

RESEARCH ARTICLE

Stereotypes about surgeon warmth and competence: The role of surgeon gender

Claire E. Ashton-James^{1,2*}, Joshua M. Tybur², Verena Griebner³, Daniel Costa¹

1 Pain Management Research Institute, Faculty of Medicine and Health, The University of Sydney, Sydney, Australia, **2** Department of Experimental and Applied Psychology, VU University Amsterdam, Amsterdam, The Netherlands, **3** Department of Psychology, Ludwig Maximilian University Munich, Munich, Germany

* claire.ashton-james@sydney.edu.au

Abstract

Past research indicates that patient perceptions of surgeon warmth and competence influence treatment expectancies and satisfaction with treatment outcomes. Stereotypes have a powerful impact on impression formation. The present research explores stereotypes about surgeon warmth and competence and investigates the extent to which surgeon gender influences perceptions of female and male surgeons. A between-subjects experiment was conducted online using crowdsourcing technology to derive a representative sample from the general population. Four hundred and fifteen participants were randomly assigned to evaluate the warmth and competence of males, females, surgeons, male surgeons, or female surgeons, using validated measures. Planned contrasts revealed that as a group, surgeons received higher warmth and competence ratings than non-surgeons ($p = .007$). Consistent with gender stereotypes, female surgeons received higher warmth ratings ($p < .001$) and lower competence ratings ($p = .001$) than male surgeons. The stereotype of surgeons held by the general public is that they are high in warmth and competence relative to other occupational groups. Surgeon gender appears to influence general beliefs about the warmth and competence of female and male surgeons.



OPEN ACCESS

Citation: Ashton-James CE, Tybur JM, Griebner V, Costa D (2019) Stereotypes about surgeon warmth and competence: The role of surgeon gender. PLoS ONE 14(2): e0211890. <https://doi.org/10.1371/journal.pone.0211890>

Editor: Brenessa Lindeman, University of Alabama at Birmingham, UNITED STATES

Received: October 10, 2018

Accepted: January 22, 2019

Published: February 27, 2019

Copyright: © 2019 Ashton-James et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

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

Funding: The authors received no specific funding for this work.

Competing interests: The authors have declared that no competing interests exist.

Introduction

Patients' impressions of surgeons play an important role in treatment outcomes. In particular, patients' impressions of surgeon competence (knowledge, skill, capability) and warmth (goodwill, empathy, beneficence) are associated with greater trust in surgeons,[1, 2] satisfaction with treatment outcomes,[3, 4] post-operative pain and analgesic use,[5] adherence to post-surgical rehabilitation programs,[6] referral patterns,[7] and incidence of malpractice claims.[8] Despite the impact of patients' impressions of surgeons for treatment outcomes, there is a dearth of research into factors that *shape* patients' impressions of surgeons' competence and warmth.

Patients' impressions of their surgeon's warmth and competence may be informed by a surgeon's behavior,[5, 7–10] or by third party testimony.[11] Patients' impressions of surgeons are also likely to be shaped by social stereotypes. Stereotypes are socially learned and culturally-derived perceptions of the attributes and behavior of group members.[12] They are not

always consciously held or in agreement with people's explicit beliefs,[13] and are not especially accurate, particularly in relation to individual group members.[14, 15] Nevertheless, stereotypes are often relied upon—consciously or unconsciously—as a “short cut” for forming impressions of others, particularly in situations that are time-pressured, stressful or anxiety-provoking.[16–19]

Previous research into stereotypes about surgeons has almost exclusively represented the views of medical students and nursing staff, who perceive surgeons to be egoistic, stubborn, aggressive, competitive, and domineering, but also technically masterful, astute, energetic, and precise.[20–28] In other words, surgeons have been described by medical “insiders” as low in warmth but high in competence. These stereotypes about surgeons are not necessarily generalizable to the general public, however, whose views may be more representative of past, current, or future surgical patients. In addition, previously reported evaluations of surgeons have been relative rather than absolute: surgeons were perceived by medical staff and students to be less nurturing and more hierarchical in comparison to pediatricians and general practitioners,[22] however, they may not be perceived as such in comparison to non-medical professionals, particularly since they are in a healthcare field which indicates some level of care for the well-being of people. Finally, much of the research describing perceptions of surgeons was conducted more than 20 years ago, at a time when the surgeon-patient relationship was more paternalistic and less patient-centered than is advocated in current medical education. In view of this gap in the literature, and the clear potential for stereotypes to influence patients' impressions of surgeons, the present study investigates current, publicly-held stereotypes of surgeon warmth and competence, and benchmarks these stereotypes against a selection of non-medical occupational groups.

Based on previous research, we expect surgeons, as a professional group, to be perceived as lower in warmth than competence. As members of the healthcare profession, however, we expect surgeons to be higher in both competence and warmth relative to members of non-medical professions (businessmen, politicians, professional athletes). At the same time, we expect that stereotypes of surgeons may vary by surgeon gender in one of two ways. On the one hand, gender stereotypes (that females are higher in warmth than competence, and males are higher in competence than warmth)[29, 30] may have “spillover effects” on judgments of female and male surgeons,[31, 32] such that female surgeons are perceived to be higher in warmth and lower in competence than male surgeons. On the other hand, gender stereotypes may create “backlash effects” on perceptions of female surgeons, whereby female surgeons are evaluated more negatively than male surgeons with respect to *both* warmth and competence, reflecting perceivers discomfort with females occupying traditionally “masculine” professional roles.[33–35]

Method

Study site

Ethical approval was obtained by the Free University Amsterdam Human Ethics Review Board (VCWE) of the Faculty of Behavioral and Movement Sciences, Department of Experimental and Applied Psychology, 2013), a member of the National Ethics Council for Social and Behavioural Sciences (www.nethics.nl). As such, the institutional review committee adheres to national and international codes of ethics, including the Declaration of Helsinki (2008).

Participants

Four hundred and fifteen participants were recruited through an online crowd sourcing website, “Crowdfunder”, in 2013, which at the time of this study required members of the online

platform to hold a US credit card. Hence, participants in this study were assumed to be US residents. Members were provided with information about the study content and purpose and were required to indicate their consent to participate in research before answering any questions.

Respondents were paid \$1.00(USD) to participate in a 3–5 minute anonymous online survey and were included in analyses if they (a) completed at least 90% of the survey items, (b) recorded a survey completion time of *at least* 2.5 minutes, and (c) had not previously participated in the study (as indicated by their recorded IP address).

Design and procedure

The current study uses a within- and between-subjects experimental design to examine stereotypes of surgeons in general (relative to non-medical professional groups), and to explore stereotypes of female and male surgeons, specifically.

Participants in the study completed a ‘Social Perception Task’, in which they indicated their perceptions of the one of the following target evaluation groups to which they were randomly assigned: ‘Females’, ‘Males’, ‘Surgeons’, ‘Female Surgeons’, or ‘Male Surgeons’. In addition, participants indicated their impressions of four non-medical professional groups: TV Celebrities, Politicians, Elite Athletes, and Inner City Police Officers (order counter-balanced). These additional evaluations served to mask the target evaluation groups and to provide a benchmark against which to interpret participants’ ratings of the target evaluation groups. Participants reported whether or not they had previously experienced surgery, as well as their age, gender, and ethnicity.

Measures

Participants used a 5-point scale ($1 = \text{not at all}$, $2 = \text{slightly}$, $3 = \text{moderately}$, $4 = \text{very}$, $5 = \text{extremely}$) to indicate their general perceptions of “the attributes associated with different social groups”. Based on previous research,[36] stereotypes about warmth were gauged by asking participants to indicate the extent to which the members of a social group were ‘warm’ ‘tolerant’, ‘good-natured’, ‘sincere’, ‘friendly’, ‘well-intentioned’, and ‘trustworthy’, and stereotypes about competence were assessed by asking participants to indicate the extent to which the members of a social group were ‘competent’, ‘skilful’, ‘independent’, ‘confident’, ‘competitive’, ‘intelligent’, ‘capable’, and ‘efficient’. The order in which these attributes were presented to participants was randomized and counterbalanced. Mean warmth and competence ratings were calculated for the target and comparison evaluation groups. A scale reliability analysis of warmth items ($\alpha = .88$) and competence items ($\alpha = .89$) indicated high internal consistency. All statistical analyses were conducted using SPSS v22.

Statistical analysis

Mean warmth and competence scores were compared using a paired-samples *t*-test. These stereotypes of surgeon warmth and competence were evaluated against selected non-medical professional groups (TV Celebrities, Inner City Police Officers, Politicians and Elite Athletes) using separate one-way repeated measures ANOVAs for warmth and competence. To examine sex effects, a 5 (Target Group: Surgeons, Male Non-Surgeons, Female Non-Surgeons, Male Surgeons, Female Surgeons) \times 2 (participant sex: Male, Female) ANOVA with planned contrasts was conducted separately for warmth and competence ratings. We included previous surgery (dummy-coded) as a covariate. We planned the following between-groups contrasts: (1) Female Non-Surgeons vs. Male Non-Surgeons; (2) Female Surgeons vs. Male Surgeons; (3) Female Surgeons vs. Surgeons (unspecified sex); (4) Male Surgeons vs. Surgeons (unspecified

sex); (5) Female Non-Surgeons vs. Female Surgeons; and (6) Male Non-Surgeons vs. Male Surgeons. We examined all interactions and controlled Type I error rate using the Hochberg method, to give $\alpha = .01$.

Results

Sample characteristics

There were 328 participants included in the analysis after applying the exclusion criteria (mean age = 31.5 years, range = 16–75 years, 34.5% female, 65.5% male). Participants identified themselves as Caucasian American (34.6%), Asian or Asian American (34.8%), African American (4.3%), Hispanic or Hispanic American (5.8%), Native American (1.5%), or “Other” (19.0%). Approximately half of the participants (47.6%) had previously had surgery: 35.1% with a male surgeon, 7.9% with a female surgeon, 6.1% with both a male and a female surgeon, and 3.4% did not remember the gender of their surgeon.

Surgeon stereotypes

Overall, surgeons (unspecified sex) were rated as higher in competence ($M = 4.13, SD = 0.62$) than warmth ($M = 3.49, SD = 0.68$), $t(62) = 7.18, p < .001$.

As shown in Fig 1, Surgeons (unspecified sex) received significantly higher warmth ratings than selected non-medical professional groups, including TV Celebrities, $F(1,195) = 121.32, p < .001, \eta_p^2 = .38$, Inner City Police Officers, $F(1,195) = 125.05, p < .001, \eta_p^2 = .39$, Politicians, $F(1,195) = 199.48, p < .001, \eta_p^2 = .51$, and Elite Athletes, $F(1,195) = 27.31, p < .001, \eta_p^2 = .12$. Surgeons (unspecified sex) also received significantly higher competence ratings than TV Celebrities, $F(1,195) = 118.31, p < .001, \eta_p^2 = .38$, Inner City Police Officers, $F(1,195) = 147.28, p < .001, \eta_p^2 = .43$, Politicians, $F(1,195) = 211.16, p < .001, \eta_p^2 = .52$, and Elite Athletes, $F(1,195) = 23.09, p < .001, \eta_p^2 = .11$.

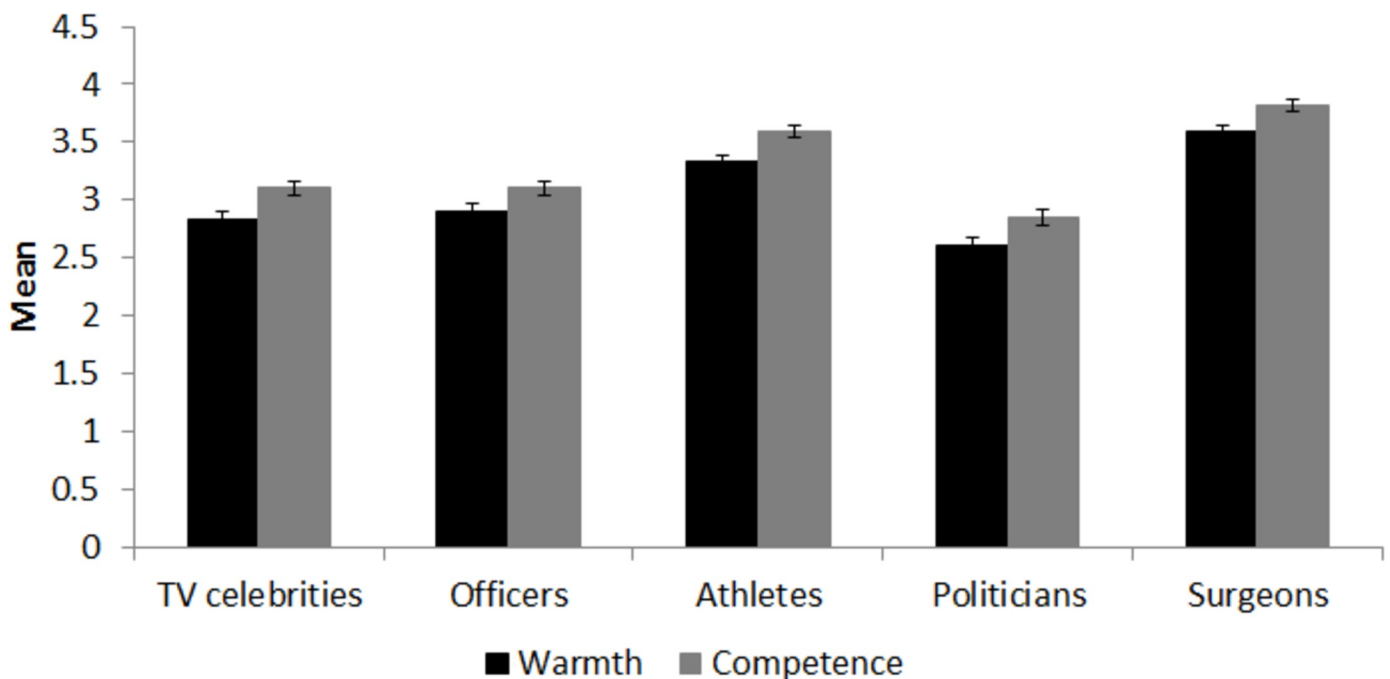


Fig 1. Mean competence and warmth ratings for surgeons and each of the four comparison professional groups.

<https://doi.org/10.1371/journal.pone.0211890.g001>

Surgeon gender

Warmth ratings. Female Surgeons were rated as higher in warmth than Male Surgeons $F(1,311) = 22.77, p < .001, \eta_p^2 = .07$. Female Surgeons were also rated as higher in warmth than Female Non-Surgeons, $F(1,311) = 12.59, p < .001, \eta_p^2 = .04$, and Surgeons (unspecified sex), $F(1,311) = 15.88, p < .001, \eta_p^2 = .05$.

There was no difference between the warmth ratings given to Surgeons (unspecified sex) and Male Surgeons, $F(1,311) = 0.38, p = .539, \eta_p^2 = .001$. Further, there was no difference between the perceived warmth of Male Non-Surgeons and Male Surgeons, $F(1,311) = 1.45, p = .229, \eta_p^2 = .01$. Replicating previous research, Female Non-Surgeons were perceived as significantly warmer than Male Non-Surgeons, $F(1,311) = 7.00, p = .009, \eta_p^2 = .02$ (see Table 1). None of these effects differed significantly depending on participant sex (i.e., there were no interaction effects). Further, there was no difference in the warmth ratings reported by Female and Male participants overall, $F(1,311) = 0.50, p = .482, \eta_p^2 = .002$.

Competence ratings. Male Surgeons were perceived as significantly more competent than Female Surgeons, $F(1,311) = 10.58, p = .001, \eta_p^2 = .03$ (see Table 1). Surgeons (unspecified sex) received significantly higher competence ratings than Female Surgeons, $F(1,311) = 30.35, p < .001, \eta_p^2 = .09$, and there was no difference in evaluations of the competence of Female Surgeons and Female Non-Surgeons, $F(1,311) = 0.66, p = .416$. When applying the Bonferroni correction, ratings of Surgeons (unspecified sex) were not significantly different from ratings of Male Surgeons, $F(1,311) = 5.59, p = .019, \eta_p^2 = .02$. However, Male Surgeons were rated as significantly more competent than Male Non-Surgeons, $F(1,311) = 6.90, p = .009, \eta_p^2 = .02$. In contrast to previous research, there was no difference between the rated competence of Female and Male Non-Surgeons, $F(1,311) = 0.02, p = .895, \eta_p^2 < .001$. None of these effects interacted with participant sex. Further, the competence ratings reported by Female and Male participants were not statistically different, $F(1,311) = 3.57, p = .060, \eta_p^2 = .01$.

Discussion

In contrast to the view that surgeons are low in social skills but high in technical skills, participants from the general population (48% of whom had previously been a surgical patient) rated surgeons, as a group, as high in warmth as well as competence, relative to other non-medical occupational groups. In addition, the extent to which surgeons were rated as high in warmth and competence depended on their gender: As a group, female surgeons received higher warmth ratings than male surgeons, while male surgeons received higher competence ratings than female surgeons. Our findings did not reveal evidence for “backlash effects”, whereby females who occupy traditionally male-dominated professions (i.e. surgery) are perceived as less warm than females in general.[34] Instead, female surgeons were perceived to be higher in warmth than both male surgeons and females in general.

It is important to emphasize that the stereotypes reflect perceptions, not reality:[28] Female surgeons, as a group, are not necessarily more compassionate and caring than male surgeons, and male surgeons, as a group, are not necessarily more skilled and capable than female surgeons. There is evidence that female general practitioners exhibit more empathic behavior than male general practitioners.[37–39] However, this finding more likely reflects differences

Table 1. Warmth and competence means (and standard deviations) for each target group.

Participants	Female non-surgeons	Male non-surgeons	Surgeons	Female surgeons	Male surgeons	Total
Warmth	3.46 (0.76)	3.20 (0.61)	3.49 (0.68)	3.93 (0.72)	3.38 (0.72)	3.49 (0.74)
Competence	3.53 (0.74)	3.58 (0.64)	4.13 (0.62)	3.50 (0.56)	3.85 (0.75)	3.72 (0.70)

<https://doi.org/10.1371/journal.pone.0211890.t001>

in the way that patients communicate with female and male doctors (disclosing greater emotion and need for empathy to female compared to male doctors), rather than differences in the way that female and male physicians communicate in general.[40] Patient behavior towards female and male *surgeons* has not been investigated, however in light of our finding that people expect female surgeons to be higher in warmth than male surgeons, we would expect patients to show more partnership building, question asking, social conversation, and emotional disclosure with female surgeons compared to male surgeons. I may be because of patients' greater willingness to communicate more demonstratively with female surgeons that female surgeons then display greater warmth than male surgeons.

It important to acknowledge that there will be conditions under which stereotypes are not used to form judgments of surgeons in a clinical context. Stereotypes are generally not used to form impressions of others when their attributes are unambiguous or if their attributes have been explicitly described by a reliable source.[11] For example, if a male surgeon's communication behavior is unambiguously warm, or if a patient has been referred to a particular male surgeon because of his exceedingly compassionate and caring bedside manner, then his gender is less likely to undermine patients' perceptions of his warmth relative to a female surgeon. In the same vein, if patients have been recommended to a female surgeon because "she is the best and most trusted surgeon", her competence is less likely to be undervalued relative to a male surgeon.

Nevertheless, the finding that people hold positive stereotypes of surgeons (both male and female) bodes well for perceptions of surgeon warmth and competence in interactions with patients. Stereotypes have been shown to shape judgments of behavior in two ways, both by increasing peoples' attention to and memory for stereotype consistent behavior, and by influencing the interpretation of ambiguous behavior.[18, 41] Theoretically, therefore, the stereotype of surgeons as both competent and warm may lead patients to interpret paternalistic communication ("do as I say and you will be healed") as a sign of confidence and concern for patient well-being rather than arrogance and a lack of empathic concern. Again, this is a fertile area for future research.

Strengths and limitations

Participants in the current study reported their perceptions of surgeons (unspecified sex), male surgeons, or female surgeons, in response to an online survey. There are two main strengths to this research design and procedure. Online surveys enable researchers to recruit a participant sample that is heterogeneous in terms of age, ethnicity and education. Consequently the social attitudes that are reported by participant samples recruited online tend to be more reliable (generalizable) than reports provided by selective samples of medical or psychology students.[42] An additional strength of this research method is that it is "double-blind", in the sense that researchers and participants do not come face to face with each other. Hence, the social attitudes reported by participants in the present study are unlikely to be biased by participants' social desirability concerns, or the gender of the researcher conducting the study.

Several researchers have independently validated the use of online participant recruitment for the collection of reliable (generalizable) data on publicly held opinions.[42–44] However, the opinions reported by participants in the current study are likely to be specific to residents of the USA, and may also be specific to members of online survey distribution platforms such as Crowdfunder (used in the present study), or Mechanical Turk (Amazon). It has been argued that persons who are recruited to participate in online surveys and experiments through crowdsourcing websites such as these may in some cases be "non-naïve", having participated in many similar studies over time[45]. If researchers post various iterations of the same study on

the same recruitment website, it is certainly possible that participants would become familiar with the type of questions being asked and may even get a sense of what the experimenter is investigating, leading to demand effects. The present study recruited participants for a single study in one iteration, and hence non-naivety of participants is unlikely to be a concern in the present research.

Nevertheless, given the experimental nature of the present research we would caution against making inferences about how patients perceive and respond to female and male surgeons based on the current data alone. Follow-up research studies are required to observe how these stereotypes influence patients' impressions of surgeons in a clinical context. On the one hand, interactions between patients and surgeons are relatively limited, especially in comparison to primary care specialists. Hence, it is plausible that stereotypes of surgeons (both female and male) predict patients' impressions of surgeons in practice. On the other hand, research suggests that when people are motivated to form accurate impressions of others (as one might expect when a patient is *choosing* a surgeon), they tend to use individuating information to form impressions rather than stereotypes.[41] Hence, in the context of elective surgery, patients may have the opportunity to "interview" their surgeon and may be less likely to use stereotypes about surgeons (global or gender-specific) when evaluating the warmth and competence of their prospective surgeon. In the context of emergency surgery, however, or in cases where the patient does not have an opportunity to even meet their surgeon, patients may be more likely to rely on their internalized beliefs or stereotypes about female and male surgeons to form their impressions.

Future directions

The current research suggests that there is a general held perception that surgeons, as a group, are higher in warmth and competence than other professional groups and that female surgeons, specifically, are perceived to be higher in warmth and lower competence than male surgeons. In consideration of the limitations of the current research, described above, the implications of the current results are unclear. In particular, it will be important for future research to investigate whether social stereotypes of male and female surgeon attributes bias *patients'* expectations and impressions of their surgeons. Such studies will by necessity be observational in nature, and may benefit from using implicit (behavioral) measures of patient preferences, such as waitlist demands on male versus female surgeons for elective surgeries, rather than patient self-reported preferences or behavioral intentions. In many countries, such as the United States, patients provide satisfaction ratings (Press Ganey Scores) which may provide insight into whether patients' expectations of differences in male and female surgeon warmth and competence have any consequences for their experience of female and male surgeon warmth and competence. It will be interesting to note whether there are differences between patients' explicitly reported satisfaction ratings of male and female surgeons following non-elective (emergent) surgeries. Finally, it will be important to consider factors that moderate patients' expectations of and preferences for surgeon attributes. For example, the degree to which patients expect and value surgeon warmth may depend on the type of surgery being performed (e.g. mastectomy vs. lung transplant)[11], or whether the surgery is elective (e.g. cosmetic surgery), potentially life-saving surgery (e.g. prophylactic cardiac surgery) or emergent surgery.

Conclusion

The current study contributes to our understanding of patient expectations and impressions of surgeons by examining generally held beliefs or stereotypes about surgeons, as a professional

group. The results of this study suggest that surgeons are, as a group, expected to be high in both warmth and competence relative to other professional groups and that gender stereotypes may “spillover” to further nuance beliefs and expectations of female and male surgeons. In consideration of the experimental methodology used in the current research, additional studies are recommended to validate the generalizability of the current findings with a patient population.

Supporting information

S1 File. Supplementary material data file.
(XLSX)

Author Contributions

Conceptualization: Claire E. Ashton-James.

Data curation: Claire E. Ashton-James, Joshua M. Tybur, Verena Grieser, Daniel Costa.

Formal analysis: Claire E. Ashton-James, Joshua M. Tybur, Verena Grieser, Daniel Costa.

Investigation: Claire E. Ashton-James.

Methodology: Claire E. Ashton-James, Verena Grieser, Daniel Costa.

Project administration: Claire E. Ashton-James.

Resources: Claire E. Ashton-James.

Supervision: Claire E. Ashton-James.

Validation: Claire E. Ashton-James, Joshua M. Tybur.

Visualization: Daniel Costa.

Writing – original draft: Claire E. Ashton-James, Verena Grieser, Daniel Costa.

Writing – review & editing: Joshua M. Tybur.

References

1. Axelrod DA, Goold SD. Maintaining trust in the surgeon-patient relationship: challenges for the new millennium. *Archives of Surgery*. 2000; 135(1):55–61. PMID: [10636348](#)
2. Hall MA, Dugan E, Zheng B, Mishra AK. Trust in physicians and medical institutions: what is it, can it be measured, and does it matter? *Milbank Quarterly*. 2001; 79(4):613–39. <https://doi.org/10.1111/1468-0009.00223> PMID: [11789119](#)
3. Buller MK, Buller DB. Physicians' communication style and patient satisfaction. *Journal of health and social behavior*. 1987:375–88. PMID: [3429807](#)
4. Steinhausen S, Ommen O, Thüm S, Lefering R, Koehler T, Neugebauer E, et al. Physician empathy and subjective evaluation of medical treatment outcome in trauma surgery patients. *Patient education and counseling*. 2014; 95(1):53–60. <https://doi.org/10.1016/j.pec.2013.12.007> PMID: [24411659](#)
5. Egbert LD, Battit GE, Welch CE, Bartlett MK. Reduction of postoperative pain by encouragement and instruction of patients: a study of doctor-patient rapport. *New England Journal of Medicine*. 1964; 270(16):825–7.
6. 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.
7. McLafferty RB, Williams RG, Lambert AD, Dunnington GL. Surgeon communication behaviors that lead patients to not recommend the surgeon to family members or friends: analysis and impact. *Surgery*. 2006; 140(4):616–24. <https://doi.org/10.1016/j.surg.2006.06.021> PMID: [17011909](#)
8. Ambady N, LaPlante D, Nguyen T, Rosenthal R, Chaumeton N, Levinson W. Surgeons' tone of voice: a clue to malpractice history. *Surgery*. 2002; 132(1):5–9. PMID: [12110787](#)

9. Levinson W, Chaumeton N. Communication between surgeons and patients in routine office visits. *Surgery*. 1999; 125(2):127–34. PMID: [10026744](#)
10. Schoenfelder T, Klewer J, Kugler J. Factors associated with patient satisfaction in surgery: the role of patients' perceptions of received care, visit characteristics, and demographic variables. *Journal of Surgical Research*. 2010; 164(1):e53–e9. <https://doi.org/10.1016/j.jss.2010.08.001> PMID: [20863521](#)
11. Dusch MN, O'Sullivan PS, Ascher NL. Patient perceptions of female surgeons: how surgeon demeanor and type of surgery affect patient preference. *Journal of Surgical Research*. 2014; 187(1):59–64. <https://doi.org/10.1016/j.jss.2013.10.020> WOS:000331607500010. PMID: [24300130](#)
12. Hilton JL, Von Hippel W. Stereotypes. *Annual review of psychology*. 1996; 47(1):237–71.
13. Kurdi B, Seitchik AE, Axt JR, Carroll TJ, Karapetyan A, Kaushik N, et al. Relationship between the implicit association test and intergroup behavior: A meta-analysis. *American psychologist*. 2018.
14. Judd CM, Park B. Definition and assessment of accuracy in social stereotypes. *Psychological review*. 1993; 100(1):109. PMID: [8426877](#)
15. Hamilton DL, Gifford RK. Illusory correlation in interpersonal perception: A cognitive basis of stereotypic judgments. *Journal of Experimental Social Psychology*. 1976; 12(4):392–407.
16. Wilder DA. The role of anxiety in facilitating stereotypic judgments of outgroup behavior. *Affect, cognition, and stereotyping: Interactive processes in group perception*. 1993:87–109.
17. Sherman JW, Macrae CN, Bodenhausen GV. Attention and stereotyping: Cognitive constraints on the construction of meaningful social impressions. *European review of social psychology*. 2000; 11(1):145–75.
18. Bodenhausen GV. Emotions, arousal, and stereotypic judgments: A heuristic model of affect and stereotyping. 1993.
19. Pratto F, Bargh JA. Stereotyping based on apparently individuating information: Trait and global components of sex stereotypes under attention overload. *Journal of Experimental Social Psychology*. 1991; 27(1):26–47.
20. Cochran A, Paukert JL, Neumayer LA. Does a general surgery clerkship influence student perceptions of surgeons and surgical careers? *Surgery*. 2003; 134(2):153–7. <https://doi.org/10.1067/msy.2003.216> PMID: [12947312](#)
21. Hill EJ, Bowman KA, Stalmeijer RE, Solomon Y, Dornan T. Can I cut it? Medical students' perceptions of surgeons and surgical careers. *The American Journal of Surgery*. 2014; 208(5):860–7. <https://doi.org/10.1016/j.amjsurg.2014.04.016> PMID: [25092269](#)
22. Couch JV, Sigler JN. Gender perception of professional occupations. *Psychological Reports*. 2001; 88(3):693–8.
23. Furnham A. Career attitudes of preclinical medical students to the medical specialties. *Medical education*. 1986; 20(4):286–300. PMID: [3747874](#)
24. Coombs RH. *Mastering medicine: Professional socialization in medical school*. 1978.
25. Zimet CN, Held ML. The development of views of specialties during four years of medical school. *Academic Medicine*. 1975; 50(2):157–66.
26. Fishman DB, Zimet CN. Specialty choice and beliefs about specialties among freshman medical students. *Academic Medicine*. 1972; 47(7):524–33.
27. Bruhn JG, Parsons OA. Medical Student Attitudes toward Four Medical Specialties. *Academic Medicine*. 1964; 39(1):40–9.
28. Warschkow R, Steffen T, Spillmann M, Kolb W, Lange J, Tarantino I. A comparative cross-sectional study of personality traits in internists and surgeons. *Surgery*. 2010; 148(5):901–7. <https://doi.org/10.1016/j.surg.2010.03.001> PMID: [20430410](#).
29. Eagly AH. *Sex differences in social behavior: A social-role interpretation*: Psychology Press; 2013.
30. Cejka MA, Eagly AH. Gender-stereotypic images of occupations correspond to the sex segregation of employment. *Personality and social psychology bulletin*. 1999; 25(4):413–23.
31. Nicolai J, Demmel R. The impact of gender stereotypes on the evaluation of general practitioners' communication skills: an experimental study using transcripts of physician–patient encounters. *Patient education and counseling*. 2007; 69(1):200–5.
32. Delgado A, López-Fernández L-A, de Dios Luna J, Saletti-Cuesta L, Gil N, Jiménez M. The role of expectations in preferences of patients for a female or male general practitioner. *Patient education and counseling*. 2011; 82(1):49–57. <https://doi.org/10.1016/j.pec.2010.02.028> PMID: [20371157](#)
33. Rudman LA, Phelan JE. Backlash effects for disconfirming gender stereotypes in organizations. *Research in organizational behavior*. 2008; 28:61–79.

34. Phelan JE, Rudman LA. Prejudice toward female leaders: Backlash effects and women's impression management dilemma. *Social and Personality Psychology Compass*. 2010; 4(10):807–20.
35. Eagly AH, Karau SJ. Role congruity theory of prejudice toward female leaders. *Psychological review*. 2002; 109(3):573. PMID: [12088246](#)
36. Fiske ST, Cuddy AJ, Glick P, Xu J. A model of (often mixed) stereotype content: competence and warmth respectively follow from perceived status and competition. *Journal of personality and social psychology*. 2002; 82(6):878. PMID: [12051578](#)
37. Hall JA, Roter DL. Medical communication and gender: a summary of research. *The journal of gender-specific medicine: JGSM: the official journal of the Partnership for Women's Health at Columbia*. 1997; 1(2):39–42.
38. Roter DL, Hall JA, Aoki Y. Physician gender effects in medical communication: a meta-analytic review. *Jama*. 2002; 288(6):756–64. PMID: [12169083](#)
39. Bylund CL, Makoul G. Empathic communication and gender in the physician–patient encounter. *Patient education and counseling*. 2002; 48(3):207–16. PMID: [12477605](#)
40. Hall JA, Roter DL. Do patients talk differently to male and female physicians?: A meta-analytic review. *Patient education and counseling*. 2002; 48(3):217–24. PMID: [12477606](#)
41. Fiske ST, Neuberg SL. A continuum of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. *Advances in experimental social psychology*. 1990; 23:1–74.
42. Gosling SD, Vazire S, Srivastava S, John OP. Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. *American Psychologist*. 2004; 59(2):93. <https://doi.org/10.1037/0003-066X.59.2.93> PMID: [14992636](#)
43. Goodman JK, Cryder CE, Cheema A. Data collection in a flat world: The strengths and weaknesses of Mechanical Turk samples. *Journal of Behavioral Decision Making*. 2013; 26(3):213–24.
44. Huff C, Tingley D. “Who are these people?” Evaluating the demographic characteristics and political preferences of MTurk survey respondents. *Research & Politics*. 2015; 2(3):2053168015604648.
45. Chandler J, Mueller P, Paolacci G. Nonnaïveté among Amazon Mechanical Turk workers: Consequences and solutions for behavioral researchers. *Behavior research methods*. 2014; 46(1):112–30. <https://doi.org/10.3758/s13428-013-0365-7> PMID: [23835650](#)