Racial bias in pain perception predicts disparities in treatment, independent of stimulus effects

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Introduction

- The pain of Black Americans is systematically under-diagnosed and under-treated (Anderson et al., 2009; Green et al., 2003) in the United States
- Explicit stereotypes/prejudices underscore such disparities (Hoffman et al., 2016; Trawalter et al., 2012), while other work suggests a perceptual source
- White perceivers show robust racial bias in the visual perception of pain, which predicts bias in treatment (Mende-Siedlecki et al., under revision)
- **Research motivation:** To examine the robustness of our proposed perceptual pathway, we attempted to rule out potential stimulus confounds related to pain tolerance and experience, by using 1) objectively-equated computer-generated stimuli, and 2) subjectively-balanced photographic stimuli, allowing us to apply a more conservative test of our hypotheses

## Selecting the Stimulus Set

Study 1
- 81 participants (M_{age} = 37.48, SD = 11.92; 45F) rated 41 painful expressions created in FaceGen Modeller Core 3.14 and 14 emotional decoys on their resemblance to 8 emotions (sadness, disgust, surprise, threat, happiness, anger, fear, and physical pain), on 7-point Likert-type scales (1 = not at all; 7 = extremely; e.g., "How much does this face look like it's in physical pain?")
- We selected the eight that were most robustly recognized as high-intensity pain, while still being visually discernible from each other (**Figure 1**)

Study 2
- Eight Black and eight White targets from the Delaware Database of Painful Expressions (Mende-Siedlecki et al., in prep) were selected based on balanced pilot ratings related to pain experience and tolerance (e.g., dominance, strength, status, pain intensity & believability, etc.)
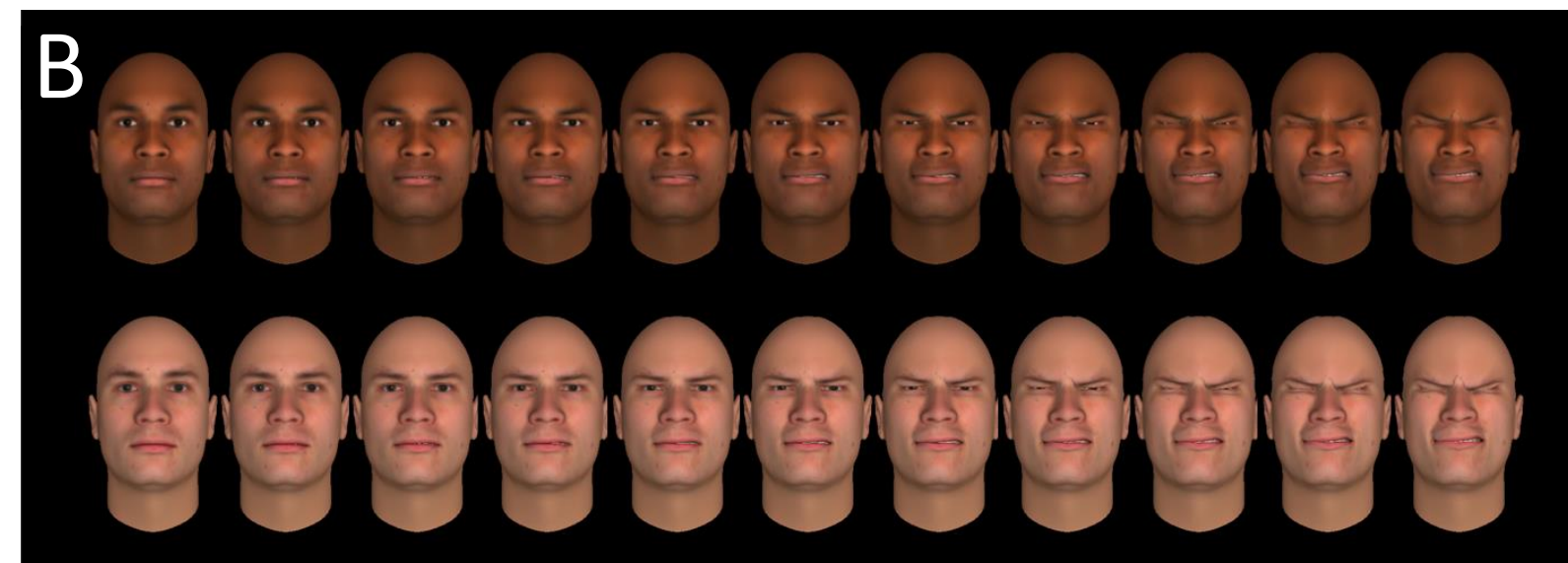

Figure 1A. Two sample morph sets of actors' neutral and pain expressions used in Study 2.
1B. Two sample morph sets used in Study 1. (Race, expression, head shape, and texture were counterbalanced across participants. Each expression appeared twice for each participant – once on a Black target, once on a White target.)

Methods & Procedure

- **Participants**
  - Study 1: 124 White MTurkers (75 female, M_{age}= 35.81, SD_{age}= 11.22)
  - Study 2: 129 White MTurkers (70 female, M_{age}= 36.03, SD_{age}= 10.60)
- **Pain Rating Phase**
  - In Study 1, participants saw 11 FaceGen morphs for each target, proceeding from neutral to pain, and made Yes/No judgments of whether each face was in pain (a "Yes" response advanced the task to the next target)
  - Study 2 used an identical procedure with photos of real individuals posing painful expressions
- **Treatment Recommendations**
  - Participants saw ambiguously painful expressions (50%/50% morphs) of two Black and two White targets from the previous task and determined how much of a non-narcotic analgesic cream each should receive (0 to 20g)
- **Social Evaluations**
  - Participants made evaluations of these four targets along 12 dimensions (7-point scale; 1 = "not at all," to 7 = "extremely") including four status items (adapted from Trawalter et al., 2012), and one strength item
- **Demographics, Feeling Thermometers, and False Beliefs**
  - Participants completed 1) demographics, 2) feeling thermometers describing warmth (0 = "very cold" to 100 = "very warm") towards ten social groups, including "Blacks" and "Whites," from which we calculated explicit anti-Black bias, and 3) a measure of false beliefs about biological differences between Blacks and Whites (Hoffman et al., 2016)
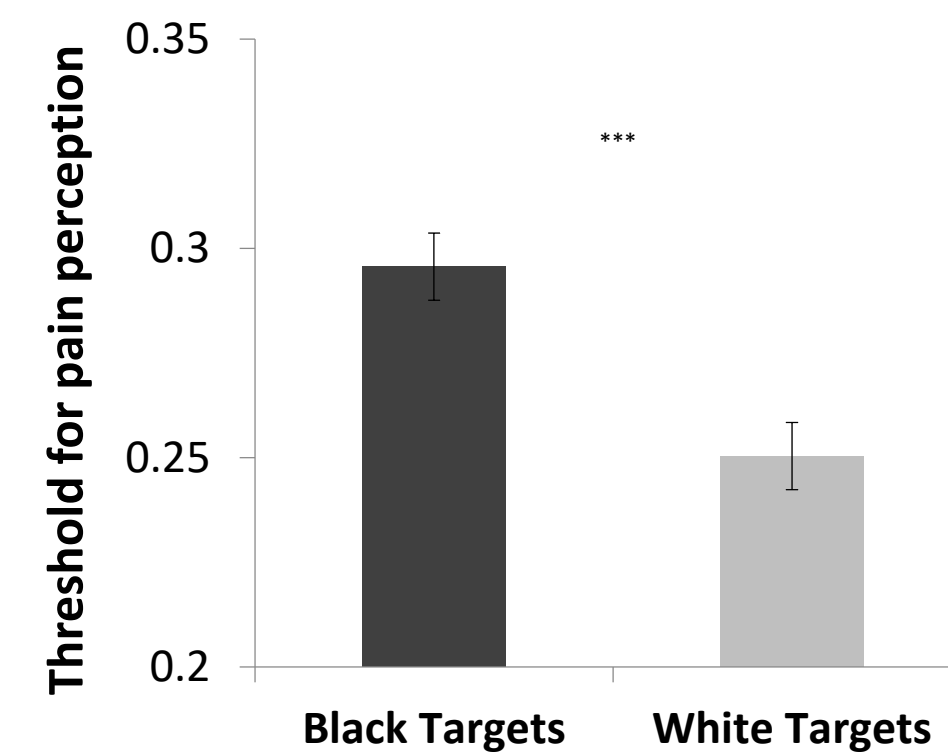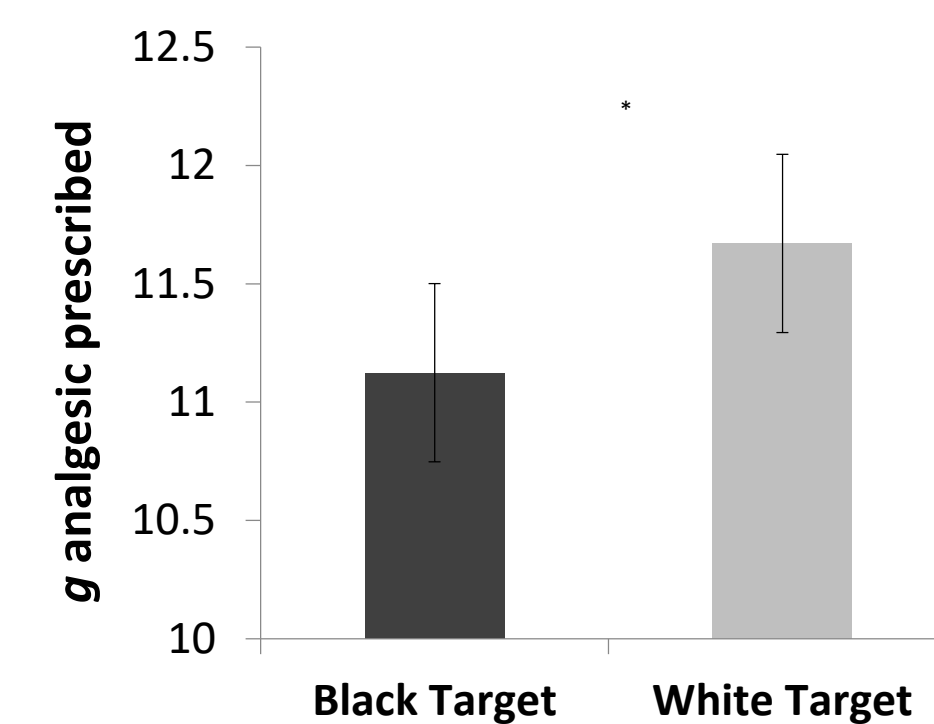

Fig. 2. Racial bias in pain perception, Study 1
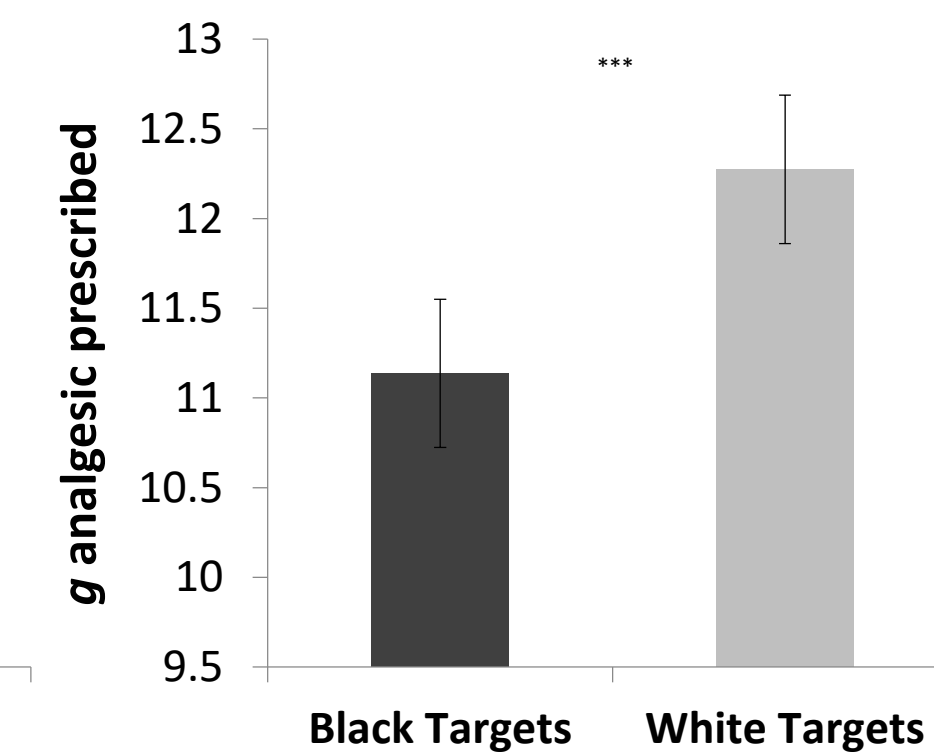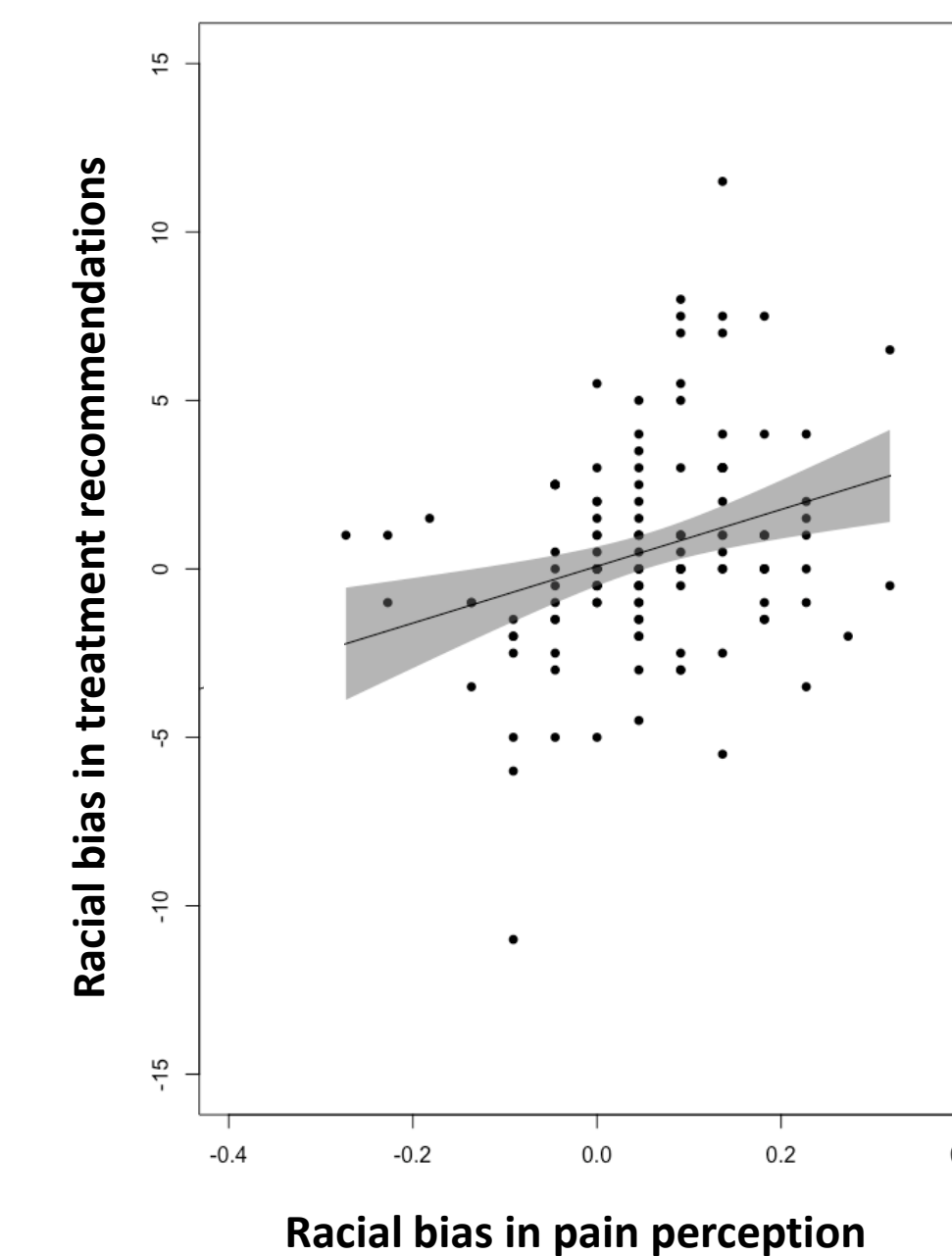

Fig. 3. Racial bias in treatment, Study 1
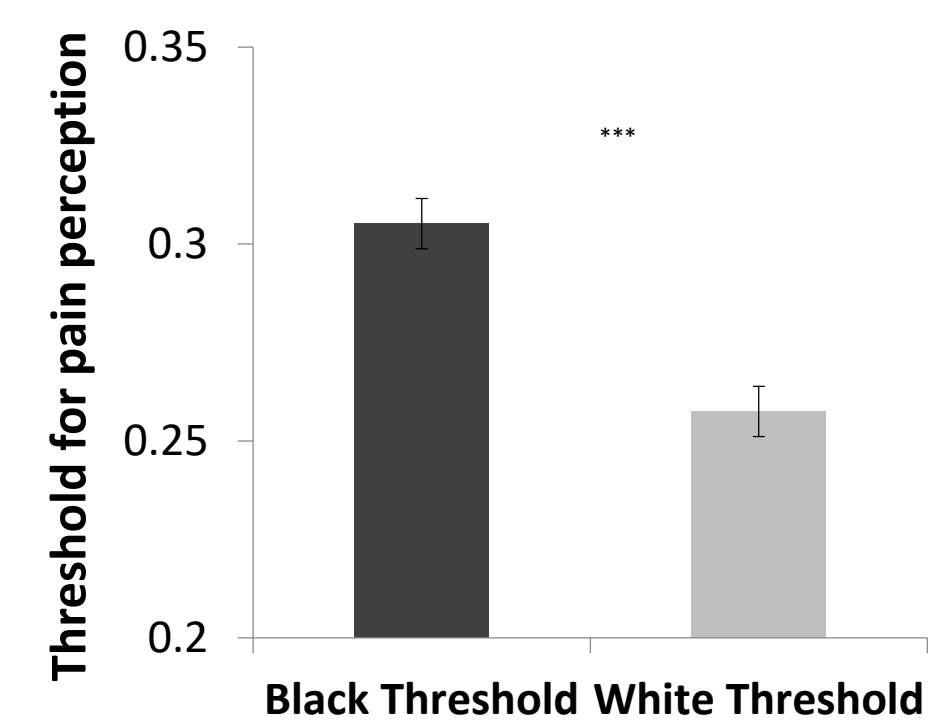
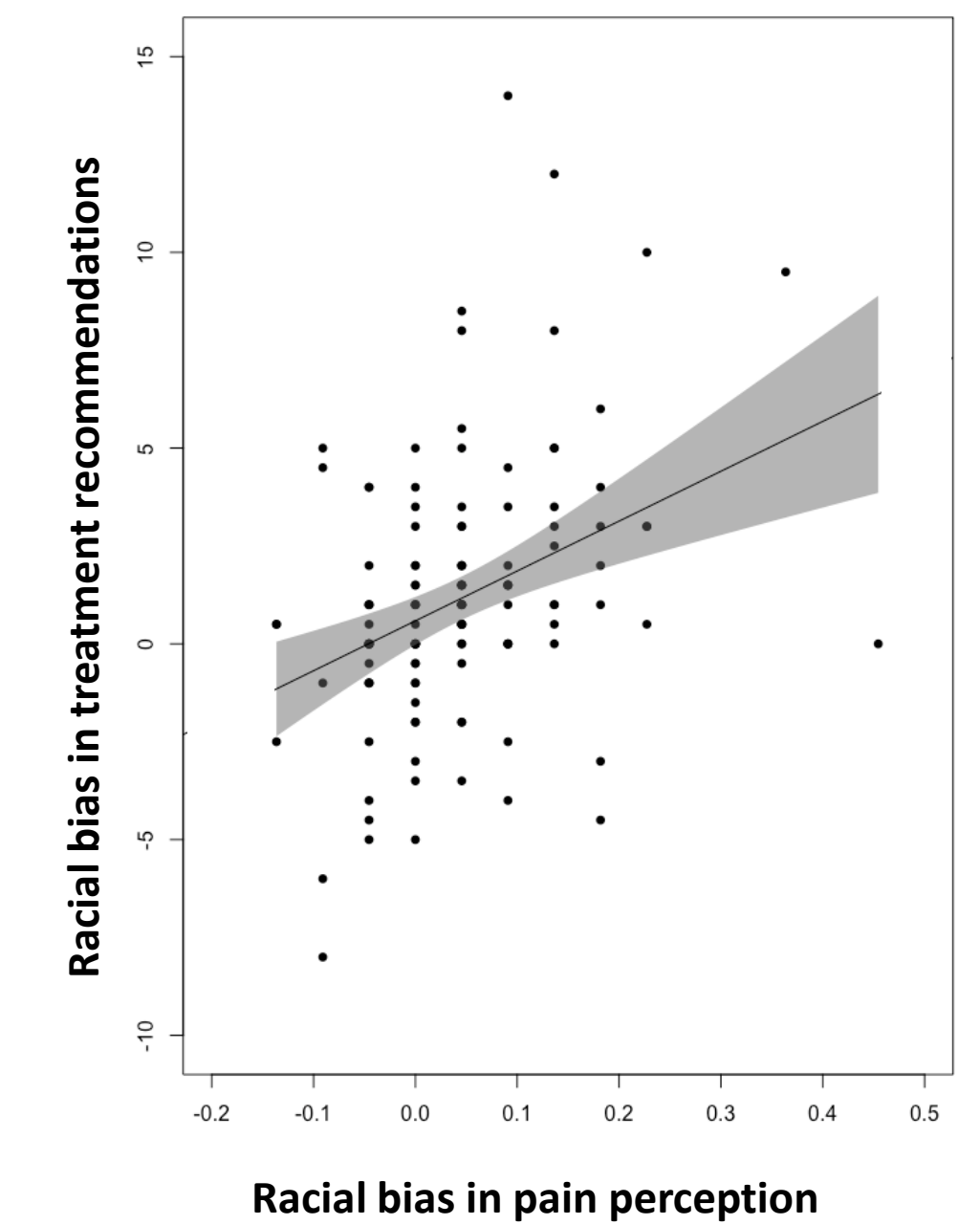

Fig. 4. Racial bias in pain perception, Study 2

Fig. 5. Racial bias in treatment, Study 2

Results

- ***Racial bias in thresholds for pain perception***
  - ✓ We observed a main effect of race on participants' threshold for pain perception (S1: $p < .001$, $\eta_p^2 = .33$; S2: $p < .001$, $\eta_p^2 = .46$): participants displayed more stringent thresholds for perceiving pain on Black faces, as compared to White faces (**Figure 2** in S1; **Figure 4** in S2)
- ***Racial bias in treatment recommendations***
  - ✓ We observed a main effect of race on participants' treatment recommendations (S1: $p < .001$; $\eta_p^2 = .11$; S2: $p = .047$, $\eta_p^2 = .03$): participants prescribed more analgesic to White targets, versus Black targets (**Figure 3** in S1; **Figure 5** in S2)
- ***Bias in pain perception predicts bias in treatment recommendations***
  - ✓ Comparatively higher thresholds for perceiving pain on Black faces were associated with comparatively less analgesic prescribed to Black targets (S1: $r = .38$, $p < .001$; **Figure 6**; S2: $r = .29$, $p < .001$; **Figure 7**)
  - ✓ This relationship held in a multiple regression controlling for explicit anti-Black bias, bias in strength and status judgments, and false beliefs (S1: $B = 12.17$, $SE = 3.02$, $t(122) = 4.02$, $p < .001$; S2: $B = 8.54$, $SE = 2.53$, $t(128) = 3.38$, $p = .001$)

Figure 6. Racial bias in pain perception predicts bias in treatment in Study 1

Figure 7. Racial bias in pain perception predicts bias in treatment in Study 2

Discussion & Future Directions

- Taken together, these results replicated and extended our previous work on racial biases in pain perception and care
- Not only was racial bias in pain perception associated with bias in subsequent treatment recommendations (independent of explicit prejudice and stereotypes that are relevant to judgments of pain experience and pain tolerance), but this relationship was even observed when completely controlling for differences in facial structure and expression intensity across Black and White targets

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