Empathy Decline and Its Reasons: A Systematic Review of Studies With Medical Students and Residents

Melanie Neumann, PhD, Friedrich Edelhäuser, MD, Diethard Tauschel, MD, Martin R. Fischer, MD, Markus Wirtz, PhD, Christiane Woopen, MD, PhD, Aviad Haramati, MD, and Christian Scheffer, MD, MME

Abstract

Purpose

Empathy is a key element of patient–physician communication; it is relevant to and positively influences patients' health. The authors systematically reviewed the literature to investigate changes in trainee empathy and reasons for those changes during medical school and residency.

Method

The authors conducted a systematic search of studies concerning trainee empathy published from January 1990 to January 2010, using manual methods and the PubMed, EMBASE, and PsycINFO databases. They independently reviewed and selected quantitative and qualitative studies for inclusion. Intervention studies, those that evaluated psychometric properties of self-assessment tools, and those with a sample size <30 were excluded.

Results

Eighteen studies met the inclusion criteria: 11 on medical students and 7 on residents. Three longitudinal and six cross-sectional studies of medical students demonstrated a significant decrease in empathy during medical school; one cross-sectional study found a tendency toward a decrease, and another suggested stable scores. The five longitudinal and two cross-sectional studies of residents showed a decrease in empathy during residency. The studies pointed to the clinical practice phase of training and the distress produced by aspects of the "hidden," "formal," and "informal" curricula as main reasons for empathy decline.

Conclusions

The results of the reviewed studies, especially those with longitudinal data, suggest that empathy decline during medical school and residency compromises striving toward professionalism and may threaten health care quality. Theory-based investigations of the factors that contribute to empathy decline among trainees and improvement of the validity of self-assessment methods are necessary for further research.

Communicating with patients is an essential medical activity.[1] Patient–physician communication not only helps capture the anamnesis and transmit information but also has a therapeutic effect and supports the patient's healing process. Patient–physician communication has been shown to have a positive effect on psychosocial outcomes (e.g., quality of life, anxiety, depression) and on objectively measurable outcome parameters (e.g., symptom reduction, lowering of blood pressure and blood glucose levels).[2–5]

Please see the end of this article for information about the authors.

Correspondence should be addressed to Dr. Neumann, Gemeinschaftskrankenhaus, Integrated Curriculum for Anthroposophic Medicine (ICURAM), Gerhard-Kienle-Weg 4, 58313 Herdecke, Germany; telephone: +49 (0) 2330-62-3967; fax: +49 (0) 02330-62-4062; e-mail: melanie.neumann@uni-wh.de.

Physician empathy is a particularly effective therapeutic element of patient–physician communication. Mercer and Reynolds'[6(pS10)] widely accepted definition describes physician empathy as the ability of a physician to "(a) understand the patient's situation, perspective and feelings (and their attached meanings), (b) communicate that understanding and check its accuracy and (c) act on that understanding with the patient in a helpful (therapeutic) way." Such empathic behavior may lead to

- patients' reporting more about their symptoms and concerns,[7–11]
- physicians' increased diagnostic accuracy,[9,10,12,13]
- patients' receiving more illness-specific information,[14–16]
- patients' increased participation and education,[6,16,17]
- patients' increased compliance and satisfaction,[16,18–20]
- patients' greater enablement,[17,21–23] and

- patients' reduced emotional distress and increased quality of life.[15]

Further, in patients with the common cold, physician empathy is a significant predictor of the duration and severity of the illness and is associated with immune system changes in immune cytokine interleukin-8.[24]

These specific therapeutic effects of physician empathy and their mutual associations can be detailed with the help of the "effect model of empathic communication in the clinical encounter,"[25] which demonstrates how an empathically communicating physician can achieve improved patient outcomes.

This therapeutic relevance emphasizes the importance of developing and supporting physician empathy during medical school and residency. Moreover, according to the Institute of Medicine, empathy also plays an important role in achieving patient-centeredness, which is one of the six main goals of a 21st-century health system and comprises the "qualities of compassion,

empathy, and responsiveness to the needs, values, and expressed preferences of the individual patient."[26(p48)] In addition, studies have concluded that patients most value empathy, support, and information from their physicians.[27–31] Correspondingly, empathy has long been a key element of the framework of medical professionalism[32] as well as a defined educational objective in medical training in the United States, Canada, and Switzerland.[33–35]

By conducting a systematic review of the literature according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Guidelines,[36] we aimed to describe the current state of research and address the following questions: (1) How does empathy change in trainees during medical school and residency? (2) Which factors influence trainees' ability to empathize?

Method

Data sources

During June 2009 to February 2010, three of us (M.N., C.S., D.T.) performed a systematic review of the literature to identify original articles reporting quantitative and qualitative investigations of the determinants of, development of, and changes in empathy during medical school and residency. We searched the PubMed, EMBASE, and PsycINFO electronic databases using the National Library of Medicine's Medical Subject Heading terms *empathy*, *medical education*, and *change* (see Table 1). We also conducted a manual search of reprint files, reference sections of review articles, and other publications.

Eligible studies were those published from January 1990 through January 2010 in English with a sample size of 30 or more. We excluded from our review intervention studies intended to enhance empathy because they were recently analyzed in a review by Stepien and Baernstein.[37] We also excluded studies on the psychometric qualities of different empathy measures because such studies were recently reviewed by Hemmerdinger et al[38] and Pedersen.[39]

Data extraction

Three of us (M.N., C.S., D.T.) identified relevant publications from the generated list by examining publication titles and abstracts and reading the entire article if in doubt. We excluded publications that

Table 1

Key Words and Medical Subject Heading (MeSH) Terms Used in Searches of the PubMed, EMBASE, and PsycINFO Electronic Databases

Key words	MeSH terms
Empathy, emotional intelligence	Empathy
Medicine; education, medical; education, medical, continuing; education, medical, graduate; education, medical, undergraduate; clinical clerkship; residency education; internship and residency; medical residency; medical internship; students, medical; medical school; curriculum	Medical education
Decrease, decline, reduce, increase	Change

did not meet the eligibility criteria, did not examine medical students or residents, or did not present empirical research, as well as those that presented personal experiences or case studies without explaining how the experiences or examples were selected or analyzed. We resolved any disagreements through discussion until we reached consensus.

Data synthesis and analysis

First, one author (M.N.) read all of the relevant studies on empathy during medical school and residency and created Appendix 1, which describes these studies and their findings. Second, she analyzed the reasons for changes in empathy that each study investigated and discussed. Third, she evaluated the methodological quality of each study, focusing on study design and method, response rates, and the validity of the self-assessment measures used. The other authors validated her analysis and conclusions. We discussed and resolved all disagreements.

Results

Study characteristics

We identified 669 unique studies. Among those, 18 studies satisfied all inclusion and no exclusion criteria (see Figure 1). Eleven investigated empathy during medical school, and 7 studied empathy during residency (Appendix 1). Nearly all of the studies were conducted in the United States, with the exception of 1 study conducted in Poland[40] and 2 in the United Kingdom.[41,42] All 18 studies were based on standardized questionnaires or surveys with students and residents and exclusively used tools for self-assessment of empathy.

Changes in empathy during medical school and residency

None of the 18 studies documented increases in trainees' self-assessed

empathy. Two of the studies showed increases in empathy during early student years but significant declines on entering the clinical practice phase when students had contact with patients.[41,43]

Of the 11 studies on medical students, 3 had longitudinal designs and 8 had cross-sectional designs. All 3 longitudinal studies[44–46] and 6 cross-sectional studies[40,41,43,47–49] described significant declines in empathy as training progressed. One of the other cross-sectional studies noted a trend toward empathy decline, but the trend was not significant.[50] The last cross-sectional study, by Todres et al,[42] suggested stable emotional intelligence scores during medical school. However, the study's "managing emotions" subscale of the emotional intelligence score showed significantly improved scores in final-year students compared with those of students in their first two years of study.

Of the seven studies on residents, five had longitudinal designs,[51–55] one incorporated both longitudinal and cross-sectional designs,[56] and one had a cross-sectional design.[57] Six of these studies found significant downward trends in self-assessed empathy[51–55,57]; in the other study, a significant downward trend was present in the longitudinal results whereas only a slight trend was present in the cross-sectional findings.[56]

Reasons for empathy decline during medical school and residency

Each study investigated only a small number of influential factors compared with those theoretically possible.[32] Investigators' analysis of obvious variables, such as gender[41,44,48–50] and age,[42,45,48] did not yield consistent results in studies of medical students.[42,45,48]

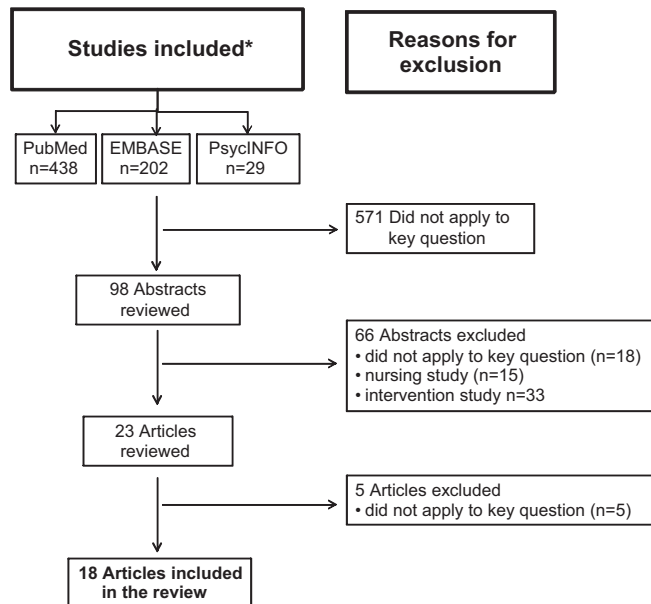Some studies of medical students investigated specialty choice as a determinant of self-perceived empathy

Figure 1 Flowchart showing the study inclusion process. * *Empathy*, *medical education*, and *change* were used as Medical Subject Heading search terms to conduct the electronic database searches (see Table 1).

and indicated that medical students who selected patient-oriented specialties had higher empathy scores than did those who entered patient-remote areas (e.g., surgery, radiology).[43,44,46,50]

Ten of the 11 studies that focused on medical students[40,41,43–50] agreed that self-assessed empathy decreased significantly between the student's third year of study and his or her first experience with a patient. Similarly, the seven studies of residents found that empathy decreased during clinical practice.[51–57]

Studies that investigated distress (e.g., burnout, low sense of well-being, reduced quality of life, depression) identified it as a factor with significant influence on self-assessed empathy in medical students and residents.[47–49,51–53,55,57] Because distress seems to be a main cause of empathy decline, almost all studies considered the issue of why trainees experience it. The following points represent the common denominators in the studies' discussions of trainee distress and describe aspects of the "hidden curriculum"[32]:

- Mistreatment by superiors or mentors: Medical students may experience situations of harassment, belittlement, degradation, humiliation, gender-specific discrimination, or sexual harassment.[45–47,49]

- Vulnerability of medical students and residents: Values of idealism,

enthusiasm, and humanity are present in students at the beginning of medical school,[49] but these may diminish as trainees are confronted with clinical reality (characterized by illness, human suffering, and death) and their focus shifts to technology and objectivity rather than the humanistic aspects of medicine.[43,45]

- Social support problems: Students and residents suffer from reduced contact with their families and a lack of social support from their peer groups.[45,49,51]

- High workload: Students and residents face long working hours, with an associated lack of sleep and inadequate relaxation time.[43,49,51]

Some studies also discussed aspects of the "formal/informal curriculum"[32] as potential causes for empathy decline. These include

- short length of stay of the patient, which can result in a fragmented patient–physician relationship and allows no time for related work or corresponding learning from and with the patient[43,45];

- unsuitable learning environment, which may include unstructured studying,[49] few "bedside interactions,"[43] and medical students' being treated like immature human beings[46]; and

- inadequate role models combined with the media's idealized view of the medical profession, which can lead students to hold unrealistic expectations regarding physicians' behavior.[44–46,49]

In addition, one study[44] considered elitist thinking by medical students and residents as another potential reason for empathy decline and found that the possibility of belonging to an elite and privileged group may induce a rational distancing from the patient. Further, various authors mentioned certain personality traits as possible determinants of empathy decline.[41,53] However, these traits were not discussed extensively in all of the studies.

Discussion

Decline of empathy during medical school and residency

Our review findings show that self-perceived empathy declines significantly during the course of medical school and residency; in students and residents who choose non-patient-oriented specialties; and, particularly, as a result of increased contact with patients in the clinical phase of training. The fact that a decline in empathy was also found in the more evidence-based longitudinal studies[44–46,51–55] underlines the significance of the results of our review.

Reports on students of dental medicine paint a similar picture.[58,59] In Sherman and Cramer's[59] cross-sectional comparison of 130 U.S. dental students, self-assessed empathy declined significantly in the clinical phase of training.

Schillinger's[60] cross-sectional survey findings also merit consideration because "moral judgment competence"[61]—the capacity to make decisions and judgments which are moral (i.e., based on internal principles) and to *act* in accordance with such judgments—was measured as a construct which is similar to empathy and is also an important educational value. Schillinger surveyed 1,149 students studying various subjects in Germany, Switzerland, and Brazil. Among the 531 respondents from five German or Swiss universities, 304 were studying medicine and the rest were studying psychology or economics.

Whereas the moral judgment competency of the economics and psychology students improved considerably during their studies, that of medical students worsened.[60] Students' responses to questions regarding study environment provided relevant explanations for these findings. For example, moral judgment competence was less developed among students dealing with theory; those who were already pragmatically engaged in their field while still in university trained their moral judgment competence (i.e., "learning by practice"[62]; see Patenaude et al[63] for a Canadian study on moral development in medical school).

Some of the studies included in our review reported significant increases in cynicism among medical students.[44–46,49] Crandall et al[64] also found students' commitment to caring for medically underserved patients to be greater when they entered medical school than at graduation. This result was independent of gender and curriculum type (problem based versus traditional).

Clinical practice phase and distress as key factors of empathy decline

Nearly all of the studies in our review showed that empathy declines significantly on entering the clinical practice phase of training and with increased contact with patients. One possible explanation for this phenomenon may be that encountering morbidity and mortality heightens trainees' feelings of vulnerability. As a result, students and residents may overidentify with patients, causing them to suffer more from distress themselves; they thus become unable to provide rational health care or protect themselves by dehumanizing patients. Consequently, humane treatment, including empathizing with patients, may suffer.[65] This explanation corresponds with the results of a recent study of physicians' brains which demonstrated that medical expertise down-regulates the sensory processing elicited by the perception of pain in others.[66] This down-regulation occurs at an early stage, which is thought to reflect the automatic emotional sharing component of empathy.[67]

Another critical experience during initial clinical practice is trainees' increased responsibility for the patient, which is often guided by their unrealistic expectations that medicine can always cure and that there is always "a right thing" to do.[68] Students' and residents' expectations may lead them to react to the stress of overwhelming responsibility in undesirable ways—such as detached concern and decreased empathy—as they concentrate only on molecules, organs, reports, and data rather than on the patient.[65] Werner and Korsch[65] hypothesized that these negative coping reactions are enhanced by the fact that, in most cases, trainees are left alone to deal with the stresses mentioned above as well as their feelings of uncertainty and their fears of academic failure and of inability to master the material. They recommended that faculty recognize these problems and allow students to discuss them in a supportive environment.

Another key factor of empathy decline among medical students and residents is distress (e.g., burnout, reduced quality of life, depression), which is probably caused by the previously mentioned elements of the "hidden curriculum."[32] Some authors interpret distress as a means of survival and self-protection and as a coping mechanism[45,46,69]—that is, distress may be a strategy and behavior pattern that trainees use to confront and cope with stress factors.[70] These findings seem to correspond with those of a recently published 12-year longitudinal study which found that self-assessed empathy in adults did not decline with age but was associated with positive well-being (e.g., life satisfaction) and a positive social interaction profile (e.g., a positive relationship with others).[71]

The distress hypothesis is also in line with recent neurophysiologic studies on mirror neurons. Mirror neurons display physiological correlates of empathy, which can be activated both during an action or sensation in the body and when the same action is merely observed in another person (e.g., trainees' observation of patients' suffering[25]). Various investigations have linked mirror neuron function with empathic ability.[72–76] According to Bauer's[74] hypothesis, existing empathic ability can suffer serious damage through extreme experiences of callousness or inconsiderateness. Furthermore, anxiety, tension, and stress can significantly reduce the signal rate of mirror neurons: "Once pressure, fear and stress are present, everything that depends on the system of mirror neurons stops functioning: the ability to empathize, to understand others and to perceive subtleties."[74(p71)] Correspondingly, the negative experiences of a "hidden curriculum"[32] may contribute to the decline of empathy in students and residents.

A recent review[25] suggested that a broad range of biographical experiences (e.g., upbringing or experiences during adulthood) may also influence the development and promotion of empathy. Together with personality traits,[77] these seem to be likely moderator variables[78] in medical students' stress experiences and empathy development.[32]

Further, as reported in the Results, additional factors that contribute to empathy decline are elements of the "formal/informal curricula,"[32] namely, shorter hospital stays,[43,45] an inappropriate learning environment,[43,46,49] and inadequate role models.[44–46,49]

A recent brainstorming survey[79] supports these findings. The medical students and interns surveyed were asked which factors they viewed as affecting empathy during education. They considered "mentoring and clinical experiences that promote professional growth" to be the most important; "negative feelings and attitudes toward patients" and "negative school and work experiences" were less important in their view.

Our model of reasons contributing to a decline in empathy during medical school and residency (Figure 2) provides a graphical summary of the potential determinants of empathy decline that we have discussed above.

Methodological limitations and reflection

The following methodological limitations of the reviewed studies should be considered when looking at Appendix 1:

- Only one multicenter study[47] was identified. However, that study drew no quasi-experimental curricular comparisons between the different faculties involved.

- Only three longitudinal studies on medical student empathy were available at the time of the review.[44–46]
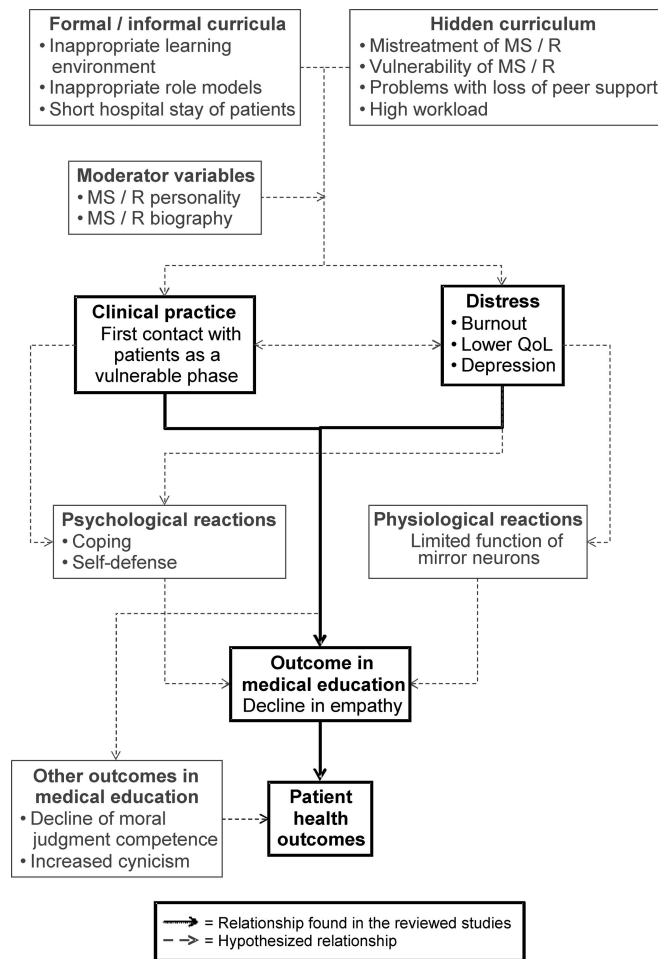
Figure 2 Model of reasons contributing to a decline in empathy during medical school and residency. MS indicates medical student; R, resident; QoL, quality of life.

- Control groups from other health-related areas (e.g., nursing) were missing, as were those from nonmedical, yet relationship-intensive, career areas (e.g., teaching).

- No explanatory variables apart from stress, gender, and specialty were included in the reviewed studies.[32]

- Only two of the studies[43,46] conducted nonresponse analyses, so little is known about the possible effects of selection bias.

- Established methods for increasing response rates were rarely used.[80−82]

- Some of the studies on residents had small samples.[54,55,57]

- The most reliable and valid measures of self-assessed empathy are the Interpersonal Reactivity Index (IRI) and the Jefferson Scale of Physician Empathy (JSPE), which were the most frequently used measures in the reviewed studies. All other measures

used in the reviewed studies lack adequate psychometric evidence.[38,39]

- Empathy was only self-assessed in the studies.

In particular, the measurement of empathy via self-assessment requires intense methodological reflection. Both self-assessments and external assessments (by patients, for example) may be used as sources of information. However, both are characterized by measurement errors and/or social desirability bias.[83] The fact that empathy-related constructs such as emotional intelligence[41,42,49] and moral judgment competence[60] have also been shown to decline during the course of university study[63] lends support to the validity of the self-assessment tools employed in the reviewed studies. Moreover, self-report measures are the most direct method for assessing subjective and internal cognitive or emotional events involving the respondents' thoughts and feelings,

which cannot otherwise be observed or mechanically recorded.[84]

Two studies have been conducted to test the validity of the JSPE. These compared scores from the JSPE self-assessment measure[85,86] with external observations made by senior staff[87] or patients.[88] Both studies yielded positive correlations between self-assessments and external assessments. Conversely, a recent study by Chen et al[89] found that self-assessed empathy measured by the JSPE decreased between the second and third years of medical school, whereas observed empathy, measured as demonstrated empathic behavior during objective structured clinical examinations (OSCEs), increased. However, Chen and colleagues'[89] results should be interpreted with caution because empathic behavior represents a desired behavior pattern during an OSCE. Thus, there is a potential for social desirability bias. Given the conflicting results of these studies, methodically structured validation studies with external (e.g., faculty, patient) and self-assessment measures seem both necessary and timely.[32]

Using self-assessment tools with overlapping constructs such as emotional intelligence,[41] interpersonal competence,[90] perspective taking,[83] and the ability to reflect[91] constitutes another possibility for increasing the validity of results. An alternative to self-assessment measures may be the Reading the Mind in the Eyes Test (RMET),[92,93] which tests a specific facet of mind reading—that is, the ability to infer an individual's internal state from observation of his or her subtle affective facial expressions. The RMET seems to be a promising alternative because it is based on the "theory of mind" and is therefore closely related to empathy,[92] and it is associated with diverse self-measures of empathy.[93]

Implications for future research

The fact that our review includes only three European studies investigating empathy in medical students[40−42] highlights the need for more research on the topic by European medical schools.

When planning future studies, researchers should place emphasis on theory-based investigations of the reasons for empathy decline.[94] To gain initial insight, such studies could use as a basis

our model of reasons contributing to a decline in empathy during medical school and residency (Figure 2).

The methodological limitations of the studies we reviewed should also be considered when designing future studies to improve the evidence base on empathy development and its determinants. A combination of theory-based and well-designed studies that incorporate a quasi-experimental comparison of different medical curricula[26] and/or an experimental investigation of well-established interventions seems highly appropriate for deriving suitable medical education recommendations. Examples of possible quasi-experimental approaches include drawing comparisons between problem-based[41] and traditional curricula or between U.S. and European curricula.

It also seems necessary to investigate whether the observed empathy decline is a "normal" process that health care professionals must go through as they adjust to their surroundings and the demands of their field—a process shaped by their experience with ill, seriously ill, and dying patients.[43] Study designs seeking to answer this question would ideally integrate comparison groups from the medical profession (e.g., nurses) as well as nonmedical, yet relationship-intensive, professions (e.g., teachers). Interesting in this context is the example of an older study by Becker and Sands[95] which found no decline in empathy among nursing students (see also Fields et al[96] and Hojat et al[97]). Also pertinent to the question of whether empathy decline is a normal development process are the results of a recent meta-analysis conducted by Konrath et al[98] among 13,737 American college students. These researchers identified a significant decline in self-perceived empathy from 1979 to 2009, with more recent college students demonstrating approximately 40% less empathy than students 20 to 30 years ago. The decrease in empathy seems to be most prominent in post-2000 samples, suggesting that empathy decline has become a social phenomenon[69] in young Americans. A possible explanation for this observation may be that the "information flooding" which started to occur in education after 2000, and the increasing use of communication technologies, have led to a kind of "emotional anesthesia"; that is, our

perceptions of our thoughts and emotions may be increasingly suppressed. Future medical education research should therefore investigate whether students are forced to learn too much and whether their use of information technologies is associated with empathy.

On the basis of our findings that the clinical practice phase of training and trainee distress seem to be key determinants of empathy decline, we propose addressing these problems by testing different, sound interventions. Mindfulness-based stress reduction, for example, is a particularly well-researched and highly promising intervention method for reducing stress and enhancing empathy.[99–109] Other interventions include self-awareness training,[110–112] Balint groups,[113,114] and "meaningful experiences and reflective practice discussions,"[111] which support students and residents in the clinical practice phase by allowing them to discuss and reflect on issues of vulnerability and responsibility within the context of health care provision.[65]

A recent, illuminating review by Shapiro[69] offers strong support for studying such interventions. She argues that in the absence of appropriate discourse on how to emotionally manage distressing aspects of the human condition, it is likely that trainees will resort to coping mechanisms that result in distance and detachment from patients. Shapiro[69] suggests incorporating reflection and self-awareness as consistent elements in the medical school curriculum.[62,115]

Finally, we believe it is highly important for future research to investigate the relationship between scores on different self-assessment measures of empathy and actual patient health outcomes. As we noted above, current knowledge primarily concerns the positive effects of physician empathy on patient health outcomes and is based on studies using patient-reported measures of physician empathy. However, evidence of the criterion validity and outcome relevance of self-assessment measures is also needed in order to show, for example, that different scores on the JSPE or the different subscales of the IRI positively or negatively affect patient well-being. For example, Krasner[116] and colleagues plan to investigate the relationship between

general practitioners' scores on the JSPE and their patients' health outcomes.

Limitations of this review

There are limitations to this review. First, the quality of a systematic review is limited by both the study design quality of the available studies and the psychometric quality of the measures used in these studies. Many of the studies included in this review suffer from the methodological difficulties discussed above. Second, not all relevant publications are indexed in the databases we searched. Therefore, we may have overlooked some studies during our electronic and manual searches. Third, the evidence we identified is not strong enough to make causal inferences.

A meta-analysis approach is the most evidence-based and comprehensive method of summarizing empirical findings. Therefore, it would be very useful for future research to calculate effect size estimates to determine the clinical and practical significance of changes in empathy.

Conclusions

Our analysis of the eligible studies, especially those with longitudinal data, suggests that empathy decreases during the course of training, particularly among trainees in the clinical practice phase and in those who have selected patient-remote specialties. Additionally, our review provides evidence that trainee distress is a key determinant of empathy decline, which can be considered a coping mechanism for dealing with various stress factors.

Given the current state of research, it is not possible to fully determine the exact reasons causing the observed empathy decline. However, identifying these would be important for making specific, evidence-based statements as well as developing targeted interventions for education and further training. Prospective and experimental multicenter studies, ideally with control groups, are necessary to give adequate consideration to the variance and interdependence of influential factors. Such a goal can only be reached through structured, interdisciplinary, and evidence-based medical education research,[94] which

ultimately places the responsibility on high-quality teaching and health care.

Dr. Neumann is senior researcher, Integrated Curriculum for Anthroposophic Medicine (ICURAM), Gerhard-Kienle Chair for Medical Theory, Integrative and Anthroposophic Medicine, Faculty of Health, Department of Medicine, University of Witten/Herdecke, Witten, Germany.

Dr. Edelhäuser is neurologist, senior researcher, and program director, Integrated Curriculum for Anthroposophic Medicine (ICURAM), Gerhard-Kienle Chair for Medical Theory, Integrative and Anthroposophic Medicine, Faculty of Health, Department of Medicine, University of Witten/Herdecke, Witten, Germany.

Dr. Tauschel is physician and program director, Integrated Curriculum for Anthroposophic Medicine (ICURAM), Gerhard-Kienle Chair for Medical Theory, Integrative and Anthroposophic Medicine, Faculty of Health, Department of Medicine, University of Witten/Herdecke, Witten, Germany.

Dr. Fischer is professor and dean for the medical curriculum, Institute for Teaching and Educational Research in Health Sciences, Faculty of Health, Department of Medicine, University of Witten/Herdecke, Witten, Germany.

Dr. Wirtz is professor and head, Department of Research Methods, Institute for Psychology, University of Education Freiburg, Freiburg, Germany.

Dr. Woopen is professor and chair, Research Unit Ethics, Institute for the History of Medicine and Medical Ethics, Medical Department, University of Cologne, Cologne, Germany.

Dr. Haramati is professor, Departments of Physiology and Biophysics and Medicine, Georgetown University School of Medicine, Washington, DC, and director of academic programs, Institute of Integrative Health, Baltimore, Maryland.

Dr. Scheffer is senior researcher and program director, Integrated Curriculum for Anthroposophic Medicine (ICURAM), Gerhard-Kienle Chair for Medical Theory, Integrative and Anthroposophic Medicine, Faculty of Health, Department of Medicine, University of Witten/Herdecke, Witten, Germany.

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Appendix 1

Descriptions of 18 Studies Investigating Trainees' Self-Assessed Empathy During Medical School (11 Studies) and Residency (7 Studies), Published From January 1990 through January 2010, Organized by Study Group

Author(s), date published	Country, city/state	Study objective*	Study design	Sample size (response rate)	Scales†	Results*	Comments on study quality
Medical students							
Austin et al, 2007[41]	UK, Edinburgh	Investigation on empathy and EI; association between empathy, EI, and academic success; gender research on empathy and EI	Cross-sectional survey of medical students in years 1 and 2 (preclinical), and year 5 (clinical)	273 (46%)	JSPE-S, EI	• Between years 1 and 2, empathy increased in men but decreased in women • No correlation was found between empathy or EI and academic success • Problem-based learning was correlated with EI	• Single-institution survey • Imbalance between men (n = 85) and women (n = 188) in the sample
Chen et al, 2007[43]	USA, Boston	Investigation on empathy as well as the influence of specialty choice on empathy	Cross-sectional survey of medical students before medical school entry and after years 1, 2, 3, and 4	658 (91%)	JSPE-S	• Empathy declined from medical school entry up to the end of year 1 • There was a progressive decline in empathy, especially between years 2 and 3 • Empathy was higher in students in patient-oriented specialties as well as in female students	• Single-institution survey • Positive: Nonresponse analysis was conducted
DiLalla and Hull, 2004[48]	USA, Illinois	Investigation on empathy, spirituality, well-being, and tolerance, while taking gender and age into consideration	Cross-sectional survey of medical students before medical school entry and during years 1, 2, and 4; also surveyed residents, faculty physicians, and alumni	1,181 (before entry = 53%, year 1 = 78%, year 2 = 44%, year 4 = 49%, residents = 19%, clinical faculty = 45%, alumni = 48%)	ESWIM	• Empathy, spirituality, and tolerance were higher in women; men achieved a higher score regarding their own well-being • Empathy declined between years 1 and 4 • Younger groups (<30 years old) had the highest scores for empathy and personal health promotion, but the lowest scores for tolerance • Respondents in health promotion courses correlated with higher empathy and well-being scores • Respondents in empathy and spirituality courses correlated with higher empathy scores	• Single-institution survey
Hojat et al, 2004[45]	USA, Philadelphia	Investigation on empathy and its association with exam results	Longitudinal survey of medical students at the beginning of year 3 and on completion of year 3	125 (56%)	JSPE-S	• Empathy declined from beginning to completion of year 3; no associations were found between empathy decline and age or gender • No correlation between empathy and exam results	• Single-institution survey

(Appendix continues)

Appendix 1, continued

Author(s), date published	Country, city/state	Study objective*	Study design	Sample size (response rate)	Scales†	Results*	Comments on study quality
Hojat et al, 2009[44]	USA, Philadelphia	Investigation on empathy	Longitudinal survey of medical students at the beginning of year 1 and the end of each year in medical school	456 (78% at the end of the study)	JSPE-S	• Women had higher empathy scores • Empathy level was constant until the end of year 2; empathy declined at the end of year 3 • Patterns of decline were similar for men and women and for those who pursued their medical training in patient-oriented and technology-oriented specialties • Students selecting patient-oriented specialties showed higher empathy scores than those choosing technology-oriented specialties	• Single-institution survey
Kliszcz et al, 1998[40]	Poland	Investigation on empathy	Cross-sectional survey of first-year and final-year medical students	353 (not reported)	BEES, IRI	• Women were more empathic than men in both years of study • Women's empathy decreased, while men's cognitive empathy increased slightly • Empathy declined during first and final years	• Single-institution survey • Report was brief and did not provide detailed statistics
Newton et al, 2000[50]	USA, Arkansas	Research on empathy and specialty choice	Cross-sectional survey of medical students at the beginning of years 1, 2, 3, and 4	548 (not reported)	BEES	• Slight, but not significant, progressive decline in empathy • Empathy declined in men between years 3 and 4 • Empathy scores were higher in students in patient-oriented specialties (e.g., internal medicine, general medicine, pediatrics)	• Single-institution survey
Newton et al, 2008[46]	USA, Arkansas	Research on empathy and specialty choice	Longitudinal survey of 4 cohorts of medical students at the beginning of years 1, 2, 3, and 4	419 (78.3%)	BEES	• On admission to medical school, all cohorts had similar empathy levels • Empathy declined from years 1 to 4, with the strongest decline between years 1 and 3 (clinical) • Empathy scores were higher in students in patient-oriented areas of specialty (e.g., internal medicine, general medicine, pediatrics) as well as in female students • Empathy decline was the strongest in women in non-patient-oriented specialties	• Single-institution survey • Positive: Nonresponse analysis was conducted

(Appendix continues)

Appendix 1, continued

Author(s), date published	Country, city/state	Study objective*	Study design	Sample size (response rate)	Scales†	Results*	Comments on study quality
Stratton et al, 2008[49]	USA, Kentucky	Investigation on progressive changes in EI, empathy, and distress	Cross-sectional survey of medical students during years 1 and 3	64 (68.8%)	IRI, TMMS (EI)	• Significant decline in EI and empathy • EI and empathy scores were higher in women • Distress increased during the course of medical school	• Single-institution survey • Sample size was relatively small
Thomas et al, 2007[47]	USA, Minnesota	Influence of stress (professional and private) and well-being on empathy	Cross-sectional survey of medical students during years 1–4; multicenter study with 3 medical faculties	545 (50%)	IRI, MBI, QoL, depression (2 items)	• Medical students had higher empathy scores than students of other disciplines • Empathy declined during the course of medical school • Higher QoL had a positive effect on empathy • Burnout had the strongest negative influence on empathy	• No comparison of empathy among the 3 medical schools • Validity of the depression measuring tool unclear
Todres et al, 2010[42]	UK, London	Association between EI and students' age, gender, ethnicity, and stage of study	Cross-sectional survey of medical students in all years	263 (12.3%)	EI	• Aggregated EI scale scores were similar throughout the curriculum • Age (>25 years), gender (female), and ethnicity (white compared with Asian) explained 9.2% of the variance in aggregated EI scale scores • 6.7% of the variance in the "managing emotions" subscale was explained by stage of study, with significantly higher scores for students in their final year compared with those in the first two years	• Single-institution survey • Positive: Three reminders to enhance response rate • Very low response rate

Residents

Bellini et al, 2002[51]	USA, Philadelphia	Association between mood and empathy	Longitudinal survey of internal medicine residents: 4 measurement time frames over the course of one year	60 (by measurement period: 1 = 98%, 2 = 72%, 3 = 79%, 4 = 79%)	IRI, POMS (mood)	• Progressive decline in empathy • After 5 months, more depression, anger/hostility, fatigue/inertia, and personal distress; less vigor/activity	• Single-institution survey

(Appendix continues)

Appendix 1, continued

Author(s), date published	Country, city/state	Study objective*	Study design	Sample size (response rate)	Scales†	Results*	Comments on study quality
Bellini and Shea, 2005[52]	USA, Philadelphia	Association between mood and empathy	Longitudinal survey of residents: 6 measurement time frames across 3 years	60 (by measurement period: 1 = 98%, 2 = 72%, 3 = 79%, 4 = 79%, 5 = 94%, 6 = 95%)	IRI, POMS (mood)	• Progressive decline in empathy scores during the 3 years; no return to baseline scores after 3 years • Successive increase in personal distress scores with a return to baseline scores between years 2 and 3 • At the beginning, less depression/dejection, confusion/bewilderment, anger/hostility, fatigue/inertia and more vigor/activity; only the scores for confusion/bewilderment returned to baseline by the end of year 3	• Single-institution survey
Mangione et al, 2002[56]	USA, Philadelphia	Investigation on empathy	Cross-sectional and longitudinal survey of residents from 3 age groups	98 [by group: first = 41, second = 26, third = 31] (84%)	JSPE-S, humanistic qualities (1 question)	• Tendency toward empathy decline between years 1 and 3, although statistically insignificant • Slight connection between empathy and humanistic qualities, although statistically insignificant	• Single-institution survey • Validity of humanistic qualities measure unclear • Sample size was relatively small
Rosen et al, 2006[55]	USA, Pennsylvania	Association among lack of sleep, mood disturbances, burnout, and empathy	Longitudinal survey of internal medicine residents at the beginning and end of residency	47 (80%)	Sleep disturbance (Epworth Sleepiness Scale), depression (BDI), IRI, MBI	• Progressive decline in empathy • Lack of sleep increased from the first to the second measurement time frame, as did depression and burnout	• Single-institution survey • Sample size was relatively small
Shanafelt et al, 2005[57]	USA, Rochester, Minn	Association between empathy and personal well-being	Cross-sectional survey of one cohort of internal medicine residents	83 (50%)	QoL, IRI, wellness promotion strategies, work–life balance	• Higher level of mental well-being was associated with higher empathy scores	• Single-institution survey • Small sample size for comparing residents with high (n = 19) or low (n = 64) levels of mental well-being
West et al, 2006[53]	USA, Rochester, Minn	Association between subjectively perceived medical errors and QoL, burnout, depression, and empathy	Longitudinal survey of residents: every 3 months across 3 years (Mayo Internal Medicine Well-Being Study)	184 (84%)	Self-perceived medical errors, QoL, MBI, depression, IRI	• Medical errors were often associated with QoL, burnout, and depression (personal distress) • Personal distress and empathy decline increased the chance of self-perceived medical errors in the future	• Single-institution study

(Appendix continues)

Appendix 1, continued

Author(s), date published	Country, city/state	Study objective*	Study design	Sample size (response rate)	Scales†	Results*	Comments on study quality
West et al, 2007[54]	USA, Rochester, Minn	Association between medical knowledge and empathy	Longitudinal survey of residents: every 3 months during years 1 and 2 (Mayo Internal Medicine Well-Being Study)	55 (73%)	ITE (medical knowledge), IRI	• ITE scores increased between years 1 and 2 • Progressive decline in empathy • No connection between medical knowledge and empathy	• Single-institution survey • Sample size was relatively small

* EI indicates emotional intelligence; QoL, quality of life.

† BEES indicates Balanced Emotional Empathy Scale (self-assessed empathy); BDI, Beck Depression Inventory; EI, Emotional Intelligence Scale; ESWIM, Empathy, Spirituality, and Wellness in Medicine Scale; IRI, Interpersonal Reactivity Index (self-assessed empathy); ITE, Internal Medicine In-Training Examination (medical knowledge measure); JSPE-S, Jefferson Scale for Physician Empathy–Student Version (relevance of empathy in the physician–patient relationship); MBI, Maslach Burnout Inventory; POMS, Profile of Mood States (mood measure: tension/anxiety, depression/dejection, fatigue/inertia, confusion/bewilderment, vigor/activity, anger/hostility); QoL, Quality of Life (various measuring tools); TMMS, Trait Meta-Mood Scale (emotional intelligence measure).