Research

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Impact of physician empathy on patient outcomes:

a gender analysis

Abstract

Background
Empathy in primary care settings has been linked to improved health outcomes. However, the operationalisation of empathy differs between studies, and, to date, no study has concurrently compared affective, cognitive, and behavioural components of empathy regarding patient outcomes. Moreover, it is unclear how gender interacts with the studied dimensions.

Aim
To examine the relationship between several empathy dimensions and patient-reported satisfaction, consultation's quality, and patients' trust in their physicians, and to determine whether this relationship is moderated by a physician's gender.

Design and setting
Analysis of the empathy of 61 primary care physicians in relation to 244 patient experience questionnaires in the French-speaking region of Switzerland.

Method
Sixty-one physicians were video-recorded with two male and two female patients. Six different empathy measures were assessed: two self-reported measures, a facial recognition test, two external observational measures, and a Synchrony of Vocal Mean Fundamental Frequencies (SVMFF), measuring vocally coded emotional arousal. After the consultation, patients indicated their satisfaction with, trust in, and quality of the consultation.

Results
Female physicians self-rated their empathic concern higher than their male counterparts did, whereas male physicians were more vocally synchronised (in terms of frequencies of speech) to their patients. SVMFF was the only significant predictor of all patient outcomes. Verbal empathy statements were linked to higher satisfaction when the physician was male.

Conclusion
Gender differences were observed more often in self-reported measures of empathy than in external measures, indicating a probable social desirability bias. SVMFF significantly predicted all patient outcomes, and could be used as a cost-effective proxy for relational quality.

Keywords
empathy; empathy measures; facial emotion recognition; general practice; patient-reported outcome measures; satisfaction; self report; gender; stereotypes.

INTRODUCTION

Empathy in primary care settings has been linked to improved health outcomes, such as patient satisfaction, adherence to treatment, and, by trickle effect, fewer malpractice complaints.[1] However, there is as yet no consensus on the definition and operationalisation of empathy, making cross-study comparisons challenging.[2]

A comprehensive definition of empathy has been proposed by Decety and Jackson: *'Feeling what another person is feeling, knowing what another person is feeling, and having the intention to respond compassionately to another person's distress.'*[3] This distinguishes affective, cognitive, and behavioural components of empathy. When it comes to the operationalisation of empathy, instruments used to measure these components can be classified into three categories: self-reported questionnaires (level of agreement with various empathy-oriented statements describing oneself), tests (performance tasks in which there is a correct empathic answer), and observational ratings (behaviours coded by external evaluators). Many studies have reported on the beneficial impact of physicians' empathy;[4,5] nevertheless, no study has concurrently compared these different measures in regard to patient outcomes. Different outcomes are expected, because self-reported empathy, tests, and observed empathy do not measure precisely the same construct of empathy.[6] Moreover, self-reported measures are more prone to biases (for example, social desirability)[7–9] than other measures.

Literature shows that empathy is highly influenced by gender. Stereotypically, females are considered more prosocial than males,[10,11] and female physicians self-assess their empathy higher than male physicians do.[12] Though females are expected to show more empathy,[13] it is unclear whether gender differences can be observed across different types of empathy measures. If this difference is primarily driven by gender stereotypes, it is likely that more gender differences will be observed in self-reported questionnaires than in tests or external observations of empathy.[7,14] On the contrary, if empathy is indeed more enacted by female physicians as a result of natural predisposition and/or social construct,[15] gender differences will be observed in tests and external observations of empathy as well. Finally, patients may evaluate the display of empathy differently when standing in front of a male or female physician. Indeed, patients positively evaluate female physicians behaving in line with expected gender roles (softer voice, less dominance), whereas, for their male counterparts, a larger range of behaviour is related to patient satisfaction.[16]

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The present project strives to fill in the literature gap regarding the concurrent analysis of different empathy dimensions with a gender perspective. The specific aims of this study are to investigate gender differences in six different empathy measures, compare these empathy measures regarding their relation to patient outcomes, and determine whether physicians' gender impacts this relationship.

METHOD

Study design and participants

The present study is a secondary analysis of data collected for a physician–patient communication study that received ethical approval from the regional ethic committees.[17] More than 400 GPs in the French-speaking region of Switzerland were contacted to participate in a study on patient–physician communication. In total, 61 physicians (43% female) participated in the study. This represents a convenience sample. After being enrolled in the study, they filled in online questionnaires and took a test measuring their empathy and sociodemographic information.

Each participating physician was then video-recorded with the first two female and first two male patients agreeing to participate (recruited in the waiting room during a usual day of consultation), ending with 244 video-recorded consultations. Participating patients had to be aged >18 years, fluent in French, and present no documented psychiatric disorder. At the end of the consultation, patients indicated sociodemographic characteristics, as well as their satisfaction with the consultation, quality of the consultation, and their trust in the physician.

Measures

This study compared six different measures of empathy measured through self-reported questionnaires, an online test, and external observation (Table 1).

Self-reported questionnaires of empathy. Physicians' self-reported empathy was measured with two subscales of the Interpersonal Reactivity Index,[18] known for its internal consistency.[19] In the present study, the empathic concern subscale was used (which measured affective empathy), as was the perspective-taking subscale (which measured cognitive empathy).

Empathy test. Physicians filled in a validated emotion recognition test (the Diagnostic Analysis of Nonverbal Accuracy [DANVA])[20] online. It consisted of 24 pictures of faces displaying one of four emotions (happiness, sadness, anger, or fear). Each picture was presented for 2 seconds, and the participant indicated which emotion was displayed. The final score was the number of emotions correctly recognised.

Observational empathy. Three external observational empathy assessments were included in the present study.

Verbal empathy statements (VES) were measured with the Roter interaction analysis system (RIAS),[21] a validated coding system specifically designed for medical interactions. Certified coders classified the physician's speech into 41 categories. To measure VES, a cluster used in previous studies in the field was applied.[22] The number of statements for the categories 'Empathy', 'Shows concern or worry', 'Reassures, encourages or shows optimism', and 'Legitimise' (see Table 1 for more details) were aggregated and divided by the total number of intelligible statements.

Overall rating of physicians' empathy was coded using the Therapist Empathy Scale (TES), a nine-item scale measuring behavioural display of empathy that showed internal consistency in past research.[23]

The Synchrony of Vocal Mean Fundamental Frequencies (SVMFF) has been proposed as a cost-effective alternative to the very time-consuming behavioural coding.[24] This measure is based on the assumption that two individuals tend to synchronise their behaviour in highly empathic interactions,[24–27] and thus are expected to synchronise their mean

Table 1. Measures of physician's empathy: items, scales, missing, and Cronbach's α

Variables

Self-reported measures

Empathic concern

Seven items: for example, 'I am often quite touched by things that I see happen.'
Scale: 1 = 'Does not describe me well', 2 = 'Rarely describes me well', 3 = 'Sometimes describes me well',
4 = 'Most of the time describes me well', 5 = 'Describes me very well'
Score: Mean of the seven items (after reversing specific reversed items)
n = 58 physicians; missing values: n = 3 (4.9%), Cronbach's α = .70

Perspective taking

Seven items: for example, 'Before criticising somebody, I try to imagine how I would feel if I were in their place.'
Scale: 1 = 'Does not describe me well', 2 = 'Rarely describes me well', 3 = 'Sometimes describes me well',
4 = 'Most of the time describes me well', 5 = 'Describes me very well'
Score: Mean of the seven items (after reversing specific reversed items)
n = 58 physicians; missing values: n = 3 (4.9%), Cronbach's α = .77

Empathy online test

DANVA

Participants are asked to determine which emotion is displayed in 24 portraits (happiness, sadness, anger, or fear)
Scale: 0 = 'False', 1 = 'Correct'
Score: sum of the number of emotions correctly recognised (0 to 24)
N = 58 physicians; missing values: n = 3 (4.9%), Cronbach's α = .52

External coding of empathy

VES with RIAS

Aggregation of the statement frequencies of four categories (physician statements only): *empathy* (paraphrasing, interpreting, recognising, or naming other's emotional state), *shows concern or worry* (indicates that a condition/event is serious, worrisome, distressing, or deserving special attention), *reassurance* (indicates optimism, encouragement, relief of worry, or reassurance), and *legitimise* (indicates that the other's actions, emotions, or thoughts are understandable and normal)
Scale: number of statements per category divided by the total number of statements
Score: mean across the four categories
n = 243 sessions; missing values: n = 1 (0.4%)

TES

Nine items assessing affective, cognitive, and attitudinal aspects of the physician's empathy such as concern for the patient, warmth, or understanding of the patient's feelings.
Scale: 1 = 'no display of empathy', 7 = 'extensive display of empathy'
Score: mean across the nine items
n = 241 sessions; missing values: n = 3 (1.2%)

SVMFF

Degree of synchrony of mean fundamental frequency of patient's and physician's voices
Estimates read as correlation coefficients [–1 to +1], positive estimates indicating higher synchrony.
n = 202 sessions; missing values: n = 40 ([19.6%).

DANVA = Diagnostic Analysis of Nonverbal Accuracy. RIAS = Roter interaction analysis system. SVMFF = Synchrony of Vocal Mean Fundamental Frequencies. TES = Therapist Empathy Scale. VES = verbal empathy statements.

fundamental frequency (MFF), which relates to emotional arousal.[28] Patients' and physicians' MFF was automatically measured every 0.25 seconds using Praat software version 5.3.82. The correlation between the patient's and physician's MFF was then computed across minutes while controlling for physician's and patient's gender (see Gaume *et al*[29] and Baldwin *et al*[30] for model details), ending with SVMFF scores ranging from –1 = total dyssynchrony (for example, patient displaying elevation of voice pitch while physician uses low pitch) to 1 = total synchrony.

Patient outcomes

Patient outcomes were measured with three commonly used measures in healthcare studies: satisfaction, quality of consultation, and trust. These measures have been shown to relate to positive clinical outcomes such as less work impediment,[31] better adherence to treatment,[32,33] or higher quality of life,[34] and were thus used as indicators of medical outcomes. Clinical outcomes were not measured as such. Satisfaction with the consultation was measured with the reversed single item: 'I am not completely satisfied with my consultation with this doctor'. Quality of the consultation was assessed with the reversed single item: 'Certain aspects of my consultation with this doctor could have been improved'. Both items originate from a validated scale[35,36] and have shown good reliability in previous research.[37–39] Finally, patients indicated their trust in the physician with the average (Cronbach's α = .73) of four items (for example, 'I completely trust my doctor's decisions about which treatments are best for me').

All outcome items were rated on a scale from 1 (do not at all agree) to 5 (completely agree). Because of the important ceiling effect (between 47% and 84% of the patients giving the maximum score), the outcome measures were dichotomised into two categories as follows: best score (5) versus any other score (1–4).

Covariates

Four covariates were included: patient gender, frequency of consultations with this physician, years since first consultation with this physician, and physician clinical experience (aggregation of physician's age, years since graduation, years of practice, and years since start of private practice; Cronbach's α = .97).

Statistical analysis

To investigate gender differences in the six empathy measures, separate independent sample *t*-tests were run comparing female and male physicians' scores for each measure. Owing to skewness (indices between –0.94 and 0.94), nonparametric tests were also run, which showed similar results and are not presented in the result section.

To compare the different empathy measures regarding their relation to patient outcomes, and to determine whether the physician's gender impacted this

Table 2. Descriptive statistics

Physicians' variables	Female physicians (N = 26)					Male physicians (N = 35)					t-test
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max	t
Age	25	50.5	9.1	33	70	33	51.6	8.1	39	65	0.99
Years since graduation, n	25	23.5	9.1	3	42	33	25.8	8.2	13	40	1.98[d]
Years since beginning medical practice, n	25	23.4	8.4	10	41	33	24.6	8.1	13	40	1.17
Years since beginning private practice, n	25	12.5	8.8	1	33	33	16.6	10.1	2	34	3.29[e]
Physician's clinical experience (years)	25	27.5	8.4	14.8	46.5	33	29.7	8.4	17	44.5	1.98[d]
Working time (%)	25	72.8	17.8	48	100	33	95.2	10.2	60	100	12.11[e]
Patients' satisfaction with consultation[a]	104	4.7	0.8	1	5	140	4.8	0.7	1	5	0.30
Patients' evaluation of consultation quality[b]	104	4.2	1.1	1	5	140	4.2	1.2	1	5	0.21
Patient's trust in physician[c]	104	4.6	0.5	3.25	5	140	4.6	0.6	2.5	5	0.78

Patients' variables	Female patients (N = 122)					Male patients (N = 122)					t-test
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max	t
Age	122	57.3	18.5	18	97	122	57.7	17.5	19	91	0.18
Years since first consultation with this physician	122	9.4	9.3	0	43	121	9.3	9.7	0	44	0.07
Patients' satisfaction with consultation[a]	122	4.8	0.6	2	5	122	4.7	0.9	1	5	1.56
Patients' evaluation of consultation quality[b]	122	4.3	1.2	1	5	122	4.1	1.1	1	5	1.09
Patient's trust in physician[c]	122	4.6	0.6	2.5	5	122	4.6	0.5	3.25	5	0.27

Education	n	%				n	%				χ^2
Compulsory secondary education	33	27.1				22	18.0				4.68
Vocational training	51	41.8				58	47.5				
Tertiary education	23	18.9				23	18.9				
Advanced studies	14	11.5				15	12.3				
Bachelor's degree	1	0.8				3	2.5				
Master's degree	—	—				1	0.8				
Doctorate	—	—				—	—				
Frequency of visits to this physician per year[f]											
Less than once a year	19	15.7				18	14.8				1.37
Once or twice a year	30	24.8				35	28.7				
3 or 4 times a year	28	23.1				28	23.0				
5 or 6 times a year	11	9.1				14	11.5				
>6 times a year	33	27.3				27	22.1				
Severity of reason for consultation											
Not severe at all	59	48.4				48	39.3				9.83
Moderately severe	43	35.3				50	41.0				
Severe	18	14.8				15	12.3				
Very severe	1	0.8				8	6.6				
Extremely severe	1	0.8				1	0.8				

[a]Scale: 1 = Very bad satisfaction, 2 = Bad satisfaction, 3 = OK satisfaction, 4 = Good satisfaction, 5 = Excellent satisfaction. [b]Scale: 1 = Very bad quality, 2 = Bad quality, 3 = OK quality, 4 = Good quality, 5 = Excellent quality. [c]Scale: 1 = Very bad trust, 2 = Bad trust, 3 = OK trust, 4 = Good trust, 5 = Excellent trust. [d]P<0.05. [e]P<0.001. [f]Data missing, n = 1. SD = standard deviation.

relationship, 18 logistic regression models were run (six empathy measures times three outcomes). Finally, these logistic regression models were replicated with an interaction term between physician's gender and the empathy measure to test for gender effect on the relation between empathy and patient outcome. Each model controlled for the four covariates. Robust estimation was applied and the nested structure of the data (four patients nested in each physician) was accounted for with standard errors (SEs) adjusted for the clustering of the data. All analyses were performed using Stata (version 13.0).

RESULTS

Male and female physicians did not significantly differ in terms of age and experience. However, they differed in the number of years since their beginning of private practice (average of 2.9 years later for females, adjusting for age), and in their working hours, with more females working

part-time (Table 2). When it came to patients, males and females were similar in terms of age, education, severity of reason for consultation, and frequency of visits with this physician (Table 2). The patients participating in the present study had a slightly lower level of education on average, but similar age and health status compared with the general practice patients of other Swiss studies.[40–42]

T-tests analysing physician gender differences in empathy measures showed that most empathy measures (4/6) did not significantly differ between female and male physicians (Table 3). Nevertheless, female physicians self-rated their empathic concern significantly higher than male physicians did, and male physicians were significantly more vocally synchronised with their patient compared with female physicians.

As shown in Table 4, the logistic regressions testing the relationship between the empathy measures and the patient outcomes showed that SVMFF was the only empathy measure related to patient outcomes. Additional logistic regression models with the interaction term between physician's gender and empathy showed that the physician's gender did not significantly impact the relation between empathy measures and patient outcomes, except for VES on patient satisfaction. In this model, a significant interaction was observed between VES and physician's gender (χ^2 = 18.28, *P*<0.05, odds ratio [OR] = 1.33, SE = 0.18, *P*<0.05). This result indicates that VES was linked to lower patient satisfaction when the physician was female, but to higher satisfaction when the physician was male.

DISCUSSION

Summary

This study aimed to compare six different empathy measures in relation to patient outcomes and physician gender. The study points out the influence of gender

Table 3. Independent sample *t*-tests for empathy measures between female and male physicians

Variables	Female physicians			Male physicians			*t*-test			
	Mean	SD	95% CI	M	SD	95% CI	*t*	DF	*P*-value	Cohen's *d*
Empathic concern	4.27	0.37	4.13 to 4.42	3.93	0.52	3.75 to 4.12	2.80	56	0.007[a]	.75
Perspective taking	3.78	0.53	3.56 to 3.99	3.72	0.63	3.50 to 3.96	0.30	56	0.763	.08
DANVA	18.08	2.70	16.99 to 19.17	18.06	2.53	17.15 to 18.97	0.02	56	0.983	.01
VES	0.69	0.48	0.60 to 0.78	0.66	0.50	0.58 to 0.75	0.44	241	0.659	.06
TES	3.43	0.77	3.28 to 3.58	3.25	0.76	3.12 to 3.38	1.84	239	0.067	.24
SVMFF	0.29	0.29	0.23 to 0.36	0.41	0.22	0.37 to 0.45	3.14	202	0.002[a]	.45

[a]*P*<0.01. CI = confidence interval. DANVA = Diagnostic Analysis of Nonverbal Accuracy. DF = degrees of freedom. SD = standard deviation. SVMFF = Synchrony of Vocal Mean Fundamental Frequencies. TES = Therapist Empathy Scale. VES = verbal empathy statements.

Table 4. Logistic regression analysis of empathy dimensions predicting satisfaction, quality, and trust outcomes

	Satisfaction			Quality			Trust		
	OR	SE	95% CI	OR	SE	95% CI	OR	SE	95% CI
Empathic concern[a]	0.43	0.23	0.15 to 1.25	0.64	0.16	0.39 to 1.06	0.70	0.26	0.34 to 1.47
Perspective taking[a]	1.10	0.34	0.60 to 2.03	0.72	0.22	0.39 to 1.32	0.62	0.16	0.38 to 1.03
DANVA[a]	1.10	0.10	0.92 to 1.30	1.00	0.05	0.90 to 1.12	0.93	0.06	0.82 to 1.05
VES[a]	0.96	0.06	0.84 to 1.09	1.03	0.05	0.95 to 1.14	1.00	0.05	0.91 to 1.10
TES[a]	1.76	0.64	0.86 to 3.57	1.21	0.26	0.79 to 1.84	1.09	0.22	0.74 to 1.61
SVMFF[a]	4.59[b]	3.01	1.27 to 16.56	11.69[c]	7.85	3.14 to 43.56	3.61[b]	2.07	1.17 to 11.13

[a]*Each empathy measure was run in independent logistic regressions; ending with a total of six models for each outcome (that is, 18 models). Every model included the following covariates: frequency of consultations with this physician, time since the first consultation with this physician, an aggregate of highly correlated indicators of physician experience (physician's age, number of years since graduation, number of years of practice, and year of the start of private practice), and the patient's gender.* [b]*P*<0.05. [c]*P*<0.001 CI = confidence interval. DANVA = Diagnostic Analysis of Nonverbal Accuracy. OR = odds ratio. SE = standard error. SVMFF = Synchrony of Vocal Mean Fundamental Frequencies. TES = Therapist Empathy Scale. VES = verbal empathy statements.

stereotype on self-reported empathy, with male physicians self-reporting lower empathic concern, but not differing from female physicians in most behaviourally based empathy measures. The divergent results between emotional concern and behavioural demonstration of empathy or emotion recognition tests could suggest that self-reported measures were influenced by gender stereotypes, that is, female physicians aligning their self-reported empathic concern with the stereotypical prosocial characteristics expected for their gender.[7] Nevertheless, it is also possible that the number of opportunities to demonstrate empathy during these general practice consultations were too few, impeding the detection of any difference between female and male general physicians.

Synchrony measured with SVMFF showed a significant gender difference, with male physicians showing higher synchrony than their female counterparts. However, unlike the other empathy measures, synchrony was computed while considering both patient's and physician's behaviour. It may be the case that it was actually the patients who synchronised their vocal frequencies more when facing a male physician, and not the other way around. This could indicate that patients reacted to the status of power usually attributed to males (especially male physicians)[43] by aligning their vocal frequency to them. More studies are needed to back up this hypothesis.

Counterintuitively, whereas numerous studies have underlined the beneficial impact of empathy on patients' outcomes,[1,4,10,44–49] this study revealed very few significant relationships between the empathy measures and patient outcomes, SVMFF being the only measure positively related to all outcomes. The setting of this study in primary care, with patients consulting for varied reasons (such as hypertension control or laboratory test feedback) may not have been the ground for an extensive demonstration of empathy. Thus, empathic display might have not been expected or acknowledged by the patients, explaining why empathy measures failed to predict outcomes. Moreover, synchrony may show different results compared with the other empathy measures, because it encompasses a broader concept than strictly empathy and could be considered as a proxy for relationship quality.

A higher count of VES was related to lower likelihood of patient satisfaction within consultations led by female physicians. This indicates that male physicians might be better rewarded than females when

expressing their empathy. On the other hand, it is more surprising to observe that female physicians' verbal empathy is related to less patient satisfaction. As other studies in the field suggest,[50] female physicians' verbal display of empathy might actually trigger more patient empowerment and enable them to feel more confident and dare to express more negative feedback, but more studies are needed to assess this.

Strengths and limitations
The main strength of this study was to compare six measures of empathy covering the affective, cognitive, and behavioural components of empathy with outcomes. A variety of empathy measures was used (self-reported assessments, emotion recognition test, as well as external coding and a novel cost-effective proxy measure of empathy). However, VES and SVMFF encompass broader aspects of patient–physician communication than strictly empathy. In any case, the patient outcomes measured in the present study showed a typical high-ceiling effect, which lowered the variance that could be explained by the statistical models. Furthermore, the context of general practice might carry fewer or subtler opportunities for empathic display as compared with other settings such as psychiatry or oncology.[51–54] Moreover, the sample of voluntary physicians, who tend to be interested in medical communication, have high interpersonal skills. This may have lowered the chances of revealing more important gender differences. Thus, the results of the present study may not be generalisable to the whole GP population.

Comparison with existing literature
This study's results showed that female physicians self-reported higher emotional concern than their male counterparts did, in line with existing literature regarding medical students[12,55,56] and physicians.[12] Similar results were reported in non-medical settings in youth[57] and adults.[58]

Synchrony measured with SVMFF showed a significant gender difference, with male physicians showing higher synchrony than their female counterparts. Unfortunately, research on synchrony of voice frequency in clinical settings is rare, and studies focusing on other types of synchrony (facial mimicry, position, gesture, or lexical field alignment) report gender-aggregated data[24,59] or use same-gender dyads,[26,60,61] impeding any conclusions regarding gender-dyad differences.

SVMFF significantly predicted all patient outcomes. This result corroborates

precedent studies showing that synchrony *'embodies the patients' self-reported quality of the relationship'*[26] and is positively related to better medical outcomes,[62] therapeutic alliance,[63] and interpersonal trust.[64]

VES was only related to higher satisfaction within male-conducted consultations, in line with other studies reporting that male physicians seem to be better rewarded than females for their use of a patient-centred communication style,[65,66] and that female physicians with better emotional recognition skills receive more ambivalent patient reactions than their male counterparts.[50]

Implications for research

In the present study, self-reported empathy displayed more gender differences in comparison with other coded empathy.

This result challenges the common notion that female physicians are more empathic than their male counterparts, and asks questions about the influence of gender stereotypes and gender expectations on empathy. Nevertheless, opportunities to demonstrate empathy may have been too rare in the present study's setting, and more research should be conducted in fields where empathy is more central, such as in oncology, palliative care, or psychiatry. SVMFF significantly predicted patient outcomes, and could be used as a cost-effective proxy for relational quality in future studies. As SVMFF showed a significant gender difference, more gender studies of synchrony should be conducted in clinical settings to understand gender-dyad dynamics of synchrony.

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REFERENCES

1. Decety J, Fotopoulou A. Why empathy has a beneficial impact on others in medicine: unifying theories. *Front Behav Neurosci* 2015; **8:** 457.

2. Levy J. A note on empathy. *New Ideas Psychol* 1997; **15(2):** 179–184.

3. Decety J, Jackson PL. The functional architecture of human empathy. *Behav Cogn Neurosci Rev* 2004; **3(2):** 71–100.

4. Bertakis KD, Roter D, Putnam SM. The relationship of physician medical interview style to patient satisfaction. *J Fam Pract* 1991; **32(2):** 175–181.

5. Roter DL, Hall JA, Katz NR. Relations between physicians' behaviors and analogue patients' satisfaction, recall, and impressions. *Med Care* 1987; **25(5):** 437–451.

6. Jarski RW, Gjerde CL, Bratton BD, *et al.* A comparison of four empathy instruments in simulated patient–medical student interactions. *J Med Educ* 1985; **60(7):** 545–551.

7. Gerdes KE, Segal EA, Lietz CA. Conceptualising and measuring empathy. *Br J Soc Work* 2010; **40(7):** 2326–2343.

8. Colley RC, Butler G, Garriguet D, *et al.* Comparison of self-reported and accelerometer-measured physical activity in Canadian adults. *Health Rep* 2018; **29(12):** 3–15.

9. Flegal KM, Ogden CL, Fryar C, *et al.* Comparisons of self-reported and measured height and weight, BMI, and obesity prevalence from national surveys: 1999–2016. *Obesity* (Silver Spring) 2019; **27(10):** 1711–1719.

10. Chaitoff A, Sun B, Windover A, *et al.* Associations between physician empathy, physician characteristics, and standardized measures of patient experience. *Acad Med J Assoc Am Med Coll* 2017; **92(10):** 1464–1471.

11. Espinosa MP, Kovářík J. Prosocial behavior and gender. *Front Behav Neurosci* 2015; **9:** 8.

12. Hojat M, Gonnella JS, Nasca TJ, *et al.* Physician empathy: definition, components, measurement, and relationship to gender and specialty. *Am J Psychiatry* 2002; **159(9):** 1563–1569.

13. Schmid Mast M, Hall JA, Roter DL. Disentangling physician sex and physician communication style: their effects on patient satisfaction in a virtual medical visit. *Patient Educ Couns* 2007; **68(1):** 16–22.

14. Eisenberg N, Lennon R. Sex differences in empathy and related capacities. *Psychol Bull* 1983; **94:** 100–131.

15. Krieger N. Measures of racism, sexism, heterosexism, and gender binarism for health equity research: from structural injustice to embodied harm — an ecosocial analysis. *Annu Rev Public Health* 2020; **41(1):** 37–62.

16. Schmid Mast M, Hall JA, Klöckner C, Choi E. Physician gender affects how physician nonverbal behavior is related to patient satisfaction. *Med Care* 2008; **46(12):** 1212–1218.

17. Carrard V, Schmid Mast M, Jaunin-Stalder N, *et al.* Patient-centeredness as physician behavioral adaptability to patient preferences. *Health Commun* 2018; **33(5):** 593–600.

18. Davis MH. A multidimensional approach to individual differences in empathy. *J Pers Soc Psychol* 1980; **10:** 85.

19. Hemmerdinger JM, Stoddart SD, Lilford RJ. A systematic review of tests of empathy in medicine. *BMC Med Educ* 2007; **7(1):** 24.

20. Nowicki S, Duke MP. Individual differences in the nonverbal communication of affect: the diagnostic analysis of nonverbal accuracy scale. *J Nonverbal Behav* 1994; **18(1):** 9–35.

21. Roter D, Larson S. The Roter interaction analysis system (RIAS): utility and flexibility for analysis of medical interactions. *Patient Educ Couns* 2002; **46(4):** 243–251.

22. Watanabe S, Yoshida T, Kono T, *et al.* Relationship of trainee dentists' self-reported empathy and communication behaviors with simulated patients' assessment in medical interviews. *PLoS One* 2018; **13(12):** e0203970.

23. Decker SE, Nich C, Carroll KM, Martino S. Development of the therapist empathy scale. *Behav Cogn Psychother* 2014; **42(3):** 339–354.

24. Imel ZE, Barco JS, Brown HJ, *et al.* The association of therapist empathy and synchrony in vocally encoded arousal. *J Couns Psychol* 2014; **61(1):** 146–153.

25. Cattaneo L, Rizzolatti G. The mirror neuron system. *Arch Neurol* 2009; **66(5):** 557–560.

26. Ramseyer F, Tschacher W. Nonverbal synchrony in psychotherapy: coordinated body movement reflects relationship quality and outcome. *J Consult Clin Psychol* 2011; **79(3):** 284–295.

27. Finset A, Ørnes K. Empathy in the clinician–patient relationship: the role of reciprocal adjustments and processes of synchrony. *J Patient Exp* 2017; **4(2):** 64–68.

28. Juslin PN, Scherer KR. Vocal expression of affect. In: Harrigan J, Rosenthal R, Scherer KR, eds. *The new handbook of methods in nonverbal behavior research*. New York, NY: Oxford University Press, 2005: 65–135.

29. Gaume J, Hallgren KA, Clair C, *et al.* Modeling empathy as synchrony in clinician and patient vocally encoded emotional arousal: a failure to replicate. *J Couns Psychol* 2019; **66(3):** 341–350.

30. Baldwin SA, Imel ZE, Braithwaite SR, Atkins DC. Analyzing multiple outcomes in clinical research using multivariate multilevel models. *J Consult Clin Psychol* 2014; **82(5):** 920–930.

31. Wickizer TM, Franklin G, Fulton-Kehoe D, *et al.* Patient satisfaction, treatment experience, and disability outcomes in a population-based cohort of injured workers in Washington State: implications for quality improvement: injured workers and implications for quality improvement. *Health Serv Res* 2004; **39(4p1):** 727–748.

32. Ortega F, Otero A, Crespo JF, *et al.* Satisfaction and adherence with immunosuppressant treatment in renal transplant patients living with a working graft. *J Nephrol* 2013; **26(2):** 297–305.

33. Lee Y-Y, Lin JL. The effects of trust in physician on self-efficacy, adherence and diabetes outcomes. *Soc Sci Med* 2009; **68(6):** 1060–1068.

34. Yildirim A. The importance of patient satisfaction and health-related quality of life after renal transplantation. *Transplant Proc* 2006; **38(9):** 2831–2834.

35. Langewitz W, Keller A, Denz M, *et al.* [The Patient Satisfaction Questionnaire: a suitable tool for quality control in the physician–patient relationship?]. [Article in German]. *Psychother Psychosom Med Psychol* 1995; **45(9–10):** 351–357.

36. Thayaparan AJ, Mahdi E. The Patient Satisfaction Questionnaire Short Form (PSQ-18) as an adaptable, reliable, and validated tool for use in various settings. *Med Educ Online* 2013; **18:** 21747.

37. Cousin G, Schmid Mast M. Trait-agreeableness influences individual reactions to a physician's affiliative behavior in a simulated bad news delivery. *Health Commun* 2016; **31(3):** 320–327.

38. Cousin G, Schmid Mast M, Jaunin-Stalder N. Finding the right interactional temperature: do colder patients need more warmth in physician communication style? *Soc Sci Med* 2013; **98:** 18–23.

39. Cousin G, Schmid Mast M, Roter DL, Hall JA. Concordance between physician communication style and patient attitudes predicts patient satisfaction. *Patient Educ Couns* 2012; **87(2):** 193–197.

40. Rachamin Y, Meier R, Grischott T, *et al.* General practitioners' consultation counts and associated factors in Swiss primary care — a retrospective observational study. *PLoS One* 2019; **14(12):** e0227280.

41. Sebo P, Herrmann FR, Bovier P, Haller DM. What are patients' expectations about the organization of their primary care physicians' practices? *BMC Health Serv Res* 2015; **15:** 328.

42. Jaworski M, Rzadkiewicz M, Adamus M, *et al.* Primary care patients' expectations regarding medical appointments and their experiences during a visit: does age matter? *Patient Prefer Adherence* 2017; **11:** 1221–1233.

43. Schmid Mast M. Dominance and gender in the physician–patient interaction. *J Men Health Gend* 2004; **1:** 354–358.

44. Derksen F, Bensing J, Lagro-Janssen A. Effectiveness of empathy in general practice: a systematic review. *Br J Gen Pract* 2013; DOI: https://doi.org/10.3399/bjgp13X660814.

45. Derksen F, Bensing J, Kuiper S, *et al.* Empathy: what does it mean for GPs? A qualitative study. *Fam Pract* 2015; **32(1):** 94–100.

46. Derksen FA, Hartman TO, Lagro-Janssen T. The human encounter, attention, and equality: the value of doctor–patient contact. *Br J Gen Pract* 2020; DOI: https://doi.org/10.3399/bjgp20X709817.

47. Kurtz J, Steenbergh K, Kessler J, *et al.* 'What I wish my surgeon knew': a novel approach to promote empathic curiosity in surgery. *J Surg Educ* 2019; **77(1):** 82–87.

48. Ong LM, de Haes JC, Hoos AM, Lammes FB. Doctor–patient communication: a review of the literature. *Soc Sci Med* 1995; **40(7):** 903–918.

49. Ridd M, Shaw A, Lewis G, Salisbury C. The patient–doctor relationship: a synthesis of the qualitative literature on patients' perspectives. *Br J Gen Pract* 2009; DOI: https://doi.org/10.3399/bjgp09X420248.

50. Hall JA, Roter DL, Blanch DC, Frankel RM. Nonverbal sensitivity in medical students: implications for clinical interactions. *J Gen Intern Med* 2009; **24(11):** 1217–1222.

51. Elliott R, Bohart AC, Watson JC, Murphy D. Therapist empathy and client outcome: an updated meta-analysis. *Psychotherapy* (Chic) 2018; **55(4):** 399–410.

52. Elliott R, Bohart AC, Watson JC, Greenberg LS. Empathy. *Psychotherapy* (Chic) 2011; **48(1):** 43–49.

53. Dahl H-SJ, Høglend P, Ulberg R, *et al.* Does therapists' disengaged feelings influence the effect of transference work? A study on countertransference. *Clin Psychol Psychother* 2017; **24(2):** 462–474.

54. Kallergis G. [The contribution of the relationship between therapist-patient and the context of the professional relationship]. [Article in Greek]. *Psychiatriki* 2019; **30(2):** 165–174.

55. Hojat M, Gonnella JS. Eleven Years of Data on the Jefferson Scale of Empathy-Medical Student Version (JSE-S): Proxy Norm Data and Tentative Cutoff Scores. *Med Princ Pract* 2015; **24(4):** 344–350.

56. Bratek A, Bulska W, Bonk M, *et al.* Empathy among physicians, medical students and candidates. *Psychiatr Danub* 2015; **27 Suppl 1:** S48–S52.

57. Macaskill A, Maltby J, Day L. Forgiveness of self and others and emotional empathy. *J Soc Psychol* 2002; **142(5):** 663–665.

58. Schieman S, Van Gundy K. The personal and social links between age and self-reported empathy. *Soc Psychol Q* 2000; **63(2):** 152–174.

59. Schmid Mast M, Hall JA, Roter DL. Caring and dominance affect participants' perceptions and behaviors during a virtual medical visit. *J Gen Intern Med* 2008; **23(5):** 523–527.

60. Fujiwara K, Kimura M, Daibo I. Gender differences in synchrony: females in sync during unstructured dyadic conversation. *Eur J Soc Psychol* 2019; **49(5):** 1042–1054.

61. Goldstein P, Losin EAR, Anderson SR, *et al.* Clinician–patient movement synchrony mediates social group effects on interpersonal trust and perceived pain. *J Pain* 2020; **21(11–12):** 1160–1174.

62. Hamel LM, Moulder R, Albrecht TL, *et al.* Nonverbal synchrony as a behavioural marker of patient and physician race-related attitudes and a predictor of outcomes in oncology interactions: protocol for a secondary analysis of video-recorded cancer treatment discussions. *BMJ Open* 2018; **8(12):** e023648.

63. Schoenherr D, Paulick J, Strauss BM, *et al.* Nonverbal synchrony predicts premature termination of psychotherapy for social anxiety disorder. *Psychotherapy* 2019; **56(4):** 503–513.

64. Vacharkulksemsuk T, Fredrickson BL. Strangers in sync: achieving embodied rapport through shared movements. *J Exp Soc Psychol* 2012; **48(1):** 399–402.

65. Schmid Mast M, Kadji KK. How female and male physicians' communication is perceived differently. *Patient Educ Couns* 2018; **101(9):** 1697–1701.

66. Schmid Mast M, Hall JA, Köckner C, Choi E. Physician gender affects how physician nonverbal behavior is related to patient satisfaction. *Med Care* 2008; **46(12):** 1212–1218.