# Impact of Race and Sex on Pain Management by Medical Trainees: A Mixed Methods Pilot Study of Decision Making and Awareness of Influence

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## Abstract

**Objective.** Previous research suggests female and black patients receive less optimal treatment for their chronic pain compared with male and white patients. Provider-related factors are hypothesized to contribute to unequal treatment, but these factors have not been examined extensively. This mixed methods investigation examined the influence of patients' demographic characteristics on providers' treatment decisions and providers' awareness of these influences on their treatment decisions.

**Methods.** Twenty medical trainees made treatment decisions (opioid, antidepressant, physical therapy) for 16 virtual patients with chronic low back pain; patient sex and race were manipulated across patients. Participants then indicated from a provided list the factors that influenced their treatment decisions, including patient demographics. Finally, individual interviews were conducted to discuss the role of patient demographics on providers' clinical decisions.

**Results.** Individual regression analyses indicated that 30% of participants were reliably influenced by patient sex and 15% by patient race when making their decisions ($P < 0.05$ or $P < 0.10$). Group analyses indicated that white patients received higher antidepressant recommendations, on average, than black patients ($P < 0.05$). Half of the medical trainees demonstrated awareness of the influence of demographic characteristics on their decision making. Participants, regardless of whether they were influenced by patients' demographics, discussed themes related to patient sex and race; however, participants' discussion of patient demographics in the interviews did not always align with their online study results.

**Conclusions.** These findings suggest there is a considerable variability in the extent to which medical trainees are influenced by patient demographics and their awareness of these decision making influences.

**Key Words.** Decision Making; Treatment Disparities; Mixed Methods; Virtual Human

## Introduction

Although the majority of chronic pain patients reports inadequate pain management, retrospective chart reviews have found female and black patients receive less optimal pain management compared with male and white patients, respectively. For instance, women are more likely than men to receive a nonspecific, somatic diagnosis and be treated less aggressively for their pain [1,2]. Black patients are less likely to rate their chronic pain treatment as "very good" or "excellent" compared with white patients [3], and black patients are less likely to receive any analgesic medication, including opioids [4–8].

The disparities literature consists primarily of observational studies that lack experimental control, with only a few experimental studies examining the influence of patient demographics on providers' treatment decisions. Moreover, many of the published experimental studies used traditional "paper–pencil" vignette methods, which lack realism. Previous experimental investigations with laypersons and nurses have found participants were influenced by patient demographic characteristics when making pain assessment ratings and treatment recommendations [9–12]. Interestingly, findings from experimental and observational studies have been inconsistent. For instance, an experimental study by Hirsh, George, and Robinson [10] found nurses gave higher opioid medication ratings (i.e., more likely to prescribe/administer an opioid) to female and black patients presenting with acute pain than to male and white patients, respectively.

Although previous studies have examined patient factors related to treatment differences, few have examined provider factors that may advance our understanding of these differences. One provider factor that may be important in this context is providers' awareness of the influences on their decision-making process, specifically the extent to which providers are aware that they are influenced by patient demographics when assessing and treating pain. Studying this provider factor may help to explain some of the inconsistencies in the literature and yield important information on how to reduce disparities. A previous investigation examining nurses' level of decision-making awareness found that although none of the nurses *reported* using patient sex, race, and/or age when making acute pain management decisions, judgment analyses revealed between 13% and 31% of participants *actually* used one of these demographic characteristics in their decision-making process [13]. To our knowledge, no other published studies have examined the extent to which providers are aware of treating patients differently across demographic groups. Addressing this gap in the disparities literature will help us understand whether providers are knowingly making different decisions based on patients' sex or race or if providers are unaware of this influence. Either finding will highlight a need for educational interventions to reduce decision-making reliance on nonmedical factors or increase decision-making awareness among medical professionals.

In the current study, we used a mixed methods approach to examine the influence of patient sex and race on participants' pain treatment decisions and participants' awareness of these influences on their decision making. Specifically, we employed virtual human technology, lens model methodology, and qualitative interviews to examine medical trainees' *actual use* of patient sex and race (as indicated by individual regression analyses), *self-reported use* of patient sex and race (as indicated by responses to the "information used questionnaire"), and *in-depth discussion* of patient sex and race in the context of clinical pain management (as indicated by qualitative analyses of individual interviews). This mixed methods approach of three data sources facilitated a more comprehensive

analysis of clinician decision making and awareness than is possible with conventional research methods [14]. We hypothesized that 1) a subset of trainees would be reliably influenced by patient sex and race; 2) female and black patients would receive less aggressive treatment than male and white patients, respectively, except women would receive higher antidepressant recommendations than men; and 3) trainees would demonstrate a lack of awareness about the influence of patient demographics on their treatment decisions. Qualitative data were analyzed to provide a deeper understanding of providers' perceptions of patient sex and race as influential factors in their treatment decisions. Portions of this investigation were presented at the 2013 American Pain Society Annual Conference.

## Methods

### Procedure

This study used a mixed methods design that consisted of both an online quantitative portion and individual qualitative interviews. For the purposes of this study, we examined only those participants (20 medical trainees) who completed both the online portion and follow-up interview. Information on the parent investigation, which included over 100 participants, can be found in a previous publication (see [15]). Participants were recruited from the Indiana University School of Medicine by flyers and word of mouth. Individuals were excluded from the parent study if they were not a health care provider (nurse, practitioner) or medical trainee (medical student, resident, fellow). The online portion of the study and the qualitative interview each took approximately 1 hour to complete, and participants received a gift card after completion of each study portion. Study procedures were approved by our institutional review board.

### Quantitative Procedures

We used virtual human technology and text vignettes for the online portion. Participants viewed 16 patient profiles; each profile consisted of a still facial image expressing a high level of pain (see [15] for sample images) that varied by sex (male, female) and race (white, black). Patient demographics were manipulated and systematically balanced across the 16 profiles. To enhance realism, the vignettes contained information about the patients' vital signs (e.g., blood pressure, respiration); these values varied across patients but were always within normal limits. The text-based vignettes presented identical information regarding the patients' history of chronic pain (e.g., pain from a back injury 1 year ago), openness to all treatment options, and experiencing no other physical or mental health symptoms (Appendix A). Depression status was manipulated in the parent study but was held constant in the current analyses (see 15). This method allowed for a higher level of experimental control and increased the reliability of our treatment decision data through multiple observations.

Participants were told that the purpose of the study was to examine clinical decisions about pain management; however, they were not given information about the specific aims or hypotheses. Participants were emailed unique login credentials to access a secure study Website (hosted on the university Web server) on their personal computers from a quiet, private location. Participants provided informed consent and demographic information. They then read instructions about how to complete the treatment decision task. Participants viewed and made treatment decisions for 16 unique patients. The order of patient presentation was randomized. For each patient, participants made decisions about using three common chronic pain treatments (see Measures section below). After rating all patients, participants selected factors they used when making decisions for the vignettes. Finally, participants indicated their willingness to be contacted for a qualitative interview.

*Measures*

### Demographic Questionnaire

Participants provided information about their sex, age, race, and ethnicity. They also indicated their level of training (medical student or medical resident).

### Treatment Decisions

For each vignette, participants were asked to rate the likelihood that they would recommend the following three pain treatment options: 1) opioid/narcotic pain medication; (2) antidepressant medication; and 3) physical therapy (PT). Participants rated each treatment decision on separate 0 ("not at all likely") to 100 ("extremely likely") visual analogue scales. These treatment options were included to better understand treatment disparities for commonly used (i.e., opioids) and under-researched (i.e., antidepressants, PT) treatments for chronic pain management.

### Information Used Questionnaire

Participants indicated which factors they used when making treatment decisions for the patient vignettes. Participants chose from a list of 10 items, such as patients' pain history and patients' vital signs. Specifically, we were interested in responses to the item "patient demographics" in order to examine participants' level of decision-making awareness.

*Qualitative Procedures*

Participants willing to be contacted for a qualitative interview completed the interviews 2–8 weeks after completion of the online study. Individual, semistructured interviews were completed in a private room on campus.

The interview guide was created after a series of meetings between a four-member interdisciplinary research team (clinical psychology doctoral student, clinical psychologist,

internal medicine physician, and health communications scientist). The interview guide consisted of open-ended questions about the influence of patient sex and race on participants' clinical pain management decisions. To increase the reliability of the interview data, the same interviewer (N.A.H.) was used for all participants. Participants and the interviewer were blinded to the results from the online portion of the study.

*Data Analyses*

### Quantitative Analysis

This study used a lens model design and 16 unique patient profiles to examine two cues of interest (patient sex and race). Lens model designs are well suited for studying clinical decision making as they allow investigators to calculate the influence of each variable of interest, or "cue," while holding other variables constant [16]. These other variables consist of patient factors that were included but not manipulated in a study (e.g., in this study, we included patients' facial expressions of pain in the images and their pain histories in the text, but these were held constant across vignettes), as well as variables that were not included or manipulated in a study (e.g., in this study, we did not provide information about patients' socioeconomic status [SES]). We held both types of variables constant across patient vignettes and manipulated two cues of interest (patients' sex and race). Individual-level regression models are then used to analyze participant's decisions to determine the extent of each cue's influence on the participant's decisions [16]. Our 8:1 profile-to-cue ratio permitted each possible cue combination to be presented four times, which enhanced study power and reliability of participants' treatment ratings. This ratio also exceeded the recommended 5:1 profile-to-cue ratio necessary to achieve sufficient power for idiographic analyses (see [17]).

All quantitative statistical analyses were performed using PASW Statistics 18.0 (SPSS Inc., Chicago, IL, USA). We first used descriptive statistics to summarize participants' demographic and training level characteristics. We then conducted both idiographic (individual-level) and nomothetic (group-level) analyses to determine the influence of patient sex and race on each participant's pain treatment decisions (idiographic) and the overall samples' treatment decisions (nomothetic). Idiographic multiple regression analyses calculate the influence of each cue (patient sex and race) on each participant's separate treatment decisions. To examine our first hypothesis, patient sex and race were entered simultaneously as independent variables, and each participant's treatment decision ratings were entered as dependent variables in separate models. The standardized regression coefficient (beta weight, $\beta$) indicates the unique contribution and direction of influence for each cue. Consistent with previous experimental studies investigating patient sex and race, $\beta$ values were examined at both the 0.05 (referred in-text as "significantly influenced") and 0.10 (referred in-text as "reliably influenced") alpha level [9].

Consistent with lens model methodology, we then examined the data using traditional group-level, or nomothetic, analyses. Descriptive statistics were used to determine the number of participants who were reliably influenced by patient sex and/or race (β, $P < 0.05$ and $P < 0.10$) based on the idiographic findings. We then squared the semipartial correlation coefficients for each individual regression model and summarized these values using descriptive statistics. Participants' average treatment ratings for each cue (e.g., average opioid rating for black patients) were calculated prior to conducting paired samples $t$-tests to compare the treatment ratings between male/female patients and black/white patients in the overall sample of trainees. Cohen's $d$ for dependent cases ($d_z$) effect sizes were calculated.

We then conducted cross-tabulation analyses to examine the concordance between participants' decision-making data and their questionnaire responses; these analyses were used as an indicator of participants' level of decision-making awareness. We compared participants' idiographic results (coded 0 = did not reliably use patient sex or race [$P > 0.10$] and 1 = reliably used patient sex or race [$P < 0.10$]) with their responses to the item "patient demographics" on the "information used questionnaire" (coded 0 = did not endorse using patient demographics; 1 = reported using patient demographics).

### Qualitative Analysis

All interviews were transcribed by a professional transcription service. Transcripts were checked for accuracy, and all identifying information was removed prior to review. Data analysis followed the same analytic protocol as a previous qualitative pain study examining health care providers [18]. This mixed methods investigation used parallel data analysis to integrate our qualitative and quantitative findings. This method includes collecting data separately and using qualitative data to provide further insight into the quantitative findings [19]. Each member of the interdisciplinary team read selected transcripts independently for overall impressions. Each team member maintained a list of themes emerging from the transcripts and met regularly to modify, combine, add, or delete themes based on consensus discussions and the content of subsequent transcripts. This facilitated development of a preliminary code list. Through an iterative process, team members applied the preliminary code list to a transcript and met to discuss and modify the code list based on transcripts and discussions. When the code list was deemed stable and consistent across reviewed transcripts, the interviewer (N.A.H.) applied the final code list to all transcripts, including those that had already been reviewed in the preliminary coding phases. ATLAS-TI (Atlas-ti Scientific Software Development GmbH, Berlin, Germany) was used to facilitate coding. During the final stage of coding, every fourth transcript was independently reviewed by all interdisciplinary team members to ensure consensus and stability of coding over time. Once all transcripts were coded, the quantitative and qualitative data were reviewed to examine patterns and variations between participants who were reliably influenced by patient sex or race and participants who were not reliably influenced by patient demographics in their treatment decisions.

### Power Analysis

The current lens model study was powered for idiographic analyses (see quantitative analysis above). G*POWER was used to conduct an *a priori* power analysis for nomothetic analyses [20]. To calculate power, effect sizes were estimated from a study that used a similar quantitative research methodology and examined sex and race differences in pain management (see [10]). Effect sizes for patient sex and race ranged from 0.59 to 0.70. The power analysis estimated a sample size ranging from 19 to 25 participants (based on effect size of 0.70 and 0.59, respectively; two-tailed dependent samples $t$-test, $\alpha = 0.05$, and power = 0.80).

This study recruited 20 participants, which falls into the range suggested by the power analysis. In addition, lens model studies have increased power at the group-level due to a greater reliability of each participant's responses through multiple observations [17]. This investigation presented each cue combination four times (2 sex × 2 race) to further enhance statistical power. Finally, the mixed methods approach used in this study enhanced overall quality and validity of our findings. [19].

## Results

Twenty medical trainees (10 medical students, 10 medical residents) completed both online and interview portions of the study. Over half of the participants were female (65%), and the majority was non-Hispanic (95%). Approximately 70% were white, 20% were Asian, 5% were black, and 5% were Middle Eastern.

### *Quantitative Results: Influence of Patient Sex and Race*

Idiographic (individual-level) and nomothetic (group-level) results are organized by treatment type. Results of idiographic regression analyses are presented in Table 1. Descriptive data on squared semipartial correlations for each cue are presented in Table 2. Results of nomothetic paired samples $t$-test analyses are presented in Table 3.

### Opioid Treatment

*Sex.* Results of idiographic analyses (Table 1) indicated four participants (20%) had a significant ($P < 0.05$) or reliable ($P < 0.10$) regression coefficient for patient sex (β coefficient value corresponding to patient sex). One trainee had a statistically significant ($P < 0.05$) cue use for patient sex, and three trainees had a reliable cue use for patient sex ($P < 0.10$). These findings indicate that patient sex was an influential factor in these four participants' opioid treatment decisions. Examination of the β value signs indicated three participants gave higher opioid treatment ratings (i.e., more likely to recommend/treat with an

**Table 1** Idiographic analyses: number of trainees with reliable cue use ($P < 0.10$) at the individual cue level for each treatment decision

| | | Treatment Decision | | | |
|---|---|---|---|---|---|
| Cue | | Opioid | Antidepressant | Physical Therapy | Total |
| Sex | Male | 3 | 1 | 1 | 4* |
| | Female | 1 | 0 | 1 | 2 |
| Race | White | 0 | 0 | 1 | 1 |
| | Black | 0 | 0 | 2 | 2 |

Columns represent the treatment decision. Rows represent the individual cue level. Cell values represent the number of participants with a reliable policy for a particular treatment decision (column) weighted toward a particular individual cue (row).
* One participant had a reliable patient sex β coefficient for both opioid and antidepressant ratings (gave higher opioid and antidepressant ratings to male patients) and is only counted once.

opioid) to male patients, and one participant gave higher ratings to female patients. The squared semipartial correlation indicates the amount of variance patient sex accounted for in each participant's opioid treatment deci- sion (Table 2). Patient sex ranged from accounting for almost none (<1%) to over a quarter (27%) of the variance in opioid ratings (mean amount of variance accounted for by sex = 7%). The result of nomothetic analyses (Table 3)

**Table 2** Variance in treatment decisions explained by patient demographics

| Treatment Decision | Sex Mean (SD) Range | Race Mean (SD) Range | $R^2$ Mean (SD) Range |
|---|---|---|---|
| Opioid | 0.07 (0.09) <0.01–0.27 | 0.06 (0.05) <0.01–0.18 | 0.13 (0.09) <0.01–0.31 |
| Antidepressant | 0.03 (0.06) <0.01–0.21 | 0.03 (0.04) <0.01–0.16 | 0.06 (0.09) <0.01–0.32 |
| Physical therapy | 0.05 (0.07) <0.01–0.29 | 0.07 (0.08) <0.01–0.26 | 0.12 (0.10) <0.01–0.31 |

Sex and race values represent squared semipartial correlations. $R^2$ values represent the amount of variance accounted for by both sex and race.
SD = standard deviation.

**Table 3** Results of nomothetic analyses for chronic pain treatment decisions

| Decision | Cue | | Mean (SD) | $t$ | $d_z$ |
|---|---|---|---|---|---|
| Opioid | Sex | Male | 17.73 (20.9) | ns | <0.01 |
| | | Female | 17.72 (20.4) | | |
| | Race | White | 17.13 (19.5) | ns | 0.28 |
| | | Black | 18.31 (21.5) | | |
| Antidepressant | Sex | Male | 36.74 (16.8) | ns | 0.05 |
| | | Female | 37.12 (17.1) | | |
| | Race | White | 38.64 (17.2) | 2.159* | 0.48 |
| | | Black | 35.22 (16.7) | | |
| Physical therapy | Sex | Male | 75.61 (29.0) | ns | 0.09 |
| | | Female | 76.07 (29.1) | | |
| | Race | White | 76.64 (29.7) | ns | 0.16 |
| | | Black | 75.67 (28.5) | | |

* $P < 0.05$.
$t$ is used for paired samples $t$-tests. $d_z$ is Cohen's $d$ used as effect size indices for paired samples $t$-tests.
ns = not significant ($P > 0.05$); SD = standard deviation.

was not significant ($P > 0.10$, $d_z = < 0.01$), indicating that, at the group-level, male and female patients received similar opioid treatment ratings.

*Race.* At the idiographic level, no participants were reliably influenced by patient race when making opioid ratings ($P > 0.10$). Squared semipartial correlations indicated patient race accounted for as little as <1% and as much as 18% (mean = 6%) of the variance in participants' opioid treatment decisions. At the nomothetic level, participants' opioid treatment ratings for white and black patients were not significantly different ($P > 0.10$, $d_z = 0.28$).

### Antidepressant Treatment

*Sex.* One participant reliably used patient sex in his/her treatment decision for antidepressant recommendations, and this participant gave higher antidepressant recommendations to male patients than female patients ($P < 0.10$). Patient sex accounted for almost none (<1%) and up to 21% (mean = 3%) of the variance in participants' antidepressant ratings. At the group-level, antidepressant recommendations for male and female patients were not significantly different ($P > 0.10$, $d_z = 0.05$).

*Race.* At the individual-level, no participants were significantly or reliably influenced by patient race when making antidepressant treatment ratings, and patient race accounted for <1% and up to 16% (mean = 3%) of the variance in these ratings. However, when antidepressant ratings were averaged across the entire sample and examined at the nomothetic level, the results indicated that white patients received significantly higher antidepressant ratings than black patients ($t[19] = 2.159$, $P < 0.05$, $d_z = 0.48$).

### PT Treatment

*Sex.* Results of idiographic analyses indicated two participants reliably used patient sex, with one participant giving higher PT recommendations to male patients than female patients ($P < 0.05$) and the other participant showing the opposite pattern ($P < 0.10$). Examining participants' squared semipartial correlations revealed patient sex accounted for as little as <1% to over a quarter (29%; mean = 5%) of the variance in PT ratings. There was no significant sex difference in average PT ratings for the entire sample ($P > 0.10$, $d_z = 0.09$).

*Race.* Patient race was reliably used by three participants in their PT recommendations. Two participants gave higher PT recommendations to black patients, and one participant gave higher PT ratings to white patients. Patient race also accounted for almost none (<1%) to over a quarter (26%; mean = 7%) of the variance in PT ratings. At the group level, PT ratings for black and white patients were not reliably different ($P > 0.10$, $d_z = 0.16$).

### Influence of Patient Sex and Race

No participant was significantly or reliably influenced by both sex and race at the idiographic level. We examined $R^2$ values to determine how much variance both patient sex *and* race accounted for in each treatment decision (Table 2). Collectively, patient sex and race accounted for as much as 31% (mean = 13%) of the variance in participants' opioid recommendations. Similarly, these two cues accounted for as much as 32% (mean = 12%) of the variance in participants' antidepressant ratings and as much as 31% (mean = 12%) of the variance in participants' PT ratings. Across all treatments, values ranged between accounting for almost none of the variance (<1%) up to almost a third of the variance, further illustrating the considerable individual variability in participants' pain treatment decisions.

### Providers' Level of Decision-Making Awareness

Based on idiographic analyses, a total of six participants were significantly or reliably influenced by patient sex, and three participants were reliably influenced by patient race across treatment decisions (Table 1). Therefore, nine participants (45% of sample) were reliably influenced by patient sex or race when making treatment decisions (as determined by β coefficient during idiographic analyses). After making treatment recommendations, participants indicated from a list the factors they used to make their treatment decisions. Thirteen participants (65% of sample) endorsed using patients' demographics on the "information used questionnaire" to make their treatment decisions for the online vignettes. Thus, nine participants were actually influenced by patients' sex or race, while 13 participants reported using patients' demographics in their treatment decisions.

Cross-tabulation analysis indicated that of the nine participants who were actually influenced by patient sex or race (β, $P < 0.10$), six endorsed using patient demographics. Thus, these six participants demonstrated concordance (from a statistical perspective) between their reported and actual use of patient demographics; this concordance may be interpreted as demonstrating awareness of the influence of patient demographics on decision making. The remaining three participants did not report using demographics, which is discordant with their actual use of these factors and suggests they were less aware of the influence of patient demographics on their treatment decisions compared with concordant participants. Alternatively, of the 11 participants who were not reliably influenced by patient sex or race (β, $P > 0.10$), four did not report using patient demographics (suggesting greater awareness), and seven participants did report using patient demographics in their treatment decisions (suggesting a relative lack of decision-making awareness).

Overall, 10 trainees (50%) demonstrated greater awareness, and 10 trainees demonstrated a relative lack of awareness of the influence of patient demographics on their treatment decisions. A closer examination of

participants who demonstrated awareness indicated that six participants were aware of being influenced by patient demographics and four participants were aware of *not* being influenced by demographics when making treatment decisions. Among participants who demonstrated a relative lack of awareness, three participants were statistically influenced by patient sex or race but did not report using patient demographics, and seven participants were *not* statistically influenced but reported using these patient factors. Based on our operational definition of awareness (i.e., concordance between reported and actual use of patient demographics), half of the sample demonstrated awareness, and half of the participants demonstrated a lack of awareness of the influence of patient demographics on their treatment decisions for chronic pain.

*Qualitative Results*

To better understand the influence of patient sex and race, as well as providers' level of decision-making awareness, qualitative themes were examined between participants who were reliably influenced by patient sex or race and those who did not reliably use this patient factor (as determined by idiographic analyses). Prominent themes are included in Table 4.

### Not Reliably Influenced by Patient Sex

Participants who were not reliably influenced by patient sex (70% of sample) reported women tend to be more open to mental health treatments, discussed choosing similar treatments for male and female patients, and mentioned stereotypical occupational differences. Most of the participants stated that women are more open to mental health treatment options, particularly counseling and antidepressant medication. For example, one participant stated: "I perceive women as being more receptive to counseling or to admitting that they're depressed as opposed to men and so I find myself suggesting . . . antidepressants and mental health counseling maybe more frequently to women than I do to men" (Participant

**Table 4** Qualitative themes

| Subgroup | Theme (Ranked by Most Discussed) |
|---|---|
| Not reliably influenced by patient sex (N = 14) | Tailoring/individualizing treatments Patients' openness to treatments Occupational differences |
| Reliably influenced by patient sex (N = 6) | Tailoring/individualizing treatments |
| Not reliably influenced by patient race (N = 17) | Tailoring/individualizing treatments Patients' SES |
| Reliably influenced by patient race (N = 3) | Tailoring/individualizing treatments Patients' SES Beliefs about cultural differences |

SES = socioeconomic status.

1). Most participants said they would need evidence (i.e., studies showing the benefits of tailoring treatments) before they would feel comfortable tailoring based on patient sex. However, a substantial portion of these trainees' responses focused on differences in rates of depression and fibromyalgia, which they felt warrants tailoring: "[T]here tends to be a higher rate of problems with fibromyalgia and maybe depression overlying chronic pain in women, so I would be more likely to put them on an antidepressant" (Participant 23). Some trainees also mentioned stereotypical sex differences related to occupation. For example, one participant stated: "The women sometimes have more desk jobs . . . so you know they can sometimes tolerate [pain] more being at work" (Participant 11).

### Reliably Influenced by Patient Sex

Five of the six participants who were reliably influenced by patient sex reported they used the same treatments regardless of patient sex. Only one participant in this group expressed some awareness about the influence of patient sex on his/her clinical decision making:

> [I]t seems I do prescribe [antidepressants] more for women just because I feel like they have more psychological component to their pain and also because they tend to have more diffuse pain so I'll have to use these drugs to kind of hit it all; whereas, men I sometimes use more localized treatments or I feel like they don't have as much psychological component to their pain. (Participant 3)

This discussion demonstrates a level of decision-making awareness because this participant gave higher opioid ratings to male than female patients on the online study. Furthermore, this was the only participant within this group to state that he/she does not "purposely try to tailor treatments" based on patients' sex but noted that "certain genders tend to present similarly or with the same condition, so . . . that overall determines how I prescribe" (Participant 3). However, because male and female patients in the current study presented with the same condition (i.e., chronic low back pain) and symptoms, this participant's statement does not align with his/her quantitative data. The remaining participants reported tailoring only if there was strong evidence to support tailoring treatments.

### Not Reliably Influenced by Patient Race

The majority of participants (85% of sample) did not reliably use patient race in their treatment decisions. Overall, participants in this group described treating white and black patients similarly, discussed the influence of patients' SES on their treatment decisions, and talked about cultural differences among the Hispanic population. The majority of participants remarked they saw no reason to treat patients differently based on their race.

Half of these participants stated that the patients' SES often influenced their treatment decisions: "It's more of their socioeconomic status that would make me alter the treatment just based upon what they could feasibly get,

more so than race" (Participant 6). Although participants discussed not treating patients differently based on race, several noted different treatment preferences among the Hispanic population, particularly a resistance to opioid medications. Some participants attributed this to "cultural differences," while another participant mentioned more specific concerns:

> I feel like the majority of my Hispanic population is very resistant to a lot of medications. Some patients are afraid to have narcotics in their home. They are afraid they will get stolen, that their house will get broken into, that they will get robbed if they know they have narcotics. They're also afraid of the side effects, the sedation, the feeling loopy as they call it. (Participant 2)

Although participants were not specifically queried about their perceptions of Hispanic patients, nor did we include Hispanic ethnicity in the online portion of the study, participants demonstrated a greater willingness to discuss differences among these patients than among black or white patients.

### Reliably Influenced by Patient Race

Three participants reliably used patients' race when making their treatment decisions for the online study. Among this group, all of the trainees reported that race was not an important factor when making treatment decisions. One trainee mentioned that his/her treatment decision is more influenced by SES than race: "I don't think it matters so much about race as it matters as much as their economic status. I think it probably influences us more because our pain treatment is based on what they can afford" (Participant 11). However, as the vignette text did not include information on patients' SES, this statement does not align with this participant's use of race in the online study. The qualitative data suggest a relative lack of decision-making awareness among participants in this group.

## Discussion

Female and black patients are at increased risk for suboptimal pain care, which may relate to providers' being influenced by patient sex and race when making treatment decisions and providers' decision-making awareness. Using virtual human technology, lens model methodology, and qualitative interviews, we found that almost half of the medical trainees sampled were reliably influenced by patient demographics when making pain treatment decisions, and half of the trainees demonstrated some awareness of this influence. During follow-up individual interviews, trainees discussed treating patients similarly regardless of patients' sex or race; however, they perceived some differences in patients' treatment preferences. Participants influenced by patient demographics generally did not discuss using these patient factors when making their treatment decisions, suggesting a relative lack of awareness about the influence of patient demographics on their clinical decisions.

Consistent with our first hypothesis, over a quarter of the trainees (30%) were influenced by patient sex in their treatment decisions. However, at the group level, no significant sex differences in treatment ratings emerged. Thus, although patient sex was not a consistently strong predictor at the group level, individual-level analyses indicated patient sex did influence a subset of trainees. These individual differences are important to capture in empirical studies but are typically overlooked when using a traditional group-based analyses. These individual differences are particularly important given that women typically have a higher prevalence of pain conditions than men [21].

During the interviews, some participants endorsed stereotypical beliefs about female patients, such as women have less occupational impairment due to pain and are more open to certain treatments (e.g., antidepressants, mental health counseling). These views fit with evidence that providers often attribute female patients' pain to psychological factors, particularly when there is no observable pain pathology, and believe that women have higher pain tolerances than men [22,23]. With regard to patient preference, an investigation of total joint replacement surgery found that women with osteoarthritis delayed surgery longer than men due to skepticism, fears of surgery, and distrust of surgeons, suggesting that misinformation and bias could wrongly inform patient preference [24,25]. Additionally, Houle et al. [26] found that approximately half of men experiencing their first episode of depression preferred psychotherapy, leading the authors to recommend that providers ascertain patients' preference for treatment rather than assume preference. Medical school, residency, and continuing medical education training should provide evidence-based information that corrects providers' inaccurate beliefs about sex differences in treatment preference and encourage discussion of preference with patients, which may decrease sex/gender disparities and improve pain management.

A subset of trainees (15%) was also influenced by patient race, specifically for PT recommendations. The direction of this effect was not always consistent, with two out of the three trainees giving higher PT ratings to black than white patients. Our findings conflict with published retrospective studies (e.g., [8]), which find that compared to white patients, black patients receive less pain management. A possible explanation for the inconsistency is that patient race serves as a proxy for the true operating variables that influence providers, such as patients' SES and access to care. This explanation is consistent with the qualitative data in which several participants stated patients' SES, but not race *per se*, influences their decisions. Participants also cited issues related to patients' insurance status and transportation difficulties that influence their treatment decisions. Factors such as SES and access are often confounded with race and are not measured or controlled for in most retrospective studies. These factors were held constant in the current study; thus, although we attempted to address the confounding issue, it was not possible to specifically examine their influence on participants' treatment decisions.

Group differences emerged with white patients receiving higher antidepressant recommendations than black patients. This aligns with recent findings that black patients with depression are less likely than white depressed patients to be treated with antidepressants [27]. While no individual trainee was reliably influenced by race in their antidepressant ratings, significant findings at the group level indicate that rather than antidepressant differences being driven by a small number of participants, the *majority* of trainees gave slightly higher antidepressant ratings to white than black patients, which summated to a significant effect at the group level of analysis. Only one participant discussed antidepressant medication and patient race, stating: "Some people aren't gonna take an antidepressant no matter how much you push it. So you can always offer it, but I'm sure there's gonna be some racial or cultural factors that would separate the patients" (Participant 10). This group-level finding could reflect providers' beliefs about black patients' antidepressant preferences or could be due to other factors (e.g., SES, access to care). Future investigations should examine providers' influences for antidepressant decision making in order to better understand and possibly diminish this racial disparity.

When we compared trainees' actual (regression β values) and self-reported ("information used questionnaire" responses) use of patient demographics, 50% of our sample demonstrated some awareness of their decision-making influences, which is greater than hypothesized and found in previous work [13]. An instructive feature of the current study was our use of qualitative interviews to gain a richer perspective on participants' decision-making processes. Interestingly, the qualitative results did not always align with participants' treatment or questionnaire data. Trainees who were not reliably influenced by patient demographics discussed using similar treatment regardless of the patients' sex or race; however, this was also true for trainees who were reliably influenced by these patient factors. For instance, participants who were influenced by patient sex typically reported they only felt comfortable tailoring treatments if there was supporting evidence. While some studies suggest sex differences in analgesic response to treatments, to date, there is no consistent literature supporting tailoring treatments based on patient sex alone [28,29]. Thus, although this group's discussion is consistent with the current clinical evidence base, it is in contrast with their online treatment decisions, suggesting a lack of decision-making awareness. This nuanced understanding of participants' decision making was only possible through our use of mixed methods.

Similar to the discussion above, one participant acknowledged using patients' SES but not race despite the fact that she/he did use patients' race when making treatment decisions for the virtual patients. This could reflect an assumption (implicit or explicit) that nonwhite patients have lower SES. The race–SES confounder was noted by another participant: "[I]n this area it seems that the lower socioeconomic status that I've seen in the hospital is usually an African-American or Hispanic patient" (Partici-

pant 6). Given the small number of participants influenced by race, this speculation should be empirically tested in future studies. The apparent contradiction between trainees' quantitative and qualitative findings could also be due to other factors. First, the "information used questionnaire" queried participants about their use of "patient demographics," which may be too broad of a category; participants may be more or less aware of being influenced by a specific patient demographic variable such as sex or race. Secondly, because of social desirability pressures, trainees may be more comfortable reporting demographic influences in anonymous online formats than discussing these influences in face-to-face interviews [30].

Future investigations should manipulate additional patient factors, such as SES and access to care, to determine the extent to which these factors influence treatment decisions independent of and in concert with patient sex and race. Additionally, the interviews uncovered perceived treatment preferences among Hispanic patients. Because little is known about chronic pain within the Hispanic population [31], future investigations should examine how providers' attitudes about Hispanic patients influence their pain care. Such research is particularly important because the Hispanic population is the fastest-growing demographic group in the United States, and Hispanic individuals are overrepresented in occupations that put workers at an increased risk of developing chronic pain [32–35]. Finally, future investigations should examine provider awareness of being influenced by patient sex and race, separately, as awareness may vary between these two patient factors.

Although this investigation had notable strengths (e.g., reliability of data, mixed methodology), study limitations should be acknowledged. Analogue study designs may not reflect real clinical scenarios, and interviews may be limited by socially desirable responses. Group-based analysis may have just reached adequate power with 20 participants, and qualitative data may not have reached theoretical saturation (i.e., additional data may have resulted in new theoretical insights or resulted in new themes) for all qualitative analyses. However, this lens model study used a favorable profile to cue ratio for idiographic analyses, increased power with four replications of each cue combination, and used mixed methods to strengthen and enhance quantitative and qualitative findings. Additionally, participants were asked to indicate whether they used patients' demographic characteristics, rather than specifically patients' sex and/or race, in their treatment decisions for the quantitative study. However, because patients' sex and race were the only demographic factors presented and manipulated in the study, it is unlikely that participants interpreted this question to mean additional demographic factors (e.g., SES). Another limitation is our recruitment of health care trainees from one academic medical institution, which may not generalize to other provider types or other parts of the country.

This investigation used a mixed methods approach to better understand the influence of patient sex and race on

health care trainees' chronic pain treatment decisions and trainees' awareness of these influences. Patient sex or race was influential in a subset of participants' decisions for recommending opioids, antidepressants, or PT; however, there was a considerable variability across participants. Half of the trainees were concordant in their reported and actual use of patients' demographics, which demonstrates a level of decision-making awareness and was greater than hypothesized. Qualitative interviews provided a better understanding of the quantitative findings, specifically with regard to trainees' decision-making awareness and perceptions of patient treatment preferences. Medical training programs should incorporate evidence-based information to correct provider stereotypes and inaccurate beliefs. Future investigations should include additional patient (e.g., SES, Hispanic ethnicity) and provider (e.g., attitudes) factors to examine possible mediators and moderators of pain treatment disparities.

## Acknowledgments

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## Appendix A

*Vignette text*

The patient presents with lower back pain of approximately 1 year duration. The patient reports that the pain began after lifting a heavy box at home. The pain is located in the lower back and limits the patient's ability to perform normal daily activities. The patient expresses an openness to any treatment recommendation and has no absolute contraindications for the treatments listed below (i.e., there are no medical reasons to avoid certain treatments). The patient denies any other physical or mental health symptoms. (*Alternative*: The patient denies any other physical health symptoms. The patient does report symptoms of depression over the past 6 months.)