowen ME, Erdmann JB, Hojat M. The Jefferson Scale of Attitudes toward Physician-Nurse collaboration: a study with undergraduate medical students. *J Interprof Care*. 2008;22(4):375-386. doi:10.1080/13561820802190533.

48. Hojat M, Nasca TJ, Cohen MJ, et al. Attitudes toward physician-nurse collaboration: a cross-cultural study of male and female physicians and nurses in the United States and Mexico. *Nurs Res*. 2001;50(2):123-128.

49. Hojat M, Gonnella JS, Nasca TJ, et al. Comparisons of American, Israeli, Italian and Mexican physicians and nurses on the total and factor scores of the Jefferson Scale of Attitudes toward physician-nurse collaborative relationships. *Int J Nurs Stud*. 2003;40(4):427-435.

50. Interprofessional Education Collaborative Expert Panel. *Core Competencies for Interprofessional Collaborative Practice: Report of an Expert Panel*. Washington, DC: Interprofessional Education Collaborative; 2011.

51. Berwick D, Davidoff F, Hiatt H, Smith R. Refining and implementing the Tavistock principles for everybody in health care. *BMJ*. 2001;323(7313):616-620.

52. Willingham WW, Cole NS. *Gender and Fair Assessment*. Mahwah, NJ: Lawrence Erlbaum Associates Inc; 1997.

53. Jose PE. The role of gender and gender role similarity in readers' identification with story characters. *Sex Roles*. 1989;21(9-10):697-713.

54. Hojat M, Gonnella JS, Veloski J. Rebuttals to critics of studies of decline of empathy [letter]. *Acad Med*. 2010;85(12):1812. doi:10.1097/ACM.0b013e3181fa3576.

55. Carey TS, Motyka TM, Garret JM, Keller RB. Do osteopathic physicians differ from allopathic physicians? an empirically derived approach. *J Am Osteopath Assoc*. 2003;103(7):313-318.