

RESEARCH ARTICLE

Empathic nonverbal behavior increases ratings of both warmth *and* competence in a medical context

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OPEN ACCESS

Citation: Kraft-Todd GT, Reinero DA, Kelley JM, Heberlein AS, Baer L, Riess H (2017) Empathic nonverbal behavior increases ratings of both warmth *and* competence in a medical context. PLoS ONE 12(5): e0177758. <https://doi.org/10.1371/journal.pone.0177758>

Editor: Mollie A Ruben, Massachusetts College of Pharmacy and Health Sciences, UNITED STATES

Received: October 25, 2016

Accepted: May 3, 2017

Published: May 15, 2017

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Funding: All authors recognize the funding sources, The Arnold P. Gold Foundation and The David Judah Fund, Massachusetts General Hospital, in completion of their work. The Arnold P. Gold Foundation and The David Judah Fund had no role in study design, collection, analysis, interpretation of data, writing the report, nor in the decision to submit the report for publication.

Abstract

In medicine, it is critical that clinicians demonstrate both empathy (perceived as warmth) and competence. Perceptions of these qualities are often intuitive and are based on nonverbal behavior. Emphasizing both warmth and competence may prove problematic, however, because there is evidence that they are inversely related in other settings. We hypothesize that perceptions of physician competence will instead be *positively* correlated with perceptions of physician warmth and empathy, potentially due to changing conceptions of the physician's role. We test this hypothesis in an analog medical context using a large online sample, manipulating physician nonverbal behaviors suggested to communicate empathy (e.g. eye contact) and competence (the physician's white coat). Participants rated physicians displaying empathic nonverbal behavior as more empathic, warm, *and* more competent than physicians displaying unempathic nonverbal behavior, adjusting for mood. We found no warmth/competence tradeoff and, additionally, no significant effects of the white coat. Further, compared with male participants, female participants perceived physicians displaying unempathic nonverbal behavior as less empathic. Given the significant consequences of clinician empathy, it is important for clinicians to learn how nonverbal behavior contributes to perceptions of warmth, and use it as another tool to improve their patients' emotional and physical health.

Introduction

We define empathy as a social-emotional ability having two distinct components: one *affective*: the ability to share the emotions of others, and one *cognitive*: the ability to understand the emotions of others. This definition is supported by evidence that these two components have dissociable neurological substrates [1, 2]. This approach is broad enough to encompass elements of

Competing interests: The authors have declared that no competing interests exist. Dr. Riess reported having co-ownership of the company, Empathetics LLC®. This does not alter our adherence to PLOS ONE policies on sharing data and materials.

various components of empathy that have been proposed [3, 4]—e.g. sympathy (or shared emotions) [5], perspective taking [6], and accurate interpersonal perception [7, 8]—while distinguishing basic cognitive processes underlying them. It is necessary for an operational definition of empathy to focus on the cognition of the empathic subject (i.e. the person expressing empathy, such as a physician), but because empathy is fundamentally a relational ability, it is also useful to understand the cognition of the empathic object (i.e. the individual whose emotions are being empathized with, such as a patient). There is extensive evidence that empathy (expressed by the subject) is perceived (by the object) as warmth [e.g. 9]. In this paper, we therefore discuss empathy and warmth as two sides of the same coin (i.e. “empathy/warmth”), in that they are functionally linked in the context of social interaction.

Empathy is particularly important in the context of medicine, where evidence suggests it is related to numerous positive outcomes [for a review, see 10] including increased patient satisfaction [11], good patient rapport [12], increased adherence to treatment [13], increased diagnostic accuracy [14], reduced medical errors [15], and positive health outcomes [16–18] (though see [19]; an intervention of care-giver investment does not alter diabetes outcomes). Other explorations of how physicians are perceived have further differentiated perceptions of empathy, distinguishing two dimensions: caring (similar to high empathy) and dominance (similar to low empathy) [20]. Conveying competence is also important in medicine, as the literature on “medical professionalism” demonstrates [21, 22]. There have even been attempts to institutionalize professionalism through, for example, the doctor’s “white coat” [23]. The white coat has traditionally played a significant part in physician identity formation during medical training [24–28] as well as role identity in clinical settings. Empathy (perceived as warmth) and competence are not only important in medicine, but are two frequently-used dimensions of person perception across many contexts [29].

While ratings of empathy are positively correlated with perceptions of warmth both in the lab [e.g. 30] and in clinical contexts [e.g. 31, 32], there is evidence that perceptions of warmth and competence can be inversely related in some contexts [33–37]. Four mechanisms of the warmth/competence tradeoff are particularly relevant here. First, people can exhibit compensatory judgments of warmth and competence [38] particularly when they are under threat [39]. Because high status and wealth are associated with high ratings of competence [40] and physicians are often considered high status, patients who are threatened by an upward social comparison may be biased to perceive their physicians as less warm. Second, though warmth and competence can be positively related in judgments of individuals, they are more likely to be negatively related in judgments of groups [37]. To the extent that a patient sees a clinician as a member of an outgroup—such as the “upper class,” but also in terms of other social group categories, e.g. gender or ethnicity—they may be more likely to exhibit compensatory judgments of warmth and competence. Third, when comparing two others, people see one individual or group as high on one dimension and low on the other, and the inverse for the object of comparison (e.g. among women [34], businesses [41], and immigrant groups [42]). Patients who are comparing their current clinician experience with others in the past therefore may perceive warm clinicians as less competent and vice versa. Finally, when being perceived, people engage in impression management, downplaying one dimension to highlight the other [36]. Clinicians who are trying to convey empathy, therefore, may downplay their competence.

The field of medicine therefore faces a dilemma: if empathy (perceived as warmth) and competence are both important, but are inversely related in patients’ perceptions, which should be emphasized? Indeed, some have argued that an emphasis on empathic clinician behaviors could negatively impact patient perceptions of clinician competence [43] while others argue that the white coat might emphasize professionalism at the cost of humanism [44,

45]. However, “competence” in the medical context embodies both *technical* competence (i.e. skill in medical procedures and biological knowledge) and *interpersonal* competence (i.e. skill in medical social interactions). Given that patients consider interpersonal competence to be crucial in their evaluations of clinicians, one might expect that competence and empathy/warmth would be positively correlated because empathy is increasingly becoming a component of successful medical care or *interpersonal* competence [46]. This distinction and trend in the understanding of medical competence is consistent with the movement of patient-centered care [47] (and more recently, relationship-centered care [48]), which emphasizes patient experience with and understanding of treatment (including emotional and social implications). Patient- or relationship-centered care models have demonstrated both increased efficiency in treatment and better health outcomes [49, 50]. We therefore predicted that empathic nonverbal behavior will increase perceptions of clinician warmth *and* competence.

Empathy is communicated through both verbal and nonverbal behaviors [51], though the power of nonverbal communication of empathy may be underestimated, as nonverbal behavior can communicate emotional states subtly [52] and automatically [53]. Further, the literature on “thin slicing,” demonstrates that we rapidly make judgments of others [54, 55]. In medical education, emphasis has traditionally been placed on training clinicians in *verbal* communication [56], with relatively little attention paid to *nonverbal* communication [57, 58]. The nonverbal behavior literature provides widespread support for the claim that good nonverbal behavior is crucial to patient-centered care in medicine [59, 60], and identifies a number of specific nonverbal behaviors that influence patients’ perceptions of clinicians [58, 61–63]. For example, open body posture (uncrossed arms), eye contact, smiling, and touch express positive affect, involvement, availability, attention, warmth, encouragement, respect, understanding, empathy, and affiliation with the patient [56, 58, 64–68]. Further, nonverbal communication is also related to positive health outcomes, such as increased pain tolerance [69]. In medical practice, humanistic concern for patient well-being—which can be expressed via these nonverbal behaviors—drives the standard of care forward and incentives for quality care have grown as healthcare reimbursement from third-party payers is now often tied to patient satisfaction surveys [64, 70]. There is relatively less research on nonverbal communication of clinician competence in general [71], and perceptions of the white coat in particular [72]. Because there is a growing debate about the effects of the white coat [68, 73–79], we thought manipulating its presence would be a particularly interesting test of the nonverbal communication of competence.

In the present study, we test whether a warmth/competence trade-off will occur in response to clinicians’ nonverbal behavior. We also test for interactions of participant gender with our independent variables as previous findings have indicated gender differences in judgments of warmth and competence [80–83]. Specifically, while both men and women judge traits related to warmth to be more important than traits related to competence in their formation of impressions of others, women judge the relative importance of traits related to warmth to be significantly more important [84]. There is a gender-role stereotype that women are warmer than men, and these findings might be partially explained by women internalizing this stereotype which transfers to their perception of others [81]. Finally, we wanted to ensure that any effect we found was not driven by mood, such that our manipulations put participants in a positive or negative mood, which then influenced their perceptions of clinicians [85]. Therefore, we included participant mood as a covariate in our analyses to ensure that participants’ ratings of clinicians are attributable to our manipulations. We provide preliminary evidence that nonverbal empathic behaviors increase patient perceptions of clinician empathy, warmth, *and* competence. We find that this effect may be stronger for women, cannot be attributed to mood, and that there is no effect of the white coat.

Methods

Participant characteristics

We used the crowdsourcing tool Amazon Mechanical Turk to recruit 1,377 U.S. participants (60% female, 80% white, mean age 36yrs., range 18–80) as analog patients [86] in an online study requiring 7 minutes of participants' time and paying them \$0.30 (commensurate with pay for similar tasks on this platform; see [87–92]). Participants were randomly assigned to 1 of 4 conditions in a 2 (empathic v. unempathic nonverbal behavior) x 2 (white coat v. no white coat) factorial design. This study was run in 2 runs; in the first run ($N = 194$), we did not manipulate the white coat, so subjects were randomly assigned to one of 2 conditions: empathic v. unempathic nonverbal behavior (physicians were wearing the white coat in both conditions). In the second run ($N = 1,177$), we did manipulate the white coat, so subjects were randomly assigned to 1 of 4 conditions in the full 2 (empathic v. unempathic nonverbal behavior) x 2 (white coat v. no white coat) factorial design. The result is that the *white coat* conditions had average $n = 392$ while the *no white coat* conditions had average $n = 297$. We found no significant main effects of run on any of our dependent variables, nor did we find any significant interactions of run with any independent variable, so we collapsed across run for our analyses. The study was IRB-approved by the Partners Human Research Committee and all participants provided online informed consent.

Study design and protocol

Participants viewed a series of 6 photographs of either a male or a female (randomly assigned) physician displaying various nonverbal behaviors that were either all *empathic* or *unempathic* (see Fig 1. Photographs were of real physicians—the individuals in these photographs provided written informed consent, as outlined in PLOS consent form, to publish these case details. See S1 File Stimuli for detailed descriptions). Each photograph was paired with 2 lines of a scripted patient-physician conversation (see S1 File Stimuli; all participants saw the same script), and participants were instructed to imagine that they were the patient. In the *empathic* condition, each photograph depicted the same physician displaying various nonverbal behaviors which have been implicated in physician empathy (eye contact, equal patient-physician eye-level, no physical barrier, open posture, touch, and concerned facial expression) [58]. In the *unempathic* condition, the same physician displayed the opposite nonverbal behaviors (no eye contact, unequal eye-level, physical barrier, closed posture, no touch, and unconcerned facial expression). In the *white coat* condition, each photograph depicted the same physician wearing a white coat over their clothes, while in the *no white coat* condition, they simply removed the white coat. All scenes progressed automatically in 3 phases: photograph only (2sec); photograph and script (6sec); photograph only (2sec). This progression allowed participants to focus on the image and nonverbal behaviors displayed by the physician while also incorporating the content of the verbal communication. After viewing all 6 scenes in the interaction, participants completed 3 rating scales (see S2 File Scales) in random order to assess their current mood, perceptions of clinician empathy, and perceptions of clinician warmth and competence. Finally, participants completed several demographic measures, were debriefed, and thanked for their participation.

Study measures

Mood was measured using the Positive and Negative Affect Scale (PANAS), a 20-item scale with 2 ten-item subscales for positive affect and negative affect ("Indicate to what extent you feel this way right now, at the present moment:" e.g., "Excited", "Upset", respectively) rated on a 5-point scale (from "Very slightly or not at all" to "Extremely") [93]. Both subscales

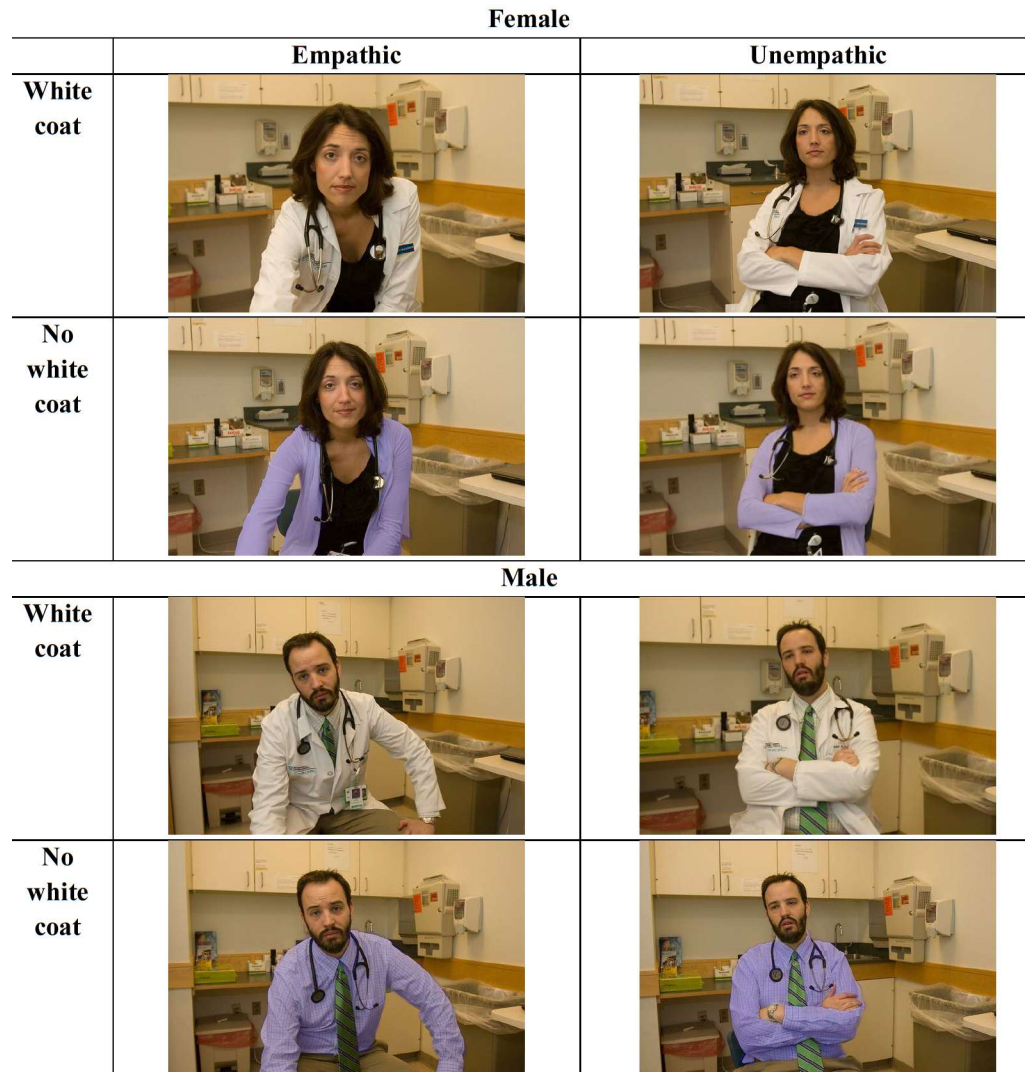


Fig 1. Example photo stimuli (scene 3). Examples of still photograph stimuli used in the experiment depicting a male or female physician displaying empathic or unempathic nonverbal behaviors either wearing or not wearing a white coat.

<https://doi.org/10.1371/journal.pone.0177758.g001>

demonstrated high reliability—PANAS positive ($\alpha = .90$) and PANAS negative ($\alpha = .93$)—so we created respective composite measures that were the means of the respective items in these subscales. Empathy was measured using the Consultation and Relational Empathy (CARE) measure [66], a 10-item (e.g., “How was the doctor at showing care and compassion (seeming genuinely concerned, connecting with you on a human level; not being indifferent or ‘detached’)?”) 5-point scale (from “poor” to “excellent”). Though there are many measures of empathy in the literature (e.g. [3]), we felt that the widely used, reliable and validated CARE measure was appropriate because it captures the components of our definition of empathy and is tailored to the clinical context. The CARE measure demonstrated high reliability ($\alpha = .97$) so we created a composite measure that was the mean of the items in this measure. Warmth and competence were measured using a 9-item scale based on Fiske’s stereotype content model [29, 33]; 4 items measured warmth (e.g., “How much did the doctor seem to be caring”) and 5 measured competence (e.g., “How much did the doctor seem to be intelligent”) on a 5-point

scale (from 0 to 4). Both measures demonstrated high reliability—warmth ($\alpha = .92$), competence ($\alpha = .71$)—so we created respective composite measures that were the means of the respective items in these subscales.

Data collection and analysis

We used STATA 13.1 to compute all statistics. We found no significant main effects of our white coat manipulation on any of our dependent variables nor did we find any significant interactions of white coat with any independent variable, so we eliminated it from our analyses (and our results are qualitatively the same whether the white coat is included or not). To assess whether physician nonverbal behavior (empathic vs. unempathic) and participant gender affected participants' ratings of physician empathy, warmth, and competence, we conducted three separate three-way ANCOVAs, with positive and negative mood as covariates.

Results

Relation among participant ratings of physician empathy, warmth, and competence

We tested for correlations among participant ratings of empathy, warmth and competence (see Fig 2A), and found that each pair was significant (all values shown with Bonferroni corrections) and highly correlated: warmth and empathy ($r(1375) = .83, p < .001$), warmth and competence ($r(1375) = .61, p < .001$), and competence and empathy ($r(1375) = .48, p < .001$). Though we expected a large correlation between empathy and warmth, given the moderate-to-large correlations of competence with empathy and warmth, we performed a principal components analysis with varimax (orthogonal) rotation of these three ratings to determine the extent to which we could interpret competence as a separate rating. We find that two orthogonal factors explain 95% of the variance. We find that while warmth and empathy load strongly on one component, competence loads strongly on the other (Fig 2B).

Participant ratings of physician empathy

As a manipulation check, we first tested participant ratings of physician empathy. Adjusting for mood, we found a significant main effect of nonverbal behavior on ratings of empathy such that participants rated physicians displaying empathic nonverbal behavior as more empathic ($M = 3.29, SD = 1.15$) than physicians displaying unempathic nonverbal behavior ($M = 1.86, SD = .93, F(1,1362) = 568.49, p < .001, \eta^2_p = .30$; see Fig 3). There was also a significant, albeit very small, main effect of subject gender such that male participants rated physicians in both conditions as more empathic ($M = 2.70, SD = 1.21$) than the female participants

a				b		
Measure	1	2	3	Measure	Component 1	Component 2
1. Empathy (Mercer et al., 2004)	----			Empathy	0.76	-0.10
2. Warmth (Fiske et al., 2002)	0.85***	----		Warmth	0.65	0.12
3. Competence (Fiske et al., 2002)	0.49***	0.61***	----	Competence	-0.01	0.99

*** $p < .001$, Bonferroni corrected

Fig 2. Relation among participant ratings of empathy, warmth, and competence. A) Correlations among the three ratings. B) Principal component weightings of the three ratings on two components using varimax rotation.

<https://doi.org/10.1371/journal.pone.0177758.g002>

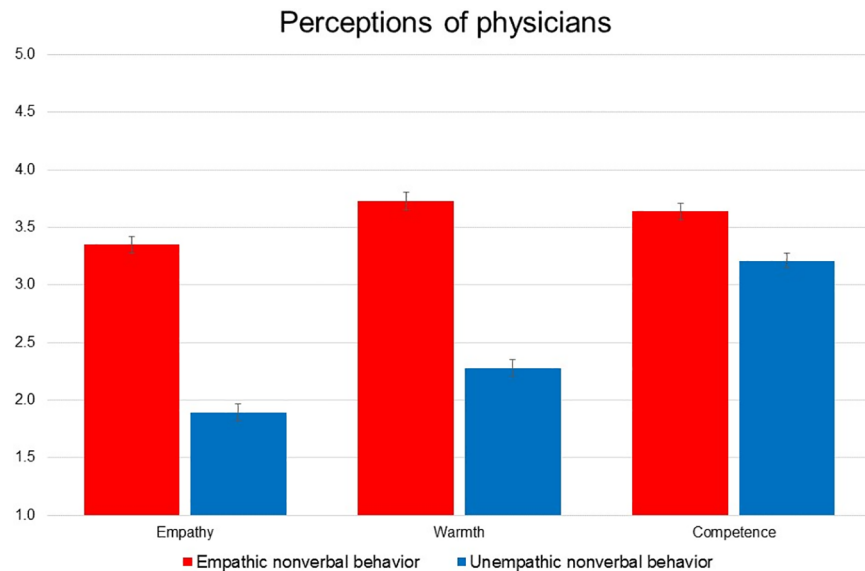


Fig 3. Perceptions of physician nonverbal behavior. Physicians displaying empathic nonverbal behaviors are perceived as more warm, empathic, and more competent than physicians displaying unempathic nonverbal behaviors. Error bars represent 95% CI of the mean.

<https://doi.org/10.1371/journal.pone.0177758.g003>

($M = 2.49$, $SD = 1.30$, $F(1,1362) = 6.60$, $p = .01$, $\eta^2_p = .005$). There was a marginally significant interaction of nonverbal behavior with participant gender ($F(1,1362) = 3.00$, $p = .084$, $\eta^2_p = .002$) such that in the unempathic condition, women perceived physicians as less empathic ($M = 1.73$, $SD = .88$) than men ($M = 2.05$, $SD = .98$, $F(679) = 13.48$, $p < .001$, $\eta^2_p = .02$). Positive mood was a significant covariate of these effects, such that higher positive mood was associated with higher ratings of physician empathy ($F(1,1362) = 95.98$, $p < .001$, $\eta^2_p = .07$). Negative mood was not a significant covariate of these effects, and there was no association of negative mood with ratings of physician empathy.

Participant ratings of physician warmth

Adjusting for mood, we found a significant main effect of nonverbal behavior on ratings of warmth such that participants rated physicians displaying empathic nonverbal behavior as more warm ($M = 3.73$, $SD = .93$) than physicians displaying unempathic nonverbal behavior ($M = 2.28$, $SD = .98$, $F(1,1362) = 674.49$, $p < .001$, $\eta^2_p = .33$). We also found a significant interaction of nonverbal behavior with participant gender ($F(1,1362) = 4.88$, $p = .027$, $\eta^2_p = .004$) such that in the unempathic condition, women perceived physicians as less warm ($M = 2.20$, $SD = 0.98$) than men ($M = 2.42$, $SD = .95$, $F(1,679) = 4.46$, $p = .035$, $\eta^2_p = .007$). Positive and negative mood were both significant covariates of these effects, such that higher positive mood was associated with higher ratings of physician warmth ($F(1,1362) = 64.68$, $p < .001$, $\eta^2_p = .05$) and higher negative mood was associated with lower ratings of physicians warmth ($F(1,1362) = 12.41$, $p < .001$, $\eta^2_p = .01$).

Participant ratings of physician competence

Adjusting for mood, there was a significant main effect of nonverbal behavior on ratings of competence, such that participants rated physicians displaying empathic nonverbal behavior as more competent ($M = 3.64$, $SD = .65$) than physicians displaying unempathic nonverbal behavior ($M = 3.21$, $SD = .81$, $F(1,1362) = 85.11$, $p < .001$, $\eta^2_p = .06$). Positive and negative

mood were also significant covariates of these effects, such that higher positive mood was associated with higher ratings of physician competence ($F(1,1362) = 87.65, p < .001, \eta^2_p = .06$) and higher negative mood was associated with lower ratings of physician competence ($F(1,1362) = 14.25, p < .001, \eta^2_p = .01$).

Discussion

We provide evidence that nonverbal empathic behaviors increase patient perceptions of clinician empathy, warmth, *and* competence, regardless of whether the clinician is wearing a white coat. Further, this effect cannot be attributed to mood and it may be stronger for women.

In our design, participants were randomly assigned to one of 4 conditions in a 2 (empathic v. unempathic nonverbal behavior) x 2 (white coat or no white coat) factorial design. In the *empathic* nonverbal condition, the physician displayed numerous empathic nonverbal behaviors concurrently, while in the *unempathic* nonverbal condition, the physician displayed numerous unempathic nonverbal behaviors concurrently. In the *white coat* condition, (the same) physicians wore a white coat while in the *no white coat* condition, they did not.

Our manipulation check of whether empathic nonverbal behaviors increased patient perceptions of empathy confirmed our hypothesis, explaining 29% of the variance. Consistent with prior research showing that empathy is perceived as warmth [9], we found empathic nonverbal behaviors increased patient perceptions of warmth, explaining 33% of the variance. Contrary to findings of a warmth/competence tradeoff in other domains [e.g. 34, 36], we found that in the context of patient-clinician interactions, empathic nonverbal behaviors increased patient perceptions of competence, though the effect size was small, explaining 6% of the variance. This might reflect changing expectations about the role of clinicians [64, 67, 94] and the importance of *interpersonal* competence [e.g. 95] in addition to traditional *technical* competence in medical procedures and biological knowledge.

Contrary to prior research [71], we did not find an effect of the clinician white coat on perceptions of empathy, warmth, or competence. Consistent with prior research [96], we found that female subjects were more attuned to signals of empathy than male subjects, as women rated physicians displaying unempathic nonverbal behaviors significantly less empathic and less warm than men, though this effect was quite small, accounting for only 0.3–0.7% of the variance. Finally, mood was a significant covariate of ratings of empathy, warmth, and competence, but it did not explain the effect of our nonverbal behavior manipulation. Positive mood was consistently significantly correlated with our effects, accounting for 5–6% of the variance while negative mood had a smaller effect in the opposite direction, accounting for 1% of the variance.

Limitations

There are a number of limitations to the current study: 1) null findings from our nonverbal competence manipulation, 2) the online analog design [97], employing still photographs rather than video or live actors, 3) including only one medical context (physicians as the only health-care provider, both of whom were white, and only one physician of each gender), and 4) clustering empathic nonverbal behaviors without investigating the individual contributions of each. Each of these suggest clear directions for future research.

The null finding of our nonverbal competence manipulation is especially interesting given that the white coat was instituted to convey physician competence [23] and research demonstrating that formal dress increases perception of physician competence [e.g. 98]. One possible explanation for our null result is that it is a “halo effect” [85] of the empathic nonverbal behavior manipulation; i.e., the effect of empathic nonverbal behavior was stronger and participants’

perceptions of empathy influenced their perceptions of competence, overshadowing any effect of the white coat. Other explanations include that the white coat simply does not affect perceptions of physician warmth (and so there might not be as much cause for concern as has been argued [e.g. 75]), or that the analog setting does not evoke ecologically valid reactions to the white coat. Also, it may be that the contrast between competence conditions was not strong enough; in the non-white coat condition, our physicians were wearing semi-formal dress rather than less professional attire, such as jeans and t-shirts (though this would be a manipulation of formal dress rather than the white coat specifically). Further, it should be noted that our design was between-subjects, and so a direct comparison between physicians wearing and not wearing a white coat might make the effect of the white coat more salient, which could be explored in future research using a within-subjects design. Future research might therefore test other manipulations of nonverbal competence behaviors. Finally, though we acknowledge the difference between *interpersonal* and *technical* competence, we did not explore this distinction in the present study. Future research might also disambiguate these components of competence.

This study was conducted online, asking participants to imagine themselves as patients rather than manipulating actual patient-clinician encounters. There is evidence that analog designs can be useful for studies of medical communication [86], though conducting an intervention study in a real medical setting would provide stronger evidence for our conclusions. We did not ask participants whether they thought the physicians pictured were real doctors, which could have affected the extent to which were able to successfully imagine themselves in the scenario. Because manipulations in analog studies could be moderated by the extent of participant engagement, this sort of manipulation check would be important to include in future research. Further, our Amazon Mechanical Turk subject pool is slightly younger, better educated, poorer, and more white than a representative sample of the US population [99] (though more representative than samples drawn from college undergraduates [100]). Finally, by using still photographs, we may be missing subtle cues of nonverbal behavior that are conveyed with more fidelity in video or by using live actors; this is a promising area for future research. While previous research has shown that nonverbal behavior can be explored using photographs [101–104], these more ecologically valid methods would enhance the generalizability of these results.

The medical context we used in this study was intentionally vague; while the script described negative test results and a required surgery (see [S1 File Stimuli](#)), much is left unspecified. It is possible that the effect of nonverbal behavior in communicating empathy could be mediated by several situational variables, including medical context (e.g. routine vs. emergency), patient affect (e.g. anxious vs. sad), and the interaction of patient and clinician cultural backgrounds and group identities. Future research could investigate the impact of these situational variables. In particular, there is an important literature using social role theory to explain how perceptions of physician empathy is influenced by physician gender [105–108]. For example, male physicians are evaluated more positively than female physicians when displaying patient-centered behavior, which could be due to the gender-role stereotyped expectation that female physicians will be more patient-centered [109]. In the present study, we did not analyze the effect of physician gender because we were limited to one physician of each gender in our design, and so any physician gender differences might be attributable to the specific physicians we used as models. Future research therefore might use multiple male and female physicians in their stimuli to test for the effect of physician gender on perceptions of empathy/warmth, and competence. In a similar vein, we only investigated the nonverbal behavior of physicians. It is likely that the nonverbal expressions of empathy communicated by other members of a medical team have significant effects on patient outcomes [110], though this question has not received as much research attention.

Finally, we used a “kitchen sink” approach to the nonverbal communication of empathy. In other words, we culled the literature for nonverbal behaviors known to affect perceptions of empathy, and ultimately chose the six that had the most robust evidence base [58]. Our empathic and unempathic conditions varied all six simultaneously, so we were unable to determine the impact of each individual nonverbal behavior on the communication of empathy. Future research could address this question in a deconstruction study that explores patient perception of empathy based on each individual nonverbal behavior, as well as the impact of empathic nonverbal behavior on mood, and the resulting mediating relationship on ratings of empathy/warmth and competence.

Conclusion

Our findings suggest a clear practical implication: *incorporate empathic nonverbal training into medical education*. A recent meta-analysis shows the empathy trainings can be successful [111], and one in particular emphasizing nonverbal behavior demonstrated a significant increase to patient ratings of clinician empathy [67]. Empathy training is therefore not only possible, but practical, both because third-party payers and the Centers for Medicare and Medicaid Services are increasingly emphasizing patient satisfaction scores for reimbursement and also because the patient-clinician relationship has a positive effect on medical outcomes [16]. Empathy training may even contribute to improved cross-cultural care, as implicit bias against minorities can be communicated nonverbally [112, 113]. Given the significant consequences of clinician empathy, it is important for clinicians to learn how nonverbal behavior contributes to empathic communication, and use it as another tool to improve their patients’ emotional and physical health.

Supporting information

S1 File. Stimuli. Instructions, script, and nonverbal behaviors used as stimuli.
(DOCX)

S2 File. Measures. PANAS, CARE, and warmth/competence scales used as dependent measures.
(DOCX)

S3 File. Data. Data used for all analyses.
(XLSX)

Author Contributions

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Formal analysis: GTKT DAR LB ASH JMK.

Funding acquisition: HR.

Investigation: GTKT DAR.

Methodology: GTKT DAR JMK ASH LB HR.

Project administration: GTKT HR.

Resources: HR.

Software: GTKT DAR.

Supervision: JMK ASH LB HR.

Validation: GTKT DAR JMK ASH LB HR.

Visualization: GTKT DAR.

Writing – original draft: GTKT DAR JMK ASH LB HR.

Writing – review & editing: GTKT DAR JMK ASH LB HR.

References

1. Shamay-Tsoory SG, Aharon-Peretz J, Perry D. Two systems for empathy: a double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Journal of Personality and Social Psychology*. 2009; 91(3):175–183. PMID: 19279313
2. Zaki J, Ochsner K. The neuroscience of empathy: progress, pitfalls and promise. *Nat Neurosci*. 2012; 15(5):675–80. <https://doi.org/10.1038/nn.3085> PMID: 22504346
3. Davis MH. Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology*. 1983; 44(1):113.
4. Wispé L. The distinction between sympathy and empathy: To call forth a concept, a word is needed. *Journal of personality and social psychology*. 1986; 50(2):314.
5. Eisenberg N, Fabes RA, Miller PA, Fultz J, Shell R, Mathy RM, et al. Relation of sympathy and personal distress to prosocial behavior: A multimethod study. *Journal of Personality and Social Psychology*. 1989; 57(1):55–66. PMID: 2754604
6. Epley N, Keysar B, Van Boven L, Gilovich T. Perspective Taking as Egocentric Anchoring and Adjustment. *Journal of Personality and Social Psychology*. 2004; 87(3):327–39. <https://doi.org/10.1037/0022-3514.87.3.327> PMID: 15382983
7. Hall JA, Ship AN, Ruben MA, Curtin EM, Roter DL, Clever SL, et al. Clinically relevant correlates of accurate perception of patients' thoughts and feelings. *Health communication*. 2015; 30(5):423–9. <https://doi.org/10.1080/10410236.2013.865507> PMID: 24949868
8. Hall JA. Clinicians' accuracy in perceiving patients: Its relevance for clinical practice and a narrative review of methods and correlates. *Patient Education and Counseling*. 2011; 84(3):319–24. <https://doi.org/10.1016/j.pec.2011.03.006> PMID: 21592718
9. Davis MH, Oathout HA. Maintenance of satisfaction in romantic relationships: Empathy and relational competence. *Journal of Personality and Social Psychology*. 1987; 53(2):397–410.
10. Hall JA, Roter DL. Physician-patient communication. *Foundations of health psychology*. 2007:325–57.
11. Kim SS, Kaplowitz S, Johnston MV. The Effects of Physician Empathy on Patient Satisfaction and Compliance. *Evaluation & the Health Professions*. 2004; 27(3):237–51.
12. Hall JA, Roter DL, Blanch DC, Frankel RM. Nonverbal sensitivity in medical students: implications for clinical interactions. *J GEN INTERN MED*. 2009; 24(11):1217–22. Language Code: eng. Date Revised: 20101102. Date Created: 20100121. Date Completed: 20100825. Update Code: 20111122. Publication Type: Comparative Study. <https://doi.org/10.1007/s11606-009-1107-5> PMID: 19771481
13. Becker MH, Maiman LA. Sociobehavioral Determinants of Compliance with Health and Medical Care Recommendations. *Medical Care*. 1975; 13(1):10–24. PMID: 1089182
14. Mercer SW, Reynolds WJ. Empathy and quality of care. *The British Journal of General Practice*. 2002; 52(Suppl):S9.
15. West CP, Huschka MM, Novotny PJ, Sloan JA, Kolars JC, Habermann TM, et al. Association of perceived medical errors with resident distress and empathy: a prospective longitudinal study. *JAMA*. 2006; 296(9):1071–8. <https://doi.org/10.1001/jama.296.9.1071> PMID: 16954486
16. Kelley JM, Kraft-Todd G, Schapira L, Kossowsky J, Riess H. The Influence of the Patient-Clinician Relationship on Healthcare Outcomes: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *PLOS ONE*. 2014; 9(4):e94207. <https://doi.org/10.1371/journal.pone.0094207> PMID: 24718585
17. Street RL, Makoul G, Arora NK, Epstein RM. How does communication heal? Pathways linking clinician-patient communication to health outcomes. *Patient Education and Counseling*. 2009; 74(3):295–301. <https://doi.org/10.1016/j.pec.2008.11.015> PMID: 19150199
18. Roter DL, Frankel RM, Hall JA, Sluyter D. The expression of emotion through nonverbal behavior in medical visits. Mechanisms and outcomes. *Journal of General Internal Medicine*. 2006; 21(Suppl 1):S28–34.

19. Kinmonth AL, Wareham NJ, Hardeman W, Sutton S, Prevost AT, Fanshawe T, et al. Efficacy of a theory-based behavioural intervention to increase physical activity in an at-risk group in primary care (ProActive UK): a randomised trial. *The Lancet*. 2008; 371(9606):41–8.
20. Schmid Mast M, Hall JA, Roter DL. Caring and Dominance Affect Participants' Perceptions and Behaviors During a Virtual Medical Visit. *Journal of General Internal Medicine*. 2008; 23(5):523–7. <https://doi.org/10.1007/s11606-008-0512-5> PMID: 18259824
21. Wynia MK, Latham SR, Kao AC, Berg JW, Emanuel LL. Medical Professionalism in Society. *New England Journal of Medicine*. 1999; 341(21):1612–6. <https://doi.org/10.1056/NEJM199911183412112> PMID: 10577119
22. Swick HM. Toward a normative definition of medical professionalism. *Academic Medicine*. 2000; 75(6):612–6. PMID: 10875505
23. Jones VA. The white coat: Why not follow suit? *JAMA*. 1999; 281(5):478-. PMID: 9952213
24. Gold A, Gold S. Humanism in medicine from the perspective of the Arnold Gold Foundation: challenges to maintaining the care in health care. *J Child Neurol*. 2006; 21(6):546–9. <https://doi.org/10.1177/08830738060210060401> PMID: 16948951
25. Kavan MG. The White Coat Ceremony: a tribute to the humanism of Arnold P. Gold. *J Child Neurol*. 2009.
26. Philip C PC. The white coat ceremony: turning trust into entitlement. *Teaching and learning in medicine*. 2002; 14(1):56–9. PMID: 11865752
27. Huber S. The white coat ceremony: a contemporary medical ritual. *Journal of medical ethics*. 2003; 29(6):364–6. <https://doi.org/10.1136/jme.29.6.364> PMID: 14662817
28. Branch WT Jr. Deconstructing the white coat. *Annals of internal medicine*. 1998; 129(9):740–2. PMID: 9841609
29. Fiske S, Cuddy A, Glick P, Xu J. A model of (often mixed) stereotype content: competence and warmth respectively follow from perceived status and competition. *J Pers Soc Psychol*. 2002; 82(6):878–902. Epub 2002/06/08. PMID: 12051578
30. Fiske S. Envy up, scorn down: how comparison divides us. *American Psychologist*. 2010; 65(8):698–706. <https://doi.org/10.1037/0003-066X.65.8.698> PMID: 21058760
31. Smith-Hanen SS. Effects of Nonverbal Behaviors on Judged Levels of Counselor Warmth and Empathy: *Journal of Counseling Psychology*; 1977.
32. Truax CB. Therapist empathy, warmth, and genuineness and patient personality change in group psychotherapy: A comparison between interaction unit measures, time sample measures, patient perception measures. *Journal of Clinical Psychology*. 1966; 22(2):225–9. PMID: 5937052
33. Fiske S, Cuddy A, Glick P. Universal dimensions of social cognition: warmth and competence. *Trends Cogn Sci*. 2007; 11(2):77–83. Epub 2006/12/26. <https://doi.org/10.1016/j.tics.2006.11.005> PMID: 17188552
34. Cuddy A, Fiske ST, Glick P. When professionals become mothers, warmth doesn't cut the ice. *Journal of Social Issues*. 2004; 60(4):701–18.
35. Kervyn N, Bergsieker HB, Fiske ST. The innuendo effect: Hearing the positive but inferring the negative. *Journal of Experimental Social Psychology*. 2012; 48(1):77–85. <https://doi.org/10.1016/j.jesp.2011.08.001> PMID: 26023243
36. Holioen DS, Fiske ST. Downplaying positive impressions: Compensation between warmth and competence in impression management. *Journal of Experimental Social Psychology*. 2013; 49(1):33–41. <https://doi.org/10.1016/j.jesp.2012.09.001> PMID: 24550571
37. Judd CM, James-Hawkins L, Yzerbyt V, Kashima Y. Fundamental dimensions of social judgment: understanding the relations between judgments of competence and warmth. *Journal of personality and social psychology*. 2005; 89(6):899. <https://doi.org/10.1037/0022-3514.89.6.899> PMID: 16393023
38. Kay AC, Jost JT. Complementary justice: effects of "poor but happy" and "poor but honest" stereotype exemplars on system justification and implicit activation of the justice motive. *Journal of personality and social psychology*. 2003; 85(5):823. <https://doi.org/10.1037/0022-3514.85.5.823> PMID: 14599247
39. Cadinu MR, Cerchioni M. Compensatory biases after ingroup threat: 'yeah, but we have a good personality'. *European Journal of Social Psychology*. 2001; 31(4):353–67.
40. Cuddy AJ, Fiske ST, Glick P. Warmth and competence as universal dimensions of social perception: The stereotype content model and the BIAS map. *Advances in experimental social psychology*. 2008; 40:61–149.

41. Aaker J, Vohs KD, Mogilner C. Nonprofits are seen as warm and for-profits as competent: Firm stereotypes matter. *Journal of Consumer Research*. 2010; 37(2):224–37.
42. Lee TL, Fiske ST. Not an outgroup, not yet an ingroup: Immigrants in the stereotype content model. *International Journal of Intercultural Relations*. 2006; 30(6):751–68.
43. Smajdor A, Stöckl A, Salter C. The limits of empathy: problems in medical education and practice. *Journal of medical ethics*. 2011; 37(6):380–3. <https://doi.org/10.1136/jme.2010.039628> PMID: [21292696](https://pubmed.ncbi.nlm.nih.gov/21292696/)
44. Goldberg JL. Humanism or professionalism? The white coat ceremony and medical education. *Academic Medicine*. 2008; 83(8):715–22. <https://doi.org/10.1097/ACM.0b013e31817eba30> PMID: [18667880](https://pubmed.ncbi.nlm.nih.gov/18667880/)
45. Wear D. On white coats and professional development: the formal and the hidden curricula. *Annals of Internal Medicine*. 1998; 129(9):734–7. PMID: [9841607](https://pubmed.ncbi.nlm.nih.gov/9841607/)
46. Buller MK, Buller DB. Physicians' Communication Style and Patient Satisfaction. *Journal of Health and Social Behavior*. 1987; 28(4):375–88. PMID: [3429807](https://pubmed.ncbi.nlm.nih.gov/3429807/)
47. Meae Gerteis. *Through the patient's eyes: Understanding and promoting patient-centered care*. San Francisco: Jossey-Bass; 1993.
48. Beach MC, Inui T, and the Relationship-Centered Care Research N. Relationship-centered Care. *Journal of General Internal Medicine*. 2006; 21(S1):S3–S8.
49. Oates J, Weston WW, Jordan J. The impact of patient-centered care on outcomes. *Fam Pract*. 2000; 49:796–804.
50. Williams GC, Frankel RM, Campbell TL, Deci EL. Research on Relationship-Centered Care and Healthcare Outcomes from the Rochester. *Families, Systems & Health: The Journal of Collaborative Family HealthCare*. 2000; 18(1):79.
51. Haase RF, Tepper DT. Nonverbal components of empathic communication. *Journal of Counseling Psychology*. 1972; 19(5):417–24.
52. Adams RB, Gordon HL, Baird AA, Ambady N, Kleck RE. Effects of Gaze on Amygdala Sensitivity to Anger and Fear Faces. *Science*. 2003; 300(5625):1536. <https://doi.org/10.1126/science.1082244> PMID: [12791983](https://pubmed.ncbi.nlm.nih.gov/12791983/)
53. Wicker B, Keysers C, Plailly J, Royet JP, Gallese V, Rizzolatti G. Both of us disgusted in My insula: the common neural basis of seeing and feeling disgust. *Neuron*. 2003; 40(3):655–64. PMID: [14642287](https://pubmed.ncbi.nlm.nih.gov/14642287/)
54. Ambady N, Rosenthal R. Half a minute: Predicting teacher evaluations from thin slices of nonverbal behavior and physical attractiveness. *Journal of personality and social psychology*. 1993; 64(3):431.
55. Carney DR, Colvin CR, Hall JA. A thin slice perspective on the accuracy of first impressions. *Journal of Research in Personality*. 2007; 41(5):1054–72.
56. Suchman AL, Markakis K, Beckman HB, Frankel R. A model of empathic communication in the medical interview. *JAMA*. 1997; 277(8):678–82. Epub 1997/02/26. PMID: [9039890](https://pubmed.ncbi.nlm.nih.gov/9039890/)
57. Griffith C III, Wilson J, Langer S, Haist S. House staff nonverbal communication skills and standardized patient satisfaction. *Journal of General Internal Medicine*. 2003; 18(3):170–4. <https://doi.org/10.1046/j.1525-1497.2003.10506.x> PMID: [12648247](https://pubmed.ncbi.nlm.nih.gov/12648247/)
58. Riess H, Kraft-Todd G. E.M.P.A.T.H.Y.: A Tool to Enhance Nonverbal Communication Between Clinicians and Their Patients. *Academic Medicine*. 2014; Publish Ahead of Print:10.1097/ACM.0000000000000287.
59. Harrigan J, Oxman T, Rosenthal R. Rapport expressed through nonverbal behavior. *J Nonverbal Behav*. 1985; 9(2):95–110.
60. Schmid Mast M. On the importance of nonverbal communication in the physician–patient interaction. *Patient Education and Counseling*. 2007; 67(3):315–8. <https://doi.org/10.1016/j.pec.2007.03.005> PMID: [17478072](https://pubmed.ncbi.nlm.nih.gov/17478072/)
61. Knapp M, Hall J, Horgan T. *Nonverbal communication in human interaction*: Cengage Learning; 2013.
62. Roter DL, Hall JA. *Doctors Talking with Patients/Patients Talking with Doctors: Improving Communication in Medical Visits*. 2nd ed. Westport, CT: Praeger; 2006.
63. Montague E, Chen P-y, Xu J, Chewning B, Barrett B. Nonverbal interpersonal interactions in clinical encounters and patient perceptions of empathy. *Journal of Participatory Medicine*. 2013;5.
64. Baron RB. Can we achieve public accountability for graduate medical education outcomes? *Academic Medicine*. 2013; 88(9):1199–201. <https://doi.org/10.1097/ACM.0b013e31829ed2ed> PMID: [23887009](https://pubmed.ncbi.nlm.nih.gov/23887009/)
65. Hojat M, Gonnella JS, Nasca TJ, Mangione S, Vergare M, Magee M. Physician empathy: definition, components, measurement, and relationship to gender and specialty. *American Journal of Psychiatry*. 2002; 159(9):1563–9. <https://doi.org/10.1176/appi.ajp.159.9.1563> PMID: [12202278](https://pubmed.ncbi.nlm.nih.gov/12202278/)

66. Mercer SW, Maxwell M, Heaney D, Watt GC. The consultation and relational empathy (CARE) measure: Development and preliminary validation and reliability of an empathy-based consultation process measure. *Family Practice*. 2004; 21(6):699–705. <https://doi.org/10.1093/fampra/cmh621> PMID: [15528286](https://pubmed.ncbi.nlm.nih.gov/15528286/)
67. Riess H, Kelley JM, Bailey RW, Dunn EJ, Phillips M. Empathy Training for Resident Physicians: A Randomized Controlled Trial of a Neuroscience-Informed Curriculum. *Journal of General Internal Medicine*. 2012; 27(10):1280–6. <https://doi.org/10.1007/s11606-012-2063-z> PMID: [22549298](https://pubmed.ncbi.nlm.nih.gov/22549298/)
68. Taylor PG. Does dress influence how parents first perceive house staff competence? *American Journal of Diseases of Children*. 1987; 141(4):426–8. PMID: [3565329](https://pubmed.ncbi.nlm.nih.gov/3565329/)
69. Ruben MA, Blanch-Hartigan D, Hall JA. Nonverbal Communication as a Pain Reliever: The Impact of Physician Supportive Nonverbal Behavior on Experimentally Induced Pain. *Health Communication*. 2016:1–7.
70. Giordano LA, Elliott MN, Goldstein E, Lehrman WG, Spencer PA. Development, Implementation, and Public Reporting of the HCAHPS Survey. *Medical Care Research and Review*. 2010; 67(1):27–37. <https://doi.org/10.1177/1077558709341065> PMID: [19638641](https://pubmed.ncbi.nlm.nih.gov/19638641/)
71. Hennessy N, Harrison DA, Aitkenhead AR. The effect of the anaesthetist's attire on patient attitudes. *Anaesthesia*. 1993; 48(3):219–22. PMID: [8460799](https://pubmed.ncbi.nlm.nih.gov/8460799/)
72. Brase GL, Richmond J. The White-Coat Effect: Physician Attire and Perceived Authority, Friendliness, and Attractiveness. *Journal of Applied Social Psychology*. 2004; 34(12):2469–81.
73. Davis RL, Wiggins MN, Mercado CC, O'Sullivan PS. Defining the core competency of professionalism based on the patient's perception. *Clinical & experimental ophthalmology*. 2007; 35(1):51–4.
74. Lill MM, Wilkinson TJ. Judging a book by its cover: descriptive survey of patients' preferences for doctors' appearance and mode of address. *BMJ: British Medical Journal (International Edition)*. 2005; 331(7531):1524–7. Language: English. Entry Date: 20070202. Revision Date: 20111230. Publication Type: journal article.
75. Chung H, Lee H, Chang DS, Kim HS, Lee H, Park HJ, et al. Doctor's attire influences perceived empathy in the patient-doctor relationship. *Patient Education & Counseling*. 2012; 89(3):387–91. Language: English. Entry Date: 20130426. Revision Date: 20130503. Publication Type: journal article.
76. Reddy AK, Coats DK, Yen KG. An evidence-based approach to physician etiquette in pediatric ophthalmology. *Journal of pediatric ophthalmology and strabismus*. 2010; 48(6):336–9; quiz 5, 40. <https://doi.org/10.3928/01913913-20101018-04> PMID: [20964272](https://pubmed.ncbi.nlm.nih.gov/20964272/)
77. Rowland PA, Coe NP, Burchard KW, Pricolo VE. Factors affecting the professional image of physicians. *Current surgery*. 2005; 62(2):214–9. <https://doi.org/10.1016/j.cursur.2004.08.008> PMID: [15796943](https://pubmed.ncbi.nlm.nih.gov/15796943/)
78. Turner RN, Leach J, Robinson D. First impressions in complementary practice: the importance of environment, dress and address to the therapeutic relationship. *Complementary therapies in clinical practice*. 2007; 13(2):102–9. <https://doi.org/10.1016/j.ctcp.2006.10.001> PMID: [17400145](https://pubmed.ncbi.nlm.nih.gov/17400145/)
79. Gjerdingen DK, Simpson DE. Physicians' attitudes about their professional appearance. *Family practice research journal*. 1989.
80. Glick P, Fiske ST, Mladinic A, Saiz JL, Abrams D, Masser B, et al. Beyond prejudice as simple antipathy: hostile and benevolent sexism across cultures. *Journal of personality and social psychology*. 2000; 79(5):763. PMID: [11079240](https://pubmed.ncbi.nlm.nih.gov/11079240/)
81. Glick P, Fiske ST. The Ambivalent Sexism Inventory: Differentiating hostile and benevolent sexism. *Journal of personality and social psychology*. 1996; 70(3):491.
82. Eagly AH, Mladinic A. Gender stereotypes and attitudes toward women and men. *Personality and Social Psychology Bulletin*. 1989; 15(4):543–58.
83. Eagly AH, Wood W, Diekmann AB. Social role theory of sex differences and similarities: A current appraisal. *The developmental social psychology of gender*. 2000:123–74.
84. Wojciszke B, Bazinska R, Jaworski M. On the Dominance of Moral Categories in Impression Formation. *Personality and Social Psychology Bulletin*. 1998; 24(12):1251–63.
85. Nisbett RE, Wilson TD. The halo effect: Evidence for unconscious alteration of judgments. *Journal of personality and social psychology*. 1977; 35(4):250.
86. van Vliet LM, van der Wall E, Albada A, Spreeuwenberg PMM, Verheul W, Bensing JM. The Validity of Using Analogue Patients in Practitioner–Patient Communication Research: Systematic Review and Meta-Analysis. *Journal of General Internal Medicine*. 2012; 27(11):1528–43. <https://doi.org/10.1007/s11606-012-2111-8> PMID: [22700392](https://pubmed.ncbi.nlm.nih.gov/22700392/)
87. Rand DG. The promise of Mechanical Turk: How online labor markets can help theorists run behavioral experiments. *Journal of Theoretical Biology*. 2012; 299(0):172–9.

88. Horton JJ, Rand DG, Zeckhauser RJ. The online laboratory: Conducting experiments in a real labor market. *Exp Econ*. 2011; 14(3):399–425.
89. Paolacci G, Chandler J, Ipeirotis PG. Running experiments on Amazon Mechanical Turk. *Judgment and Decision Making*. 2010; 5(5):411.
90. Buhrmester M, Kwang T, Gosling SD. Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data? *Perspectives on Psychological Science*. 2011; 6(1):3–5. <https://doi.org/10.1177/1745691610393980> PMID: 26162106
91. Mason W, Suri S. Conducting behavioral research on Amazon's Mechanical Turk. *Behavior Research Methods*. 2012; 44(1):1–23. <https://doi.org/10.3758/s13428-011-0124-6> PMID: 21717266
92. Behrend TS, Sharek DJ, Meade AW, Wiebe EN. The viability of crowdsourcing for survey research. *Behavior Research Methods*. 2011; 43(3):800–13. <https://doi.org/10.3758/s13428-011-0081-0> PMID: 21437749
93. Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology*. 1988; 54(6):1063. PMID: 3397865
94. Arora S, Ashrafian H, Davis R, Athanasiou T, Darzi A, Sevdalis N. Emotional intelligence in medicine: a systematic review through the context of the ACGME competencies. *Medical Education*. 2010; 44(8):749–64. <https://doi.org/10.1111/j.1365-2923.2010.03709.x> PMID: 20633215
95. Martin LR, Friedman HS. Nonverbal communication and health care. *Applications of nonverbal communication*. 2005:3–16.
96. Hall JA. Gender effects in decoding nonverbal cues. *Psychological bulletin*. 1978; 85(4):845.
97. Blanch-Hartigan D, Hall JA, Krupat E, Irish JT. Can naive viewers put themselves in the patients' shoes?: reliability and validity of the analogue patient methodology. *Medical care*. 2013; 51(3):e16–e21. <https://doi.org/10.1097/MLR.0b013e31822945cc> PMID: 22498688
98. Gledhill JA, Warner JP, King M. Psychiatrists and their patients: views on forms of dress and address. *The British Journal of Psychiatry*. 1997; 171(3):228–32.
99. Hitlin P. Research in the Crowdsourcing Age, a Case Study 2016 February 16, 2017. Available from: <http://www.pewinternet.org/2016/07/11/research-in-the-crowdsourcing-age-a-case-study/>.
100. Henrich J, Heine SJ, Norenzayan A. The weirdest people in the world? *Behavioral and brain sciences*. 2010; 33(2–3):61–83. <https://doi.org/10.1017/S0140525X0999152X> PMID: 20550733
101. Ekman P, Friesen WV. Constants across cultures in the face and emotion. *Journal of personality and social psychology*. 1971; 17(2):124. PMID: 5542557
102. Ekman P, Friesen WV, O'Sullivan M, Chan A, Diacoyanni-Tarlatzis I, Heider K, et al. Universals and cultural differences in the judgments of facial expressions of emotion. *Journal of personality and social psychology*. 1987; 53(4):712. PMID: 3681648
103. Hall JA, LeBeau LS, Reinoso JG, Thayer F. Status, gender, and nonverbal behavior in candid and posed photographs: A study of conversations between university employees. *Sex Roles*. 2001; 44(11–12):677–92.
104. Murphy NA, Hall JA, Mast MS, Ruben MA, Frauendorfer D, Blanch-Hartigan D, et al. Reliability and Validity of Nonverbal Thin Slices in Social Interactions. *Personality and Social Psychology Bulletin*. 2014:0146167214559902.
105. Hall JA, Blanch-Hartigan D, Roter DL. Patients' Satisfaction With Male Versus Female Physicians: A Meta-analysis. *Medical Care*. 2011; 49(7):611–7. <https://doi.org/10.1097/MLR.0b013e318213c03f> PMID: 21478782
106. Blanch-Hartigan D, Hall JA, Roter DL, Frankel RM. Gender bias in patients' perceptions of patient-centered behaviors. *Patient education and counseling*. 2010; 80(3):315–20. <https://doi.org/10.1016/j.pec.2010.06.014> PMID: 20638813
107. Schmid Mast M, Hall JA, Klxf, ckner C, Choi E. Physician Gender Affects How Physician Nonverbal Behavior Is Related to Patient Satisfaction. *Medical Care*. 2008; 46(12):1212–8. <https://doi.org/10.1097/MLR.0b013e31817e1877> PMID: 19300310
108. Schmid Mast M, Hall JA, Cronauer CK, Cousin G. Perceived dominance in physicians: Are female physicians under scrutiny? *Patient Education and Counseling*. 2011; 83(2):174–9. <https://doi.org/10.1016/j.pec.2010.06.030> PMID: 20673619
109. Hall JA, Roter DL, Blanch-Hartigan D, Mast MS, Pitegoff CA. How patient-centered do female physicians need to be? analogue patients' satisfaction with male and female physicians' identical behaviors. *Health communication*. 2015; 30(9):894–900. <https://doi.org/10.1080/10410236.2014.900892> PMID: 25175277

110. Watt-Watson J, Garfinkel P, Gallop R, Stevens B, Streiner D. The Impact of Nurses' Empathic Responses on Patients' Pain Management in Acute Care. *Nursing Research*. 2000; 49(4):191–200. PMID: [10929690](https://pubmed.ncbi.nlm.nih.gov/10929690/)
111. Teding van Berkhout E, Malouff JM. The efficacy of empathy training: A meta-analysis of randomized controlled trials. *Journal of counseling psychology*. 2016; 63(1):32. <https://doi.org/10.1037/cou0000093> PMID: [26191979](https://pubmed.ncbi.nlm.nih.gov/26191979/)
112. Dovidio JF, Kawakami K, Gaertner SL. Implicit and explicit prejudice and interracial interaction. *Journal of personality and social psychology*. 2002; 82(1):62. PMID: [11811635](https://pubmed.ncbi.nlm.nih.gov/11811635/)
113. Lorie Á, Reiner DA, Phillips M, Zhang L, Riess H. Culture and Nonverbal Expressions of Empathy in Clinical Settings: A Systematic Review. *Patient Education & Counseling*. (in press).