

An empirical study of decline in empathy in medical school

MOHAMMADREZA HOJAT,¹ SALVATORE MANGIONE,² THOMAS J NASCA,³ SUSAN RATTNER,⁴ JAMES B ERDMANN,⁵ JOSEPH S GONNELLA¹ & MIKE MAGEE⁶

CONTEXT It has been reported that medical students become more cynical as they progress through medical school. This can lead to a decline in empathy. Empirical research to address this issue is scarce because the definition of empathy lacks clarity, and a tool to measure empathy specifically in medical students and doctors has been unavailable.

OBJECTIVE To examine changes in empathy among medical students as they progress through medical school.

MATERIALS AND SUBJECTS A newly developed scale (Jefferson Scale of Physician Empathy [JSPE], with 20 Likert-type items) was administered to 125 medical students at the beginning (pretest) and end (post-test) of Year 3 of medical school. This scale was specifically developed for measuring empathy in patient care situations and has acceptable psychometric properties.

METHODS In this prospective longitudinal study, the changes in pretest/post-test empathy scores were examined by using *t*-test for repeated measure design; the effect size estimates were also calculated.

RESULTS Statistically significant declines were observed in 5 items ($P < 0.01$) and the total scores of the JSPE ($P < 0.05$) between the 2 test administrations.

CONCLUSIONS Although the decline in empathy was not clinically important for all of the statistically significant findings, the downward trend suggests that empathy could be amenable to change during medical school. Further research is needed to identify factors that contribute to changes in empathy and to examine whether targeted educational programmes can help to retain, reinforce and cultivate empathy among medical students for improving clinical outcomes.

KEYWORDS education, medical, undergraduate/*standards; *empathy; clinical competence/standards; educational measurement/*standards; psychometrics/methods; retrospective study; longitudinal study.

Medical Education 2004; **38**: 934–941
doi:10.1111/j.1365-2929.2004.01911.x

‘A person starts to live when he can live outside himself.’

Albert Einstein¹

INTRODUCTION

Medical students embark on the journey to becoming doctors with idealism and enthusiasm for curing disease and infirmity and improving their patients’ quality of life. Despite the intention of medical school faculty to nurture these qualities, it is ironic that some researchers have reported a decline in

¹Center for Research in Medical Education and Health Care, Jefferson Medical College, Philadelphia, Pennsylvania, USA

²Department of Medicine, Jefferson Medical College, Philadelphia, Pennsylvania, USA

³Office of the Dean and Senior Vice President, Jefferson Medical College, Philadelphia, Pennsylvania, USA

⁴Office of the Dean for Academic Affairs, Jefferson Medical College, Philadelphia, Pennsylvania, USA

⁵Office of the Dean, Jefferson College of Health Professions of Thomas Jefferson University, Philadelphia, Pennsylvania, USA

⁶Corporate Affairs, Pfizer Medical Humanities Initiative, Pfizer, Inc., New York, New York, USA

Correspondence: Mohammadreza Hojat PhD, Research Professor of Psychiatry and Human Behaviour, Director of Jefferson Longitudinal Study, Center for Research in Medical Education and Health Care, Jefferson Medical College, 1025 Walnut Street, Philadelphia, Pennsylvania 19107, USA. Tel: 00 1 215 955 9459; Fax: 00 1 215 923 6939; E-mail: Mohammadreza.Hojat@Jefferson.edu.

Overview

What is already known on this subject

It has been reported that many medical students become cynical as they progress through medical school, probably due to the emphasis of modern medical education on detachment and affective distance for the purpose of clinical neutrality.

What this study adds

This study provides empirical evidence to show that empathy declines in medical school by using a new psychometrically sound tool developed specifically to measure empathy in patient care situations.

Suggestions for future research

It is desirable to examine the decline in empathy (as an indicator of cynicism) in different years of undergraduate and graduate medical education to determine whether the changes are progressive and systematic.

humanitarianism, enthusiasm and idealism among medical students.^{2–8}

It has been reported that as many as 75% of medical students become more cynical about academic life and the medical profession as they progress through medical school.⁴ This phenomenon was likened to 'battered child syndrome' by Silver,⁹ who attributed it to a lack of appropriate treatment of medical students.^{4,5,10} Processes described as 'dehumanisation'¹¹ and 'traumatic de-idealisation'³ characterise the cynical transformation of medical students.

It has also been reported that the emphasis of modern medical education on the doctor's emotional detachment, affective distance and clinical neutrality^{12–14} can be misinterpreted or misplaced, thus contributing to a decline in empathy among medical students, and ultimately influencing doctors' compassion.^{15,16} A lack of role models^{17,18} and educational experiences^{19,20} have been described as factors contributing to cynicism in medical school.

Although medical educators have reached a consensus on the positive role of empathy in doctor–patient relationships and patient outcomes, they are divided on the definition of empathy in patient care situations.¹² We have described the conceptual complexity and multidimensionality of empathy elsewhere.^{21–23} We defined empathy in the health care context as a cognitive attribute that involves an understanding of the inner experiences and perspectives of the patient as a separate individual, combined with a capability to communicate this understanding to the patient.^{22,23}

Empirical research on empathy among medical students and doctors is hampered not only by a lack of conceptual clarity, but also by the lack of an operational tool to measure the concept in patient care situations. In recognition of this need, we developed a research tool for measuring empathy among medical students and doctors with reasonable psychometric support^{21–23} that will be described later.

Purpose

This study was designed to test the hypothesis that the medical student's personal orientation toward empathy declines in medical school. This hypothesis was based on the notion that, in the absence of any targeted educational programmes to retain and cultivate humanistic attributes, cynicism may develop that would manifest in a decline in students' empathy scores.

METHODS

Participants

Study participants were 125 Year 3 medical students (64 men, 61 women) who completed the Jefferson Scale of Physician Empathy (JSPE) at the beginning (pretest) and end (post-test) of their third medical school year. This represents 56% of the total class ($n = 223$) with useable pretest/post-test data.

Materials

The JSPE was used to measure the extent of students' orientation toward empathy.²¹ This scale was developed because there was a need for a psychometrically sound research instrument, specific to patient care situations, to measure empathy among medical students and doctors.

There are several research tools for measuring empathy in the general population (e.g. Hogan's

empathy scale,²⁴ Davis's Interpersonal Reactivity Index [IRI]²⁵ and the emotional empathy measure developed by Mehrabian and Epstein²⁶) and among nurses that we have described elsewhere.^{21–23} None of these tools was specifically developed to measure empathy among medical students or doctors and therefore may not capture the essence of an empathetic relationship in patient care situations. To the best of our knowledge, the JSPE is the first and the only research tool to be developed for that purpose.

The scale was constructed based on an extensive review of literature, followed by pilot studies with samples of medical students, residents, practising doctors and nurses. Both qualitative (Delphi technique) and quantitative (psychometrics) methods were used in the development and refinement of the JSPE.^{22,23} The first step was the development of a conceptual framework for understanding empathy in patient care situations and defining the concept. The preliminary version of the scale was subjected to empirical scrutiny by examining its psychometric properties,^{21,22} and refinements were made in subsequent analyses.²³

The JSPE includes 20 items answered on a 7-point Likert scale. Psychometric evidence in support of the construct and criterion-related validity (convergent and discriminant) and internal consistency reliability of the scale have been reported.²¹ Convergent validity was confirmed by higher correlations between empathy scores and conceptually relevant measures such as compassion ($r = 0.48$ for medical students, $r = 0.56$ for internal medicine residents).²¹ In addition, significant correlations were found between the JSPE and subscale scores on the IRI,²⁵ such as empathetic concern ($r = 0.41$ for medical students, $r = 0.40$ for internal medicine residents), perspective taking ($r = 0.29$ for medical students, $r = 0.27$ for internal medicine residents), and fantasy ($r = 0.24$ for medical students, $r = 0.32$ for internal medicine residents).

These correlations are not large enough to indicate a substantial overlap between empathy and the aforementioned criterion measures. This is desirable in validity studies to show that the test and criterion measures are 2 different entities with a sufficiently large overlap.

Correlations of scores on the JSPE and self-ratings of empathy were 0.37 for medical students and 0.45 for internal medicine residents.²¹ Discriminant validity was supported by a lack of relationship between empathy scores and conceptually irrelevant measures

such as self-protection ($r = 0.11$, not significant).²¹ The internal consistency reliability was determined by coefficient alphas of 0.89 and 0.87 for medical students and medical residents, respectively.²¹ The coefficient alpha for practising doctors was 0.81, and test–retest reliability was 0.65.²² The coefficient alpha for nurse practitioners was 0.85²⁷ and for registered nurses was 0.87.²⁸ The JSPE scores can range from a minimum of 20 to a maximum of 140. The higher the score, the more empathetic the orientation.

Two versions of the JSPE are available. The version used in this study is the student version (S-Version), developed for measuring students' orientation toward empathetic relationships with patients. Another slightly modified version was developed for practising health professionals (HP-Version) to measure their empathy in actual patient care situations.^{22,23} (Copies of both versions are available from the authors.)

Procedures

The JSPE (S-Version) was administered to the students in a course orientation session at the beginning of Year 3 and re-administered at the completion of the academic year along with the final examination. Participation was voluntary, and the pretest response rate was 88% ($n = 197$), but due to the voluntary nature of the study, complete data on pre- and post-test were available on only 125 students.

Year 3 is the formal clinical training year in most medical schools in the USA. It is when students take their medical clerkships in different departments and hospitals. It is an important year of focused clinical training in which students learn how to take histories and perform basic medical examinations through direct contact with patients. During Year 3 students are exposed to the core medical disciplines of family medicine, internal medicine, obstetrics and gynaecology, paediatrics, psychiatry and surgery.

Statistical analyses

To examine the statistical significance of the differences, *t*-test for repeated measures was used. In addition, the effect size estimates were calculated to determine the clinical significance of the findings.^{29,30}

RESULTS

Comparisons of the study participants ($n = 125$) with their classmates with incomplete pretest/post-test data on the empathy scale ($n = 98$) showed no

gender or age differences between the 2 groups. The study participants scored significantly higher on Step 1 of the US Medical Licensing Examinations (USMLE) ($P < 0.05$). These findings suggest that, while the study participants were an unbiased sample of the class regarding the aforementioned demographic characteristics, they tended to represent high scorers in Step 1 of the USMLE.

In another study we showed that while empathy scores were significantly associated with ratings of clinical competence among Year 3 medical students, no significant relationship was observed between empathy scores and performance on objective examinations, including Step 1 of the USMLE.³¹ Therefore, the higher Step 1 scores obtained by the study participants do not significantly distort the pattern of pretest/post-test differences on empathy scores.

The pretest/post-test comparisons showed statistically significant declines in 5 items of the JSPE and in the total scores on the scale. The means and standard deviations of these items and the total scores obtained at the beginning and end of the year and summary results of statistical analysis are reported in Table 1.

As Table 1 shows, the mean total empathy score declined by 2.5 points during Year 3 of medical school, the first full year of clinical experience. This change of scores is statistically significant by t -test for repeated measure design ($P < 0.05$). The effect size estimate is $d = 0.29$, which is small in magnitude according to the operational definition suggested by Cohen.²⁹ The statistical power is 0.65, at $P = 0.05$.

Larger effect sizes were obtained by examining the declines in individual item scores. For example, the largest decline was for the following item: 'It is as important to ask patients about what is happening in their lives as it is to ask about their physical complaints' (effect size: $d = 0.55$). The item with the next largest effect size was: 'The best way to take care of a patient is to think like the patient' ($d = 0.51$).

Statistically significant declines were also observed on the following items: 'Emotion has no place in the treatment of medical illness' ($d = 0.42$), and 'Patients' illness can be cured only by medical treatment; physicians' affectional ties with their patients cannot have a significant place in this endeavour' ($d = 0.37$). Finally, the following item showed a statistically significant decline from the

*Table 1 Means and standard deviations for the items with significant pretest/post-test decline and for the total scores of the Jefferson Scale of Physician Empathy given at the beginning (pretest) and end (post-test) of Year 3 of medical school**

Item	Pretest M	(SD)	Post-test M	(SD)	Effect size
It is as important to ask patients about what is happening in their lives as it is to ask about their physical complaints	6.2	(0.97)	5.7	(1.3)	0.55†
Physicians should try to think like their patients in order to render better care	4.0	(1.4)	3.4	(1.6)	0.51†
Emotion has no place in the treatment of medical illness	6.7	(0.55)	6.3	(1.2)	0.42†
Patient illness can be cured by medical treatment; physicians' affectional ties with their patients cannot have a significant place in this endeavour	6.4	(1.0)	6.0	(1.4)	0.37†
For more effective treatment, physicians must be attentive to their patients' personal experiences	6.2	(0.85)	5.9	(1.0)	0.34†
Total scores	123.1	(9.9)	120.6	(13.9)	0.29*

† $P < 0.1$, * $P < 0.05$ by t -test for repeated measure design.

M = mean score, SD = standard deviation.

The correlation between empathy scores at the beginning and end of the academic year was 0.51 ($P < 0.01$).

beginning to the end of the academic year: 'For more effective treatment, physicians must be attentive to their patients' personal experiences' ($d = 0.34$). Effect size estimates around 0.50 for comparing 2 means are moderate,^{29,30} indicating that in addition to statistical significance, the decline in score of the first 2 aforementioned items has a moderate clinical (practical) significance. Four of these 5 items measure a factor that was entitled 'compassionate care' in a recent factor analytic study of the JSPE,²² indicating that a downward trend on this factor occurred in our study.

Among the other items with virtually no pretest/post-test change are the following: 'Patients feel better when their physicians understand their feelings', 'Patients value a physician's understanding of their feelings which is therapeutic in its own right', 'I do not enjoy reading non-medical literature' (reverse score), and 'Understanding body language is as important as verbal communication in physician-patient relationships'.

Moreover, no statistically significant associations were found between changes in empathy scores and gender, age or performance on Step 1 of the USMLE. These findings suggest that changes in empathy scores are independent of these demographic and performance variables. In our previous studies we found no significant link between empathy scores, age and Step 1 scores, but we noticed gender differences in favour of women.^{21-23,31}

DISCUSSION

The result of the present study is consistent with findings reported by Diseker and Michielutte,²⁰ who observed a decrease in emotional empathy (measured by Hogan's empathy scale²⁴) prior to and following clinical experiences among medical students. Whitmore and colleagues³² reported that a hedonistic personality pattern develops during medical school, which could contribute to a decline in empathetic understanding. A decline in empathy among medical residents was also observed in a study by Bellini *et al.*³³ using the IRI.²⁵

The findings of our study, however, are not in agreement with those of the study reported by Zeldow and Daugherty,⁷ in which no adverse effect on students' scores on 2 subscales (empathetic concern and perspective taking) of the IRI²⁵ was observed in medical school. In a cross-sectional study of medical students in Mexico, Alcorta *et al.*³⁴ used a

Mexican version of the JSPE and found no significant difference in the mean scores of medical students in different years of medical school. In a recent study with internal medicine residents, we noticed a decline in mean JSPE scores from the beginning to end of the internship year that did not reach the conventional level of statistical significance.³⁵

In his study of empathy, humanism and professionalism in medical education, Marcus³⁶ analysed approximately 400 dreams of non-patient medical students and housestaff. He concluded that students' identification with a cold and uncaring role model, greater emphasis on technological than on humanistic aspects of medicine, and development of a sense of being a part of a privileged group (elitism) are among the factors that contribute to the decline in empathy during medical education.

Although research findings on the effects of educational remedies to promote empathy are inconclusive, the majority of these studies report a positive result from targeted empathy training.^{19,37-40} For example, a study by Feighny and colleagues⁴¹ found that training in the early years of medical school could enhance behavioural empathy among students (measured by Carkhuff's empathetic understanding scale)⁴² and improve their communication skills. The cognitive and affective empathy (measured by the IRI) did not change in Feighny's study.⁴¹ In a recent qualitative study, Wilkes *et al.*⁴³ reported an increase in medical students' empathy when they had hospitalisation experiences.

There are other studies that show no significant change. For example, Zeldow and Daugherty⁷ found no change in empathy during medical school (measured by the IRI²⁵ subscale scores), and Markham⁴⁴ reported that a behavioural science course in medical school did not change students' orientations toward the patient as a person. The inconsistent results could be due to either the non-specific measure of empathy used in different studies to assess the effectiveness of the educational programme or to a lack of clarity or specificity in educational objectives. Using an empathy measure, such as the JSPE, that has been specifically developed for administration to medical students and practising doctors, may provide further opportunity to empirically study changes in empathy in academic medical centres.

Hornblow *et al.*⁴⁵ suggest that there is a need for systematic training of humanistic qualities in medical schools. They argue that it should not be assumed

that empathetic skills are acquired automatically during clinical training. The nurturing of empathy in medical school is important considering the argument that conditions such as transient social relationships, hurried and fragmented patient–care giver relationships, and avoidance of intimacy during medical training can have deleterious consequences on medical students' and residents' humanistic qualities.^{33,46}

It has been shown that empathetic medical students are more concerned than others about the contribution of psychosocial factors in health and illness,⁴⁷ which suggests that these students may be more receptive to the biopsychosocial, rather than the biomedical model of disease.⁴⁸ For doctors to have an ability to demonstrate empathy that can be perceived by their patients has a positive outcome that should be fostered during medical education.

Empathy is relevant to clinical performance, as shown in one of our studies in which empathy scores were positively associated with ratings of clinical competence in core clinical clerkships.³¹ It has been recommended that the capacity for empathy and relevant personal qualities should be included among selection criteria for admission to medical school if the relationship between empathy and clinical competence is empirically established.⁴⁹ In support of this proposition, Kupfer and colleagues⁵⁰ suggest that measurement of empathy and personality attributes should be taken into consideration when selecting for applicants who might excel as doctors.

The *Jefferson Scale of Physician Empathy* (S-Version) measures medical students' personal orientation toward empathy in the context of their roles as doctors. The correlation between scores on this measure and ratings of clinical competence in core clerkships³¹ suggests that there exists a significant linkage between the 2 measures. Further research to demonstrate a link between scores on this scale and actual demonstration (behavioural manifestation) of empathy in the clinical setting (as perceived by patients and other care givers) is required before the use of such measurements can be recommended in the admission decisions of medical schools. We are presently undertaking such a study.

Entry into the clinical environment should provide the opportunity to reinforce positive personal orientation toward empathy. Further research is needed to examine the impact of role models,^{17,18} the stress on faculty by financial regulations, the managed care practice environment, and malpractice regulations

on the manifestation of medical students' and doctors' empathetic attitudes. Empirical investigations of these issues are possible due to the availability of an operational measure of empathy with sound psychometric support.^{21,22}

The findings of this study generally suggest that in the absence of targeted educational programmes in medical schools, empathy is amenable to change, more likely in a negative than in a positive direction. Coupled with the findings that specific educational activities can improve empathy among medical students,^{19,20,37,40} these results call for further research to identify factors that contribute to changes of empathy and for the development and evaluation of targeted educational programmes designed to retain, cultivate and enhance empathy among medical students.

Limitations of this study include using data from a single medical school, which may jeopardise the generalisation of the findings. In addition, self-reported empathy can be a reflection of students' orientation toward empathy and may not necessarily translate into action in the practice of medicine. We also observed that none of the effect sizes was large enough to provide a strong support for the clinical significance of the findings. Despite these limitations, the downward trend in some items and in the total scores of the JSPE raises questions about the educational experiences of medical students and calls for further investigation of factors that may contribute to the changes.

CONTRIBUTORS

All authors contributed to the conceptual development of the study, interpretation of the results and preparation of the manuscript. Statistical analyses were performed by MH.

ACKNOWLEDGEMENT

We would like to thank Dorissa Bolinski for her editorial assistance.

FUNDING

Development of the Jefferson Scale of Physician Empathy was supported in part by a grant from the Pfizer Medical Humanities Initiative, Pfizer, Inc., New York.

ETHICAL APPROVAL

The Jefferson Longitudinal Study was approved by the Institutional Review Board, Thomas Jefferson University, Philadelphia, Pennsylvania, USA.

REFERENCES

- Quotation Archives. <http://www.aphids.com/quotes/index.html>.
- Shapiro HM. What is empathy and can it be taught? In: Shapiro H, McCrea Curnen MG, Peschel E, St. James D, eds. *Empathy and the Practice of Medicine*. New Haven: Yale University Press 1993:7–16.
- Kay J. Traumatic de-idealisation and future of medicine. *JAMA* 1990;**263**:572–3.
- Sheehan KH, Sheehan DV, White K, Leibowitz A, Baldwin DC Jr. A pilot study of medical student 'abuse': student perceptions of mistreatment and misconduct in medical school. *JAMA* 1990;**263**:533–7.
- Silver HK, Glickman AD. Medical student abuse: incidence, severity and significance. *JAMA* 1990;**263**:527–32.
- Wolf TM, Balson PM, Faucett JM, Randall HM. A retrospective study of attitude change during medical education. *Med Educ* 1989;**23**:19–23.
- Zeldow PB, Daugherty SR. The stability and attitudinal correlates of warmth and caring in medical students. *Med Educ* 1987;**21**:353–7.
- Maheux B, Beland F. Students' perceptions of values emphasised in three medical schools. *J Med Educ* 1986;**61**:308–16.
- Silver HK. Medical students and medical school. *JAMA* 1982;**247**:309–10.
- Rosenberg DA, Silver HK. Medical student abuse: an unnecessary and preventable cause of stress. *JAMA* 1984;**251**:739–42.
- Edwards MT, Zimet CN. Problems and concerns among medical students. *J Med Educ* 1976;**51**:619–25.
- Evans BJ, Stanley RO, Burrows GD. Measuring medical students' empathy skills. *Br J Med Psychol* 1993;**66**:121–33.
- Farber NJ, Novack DH, O'Brien MK. Love, boundaries and patient–physician relationships. *Arch Intern Med* 1997;**157**:2291–4.
- Coulehan J, Williams PC. Vanishing virtue: the impact of medical education. *Acad Med* 2001;**76**:598–605.
- Starr P. *The Social Transformation of American Medicine*. New York: Basic Books 1982.
- Ludmerer KM. *Time to Heal*. New York: Oxford University Press 1999.
- Skeff KM, Mutha S. Role models: guiding the future of medicine. *N Engl J Med* 1998;**339**:2017.
- Wright SM, Kern DE, Kolodner K, Howard DM, Brancati FL. Attributes of excellent attending physician role models. *N Engl J Med* 1998;**339**:1986–93.
- Kramer D, Ber R, Moore M. Impact of workshop on students' and physicians' rejecting behaviour in patient interviews. *J Med Educ* 1987;**62**:904–10.
- Discker RA, Michielutte R. An analysis of empathy in medical students before and following clinical experiences. *J Med Educ* 1981;**56**:1004–10.
- Hojat M, Mangione S, Nasca TJ, Cohen MJM, Gonnella JS, Erdmann JB, Veloski JJ, Magee M. The Jefferson Scale of Physician Empathy: development and preliminary psychometric data. *Educ Psychol Measurement* 2001;**61**:349–65.
- 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.
- 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. *Sem Integrative Med* 2003;**1**:25–41.
- Hogan R. Development of an empathy scale. *J Consult Clin Psychol* 1969;**33**:307–16.
- Davis MH. Measuring individual differences in empathy: evidence for a multidimensional approach. *J Pers Soc Psychol* 1983;**44**:113–26.
- Mehrabian A, Epstein NA. A measure of emotional empathy. *J Pers* 1972;**40**:547–59.
- Hojat M, Fields SK, Gonnella JS. Empathy: an NP/MD comparison. *Nurse Pract* 2003;**28**:45–7.
- Fields SK, Hojat M, Gonnella JS, Mangione S, Kane G, Magee M. Comparisons of nurses and physicians on an operational measure of empathy. *Eval Health Professions* 2004;**27**:80–94.
- Cohen J. *Statistical Power Analysis for Behavioral Sciences*. Hillsdale, New Jersey: Erlbaum 1987.
- Hojat M, Xu G. A visitor's guide to effect sizes: statistical versus practical (clinical) importance of research findings. *Adv Health Sci Educ* 2004 (in press).
- Hojat M, Gonnella JS, Mangione S, Nasca TJ, Veloski JJ, Erdmann JB, Callahan C, Magee M. Empathy in medical students as related to clinical competence, gender and academic performance. *Med Educ* 2002;**36**:522–7.
- Whitemore PB, Burstein AG, Loucks S, Schoenfeld LS. A longitudinal study of personality changes in medical students. *J Med Educ* 1985;**60**:404–5.
- Bellini LM, Baime M, Shea JA. Variation of mood and empathy during internship. *JAMA* 2002;**287**:3143–6.
- Alcorta-G de Gonzalez A, Hojat M *et al*. Empathy as a function of gender and levels of undergraduate and graduate medical education in Mexico. [Paper presented at the Annual Conference of the Association for Medical Education in Europe (AMEE), Bern, Switzerland, September 2003].
- Mangione S, Kane GC, Caruso JW, Gonnella JS, Nasca TJ, Hojat M. Assessment of empathy in different years of internal medicine training. *Med Teacher* 2002;**24**:371–4.

- 36 Marcus ER. Empathy, humanism and the professionalisation process of medical education. *Acad Med* 1999;**74**:1211–5.
- 37 Sanson-Fisher RW, Poole DA. Training medical students to empathise: an experimental study. *Med J Aust* 1987;**1**:473–6.
- 38 Elizur A, Rosenheim E. Empathy and attitudes among medical students: the effects of group experience. *J Med Educ* 1982;**57**:675–83.
- 39 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**:90–4.
- 40 Fine VK, Therrien ME. Empathy in the doctor–patient relationship: skill training for medical students. *J Med Educ* 1977;**52**:752–7.
- 41 Feighny KM, Arnold L, Monaco M, Munro S, Earl B. In pursuit of empathy and its relationship to physician communication skills: multidimensional empathy training for medical students. *Ann Behav Sci Med Educ* 1998;**5**:13–21.
- 42 Traux CB, Carkhuff RR. *Towards Effective Counseling and Psychotherapy*. Chicago: Aldine 1967.
- 43 Wilkes M, Milgrom E, Hoffman JR. Toward more empathetic medical students: a medical student hospitalisation experience. *Med Educ* 2002;**36**:528–33.
- 44 Markham B. Can a behavioural science course change medical students' attitudes? *J Psychiatric Educ* 1979;**3**:44–54.
- 45 Hornblow AR, Kidson MA, Ironside W. Empathetic process: perception by medical students of patients' anxiety and depression. *Med Educ* 1988;**22**:15–8.
- 46 Christakis DA, Fuentner C. Temporary matters: the ethical consequences of transient social relationships in medical training. *JAMA* 1997;**278**:739–43.
- 47 Striet U. Attitudes towards psycho-social factors in medicine: an appraisal of the ATSIM scale. *Med Educ* 1980;**14**:259–66.
- 48 Engel GL. The essence of the biopsychosocial model: from 17th to 20th century science. In: Balner H, ed. *A New Medical Model: a Challenge for Biomedicine?* Amsterdam: Swets & Zeitlinger 1990:13–8.
- 49 Striet-Forest U. Differences in empathy: a preliminary analysis. *J Med Educ* 1982;**57**:65–7.
- 50 Kupfer DJ, Drew FL, Curtis EK, Rubinstein DN. Personality style and empathy in medical schools. *J Med Educ* 1978;**53**:507–9.

Received 29 May 2003; editorial comments to authors 19 August 2003; accepted for publication 28 October 2003