

**ORIGINAL RESEARCH**

# Do Physicians' Implicit Views of African Americans Affect Clinical Decision Making?

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**Background:** Total knee replacement (TKR) is a cost-effective treatment option for severe osteoarthritis (OA). While prevalence of OA is higher among blacks than whites, TKR rates are lower among blacks. Physicians' implicit preferences might explain racial differences in TKR recommendation. The objective of this study was to evaluate whether the magnitude of implicit racial bias predicts physician recommendation of TKR for black and white patients with OA and to assess the effectiveness of a web-based instrument as an intervention to decrease the effect of implicit racial bias on physician recommendation of TKR.

**Methods:** In this web-based study, 543 family and internal medicine physicians were given a scenario describing either a black or white patient with severe OA refractory to medical treatment. Questionnaires evaluating the likelihood of recommending TKR, perceived medical cooperativeness, and measures of implicit racial bias were administered. The main outcome measures included TKR recommendation, implicit racial preference, and medical cooperativeness stereotypes measured with implicit association tests.

**Results:** Subjects displayed a strong implicit preference for whites over blacks ( $P < .0001$ ) and associated "medically cooperative" with whites over blacks ( $P < .0001$ ). Physicians reported significantly greater liking for whites over blacks ( $P < .0001$ ) and reported believing whites were more medically cooperative than blacks ( $P < .0001$ ). Participants reported providing similar care for white and black patients ( $P = .10$ ) but agreed that subconscious biases could influence their treatment decisions ( $P < .0001$ ). There was no significant difference in the rate of recommendation for TKR when the patient was black (47%) versus white (38%) ( $P = .439$ ), and neither implicit nor explicit racial biases predicted differential treatment recommendations by race (all  $P > .06$ ). Although participants were more likely to recommend TKR when completing the implicit association test before the decision, patient race was not significant in the association ( $P = .960$ ).

**Conclusions:** Physicians possessed explicit and implicit racial biases, but those biases did not predict treatment recommendations. Clinicians' biases about the medical cooperativeness of blacks versus whites, however, may have influenced treatment decisions. (J Am Board Fam Med 2014;27:177–188.)

**Keywords:** African Americans, Health Care Disparities, Minority Health, Race, Racial Bias

Osteoarthritis (OA) is a leading cause of physical disability among older adults in the United States, often leading to significant pain, swelling, and reduced motion at the joint. Total knee replacement

(TKR) is a cost-effective treatment option for moderate to severe knee OA,<sup>1–3</sup> relieving pain and improving quality of life. Despite these benefits, marked disparities in TKR utilization in patients with OA exist by age, sex, geographic location, and racial category. While the rate of diagnosed OA is generally higher among African Americans than whites,<sup>4,5</sup> African Americans receive TKR less than half as often as whites.<sup>6–11</sup> These racial and ethnic

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**Conflict of interest:** The senior author (BAN) is an officer of Project Implicit Inc., a nonprofit organization that includes in its mission "To develop and deliver methods for investigating and applying phenomena of implicit social cognition, including

especially phenomena of implicit bias based on age, race, gender or other factors."

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disparities remain after controlling for health insurance status,<sup>12</sup> overall health,<sup>13</sup> and disease severity.<sup>13</sup>

Other factors that may account for this disparity include patient preferences and physician recommendation bias. Physicians' treatment planning may be unintentionally influenced by race or without them being aware of the bias. Implicit racial biases favoring whites compared with blacks are pervasive in the general population<sup>14</sup> and among physicians.<sup>15</sup> Racial biases of health care providers may play a role in the unequal treatment of minority populations and subsequent health disparities.<sup>16–24</sup> Racial bias has been identified as a factor in the delivery of care for cardiovascular disease,<sup>25</sup> pain management,<sup>26</sup> and mental health care.<sup>27</sup>

Implicit racial biases are related, but distinct from, explicit, self-reported racial biases,<sup>28</sup> and both implicit and explicit biases predict behavior.<sup>29</sup> Only 2 studies have been conducted that are of direct relevance to this report. The first was an Internet-based study of medical residents that evaluated the association between implicit racial bias and thrombolytic therapy of black and white patients presenting with symptoms of myocardial infarction. The differential likelihood of treating white patients and not treating black patients with appropriate thrombolytic therapy was positively related to the physicians' implicit racial biases.<sup>30</sup> The second, by Haider et al,<sup>31</sup> failed to replicate this result, finding that medical students' preference toward white patients did not result in a statistically significant variation in treatment decisions in a similar scenario.

There have been no objective assessments of the role of racial bias in the recommendation of patients for TKR. This study used a web-based survey instrument to evaluate whether implicit and explicit racial bias predicts recommendation of TKR for white and black patients with severe OA and assessed the effectiveness of the instrument as an intervention to decrease racial bias in treatment.

## Methods

### Measures

#### *Clinical Vignette*

A clinical vignette (Appendix 1) indicated diagnostic criteria for OA for which TKR would be an appropriate treatment recommendation. The validity of this vignette was vetted a priori by a panel of

family physicians. The race of the patient (black or white) was indicated by a small photograph of a man in his 50s or 60s set immediately above the vignette. We avoided drawing attention to race in the vignette to minimize suspicion of the purpose of the study. Otherwise, participants may have invoked deliberate strategies to avoid bias that they would not in normal contexts. To elicit variation in the likelihood of recommending TKR, the vignette was written such that other recommendations were possible. Overall, 44% of doctors recommended TKR.

A family physician or general internist would refer a patient to a surgeon for TKR, but primary care physicians often discuss with their patients the pros and cons of procedures, operations, and treatments that will be performed by specialists. In the clinical vignette, participants were guided through such a discussion.

#### *Implicit Association Test*

The Implicit Association Test (IAT)<sup>32</sup> is a widely used tool to measure implicit biases.<sup>33</sup> An IAT measuring implicit attitudes toward racial groups, for example, compares the average time it takes respondents to categorize images of black and white Americans and words with a good and bad meaning (eg, wonderful, terrible) in 2 critical conditions. In one condition, participants categorize black faces and good words with one response key and white faces and bad words with a second response key. In the other condition, participants categorize white faces and good words with one key and black faces and bad words with the other key. In one study, >70% of the >700,000 participants were faster in the second condition than the first, indicating stronger associations of good words with white faces compared with black faces.<sup>14</sup> This occurs despite whether the respondent is aware of possessing the associations in memory and whether they actively agree or disagree with them. The IAT has been conducted more than 15 million times since its inception in 1998 (eg, Nosek, Banaji, & Greenwald,<sup>33</sup> Nosek et al,<sup>14</sup>), and a large literature examines its psychometric properties and validity (see Nosek, Hawkins, & Frazier<sup>34,35</sup> for recent reviews). There is substantial evidence that physicians can complete the measure effectively with valid results (Sabin et al<sup>15,36</sup>). We used the previously recommended IAT procedure<sup>33</sup> and analysis protocol.<sup>37</sup>

The Race Preference IAT used the racial category labels *black American* and *white American* (stimuli: faces of black and white men, respectively) and evaluative category labels *good* (word stimuli: friendly, pleasure, happy, smiling) and *bad* (word stimuli: angry, noxious, brutal, terrible). The race Medical Cooperativeness IAT utilized the same racial category labels and images and the categories *medically cooperative* (word stimuli: takes physical therapy, accepts steroid injections, accepts NSAIDs, welcomes surgery) and *medically uncooperative* (word stimuli: declines physical therapy, refuses steroid injections, refuses NSAIDs, opposes surgery).

### Survey Measures

Explicit bias was assessed by asking respondents whether they prefer black or white people (5-point Likert scale and 10-point thermometer scale for feelings). Participants also were asked about their beliefs about patients' willingness to undergo surgery (5-point Likert scale for both black and white patients), their opinions regarding the effectiveness of TKR, and opinions on unconscious bias and IATs before and after the test (see <http://www.briannosek.com> for a complete list of study materials).

### Procedure

Participants read the same vignette but were randomly assigned a picture of a black or a white patient. Participants were randomly assigned to complete the IATs before (intervention condition) or after reading the vignette (control condition). Then, participants reported whether the patient's knee pain was the result of severe OA (using a 5-point Likert scale), whether they would recommend TKR, the strength of their recommendation (using a 5-point Likert scale), and their explicit attitudes and beliefs about racial groups and the existence of implicit bias. To bolster the exposure of and education about implicit bias, the IAT ended with a debriefing that explained the differences between implicit and explicit biases and the possible role of implicit bias in decision making. All study methods were approved by the institutional review board at the University of Virginia, and all participants provided informed consent.

### Samples

Two sampling methods were used for this study, with one change in the procedure between them. The samples are combined for primary reporting,

and observed results did not differ meaningfully between the 2 samples when examined separately.

### Direct Recruiting

We recruited 79 family medicine and internal medicine physicians from the University of Virginia Health System via an E-mail with a link to the study. Additional family medicine physicians were recruited at departmental "Grand Rounds" at the University of Virginia and at the Virginia Academy of Family Physicians annual meeting. All clinicians recruited through direct methods have a self-reported education level of MD and are likely to refer patients for TKR.

### Indirect Recruiting

A second sample of clinicians was recruited through the volunteer participant pool at the Project Implicit website (<https://implicit.harvard.edu/>). Hundreds of thousands of volunteers visit Project Implicit each year and are educated about implicit biases and given an opportunity to participate in research. After registering, participants complete a short demographic questionnaire that includes questions about educational degree(s) attained and current occupation. Participants then are randomly assigned to a study from a pool of studies—these are sometimes unobtrusively selected based on their demographic responses.

For this study, respondents who reported their education level as MD and listed their current occupation as "health care—diagnosing and treating practitioners" during registration were eligible to be assigned to this study. Once assigned, the clinicians indicated whether they felt qualified to recommend TKR. Those who agreed continued to the study ( $n = 587$ ); those who disagreed were assigned to another study. Participants were subsequently excluded if they indicated that they were not currently or had never been employed as medical professionals ( $n = 43$ ) or reported their age as  $\leq 22$  years old ( $n = 27$ ), making it unlikely that they had completed medical school and residency. Another 53 participants dropped out of the study before viewing the patient vignette, leaving 464 participants. Other than these recruitment procedures, the study procedure was identical to the previous sample except, because of time constraints (Nosek, Sriram, & Umansky<sup>38</sup>), the online participants completed only the Race Medical Cooperativeness IAT and not the Race Preference IAT. We prior-

**Table 1. Participants' Demographic Information**

Characteristics	Patients, n (%)
Sex	
Male	256 (47)
Female	272 (50)
Race/ethnicity	
European American/white	371 (70)
African American/black	34 (6)
Asian/Pacific Islander	69 (13)
Hispanic/Latino	27 (5)
Mixed	14 (3)
Other/unknown	13 (2)
American Indian/Alaskan	2 (<1)
Specialty	
Family medicine	163 (58)
Internal medicine	116 (42)
African American patients by clinic (%)	
<10	124 (31)
10–19	51 (13)
20–29	65 (16)
30–39	60 (15)
40–49	40 (10)
≥50	64 (16)
Identification with racial/ethnic identity	
Little identification	132 (31)
Moderate identification	209 (49)
Strong identification	86 (20)
Socioeconomic level growing up	
Lower	27 (6)
Lower-middle	65 (15)
Middle	158 (37)
Upper-middle	141 (33)
Upper	35 (8)
Mean age (SD)	39.16 (11.52)
Mean years in practice (SD)	12.05 (10.26)

Percentages do not add up to 100 because of missing values and rounding.  
SD, standard deviation.

itized using the implicit measure that Green et al.<sup>30</sup> demonstrated had a stronger effect: the Race Medical Cooperativeness IAT.

## Results

Variation in degrees of freedom for inferential tests is due to nonresponses for some items. The average age of the participants was 39.16 years (standard deviation [SD], 11.52 years), and the mean number of years in medical practice was 12.05 (SD, 10.26 years) (Table 1).

## Analytical Approach

The main dependent variables were diagnosis of osteoarthritis and TKR decision. Both of these were measured on 5-point Likert scales and analyzed using linear regression. TKR decision also was measured as a dichotomous variable (recommend TKR or not) and analyzed using logistic regression. Most of the racial attitudes and stereotypes (both implicit and explicit) were measured as relative preferences for white versus black people, and these items were analyzed for significant difference from the 0 point (indicating no preference between black and white people) with 1-sample *t* tests ( $H_0 = 0$ ). Warmth and medical cooperativeness also were assessed separately for black and white people, and differences between these means were tested with paired-samples *t* tests. Patient race was a between-participants manipulation, so differences in attitudes and stereotypes, as well as beliefs about treatment and one's own biases, based on whether participants viewed a white patient or a black patient in the vignette, was tested with 2 samples *t* tests.

## Diagnosis of OA and TKR Decision

On average, participants reported that it was “somewhat likely (60% to 80%)” to “very likely (>80%)” that the vignette character Mr. Jackson's knee pain was due to OA. In total, 207 doctors (44%) recommended TKR for Mr. Jackson. A similar question asked participants to characterize their recommendation for Mr. Jackson using a 5-point scale, from 1 (would definitely *not* recommend TKR) to 5 (would definitely recommend TKR), and the average response was the midpoint of the scale (unsure). The 5-point scale had a bimodal distribution and was highly correlated with the dichotomous measure ( $r = 0.75$ ;  $P > .0001$ ). We report analyses of the dichotomous items; substantive results and interpretations were the same using the continuous variable.

## TKR Recommendation by Race and Exposure to Implicit Bias

Previous research has shown that completing an IAT can be an intervention for reducing explicit biases.<sup>39</sup> To test whether experiencing the IAT could also influence clinical decision making, we manipulated the order of the IATs and the TKR vignette and decision. We hypothesized that completing the IAT before making the TKR decision would reduce the effect of patient race on TKR

**Table 2. Implicit Association Test (IAT) Scores by Patient Race and Order of IAT**

	IAT Completed First				Vignette Completed First			
	Black Patients		White Patients		Black Patients		White Patients	
	Mean (SD)	No.	Mean (SD)	No.	Mean (SD)	No.	Mean (SD)	No.
Medical cooperativeness	0.19 (0.39)	112	0.30 (0.43)	107	0.21 (0.43)	104	0.23 (0.40)	103
Racial preference	0.50 (0.24)	19	0.50 (0.33)	14	0.38 (0.38)	27	0.36 (0.42)	12

Positive scores indicate stronger associations with white people and medically cooperative and white people and good. SD, standard deviation.

recommendations. There was a main effect of the order of the IAT ( $\chi^2(df = 1, n = 470) = 5.33; P = .02$ ): participants were more likely to recommend TKR when they completed the IAT before the decision (50%) versus after the decision (39%). However, the order did not interact with patient race to predict TKR recommendation ( $\chi^2(df = 1, n = 470) = 0.00; P = .96$ ). Furthermore, the main effect of patient race on TKR recommendation was not statistically significant ( $P = .73$ ), indicating that there was no racial bias for TKR recommendation regardless of IAT order. Doctor age and sex were added as covariates to the model in which patient race predicted TKR recommendation. Age significantly predicted TKR recommendation ( $\chi^2(df = 1, n = 456) = 5.81; P = .016$ ): older doctors were less likely to recommend TKR. Sex did not significantly predict TKR recommendation ( $\chi^2(df = 1, n = 456) = 0.55; P = .458$ ), nor did the addition of the covariates change the patient race effect ( $\chi^2(df = 1, n = 456) = 0.32; P = .569$ ). Patient race does not predict TKR decisions, even when restricting the sample to white doctors only ( $n = 371$ ) ( $\chi^2(df = 1, n = 324) = 0.02; P = .888$ ).

*Implicit Racial Attitudes and Stereotypes*

A 1-sample *t* test revealed that participants implicitly preferred white people to black people (mean, 0.43; SD, 0.34;  $t(71) = 10.64; P < .0001; d = 1.26$ ). This IAT was administered only to the directly recruited sample. Similarly, participants showed a stronger implicit association with medical cooperativeness and white people than black people (mean, 0.23; SD, 0.41;  $t(425) = 11.76; P < .0001; d = 0.57$ ). In both cases, as expected, IAT scores did not differ, despite whether they were administered before or after the vignette ( $P = 0.12$  and  $0.62$ , respectively) or whether the vignette presented a black or white patient ( $P = 0.91$  and  $0.74$ , respectively) (Table 2).

Next we tested whether implicit racial bias predicted TKR recommendation and whether this effect was moderated by the implicit bias education intervention. We also tested whether implicit cooperativeness stereotype predicted TKR recommendation. Our base model predicted TKR recommendation in a logistic regression from the main effects of patient race and order of the IAT and their interaction; then we added the main effect of the moderator along with all 2-way interactions and the 3-way interaction. Neither of the moderators produced significant main effects, nor did they moderate the effect of patient race on TKR recommendation (Table 3).

**Table 3. Predicting Total Knee Replacement (TKR) Recommendation from Patient Race, Implicit Association Test (IAT) Order, and Implicit Racial Attitude and Stereotype Moderators**

	$\chi^2$	P Value
Cooperativeness IAT (n = 417)		
Patient race main effect	0.15	.700
Cooperativeness IAT main effect	0.24	.624
Order main effect	2.30	.129
Interactions		
Patient race + cooperativeness IAT	0.50	.479
Patient race + order	0.20	.652
Order + cooperativeness IAT	0.00	.983
Patient race + cooperativeness IAT + order	0.55	.458
Race preference IAT (n=72)		
Patient race main effect	0.63	.428
Race preference IAT main effect	1.75	.185
Order main effect	3.11	.078
Interactions		
Patient race + race preference IAT	0.21	.648
Patient race + order	0.07	.796
Order + race preference IAT	2.26	.133
Patient race + race preference IAT + order	0.32	.570

**Table 4. Participants' Explicit Attitudes Toward Patients**

Attitudes	No.	Overall	Black Patients	White Patients
Explicit racial preference*	427	0.28 (0.78)	0.28 (0.69)	0.28 (0.87)
Warmth toward black people <sup>†</sup>	427	6.99 (1.80)	6.90 (1.73)	7.08 (1.88)
Warmth toward white people <sup>†</sup>	427	7.31 (1.69)	7.17 (1.64)	7.45 (1.74)
Medically cooperative*	420	0.21 (0.75)	0.15 (0.70)	0.28 (0.79)
Perception of black patients' medical cooperativeness <sup>†</sup>	425	6.22 (1.42)	6.21 (1.42)	6.24 (1.42)
Perception of white patients' medical cooperativeness <sup>†</sup>	425	6.55 (1.38)	6.52 (1.38)	6.58 (1.42)
Aggressive care*	427	0.04 (0.41)	0.04 (0.38)	0.03 (0.44)
Subconscious biases affect my decisions <sup>†</sup>	428	3.64 (1.12)	3.51 (1.17)	3.78 (1.05)
Treatment due to black patients' preferences <sup>†</sup>	215	3.26 (1.25)	3.19 (1.31)	3.33 (1.20)
Treatment due to white patients' preferences <sup>†</sup>	211	3.14 (1.26)	3.11 (1.30)	3.18 (1.21)

Data are mean (standard deviation) unless otherwise indicated.

\*This scale is centered at zero, with positive values indicating more explicit preference for white people compared to black people, believing white people are more medically cooperative than black people, and providing more aggressive care for white people over black people.

<sup>†</sup>Higher values indicate more warmth and more agreement that difference in treatment is due to patient preference.

### Self-Reported Attitudes

Overall, a 1-sample *t* test revealed that participants explicitly preferred white people to black people (mean, 0.28; SD, 0.78;  $t(426) = 7.46$ ;  $P < .0001$ ;  $d = 0.36$ ). Paired *t* tests revealed that participants reported significantly higher feelings of warmth toward white people (mean, 7.31; SD, 1.69) than black people (mean, 6.99; SD, 1.80;  $t(426) = 4.96$ ;  $P < .001$ ;  $d = 0.24$ ).

In addition, in a 1-sample *t* test participants explicitly reported that white patients were more medically cooperative than black patients ( $P < .0001$ ). Furthermore, when asked about white and black patients independently, paired *t* tests revealed significantly more agreement that white patients were more medically cooperative (mean, 6.55; SD, 1.38) than black patients (mean, 6.22; SD, 1.42;  $t(423) = 5.80$ ;  $P < .0001$ ;  $d = 0.28$ ). Even so, participants reported providing similarly aggressive care for white patients and black patients (mean,  $-0.04$ ; SD, 0.41);  $t(426) \geq 1.89$ ;  $P = .06$ ;  $d = 0.06$ ).

Finally, using a 1-sample *t* test, participants reported strong agreement that subconscious biases may influence their decision making (mean, 3.64; SD, 1.12;  $t(427) = 11.79$ ;  $P < .0001$ ). Participants agreed that if black patients received differential medical treatment it could be because of their own preferences (mean, 3.26; SD, 1.25;  $t(214) = 2.99$ ;  $P = .003$ ;  $d = 0.20$ ). In contrast, participants neither agreed nor disagreed that white patients received differential medical treatment because of their own preferences (mean, 3.14; SD, 1.26;  $t(210) = 1.64$ ;  $P = .10$ ;  $d = 0.11$ ).

Interestingly, a 2-sample *t* test revealed that participants who viewed a black patient in the vignette reported less agreement that biases could influence their decisions than participants who viewed a white patient ( $P = .02$ ), suggesting that exposure to a black patient may have increased reactance to the possibility of biases influencing behavior. However, there were no other significant differences in any attitudes or beliefs about bias by patient race condition (all  $P \geq .08$ ). For a complete list of means, see Table 4.

Explicit attitudes were standardized (SD, 1; retaining the rational zero point of “no preference” or “no difference” between blacks and whites) and averaged to create an aggregate score, indicating favorability for whites compared with blacks. (The questions included were, “Which of the following best describes your view about patients' cooperativeness with medical advice about interventions such as TKR?,” “Please rate how cooperative you feel white patients are on average with medical advice about interventions such as TKR,” “Please rate how cooperative you feel black patients are on average with medical advice about interventions such as TKR,” “I provide less/similar/more aggressive care for white patients than I do for black patients,” “I strongly prefer whites to blacks,” “Please rate how warm or cold you feel toward white people,” and “Please rate how warm or cold you feel toward black people.”) For those topics that had separate items for blacks and whites, a difference score was calculated before standardizing. An intervention-by-patient race analysis of

**Table 5. Predicting Total Knee Replacement Recommendation from Patient Race, Order, and Explicit Racial Attitude Moderators**

	$\chi^2$	<i>P</i> Value
Patient race main effect	0.04	0.85
Aggregated explicit attitudes main effect	0.09	0.77
Order main effect	2.50	0.11
Interactions		
Patient race + aggregated explicit attitudes	0.00	0.95
Patient race + order	0.17	0.68
Order + aggregated explicit attitudes	1.68	0.20
Patient race + order + aggregated explicit attitudes	0.22	0.64

variance predicting this aggregate explicit attitude measure revealed no effect of intervention ( $P = .48$ ), patient race ( $P = .92$ ), or their interaction ( $P = .55$ ) predicting explicit attitudes.

Furthermore, we examined whether explicit attitudes predicted TKR recommendation, using logistic regression with patient race, the aggregated explicit attitudes, the intervention condition, and their interactions as the independent variables predicting TKR recommendation (Table 5). The results suggest that explicit attitudes did not predict the TKR recommendation as a main effect or interaction with the other predictors.

#### *Beliefs About the Patient*

For a complete list of participants' beliefs about the patient in the scenario, see Table 4. Participants answered questions about treating the particular patient whose photograph appeared in the survey questionnaire. The race of the patient was never mentioned explicitly. Participants reported that they would feel more comfortable working with the black patient (mean, 4.34; SD, 0.82) compared with the white patient (mean, 4.16; SD, 1.02;  $t(457) = 2.06$ ;  $P = .04$ ;  $d = 0.10$ ). Results revealed no other significant differences based on the race of the patient (all  $P \geq .07$ ).

We next tested whether the beliefs about the patient were affected by his race and the intervention. Beliefs about the patient were averaged to create an aggregate score indicating favorable beliefs about the patient. An intervention-by-patient race analysis of variance revealed no effect of intervention ( $P = .70$ ), patient race ( $P = .82$ ), or their interaction ( $P = .11$ ).

**Table 6. Predicting Total Knee Replacement Recommendation from Patient Race, Order, and Aggregated Patient Belief Moderators**

	$\chi^2$	<i>P</i> Value
Patient race main effect	1.07	.30
Aggregated patient beliefs main effect	6.01	.01
Order main effect	0.09	.77
Interactions		
Patient race + aggregated patient beliefs	1.20	.27
Patient race + order	3.51	.06
Order + aggregated patient beliefs	0.76	.38
Patient race + order + aggregated patient beliefs	4.22	.04

We also examined whether beliefs about the patient predicted TKR recommendation using logistic regression, with recommendation for TKR as the dependent variable and patient race, aggregated patient beliefs, and the intervention condition as independent variables (Table 6). The results revealed a significant 3-way interaction ( $\chi^2[df = 1, n = 451] = 4.22$ ;  $P = .04$ ), suggesting that in 3 of the conditions (those who received the vignette first and/or who viewed a white patient), physicians who reported more favorable beliefs about the patient were less likely to recommend TKR. In contrast, physicians who received the IAT first and viewed a black patient reported more favorable beliefs about the patient and were more likely to recommend TKR.

#### *Beliefs About the Educational Value of Learning About Bias*

See Appendix 2 for a full correlation matrix. Questions were centered so that a rating of zero indicated neither agreement nor disagreement, whereas positive values indicated agreement and negative values indicated disagreement. After completing the study, a 1-sample  $t$  test revealed that participants agreed that subconscious biases could influence their decisions regarding patient care ( $t(379) = 13.04$ ;  $P < .0001$ ;  $d = 0.67$ ). Participants agreed that learning about subconscious biases could improve patient care ( $t(377) = 26.80$ ;  $P < .0001$ ;  $d = 1.38$ ).

Two-sample  $t$  tests revealed that participants who viewed a white patient were significantly more likely to agree that subconscious bias influences their decisions (mean, 3.83; SD, 1.01) than partic-

**Table 7. Participants' Beliefs About the Study**

Beliefs	No.	Overall	Black Patients	White Patients
Subconscious biases influence my decisions	380	0.72 (1.07)	0.62 (1.13)	0.83 (1.01)
Learning about biases can improve patient care	378	1.23 (0.89)	1.15 (0.95)	1.32 (0.83)
IAT experience is worthwhile	381	0.99 (1.00)	0.91 (1.03)	1.08 (0.96)
Knowledge about what the study	379	-1.37 (1.47)	-1.43 (1.48)	-1.31 (1.46)
The IAT results reflect my attitudes	381	0.02 (1.07)	-1.98 (1.10)	0.05 (1.04)
Would not have participated had I known about the study's contents	379	-2.45 (0.87)	-2.44 (0.88)	-2.46 (0.85)

Data are mean (standard deviation) unless otherwise indicated. Higher values indicate stronger agreement. IAT, implicit association test.

Participants who viewed a black patient (mean, 3.62; SD, 1.13;  $t(378) = 1.93$ ;  $P = .05$ ;  $d = 0.20$ ). There were no other significant differences based on patient race (all  $P \geq .06$ ), suggesting that whether participants viewed a black or white patient did not influence their remaining beliefs about the study (Table 7).

## Discussion

Patient race did not affect the decision to recommend TKR for severe OA in the clinical vignette. However, physicians demonstrated implicit pro-white bias, reported an explicit preference for white people, had beliefs that blacks were less medically cooperative than whites, and believed that subconscious biases could influence their clinical decision making.

Although our study showed no main effect for race on clinicians' decision to recommend TKR, we found a suggestive 3-way interaction. When participants were presented with the clinical vignette before the IAT or with a white patient, or both of these conditions, they were more likely *not* to recommend TKR. When they were presented with the IAT first and a black patient, or both of these conditions, they were more likely to recommend TKR. One possible explanation for this finding is that the clinicians in the study felt that a medically cooperative or "good" patient would be able to manage their arthritis with conservative treatment—analgesic medication and physical therapy—rather than surgery. Patients thought to be medically uncooperative or "bad" patients would not do as well with conservative therapy and, therefore, should receive a recommendation for the more aggressive surgical option.

Another possible explanation for the lack of a main effect of patient race on TKR recommenda-

tion is that the study population may be uniquely different from physicians included in prior studies. Our participants see a large proportion of black patients, with more than half of the participants reporting that 30% or more of their patients are African American. The proportion of blacks in the US population is 12%, and the proportion in the catchment area of the practices of the physicians in our study is even less. Moreover, we found that the participants who were randomly assigned the black patient believed that they would feel more comfortable and confident working with him than those who were randomly assigned the white patient. Perhaps the fact that our physician participants see such a disproportionately high number of African American patients has led to effective compensatory strategies that mitigate effects of implicit and explicit biases when treating African Americans.

Alternatively, our clinical vignette may not have been sensitive enough to detect a racial difference. It was a single scenario and may not have sufficiently captured the realities of racial bias in clinical practice to detect an effect. An additional limitation is the inability to study the effect of sex on racial differences. However, adding a female vignette would require controlling for sex bias, and our study lacked sufficient power to examine both sex and racial biases simultaneously.

Another conclusion to be drawn from this research is the role of the IAT as an educational intervention to help physicians manage implicit racial bias. In the educational debriefing that followed the study, our participants felt that unconscious biases could affect clinical decision making. They also agreed that learning about such implicit biases could improve the care they provide to their patients.

## Conclusion

The conditions predicting when implicit biases will predict behavior or not are not yet fully understood. The lack of a significant correlation between our participants' implicit and explicit biases and their referral for TKR provides speculative opportunity to identify occasions where implicit biases do not affect clinical decision making or show their effect through other, less direct mechanisms. Studies of the possible role of implicit racial biases on clinical decision making should continue, and tools should be developed to help clinicians mitigate the effect of such biases on clinical practice.

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## Appendix 1

### *Clinical Vignette*

The patient is a 55-year-old man with a history of right knee pain. Initially, the patient’s knee pain was controlled with acetaminophen or ibuprofen. However, his knee pain now persists despite the use of nonsteroidal anti-inflammatory drugs, and the patient is requesting a stronger medication, “maybe with some codeine in it.” He reports that “just walking to the mailbox is extremely painful.” The patient has had 2 courses of physical therapy, with minor improvement in his knee pain. Recent radiographs of his right knee show significant narrowing of the joint space.

## Appendix 2

### Overall Correlations

Correlations	Race IAT	Medical Cooperativeness IAT	Aggregated Beliefs about Patient	Aggregated Explicit Beliefs	TKR Recommendation
Overall					
Race					
IAT	1.00	0.33*	0.03	-0.07	-0.07
No.	72	67	71	64	72
Medical cooperativeness					
IAT	1.00	0.00	0.09 <sup>†</sup>	-0.02	
No.	426	414	401	417	
Aggregated beliefs about patient					
IAT		1.00	-0.08	-0.13*	
No.		455	412	451	
Aggregated explicit beliefs					
IAT			1.00	0.03	
No.				416	413
Intervention condition					
Race					
IAT	1.00	0.18	0.25	-0.34 <sup>†</sup>	-0.29 <sup>†</sup>
No.	33	32	33	32	33
Medical cooperativeness					
IAT		1.00	-0.06	0.12 <sup>†</sup>	-0.03
No.		219	209	202	211
Aggregated beliefs about patient					
IAT			1.00	-0.06	-0.10
No.			215	206	213
Aggregated explicit beliefs					
IAT				1.00	0.09
No.				208	206
Control condition					
Race					
IAT	1.00	0.42*	-0.15	0.19	0.04
No.	39	35	38	32	39
Medical cooperativeness					
IAT		1.00	0.09	0.04	-0.02
No.		207	205	199	206
Aggregated beliefs about patient					
IAT			1.00	-0.11 <sup>†</sup>	-0.16*
No.			240	206	238
Aggregated explicit beliefs					
IAT				1.00	-0.04
No.				208	207
When participants view a white patient					
Race					
IAT	1.00	0.19	-0.13	0.05	-0.08
No.	26	41	46	40	26

*Continued*

**Continued**

Correlations	Race IAT	Medical Cooperativeness IAT	Aggregated Beliefs about Patient	Aggregated Explicit Beliefs	TKR Recommendation
Medical cooperativeness					
IAT		1.00	-0.01	0.09	-0.05
No.		210	212	205	204
Aggregated beliefs about patient					
IAT			1.00	-0.11 <sup>†</sup>	-0.19*
No.			215	200	213
Aggregated explicit beliefs					
IAT				1.00	0.03
No.				203	201
When participants view a black patient					
Race					
IAT	1.00	0.19	-0.13	0.05	-0.06
No.	46	41	46	40	46
Medical cooperativeness					
IAT		1.00	-0.01	0.09	0.01
No.		216	212	205	213
Aggregated beliefs about patient					
IAT			1.00	-0.04	-0.07
No.			240	212	238
Aggregated explicit beliefs					
IAT				1.00	0.02
No.				213	212

\* $P \leq .05$ .

<sup>†</sup> $P \leq .10$ .

IAT, implicit association test; TKR, total knee replacement.