Nonverbal Sensitivity in Medical Students: Implications for Clinical Interactions

Judith A. Hall, PhD[1], Debra L. Roter, DrPH[2], Danielle C. Blanch, MA[1], and Richard M. Frankel, PhD[3]

[1]Department of Psychology 125 NI, Northeastern University, Boston, MA, USA; [2] The Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA; [3] Indiana University School of Medicine, Indianapolis, IN, USA.

BACKGROUND: Clinicians' accuracy in perceiving nonverbal cues has potentially important consequences, but has received insufficient research.

OBJECTIVE: To examine the relation of medical students' nonverbal sensitivity to their gender and personal traits, as well as to their communication and impressions made during a standardized patient (SP) visit.

DESIGN: Psychometric testing, questionnaire, and observation.

SETTING: One US medical school.

PARTICIPANTS: Two-hundred seventy-five third-year medical students.

MEASUREMENTS: Nonverbal sensitivity and attitudes were measured using standard instruments. Communication during the SP visit was measured using trained coders and analogue patients who viewed the videotapes and rated the favorability of their impressions of the student.

RESULTS: Nonverbal sensitivity was higher in female than male students ($P<0.001$) and was positively correlated with self-reported patient-centered attitudes ($P<0.01$) and ability to name one's own emotions ($P<0.05$). It was also associated with less distressed ($P<0.05$), more dominant ($P<0.001$), and more engaged ($P<0.01$) behavior by the SP, and with more liking of the medical student ($P<0.05$) and higher ratings of compassion ($P<0.05$) by the analogue patients. Correlations between nonverbal sensitivity and other variables were generally stronger and different for male than female students, but nonverbal sensitivity predicted analogue patients' impressions similarly for male and female students.

CONCLUSION: Medical students' nonverbal sensitivity was related to clinically relevant attitudes and behavioral style in a clinical simulation.

KEY WORDS: nonverbal sensitivity; emotion recognition; patient-centered behavior; medical students; standardized patients.
J Gen Intern Med 24(11):1217–22
DOI: 10.1007/s11606-009-1107-5

Received January 20, 2009
Revised May 21, 2009
Accepted August 21, 2009
Published online September 22, 2009

Whether physicians have a desirable impact on processes and outcomes of care depends a great deal upon how they communicate with their patients. A large amount of research shows that physician behaviors referred to under the heading of patient-centeredness are correlated with favorable patient outcomes, such as participation, satisfaction, adherence, and health itself.[1,2]

The literature on patient-centeredness is largely based on an analysis of physicians' verbal and nonverbal behavior towards patients.[3–7] However, there is another aspect of communication skill that has not received much empirical attention by researchers. This is the physician's ability to notice and accurately interpret patients' cues reflective of their emotional, cognitive, and physical states.[7] Accuracy in this domain may influence physicians' decisions about how to behave verbally and nonverbally toward patients and what clinical decisions to make.

Physicians have been shown to lack accuracy in recognizing affective states in their patients, for example, psychiatric disturbance,[8–10] patients' self-reported affective states,[11] and patients' responses to the physician including satisfaction and liking.[11–13] Importantly, physicians and other clinical professionals differ from one another in their ability to judge affective cues, and this variation is related to clinically relevant variables. Physicians' scores on a nonverbal sensitivity test predicted higher satisfaction and more faithful appointment keeping among their patients.[14,15] More nonverbally sensitive physicians showed more vigilance for patients' anxiety and depression, and were marginally better in detecting those states in their patients.[16] Occupational therapy students' scores on a nonverbal sensitivity test predicted the likelihood of passing their clinical fieldwork examinations,[17] and genetic counselors' scores on a nonverbal sensitivity test predicted greater knowledge acquisition in analogue (role-playing) patients who watched the counselors in a genetic counseling session.[18]

Studies of non-clinical populations similarly suggest that interpersonal sensitivity has important correlates, many of which may be relevant in a clinical situation.[19–27] These include empathy, tolerance and open-mindedness, personal adjustment, positive interpersonal relationships, social-emotional competence, supervisor-assessed competence in several professions, favorable negotiation outcomes, success in sales-based occupations, helping behavior, and the satisfaction of one's subordinates. Previous non-clinical research also shows that interpersonal sensitivity is higher among women than men.[28–30] Though little is known about male versus female physicians' accuracy in perceiving patients, it is known that female physicians have a more patient-centered interviewing style than male physicians do.[4,31,32]

In this study, we measured the accuracy of decoding affective cues conveyed by the face and body (hereafter called nonverbal sensitivity) in a sample of medical students who also filled in a battery of self-report instruments and, in an unrelated activity, were videotaped in a standardized patient interview as part of an objective structured clinical examination (OSCE). Trained coders rated both the student and the standardized patient (SP) in this interaction. In addition, analogue (role-playing) patients watched the videotape and provided ratings while imagining themselves to be the patient.

We addressed the following questions: How is nonverbal sensitivity related to self-report of patient-centered attitudes and emotional self-awareness? Does nonverbal sensitivity predict communication and impressions made in a clinical simulation? Are there gender differences in medical students' sensitivity to nonverbal cues? And, does sensitivity have the same or different correlates for male and female students?

METHODS

Participants

The main participants were the entire third-year class of medical students at the Indiana University School of Medicine, tested near the end of the 2005 academic year. Additional participants were 244 analogue patients who were students in psychology courses at Northeastern University. The study received IRB approval from the Indiana University School of Medicine, Northeastern University, and Johns Hopkins Bloomberg School of Public Health.

Procedure and Instruments

Nonverbal Sensitivity Testing. At a group testing session, the medical students signed an informed consent and were given two nonverbal sensitivity tests: (1) facial expressions test from the Diagnostic Analysis of Nonverbal Accuracy (DANVA), consisting of 24 slides of male and female adults posing four basic emotions (happy, sad, angry, and fearful), each shown for 2 s. This test is one of the most widely used and well-validated tests of nonverbal sensitivity;[20,21] (2) face and body form of the Profile of Nonverbal Sensitivity (PONS), consisting of 20 2-s silent face-only and 20 silent body-only video clips of an adult female enacting 20 different affective scenarios. This is the test that was used in the clinician studies described earlier,[14–18] and it has also been used widely in non-clinical contexts.[22]

Other Instruments. In this same testing session, the students filled in: (1) the Patient Provider Orientation Scale (PPOS),[33] an 18-item instrument to measure attitudes towards patient-centered care; (2) the Clarity Scale, an 11-item instrument measuring how accurately one can name one's emotions.[34]

OSCE Examination. Four different standardized cases were presented by several male and female SPs, which were scripted to assess all nine of the Indiana University School of Medicine competencies, of which communication was one (discussion of parent's illness and code status, stress headache, cough, and counseling for smoking cessation). Although each student participated in all four of the cases (randomly ordered), we analyzed only the first one that each student did.

Analysis of OSCE Examination. Subsequent to the OSCE, students signed an informed consent giving permission for analysis of the videotape. The following communication variables were measured.

(1) The Four Habits Coding Scheme,[35] a 23-item coding system consisting of four scales to measure patient-centered interviewing style (Invest in the beginning, Elicit the patient's perspective, Demonstrate empathy, and Invest in the end). Items are rated for how effectively the habit was demonstrated. The coding was completed by three undergraduate research assistants, who received approximately 20 h of training and practice using the handbook provided by the instruments' authors. The coders achieved satisfactory inter-rater reliability and were blind to the research hypotheses and other communication variables assessed.

(2) Rapport ratings. Rapport was rated by three trained raters on 9-point scales for minutes 1, 5, and 9 of the interaction. Ratings based on short excerpts of behavior have been used extensively in non-clinical research[36] and also in studies of physicians and patients.[37,38] Raters received approximately 5 h of training/practice, were blind to the research hypotheses, and were unaware of other assessment measures. The ratings were averaged across the 3 min. (Other results based on these rapport ratings are published elsewhere.[39])

(3) Global Ratings (Roter Interaction Analysis System, RIAS).[40] The RIAS is a widely used quantitative coding system for patient-physician communication that assesses specific categories of verbal exchange as well as global ratings of the speakers' affective demeanor. In the current analysis, only the RIAS global ratings are used. The ratings were made by highly trained and reliable coders on a numeric scale of 1–6 (1= low/none, 6= high). Rated for both the provider and the patient are irritation, anxiety, dominance, interest, warmth, engagement, sympathy, respect, and interactivity. Hurriedness is rated only for the provider, and distress is rated only for the patient.

(4) Analogue patient ratings. The medical student was viewed by analogue patients, who were undergraduate psychology students instructed to view the tape as though they were the patient. The analogue patient methodology has been used when access to the original patients' impressions is impractical or not possible.[41,42] Because the analogue patients were intended as a proxy for real patients, they were given no special training other than to make sure they understood their assigned task. These individuals rated liking for the medical student (one item) as well as compassion (six items) on 6-point scales. Each medical student was viewed by approximately three analogue patients.

Analysis

Due to absences at the testing session or the OSCE, the labor intensiveness of the coding process, and technical problems, not all of the medical students could be included for each measurement. Results are presented for variables with significant ($P<0.05$, two tail) results for the whole sample, for the whole sample partialing out student gender, for male or female medical students separately, or for the comparison between the male and female students' correlations. Reliability data for self-report instruments and observers' coding/rating of behavior are presented in Table 1.

Table 1. Reliability of Self-Report Instruments and Observers' Coding/Rating of Behavior

Name	Construct	Coefficient	Type of reliability
DANVA	Nonverbal sensitivity	0.36	Inter-item[a]
PONS	Nonverbal sensitivity	0.29	Inter-item[a]
PPOS	Total patient-centered attitudes	0.54	Inter-item[a]
Clarity	Clarity of naming own emotions	0.85	Inter-item[a]
Four Habits	Total patient-centeredness score	0.70	Inter-rater[b]
RIAS	Global ratings	>0.97	Inter-rater[c]
Excerpts	Rating of rapport	0.73	Inter-rater[b]
Analogue patients	Liking	0.54	Inter-rater[a]
	Compassion	0.45	Inter-rater[a]

[a]*Cronbach's alpha*
[b]*Pearson correlation*
[c]*Percentage agreement based on average inter-rater agreement within 1 scale point across all ratings.*

RESULTS

Sample Characteristics

Altogether there were 275 medical students in the sample (54% male). The age range was 22–39, with a mean of 24.81 years, and the ethnic distribution was 84% European/European-American, 7% Asian/Asian-American, 3% African/African-American, 2% Arab/Arab-American, 2% Hispanic/Latin American, and 3% other.

Interpersonal Sensitivity Scores

Accuracy on the DANVA exceeded the guessing level (P<0.001), with an overall mean of 18.84 (SD = 2.13, range = 10–23, maximum possible = 24, N=238), similar to normative data for this test.[43] Accuracy on the PONS also exceeded the guessing level (P<0.001), with an overall mean of 29.21 (SD = 2.73, range = 19–35, maximum possible = 40, N=238), similar to normative data for this test[22] as well as data from other samples of medical students given this test.[44,45] The two tests were significantly correlated with each other (r=0.20, P<0.01) and were subsequently standardized and combined to form a nonverbal sensitivity composite that was used in all analyses.

Sociodemographic Predictors

Female medical students scored higher than male medical students on nonverbal sensitivity, $t(236) = 3.26$, P<0.001. The magnitude of this gender difference was a Cohen's d of 0.42 (i.e., women scored 0.42 of a standard deviation above the men). Because of this gender difference, and because some of the other variables also showed gender differences, the zero-order Pearson correlations presented later were also re-calculated as partial correlations that controlled for student gender.

Self-Report Scales

Table 2 shows that, overall, students who had greater nonverbal sensitivity reported holding more patient-centered attitudes on the PPOS and also reported a greater ability to identify their own emotions (Clarity) compared to students who scored lower on nonverbal sensitivity; both associations remained significant when gender was controlled for. When male and female students were examined separately (Table 2), significant correlations between nonverbal sensitivity and the self-report variables were evident only for the men. The difference in magnitude of male and female correlation was significant at P<0.05 for the Clarity scale.

Four Habits Coding Scheme

As Table 2 shows, male students' nonverbal sensitivity was significantly correlated with two of the habits, Elicit the patient's perspective and Demonstrate empathy, while none of the habits was significantly associated with sensitivity for female students. In fact, the male and female correlations were significantly different in magnitude and direction for two of the habits.

Coders' and Analogue Patients' Impressions

Table 3 shows that, for the whole sample, the SP was rated by coders as appearing less distressed, more dominant, and more engaged when the medical student scored higher on nonverbal sensitivity. Also, the analogue patients liked the nonverbally sensitive students more and rated them higher on compassion. These results did not change appreciably when gender was statistically controlled for.

Separate analysis of male and female students revealed that the patterns of association between nonverbal sensitivity and coders' ratings of student and standardized patient demeanor often differed (Table 3). Among male students, higher nonverbal sensitivity was associated with lower ratings of student interest and higher ratings of SP warmth and engagement. Among female students, higher nonverbal sensitivity was associated with higher ratings of student anxiety and respectfulness, higher ratings of SP irritation, dominance, and interest, and lower ratings of SP distress. The male and female correlations were in the opposite direction and significantly different for rapport, anxiety, and respectfulness, and for standardized patients' irritation and interest. Nevertheless, in spite of the different correlations by gender, the relationship of

Table 2. Nonverbal Sensitivity: Correlations with Self-Report Measures and Coded Patient-Centeredness (Four Habits Coding Scheme)

Measure	All students	Male students	Female students
Total patient-centered attitudes[a]	0.18** (0.14*)	0.18*	−0.10
Clarity of naming own emotions[a]	0.15* (0.16*)	0.28**	0.00[c]
Four Habits[b]			
Invest in the beginning	−0.05 (−0.03)	0.24+	−0.21[c]
Elicit the patient's perspective	0.19+ (0.15)	0.37**	−0.02
Demonstrate empathy	0.07 (0.05)	0.28*	−0.20[c]

Note: Shown in parentheses are partial correlations that control for student gender. Significance tests are two-tail
[a]*238 medical students*
[b]*100 medical students*
[c]*Male and female correlations differ at P<0.05*
*+P<0.10, *P<0.05, **P<0.01*

Table 3. Nonverbal Sensitivity: Correlations with Ratings by Trained Raters and Analogue Patients

Rating	All students	Male students	Female students
Excerpt raters[a]			
Rapport	0.03 (0.04)	0.21+	−0.20[d]
RIAS coders[b]			
Ratings of student			
Anxiety	0.04 (0.05)	−0.08	0.21*[d]
Interest	−0.07 (−0.09)	−0.19*	0.06
Respectfulness	0.08 (0.08)	−0.09	0.29**[e]
Ratings of standardized patient			
Irritation	0.04 (0.04)	−0.13	0.22*[d]
Distress	−0.15* (−0.15*)	−0.11	−0.21*
Dominance	0.23*** (0.24***)	0.14	0.36***
Interest	0.07 (0.07)	−0.05	0.23*[d]
Warmth	0.12+ (0.11+)	0.18*	0.04
Engagement	0.19** (0.17**)	0.20*	0.17+
Analogue patients[c]			
I liked the student	0.24* (0.21+)	0.28	0.29+
Compassion	0.23* (0.21+)	0.34*	0.20

Note: Shown in parentheses are partial correlations that control for medical student gender. Significance tests are two-tail.
[a]*117 medical students*
[b]*220 medical students*
[c]*71 medical students*
[d]*Male and female correlations differ at P<0.05*
[e]*Male and female correlations differ at P<0.01*
*+P<0.10, *P<0.05, **P<0.01, ***P<0.001*

nonverbal sensitivity to analogue patient ratings of liking and compassion was positive for both male and female students.

DISCUSSION

Female medical students scored higher than their male counterparts on the tests of nonverbal sensitivity, just as found in meta-analyses in non-clinical samples.[28,29] Whether the gender difference in nonverbal sensitivity persists among physicians in practice has not been studied. If female practicing physicians are, in fact, better able to notice and interpret patients' affective cues, this would be consistent with female physicians' more patient-centered communication style, longer average visit length, and greater likelihood of making a diagnosis of a social or psychological nature.[4,31,32,46–48]

In the sample as a whole, medical students' nonverbal sensitivity predicted the favorability of analogue patients' reactions, and less distress as well as more dominance and engagement in the SP (suggestive of active participation). More nonverbally sensitive students also reported holding more patient-centered attitudes and being better able to name their own emotions.

The correlations were, however, largely different for male and female students. In the case of male students, except for the anomalous negative correlation for rated interest, the picture was consistently positive in showing that their nonverbal sensitivity was positively related to self-reported patient-centered attitudes and emotional self-awareness and patient-centered behavior. SPs interacting with these students were judged by raters to be higher on warmth and engagement, and they had favorable analogue patient impressions. The picture for nonverbally sensitive female students was less straightforward. Although they also had favorable reactions from analogue patients, in contrast to the male students they were not more patient-centered in either their attitudes or in their actual behavior and, in fact, the associations were in the negative direction. They were perceived as more anxious and respectful, and their standardized patients were seen as more dominant, interested, irritated, and as conveying less emotional distress, compared to SPs interacting with less nonverbally sensitive female students.

It may be that the heightened anxiety of more nonverbally sensitive female students creates an impression of sincerity and conscientiousness, as found in an earlier study in which physicians' anxious voice tone, when coupled with positive words, predicted patient satisfaction and appointment keeping.[49] This combination of conscientiousness and respect may have acted to stimulate the standardized patients to be more interested, dominant, engaged, and willing to express irritation, all of which characterize empowered and activated patients. Moreover, in two patient activation studies, patients' negative affect was related to more active engagement in visit communication and better outcomes at follow-up.[50,51]

Although the process correlates of nonverbal sensitivity were often different for male and female students, the correlations with analogue patients' liking and impressions of compassion were not significantly different from those found for their male counterparts.

The present study is limited to a single medical school and analysis of one standardized patient interaction. The correlations were small to modest in magnitude; however, the effects are comparable in magnitude to what is typically found with interpersonal sensitivity tests,[23] and also comparable to the predictive validity of individual difference variables in general with respect to social behavior.[52]

Another limitation is that nonverbal sensitivity tests, including those in the present study, often have relatively weak internal consistency,[53] which would attenuate the correlations. However, these tests have shown good validity in the published literature.[20–22] Another potentially attenuating factor stems from the use of standardized patients, whose behavior is designed to be less variable than that of real patients. But despite these attenuating factors, medical students' nonverbal sensitivity had numerous significant relationships with study variables.

Although there is much remaining to be learned about how interpersonal sensitivity is best taught, the evidence from nonclinical studies suggests that short-term interventions can be effective.[36,54,55] Our evidence suggests that interpersonal sensitivity is a physician skill linked to a variety of positive indicators ranging from self- awareness to performance and patient satisfaction. We believe that there is a place for this topic in the medical school curriculum.[56]

Acknowledgment: *This work was supported by a grant to the Regenstrief Institute, Indiana University School of Medicine, from the Fetzer Institute, Kalamazoo, MI. The funding source had no involvement in data collection, analysis, or the preparation of this manuscript. There are no conflicts of interest.*

Corresponding Author: *Judith A. Hall, PhD; Department of Psychology 125 NI, Northeastern University, Boston, MA 02115, USA (e-mail: j.hall@neu.edu).*

REFERENCES

1. **Roter DL, Hall JA.** Doctors talking with patients/patients talking with doctors: improving communication in medical visits. 2nd ed. Westport, CT: Praeger; 2006.
2. **Griffin SJ, Kinmonth AL, Veltman MW, Gillard S, Grant J, Stewart M.** Effect on health-related outcomes of interventions to alter the interaction between patients and practitioners: a systematic review of trials. Ann Fam Med. 2004;2:595–608.
3. **Mead N, Bower P.** Measuring patient-centredness: a comparison of three observation-based instruments. Patient Educ Couns. 2000;39:71–80.
4. **Roter DL, Hall JA.** Physician gender and patient-centered communication: a critical review of empirical research. Ann Rev Public Health. 2004;25:497–519.
5. **Hall JA, Harrigan JA, Rosenthal R.** Nonverbal behavior in clinician-patient interaction. Applied Prev Psychol. 1995;4:21–37.
6. **Roter DL, Frankel RM, Hall JA, Sluyter D.** The expression of emotion through nonverbal behavior in medical visits. J General Int Med. 2006;21:S28–34.
7. **Schmid Mast M.** On the importance of nonverbal communication in the physician-patient interaction. Pat Educ Couns. 2007;67:315–8.
8. **Bridges K, Goldberg D.** Somatic presentation of DSM-III psychiatric disorders in primary care. J Psychosom Res. 1985;29:563–9.
9. **Ormel J, Giel R.** Medical effects of nonrecognition of affective disorders in primary care. In: Sartorious N, et al, ed. Psychological disorders in general medical settings. Lewiston, NY: CJ Hogrefe; 1990:146–58.
10. **Schulberg HC, Burns BJ.** Mental disorders in primary care: epidemiologic, diagnostic and treatment research directions. General Hosp Psychiat. 1988;10:79–87.
11. **Hall JA, Stein TS, Roter DL, Rieser N.** Inaccuracies in physicians' perceptions of their patients. Med Care. 1999;37:1164–8.
12. **Hall JA, Horgan TG, Stein TS, Roter DL.** Liking in the physician-patient relationship. Patient Educ Couns. 2002;48:69–77.
13. **Merkel WT.** Physician perception of patient satisfaction: do doctors know which patients are satisfied? Med Care. 1984;22:453–9.
14. **DiMatteo MR, Taranta A, Friedman HS, Prince LM.** Predicting patient satisfaction from physicians' nonverbal communication skill. Med Care. 1980;18:376–87.
15. **DiMatteo MR, Hays RD, Prince LM.** Relationship of physicians' nonverbal communication skill to patient satisfaction, appointment noncompliance, and physician workload. Health Psychol. 1986;5:581–94.
16. **Robbins JM, Kirmayer LJ, Cathébras P, Yaffe MJ, Dworkind M.** Physician characteristics and the recognition of depression and anxiety in primary care. Med Care. 1994;32:795–812.
17. **Tickle-Degnen L.** Working well with others: the prediction of students' clinical performance. Amer J Occup Ther. 1998;52:133–42.
18. **Roter DL, Erby LH, Hall JA, Larson S, Ellington L, Dudley W.** Nonverbal sensitivity: consequences for learning and satisfaction in genetic counseling. Health Educ. 2008;108:397–410.
19. **Hall JA, Bernieri FJ, eds.** Interpersonal sensitivity: theory and measurement. Mahwah, NJ: Lawrence Erlbaum Associates; 2001.
20. **Nowicki S, Duke MP.** Individual differences in the nonverbal communication of affect: the Diagnostic Analysis of Nonverbal Accuracy Scale. J Nonv Behav. 1994;18:9–34.
21. **Nowicki S Jr, Duke MP.** Nonverbal receptivity: the Diagnostic Analysis of Nonverbal Accuracy (DANVA). In: Hall JA, Bernieri FJ, eds. Interpersonal sensitivity: theory and measurement. Mahwah, NJ: Lawrence Erlbaum Associates; 2001:183–98.
22. **Rosenthal R, Hall JA, DiMatteo MR, Rogers PL, Archer D.** Sensitivity to nonverbal communication: the PONS test. Baltimore: The Johns Hopkins University Press; 1979.
23. **Hall JA, Andrzejewski SA, Yopchick JE.** Psychosocial correlates of interpersonal sensitivity: a meta-analysis. J Nonverbal Behav. 2009; 33:149–80.
24. **Elfenbein HA, Foo MD, White J, Tan HH, Aik VC.** Reading your counterpart: the benefit of emotion recognition accuracy for effectiveness in negotiation. J Nonv Behav. 2007;31:205–23.
25. **Byron K, Terranova S, Nowicki S Jr.** Nonverbal emotion recognition and salespersons: linking ability to perceived and actual success. J Applied Social Psychol. 2007;37:2600–19.
26. **Marsh AA, Kozak MN, Ambady N.** Accurate identification of fear facial expressions predicts prosocial behavior. Emotion. 2007;7: 239–51.
27. **Byron K.** Male and female managers' ability to 'read' emotions: relationships with supervisor's performance ratings and subordinates' satisfaction ratings. J Occup Org Psychol. 2007;80:713–33.
28. **Hall JA.** Gender effects in decoding nonverbal cues. Psychol Bull. 1978;85:845–57.
29. **Hall JA.** Nonverbal sex differences: communication accuracy and expressive style. Baltimore: The Johns Hopkins University Press; 1984.
30. **McClure EB.** A meta-analytic review of sex differences in facial expression processing and their development in infants, children, and adolescents. Psychol Bull. 2000;126:424–53.
31. **Roter DL, Hall JA, Aoki Y.** Physician gender effects in medical communication: a meta-analytic review. JAMA. 2002;288:756–64.
32. **Van Zanten M, Boulet JR, McKinley D.** Using standardized patients to assess the interpersonal skills of physicians: six years' experience with a high-stakes certification examination. Health Communic. 2007; 22:195–205.
33. **Krupat E, Rosenkranz SL, Yeager CM, Barnard K, Putnam SM, Inui TS.** The practice orientations of physicians and patients: the effect of doctor-patient congruence on satisfaction. Patient Educ Couns. 2000;39:49–59.
34. **Salovey P, Mayer JD, Goldman SL, Turvey C, Palfai TP.** In: Pennebaker JW, ed. Emotion, disclosure, and health. Washington, DC: American Psychological Association; 1995:125–54.
35. **Krupat E, Frankel R, Stein T, Irish J.** The Four Habits Coding Scheme: validation of an instrument to assess clinicians' communication behavior. Patient Educ Couns. 2006;62:38–45.
36. **Ambady N, Bernieri FJ, Richeson JA.** Toward a histology of social behavior: judgmental accuracy from thin slices of the behavioral stream. Adv Experim Social Psychol. 2000;32:201–71.
37. **Ambady N, LaPlante D, Nguyen T, Rosenthal R, Chaumeton N, Levinson W.** Surgeons' tone of voice: a clue to malpractice. Surgery. 2002;132:5–9.
38. **Haskard KB, Williams SL, DiMatteo MR, Heritage J, Rosenthal R.** The provider's voice: patient satisfaction and the content-filtered speech of nurses and physicians in primary medical care. J Nonv Behav. 2008;32:1–20.
39. **Hall JA, Roter DL, Blanch DC, Frankel RM.** Observer-rated rapport in interactions between medical students and standardized patients. Patient Educ Couns. 2009;76:323–327.
40. **Roter DL, Larson S.** The Roter Interaction Analysis System (RIAS): utility and flexibility for analysis of medical interactions. Patient Educ Couns. 2002;46:243–51.
41. **Roter DL, Hall JA, Katz NR.** Relations of physicians' task and socio-emotional behaviors to analogue patients' satisfaction, recall, and impressions. Med Care. 1987;25:437–50.
42. **Schmid Mast M, Klockner C, Hall JA.** Physician gender affects how physician nonverbal behavior is related to patient satisfaction. Med Care. 2008;46:1212–8.
43. **Nowicki S.** DANVA 2: instruction manual for the receptive tests of the Diagnostic Analysis of Nonverbal Accuracy 2. Atlanta: Department of Psychology, Emory University: no date.
44. **Evans BJ, Stanley RO, Burrows GD, Sweet B.** Comparison of skills related to effectiveness of consultations: an Australian sample of medical students. Psychol Reports. 1987;61:419–22.
45. **Evans BJ, Coman GJ, Stanley RO.** Scores on the Profile of Nonverbal Sensitivity: a sample of Australian medical students. Psychol Reports. 1988;62:903–6.
46. **Mechanic D, McAlpine DD, Rosenthal M.** Are patients' office visits with physicians getting shorter? NEJM. 2001;344:198–204.
47. **Bensing JM, van den Brink-Muinen A, de Bakker DH.** Gender differences in practice style: a Dutch study of general practitioners. Med Care. 1993;31:219–29.
48. **DHHS**. Publication No. (PHS) 80–1710. Characteristics of visits to female and male physicians. The National Ambulatory Medical Care Survey, United States, 1977, Series 13, Number 39, June 1980.
49. **Hall JA, Roter DL, Rand CS.** Communication of affect between patient and physician. J Health Social Behav. 1981;22:18–30.
50. **Roter DL.** Patient participation in the patient-provider interaction: the effects of patient question asking on the quality of interaction, satisfaction, and compliance. Health Educ Monog. 1977;50:281–315.
51. **Kaplan SH, Greenfield S, Ware JE.** Assessing the effects of physician-patient interactions on the outcomes of chronic disease. Med Care. 1989;27:S110–27.

52. **Richard FD, Bond CF Jr, Stokes-Zoota JJ.** One hundred years of social psychology quantitatively described. Rev Gen Psychol. 2003;7: 331–63.
53. **Hall JA.** The PONS test and the psychometric approach to measuring interpersonal sensitivity. In: Hall JA, Bernieri FJ, eds. Interpersonal sensitivity: theory and measurement. Mahwah, NJ: Lawrence Erlbaum Associates; 2001:143–60.
54. **Costanzo M.** Training students to decode verbal and nonverbal cues: effects of confidence and performance. J Educ Psychol. 1992;84:308–13.
55. **Gillis JS, Bernieri FJ, Wooten E.** The effects of stimulus medium and feedback on the judgment of rapport. Org Behav Hum Decis Processes. 1995;63:33–45.
56. **Satterfield JM, Hughes E.** Emotion skills training for medical students: a systematic review. Med Educ. 2007;41:935–41.