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Power effects on implicit prejudice and stereotyping: The role of intergroup face processing

Petra C. Schmid[a,b] and David M. Amodio[a]

[a]Department of Psychology, New York University, New York, NY, USA; [b]Department of Management, Technology, and Economics, ETH Zurich, Zurich, Switzerland

ABSTRACT
Power is thought to increase discrimination toward subordinate groups, yet its effect on different forms of implicit bias remains unclear. We tested whether power enhances implicit racial stereotyping, in addition to implicit prejudice (i.e., evaluative associations), and examined the effect of power on the automatic processing of faces during implicit tasks. Study 1 showed that manipulated high power increased both forms of implicit bias, relative to low power. Using a neural index of visual face processing (the N170 component of the ERP), Study 2 revealed that power affected the encoding of White ingroup vs. Black outgroup faces. Whereas high power increased the relative processing of outgroup faces during evaluative judgments in the prejudice task, it decreased the relative processing of outgroup faces during stereotype trait judgments. An indirect effect of power on implicit prejudice through enhanced processing of outgroup versus ingroup faces suggested a potential link between face processing and implicit bias. Together, these findings demonstrate that power can affect implicit prejudice and stereotyping as well as early processing of racial ingroup and outgroup faces.

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Racial discrimination is often described as an expression of social power, such that powerful individuals may use prejudices and stereotypes to maintain their influence over people and resources (Fiske, 1993; Goodwin, Operario, & Fiske, 1998; Sidanius & Pratto, 1999). However, theoretical explanations of how power leads to greater bias seem contradictory on the surface, with some suggesting that power *reduces* a perceiver's processing of outgroup members and others suggesting that power *increases* a perceiver's processing of outgroup members (Goodwin, Gubin, Fiske, & Yzerbyt, 2000; Goodwin et al., 1998). That is, both accounts predict that power increases intergroup bias, but they refer to mechanisms that appear to operate in opposite ways. In an effort to illuminate the effect of power on intergroup bias, we proposed that these two accounts pertain to different components of intergroup bias. We tested the hypothesis that social power enhances both implicit prejudice and stereotyping, but that the perceptual processing of outgroup relative to ingroup individuals differs critically in the contexts of prejudice and stereotyping.

Power and social judgments

Given the role of power in subjugating lower-status individuals (Kipnis, 1972), it is widely assumed that power decreases empathic responses to and interest in others. Empirical research is generally in line with this assumption. For instance, power has been associated with reduced interpersonal accuracy and perspective taking (Galinsky, Magee, Inesi, & Gruenfeld, 2006), decreased empathic concern (Woltin, Corneille, Yzerbyt, & Förster, 2011), and less distress and compassion in response to other people's suffering (Van Kleef et al., 2008). However, in some cases, an opposite pattern has been found: when greater social processing was relevant to the participant's goals, power *increased* individuation, social concern, and interpersonal accuracy (e.g., Overbeck & Park, 2001; Schmid Mast, Jonas, & Hall, 2009). Thus, research suggests that power can affect social processing, but that the nature of this effect depends on the context and a perceiver's goals.

In the intergroup domain, power is often assumed to enhance expressions of bias in the form of both preju-

CONTACT Petra C. Schmid pcs308@nyu.edu Department of Psychology, New York University, 6 Washington Place, New York, NY 10003, USA; David Amodio david.amodio@nyu.edu.
Present address for Petra C. Schmid: ETH Zurich, Department of Management, Technology, and Economics, Weinbergstrasse 56/58, CH-8092 Zurich, Switzerland, Email: petraschmid@ethz.ch.

dices and stereotypes. Yet despite this prevailing assumption, its empirical support comes from a small set of studies, and the effects of context and goals—shown to be critical to the effect of power on perceptions of individuals—have not been examined systematically. To date, research has shown that experimentally induced power enhances White participants' implicit prejudice toward Black and Arab people, relative to White ingroup targets (Guinote, Willis, & Martellotta, 2010). In other research, White participants assigned to a high-power role exhibited greater implicit prejudice toward Blacks when anticipating an interracial interaction, but not when anticipating a same-race interaction, suggesting that the effect of power was contingent on specific social contexts or goals (Richeson & Ambady, 2003). These findings provided initial evidence that, on implicit measures of racial bias, power increases perceiver's negative evaluation of outgroup members relative to ingroup members.

Research has not directly examined effects of power on implicit stereotyping. Nevertheless, some work is relevant. For instance, it was found that, when forming impressions about others, participants assigned to high-power roles spent less time reading individuated information and more time reading stereotype-consistent information about a target person, compared with control participants (Goodwin et al., 2000; for similar effects, see Rodríguez-Bailón, Moya, & Yzerbyt, 2000). These findings are consistent with the idea that power increases one's reliance on stereotypical information, but it did not address the possibility that power increases the activation of stereotypical associations in a perceiver's mind.

It is notable that, despite strong theoretical reasons to expect that power should increase both *implicit* prejudice and stereotyping, the literature concerning power effects on *explicit* expressions of prejudice and stereotyping has been mixed. These inconsistencies may be due, in part, to differences in the methodological approaches used in each case. In some research, power was not found to affect explicit expressions of prejudice (Guinote, 2007a; Guinote et al., 2010) or stereotypes (Goodwin et al., 2000; Guinote, 2007b; Lammers & Stapel, 2011). Yet other research found that effects depended on the type of power, with social power (i.e., having power over somebody) decreasing explicit stereotyping and personal power (i.e., being independent of others) increasing explicit stereotyping (Lammers, Stoker, & Stapel, 2009). Given the types of explicit measures used in these prior studies, it is also possible that the explicit expression of prejudices and stereotypes was regulated in order to give socially desirable responses. By contrast, the use of implicit measures of prejudice and stereotyping may provide a clearer assessment of how power affects the activation of prejudices and stereotypes in the mind.

Power effects on implicit prejudice and stereotyping: potential mechanisms

Although existing research suggests power should increase both implicit prejudice and stereotyping, a closer consideration of these effects suggests they may occur through different processes. According to the power-as-control model (Fiske, 1993; Goodwin et al., 1998, 2000), powerful people are less interested in individuating lower-status people (e.g., minority group members), in part because they are preoccupied, cognitively busy, and generally unmotivated. Consequently, when forming impressions of outgroup members, high-power individuals are more likely to rely on group-based stereotypes. Furthermore, in this context, power should be associated with *reduced* processing of lower-status outgroup members, relative to ingroup members.

By contrast, when making evaluative associations in an implicit prejudice task, potential competition or threat of an outgroup member is emphasized and thus power may *enhance* the processing of outgroup members. Indeed, according to theories of intergroup relations negative attitudes may reflect a response to potential outgroup threat and group competition (Pratto, Sidanius, Stallworth, & Malle, 1994; Stephan & Stephan, 2000) and members of powerful groups tend to express prejudice as a means to reinforce power hierarchies (Sidanius, Pratto, Van Laar, & Levin, 2004). Moreover, the approach/inhibition theory of power suggests that when threat concerns maintenance of the power hierarchy, power makes people more attentive to others (Keltner, Gruenfeld, & Anderson, 2003). Thus, at least in the context of group-based power and hierarchy, high-power individuals are more responsive to threats from other groups, and this may relate to their greater tendency to express prejudice.

Importantly, for the present purposes, research on manipulated feelings of *individual-level* power suggests a similar effect. For example, in studies by Lammers and Stapel (2011) that examined both measured and manipulated individual-level power, high power was associated with greater dehumanization of outgroup members. These findings indicate that individual-level power also promotes a form of social dominance. Therefore, the context of an implicit prejudice task may foster *increased* processing of outgroup members relative to ingroup members in high-power individuals.

Our review of the existing literature suggests that power should increase the expression of both implicit prejudice and stereotyping, but that perceptual processes during the expression of such biases should differ depending on the context of judgments. Whereas power should heighten processing of outgroup members relative to ingroup members in the context of an implicit prejudice task, power should reduce processing of outgroup members relative to ingroup members in the context of a non-evaluative implicit stereotyping task. To begin to examine this hypothesis, we investigated whether power has different effects on early face processing in the context of prejudice and stereotyping. More specifically, we examined power effects on the N170 component of the event-related potential (ERP), an established index of face encoding in temporo-occipital cortex (Rossion et al., 1999; Sagiv & Bentin, 2001). Much recent research has shown that the N170 is modulated by a perceiver's social motivations in intergroup contexts (Ofan, Rubin, & Amodio, 2011, 2014; Ratner & Amodio, 2013; Senholzi & Ito, 2013), and thus assessment of the N170 permits a test of whether power affects processing of ingroup vs. outgroup members' faces differently in the context of implicit prejudice vs. implicit stereotyping. A better understanding of how power influences early perceptual processing may inform theories of how power affects implicit prejudice and stereotyping.

Study overview

The broad goal of the present studies was to test the effect of manipulated power on implicit bias and the automatic perceptual processing of racial ingroup and outgroup members. Study 1 was designed to examine power effects on comparable measures of implicit prejudice and implicit stereotyping. Study 2 was designed to investigate how power affects automatic face processing within the context of an implicit prejudice and an implicit stereotyping task.

Study 1

Study 1 tested the hypothesis that manipulated power enhances both evaluative and stereotyping biases regarding Blacks, relative to Whites. Given prior research, we did not expect power to more strongly affect either form of bias.

Method

Participants

Ninety-seven undergraduate students participated for course credit. Data were excluded from 13 participants who were suspicious with regard to the power manipulation and one participant whose task performance accuracy was below chance, indicating failure to follow instructions. Of the remaining 83 participants, 44 identified as White, 25 as Asian, 7 as Hispanic, and 7 as other (mixed race, no indication); none identified as Black. Previous research observed a significant effect of power on implicit prejudice measures with 25 participants per condition (i.e., Guinote et al., 2010), and thus this study was highly powered with 38 low-power participants and 45 high-power participants included in the analyses (89% female, M_{age} = 19.66, SD_{age} = 1.89).

Procedure

After providing consent, power was manipulated (either high power or low power, depending on participants' random assignment). Next, participants performed tasks assessing implicit prejudice and stereotypes about Black vs. White individuals, in counter-balanced order. Participants then reported their current feelings of power and mood (manipulation check), completed two questionnaires assessing individual differences unrelated to the present analysis[1], and were then probed for suspicion with regard to the power manipulation and debriefed.

Power manipulation

Power was manipulated through a bogus feedback procedure (for similar procedures, see Galinsky, Gruenfeld, & Magee, 2003; Guinote, 2007a; Mead & Maner, 2012). Participants completed a six-item "Leadership Skills" questionnaire (free download at: http://ofd.ncsu.edu/wp-content/uploads/2013/01/Leadership_Style_Questionnaire__Reading.pdf) and were informed that we would calculate their questionnaire score. In actuality, participants were pre-assigned to receive scores representing high power (72 of 80 points, *good leadership skills*) or low power (28 of 80 points, *poor leadership skills*). The experimenter explained that higher scores reflect greater dominance and willingness to lead and to speak up, as well as greater ability to ensure efficient teamwork. The power manipulation was refreshed after the first

[1]In both studies, participants completed the dominance subscale of the Personality Research Form (Jackson, 1974). In Study 1 only, participants also completed a measure of ethnocultural empathy (Wang et al., 2003) at the very end of the experiment for reasons unrelated to the present analysis.

implicit bias task by reminding participants of their questionnaire score. The power manipulation was only expected to be effective for participants who believed our cover story. Participants who indicated that they thought that the feedback was bogus were excluded from all analyses.

Implicit racial associations tasks

Participants were informed that these tasks involved category judgments and that they would have to classify a series of words as belonging to one of two different categories. Separate computer-based "race flanker" tasks were used to assess implicit evaluative and stereotypic associations (Amodio & Hamilton, 2012). Computer screens had a resolution of 1024 × 768. Both tasks began with 20 practice trials. On each practice trial, a white-noise mask (146 × 110 pixels) was presented for 250 ms, serving as a fixation point. Next, a target word appeared above or below the mask and remained onscreen until a classification was made. On the first ten practice trials, accuracy feedback was given, followed by ten practice trials on which participants received both accuracy and timing feedback, such that a "too slow!" message appeared after responses exceeding 600 ms. Next, on each of the 120 critical trials, the mask was presented (250 ms), followed by the simultaneous presentation of a face (Black or White; 146 × 110 pixels) and a target word. The target word appeared either above or below the face, quasi-randomly, which required participants to always view the face along with the target. Participants were informed that these faces would appear but that their task was to classify the target words. Feedback on timing but not accuracy was given during critical trials; classification success was self-evident to participants.

In the implicit prejudice task, participants were instructed to classify target words as "unpleasant" or "pleasant." Pleasant words included *honor, lucky, diamond, loyal, freedom, rainbow, love, honest, peace*, and *heaven*; unpleasant words included *evil, cancer, sickness, disaster, filth, vomit, bomb, rotten, abuse*, and *ugly* (adapted from Greenwald, McGhee, & Schwartz, 1998). Because target words were unrelated to known stereotypes of Whites and Blacks, responses on this task reflected evaluative but not stereotypic associations. In the stereotyping task, target words were classified as "mental" or "physical." Mental words included *math, brainy, aptitude, library, scientist, idea, learn, thinking, bookish*, and *reading*; physical words included *athletic, strong, basketball, run, agile, jump, dance, rhythm, muscular*, and *football* (adapted from Amodio and Devine 2006). Target words on this task related to common African American stereotypes (low intelligence, high athleticism) presented as terms that were moderately positive in valence; thus, responses could not be made based on evaluative associations. In past research, scores on these two tasks were uncorrelated and predicted different intergroup outcomes (Amodio & Devine, 2006). Response accuracy and reaction times (RT) were computed as a function of trial type for each task. Only responses made with the 200–600 ms time window were considered valid.

Manipulation check

After completing implicit bias tasks, participants indicated their current power-related feelings on six items, including *powerful, dominant, influential, powerless, submissive*, and *constrained* (the latter three reverse-coded), on a 5-point scale (1 = not at all, 5 = very much, α = .70). Participants also indicated their mood on a 7-point single-item scale (1 = very bad, 7 = very good).

Results

Manipulation check

High-power participants tended to feel more powerful (M = 3.31, SD = 0.61) than low-power participants (M = 3.04, SD = 0.71), $t(81) = 3.43$, $p = .068$, $d = .41$. The power manipulation did not affect participants' mood, $t(81) = 0.03$, $p = .973$, $d = .001$.

Power effects on implicit bias

To test our main hypothesis that power increases implicit racial bias, we conducted a 2 (Power: high vs. low) × 2 (Race: Black vs. White) × 2 (Target Word: pleasant vs. unpleasant or mental vs. physical) × 2 (Task: prejudice vs. stereotype) mixed-factors ANOVA, with power as the between-subjects factor and accuracy as the dependent variable. A clear pattern of implicit racial bias was evident across conditions, as indicated by the significant Race × Target Word interaction, $F(1,81) = 19.96$, $MSE = .02$, $p < .001$, $\eta_p^2 = .20$. Importantly, this effect was qualified by the predicted Power × Race × Target Word interaction, $F(1,81) = 6.42$, $MSE = .02$, $p = .013$, $\eta_p^2 = .07$ (see Figure 1). The four-way interaction was not significant, $F(1,81) = .03$, $MSE = .01$, $p = .861$, $\eta_p^2 < .001$, indicating that the effect of power on implicit bias did not differ between tasks. Results also included a significant Task × Target Word interaction, $F(1,81) = 6.09$, $MSE = .02$, $p = .016$, $\eta_p^2 = .07$, as well as separate main effects for task, race, and target word, $Fs > 6.94$, $ps < .010$, η_p^2s > .08, but these effects were difficult to interpret in the absence of power effects and thus not of conceptual interest. No other effects were significant, $Fs < 2.51$, $ps > .117$, $\eta_p^2 < .03$.

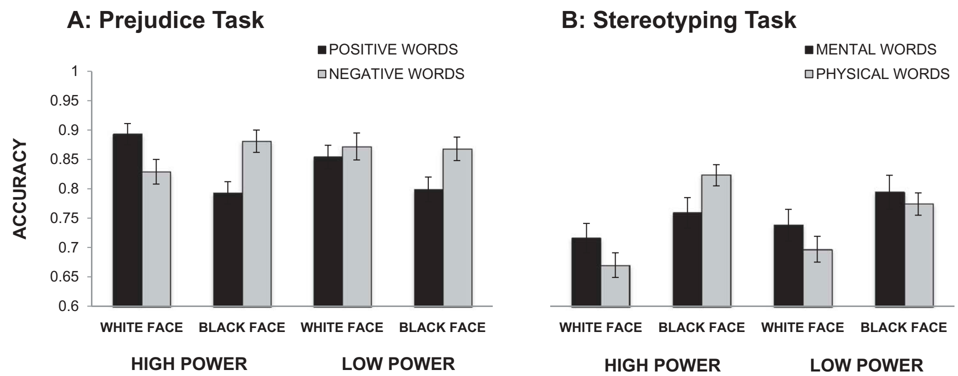

Figure 1. High-power participants expressed greater racial bias than low-power participants on measures of both implicit prejudice (panel A) and implicit stereotyping (panel B).

To decompose the significant three-way interaction of interest, we analyzed the Race × Target Word interaction separately for the high-power and the low-power condition. *High-power participants* showed a significant Race × Target Word interaction $F(1,44) = 27.30$, $MSE = .01$, $p < .001$, $\eta_p^2 = .38$. Simple effect analyses revealed that high-power participants were more accurate at categorizing positive and mental words after seeing a White ($M = .80$, $SE = .02$) than a Black face ($M = .73$, $SE = .02$), $t(81) = 7.64$, $p < .001$, $MSE = .03$, $d = 1.70$, and less accurate in categorizing negative and physical words after seeing a White face ($M = .79$, $SE = .02$) relative to a Black face ($M = .85$, $SE = .02$), $t(81) = 4.82$, $p < .001$, $MSE = .03$, $d = 1.08$. This pattern provided evidence for racial bias in high-power participants. For *low-power participants*, the Race × Target Word interaction was not significant, $F(1,37) = 1.69$, $MSE = .02$, $p = .202$ $\eta_p^2 = .04$.

Although the effect of power on implicit bias did not differ as a function of task, we conducted additional analyses to examine power effects on each task separately given their theoretical distinction. On the prejudice task, high-power participants exhibited a significant Race × Target Word interaction, $F(1,44) = 27.68$, $MSE = .01$, $p < .001$, $\eta_p^2 = .32$. Simple effect analyses revealed a clear pattern of racial bias: High-power participants were more accurate in categorizing positive words after seeing a White ($M = .89$, $SE = .01$) than a Black face ($M = .83$, $SE = .03$), $t(44) = 5.40$, $p < .001$, $MSE = .01$, $d = 1.63$, and less accurate in categorizing negative words after seeing a White face ($M = .79$, $SE = .01$) relative to a Black face ($M = .85$, $SE = .02$), $t(44) = 2.35$, $p = .023$, $MSE = .02$, $d = 0.71$. By contrast, for low-power participants, the Race × Target Word interaction was not significant, $F(1,37) = 1.66$, $MSE = .02$, $p = .21$ $\eta_p^2 = .04$.

In the stereotyping task, high-power participants also showed a Race × Target Word effect, $F(1,44) = 13.88$, $MSE = .01$, $p = .001$, $\eta_p^2 = .24$, and simple effects revealed evidence for stereotype-consistent associations: High-power participants were more accurate in categorizing mental words after seeing a White ($M = .72$, $SE = .03$) than a Black face ($M = .67$, $SE = .03$), $t(44) = 2.35$, $p = .023$, $MSE = .03$, $d = 0.71$, and less accurate in categorizing physical words after seeing a White face ($M = .76$, $SE = .03$) relative to a Black face ($M = .82$, $SE = .02$), $t(44) = 2.89$, $p = .006$, $MSE = .02$, $d = 0.87$. For low-power participants, the Race × Target Word interaction was again not significant, $F(1,37) = 0.56$, $MSE = .01$, $p = .457$ $\eta_p^2 = .02$.

Although the use of a response deadline in the implicit bias tasks was designed for an analysis of accuracy rates, we conducted a supplementary analysis of log-transformed RTs. A significant Race × Target Word interaction was found, $F(1,81) = 5.21$, $MSE<.01$, $p = .025$, $\eta_p^2 = .06$. Indicative of racial bias, simple effect analyses showed that responses were significantly faster to positive and mental words after a White face prime ($M = 6.30$, $SE < .01$) than after a Black face prime ($M = 6.34$, $SE < .01$), $t(90) = 2.06$, $p < .001$, $MSE = .08$, $d = .16$, and responses to negative and physical words were marginally slower after White face primes ($M = 6.33$, $SE = .01$) than after Black face primes, $M = 6.34$, $SE = .01$), $t(90) = 1.19$, $MSE = 0.08$, $p = .088$, $d = 0.09$. However, the Race × Target Word interaction was not moderated by power, $F(1,81) = 1.65$, $MSE < 0.01$, $p = .202$ $\eta_p^2 = .02$, and the Task × Power × Face × Word interaction was also not significant, $F(1,81) = 1.84$, $MSE < 0.01$, $p = .178$ $\eta_p^2 = .02$. The lack of a power effect on RT-based patterns of implicit bias was not surprising given that the implicit bias tasks were optimized for analysis of accuracy rates and not RTs.

Discussion

Study 1 supported the hypothesis that manipulated power increases both major forms of implicit intergroup bias: implicit prejudice and implicit stereotyping. These data replicate previous evidence that power enhances implicit evaluative bias (Guinote et al., 2010), while providing new evidence that power also increases implicit stereotype-based associations. Our results further indicated that the effect of power on the unique indices of implicit prejudice and stereotyping was similar in magnitude, suggesting that power may be associated with behaviors linked to both aspects of implicit bias in prior research (Amodio & Devine, 2006; Dovidio, Kawakami, & Gaertner, 2002; McConnell & Leibold, 2001).

Study 2

Having demonstrated in Study 1 that power increases both implicit prejudice and stereotyping, we next tested the hypothesis that power influences the visual processing of ingroup and outgroup members differently within the two contexts. Although intergroup attitudes and stereotypes often operate in conjunction (cf. Amodio & Devine, 2006; Dovidio, Brigham, Johnson, & Gaertner, 1996), this hypothesis suggests that a consideration of their distinctions may help to elucidate the effect of power on implicit bias. Following past research (Ofan et al., 2011, 2014), we assessed the processing of ingroup and outgroup prime faces during the implicit bias tasks using an event-related potential (ERP) index of face processing. This ERP component, termed the *N170* for its negative voltage polarity and peak activity at 170 ms following face onset, represents the structural encoding of a face in visual perception (Caldara et al., 2003; Rossion et al., 1999). The N170 response to faces is maximal over right temporo-occipital scalp sites and is believed to reflect activity in the fusiform gyrus and inferior temporal cortex (Herrmann, Ehlis, Muehlberger, & Fallgatter, 2005). The existing literature on N170 response to racial ingroup vs. outgroup faces includes mixed results: some studies reported larger N170 to outgroup faces (Stahl, Wiese, & Schweinberger, 2008; Walker, Silvert, Hewstone, & Nobre, 2008), others smaller N170 to outgroup faces (Ito & Urland, 2005), or no differences (Caldara, Rossion, Bovet, & Hauert, 2004; Wiese, Stahl, & Schweinberger, 2009). However, recent research has clarified these effects by showing that N170 responses to ingroup vs. outgroup faces are modulated by goals, including task goals (Senholzi & Ito, 2013) and social goals, such as those related to intergroup attitudes (Ofan et al., 2011), minimal ingroup identity (Ratner & Amodio, 2013), and anxiety about appearing prejudiced (Ofan et al., 2014). Therefore, the N170 index provided an ideal method for testing our hypothesis regarding the effect of power on the processing of ingroup vs. outgroup faces in the contexts of evaluative and stereotype judgments.

During the implicit prejudice task, evaluative words were categorized in the context of Black and White faces, thus creating a context and mindset of intergroup evaluation that, according to theories of prejudice, should increase the accessibility of potential outgroup threat (Pratto et al., 1994; Stephan & Stephan, 2000). In line with the idea that power enhances attention toward sources of threat to the high-power status (Keltner et al., 2003), we hypothesized that high-power participants would exhibit greater N170 responses to Black than White faces, relative to low-power participants, indicating greater early perceptual processing of outgroup faces. By contrast, the implicit stereotyping task involved the categorization of positive stereotype-relevant trait words on a non-evaluative dimension, creating a non-evaluative context of trait judgment. Given that high-power has been linked to a reduced interest in individuating lower-status individuals in past work (Fiske, 1993; Goodwin et al., 2000, 1998), high-power participants were expected to show smaller N170 amplitudes to Black than White faces, relative to low-power participants.

Because visual perception is highly sensitive to the luminance of stimuli, differences in skin tone associated with color or even grayscale images of White and Black faces could themselves cause differences in the N170 response. To ensure that any effects on the N170 were due to the group identity of a face, face stimuli were converted to two-toned images, in which every pixel in the image is either black or white, and the proportion of black and white pixels is made equal across all stimuli. This procedure controls luminance but preserves face structure and identity, such that racial identity remains highly discriminable (Ofan et al., 2011). Importantly, although this procedure is necessary in order to interpret N170 effects as due to group-based differences, the removal of color cues may weaken the overall effect of the race primes. Thus, the task used in Study 2 was optimized to examine power effects on the early visual processing of race, yet potentially less optimal for observing effects in behavior.

Method

Participants

A total of 118 White undergraduate students participated for course credit. Data were excuded from 10 participants who were suspicious about the power manipulation, 12 with EEG signal problems, and 1 whose accuracy scores were below chance. In addition, we excluded one participant who claimed to recognize one of the stimulus faces. Analyses were conducted on 94 participants of which 45 were in the low-power condition and 49 in the high-power condition. This sample included 52% female participants, M_{age} = 19.09 years, SD_{age} = 1.27.

Procedure

After providing informed consent, participants were prepared for EEG recording and then completed the leadership skills questionnaire. They received bogus feedback on their leadership skills and then performed either the implicit prejudice or the implicit stereotyping tasks. In this study, task type was used as a between-subjects factor because of the long study duration (2.5 hours). Participants then completed the felt power scale (α = .74) and mood item used in Study 1, a questionnaire assessing individual differences unrelated to the present analysis (see footnote 2), were probed for suspicion and then debriefed.

Power manipulation

Following the same procedure as in Study 1, power was manipulated by giving participants bogus feedback on their leadership skills.

Implicit racial association task

In Study 2, our primary interest was to examine power effects on ingroup vs. outgroup face processing. The implicit bias tasks were therefore optimized for analysis of the N170 component of the ERP. Changes included the use of two-toned face primes and adaption of the task to a sequential priming format, which allowed temporal separation between presentation of the face, which served as the prime, and the target word, so that N170 responses to the face could emerge without interference from the target word onset. Thus, a fixation cross was presented (800 ms), followed by a Black or White face (212 ms), and then a target word (6 s or until participants responded). The target words and the response deadline were identical to those in Study 1. During intertrial intervals, a blank screen was presented for 2500 ms. Participants began by performing 20 practice trials, as in Study 1, and then completed 160 critical trials. Participants were given the same instructions as in Study 1.

As in Study 1, accuracy rates were computed for each trial type, including only responses made within 200 and 600 ms. Despite the 600 ms deadline, accuracy in this study was extremely high (94% on the evaluation task; 91% on the stereotyping task), compared with Study 1 (85% and 75% on the evaluation and stereotyping tasks, respectively). Indeed, it is common to observe better performance from participants during EEG studies due to increased task engagement. However, because tasks such as this are designed to reveal racial bias in patterns of errors (Payne, 2008), the unusually high degree of accuracy rendered the task less sensitive to patterns of racial bias. Importantly, though, the high accuracy rate would not reduce the ability to detect effects in visual processing.

EEG recording and processing

EEG was recorded from 14 sites (F7, F3, Fz, F4, F8, Fcz, Cz, CPz, P7, P3, Pz, P4, P8, and Oz), with left earlobe reference (impedance < 5 kΩ), from tin electrodes in an elastic cap (ElectroCap, Eaton, OH). Vertical and horizontal eye movements were recorded to facilitate artifact scoring. Signals were amplified by a Neuroscan Synamps2 amplifier (El Paso, TX), digitized at 1000 Hz (AC coupling), and passed through a 0.15–100 Hz online filter. Offline, EEG was re-referenced to average earlobes, submitted to a regression-based blink correction procedure, and filtered through a 1–15 Hz band-pass that preserved signals of interest. To score ERPs, 600 ms stimulus-locked epochs were extracted starting 200 ms before stimulus onset. Baseline correction (subtraction of average baseline voltage) was based on the 200 ms pre-stimulus time period. Average ERP waveforms were computed separately for Black and White faces from each task. The N170 was scored at the right temporo-occipital scalp site (P8) as the peak negative amplitude between 120 and 190 ms, following previous research (Jacques & Rossion, 2007; Kolassa & Miltner, 2006).

Results

Preliminary analyses

Power was successfully manipulated: participants in the high-power condition felt significantly more powerful (M = 3.40, SD = 0.54) than participants in the low-power condition (M = 3.07, SD = 0.65), $t(91) = 2.73$, $p = .008$, $d = .55$. The manipulation did not significantly affect participants' mood, $t(91) = 0.95$, $p = .342$, $d = .20$.

N170 amplitude effects

To test the primary hypothesis of Study 2, a 2 (Power) × 2 (Race) × 2 (Task) ANOVA was conducted on N170 amplitudes. A main effect for power, $F(1,90) = 4.80$, $MSE = 24.58$, $p = .031$, $\eta_p^2 = .05$, indicated that power enhanced N170 amplitudes to faces across trial types. More importantly, the predicted Power × Race × Task interaction was significant, $F(1,90) = 8.99$, $MSE = 1.34$, $p = .004$, $\eta_p^2 = .09$. No other effects were significant, Fs < 0.74, ps > .393,

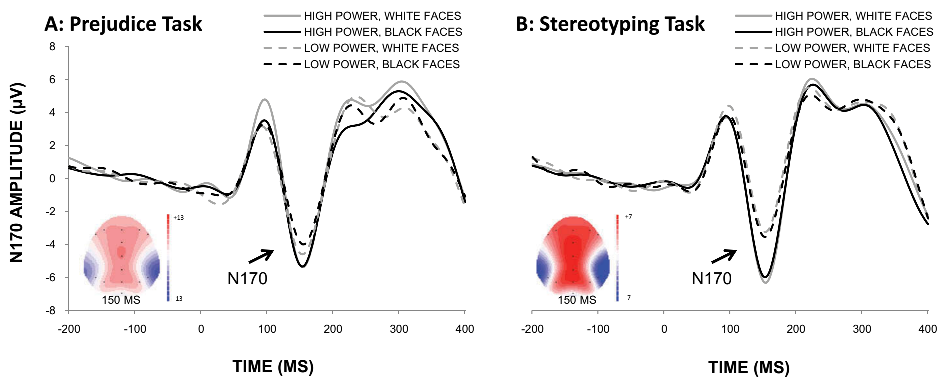

Figure 2. ERP waveforms illustrating the N170 component produced during the implicit prejudice task (panel A) and implicit stereotyping task (panel B), as a function of power manipulation and race of prime face. Topographic scalp voltage maps associated with the N170 peak are inset.

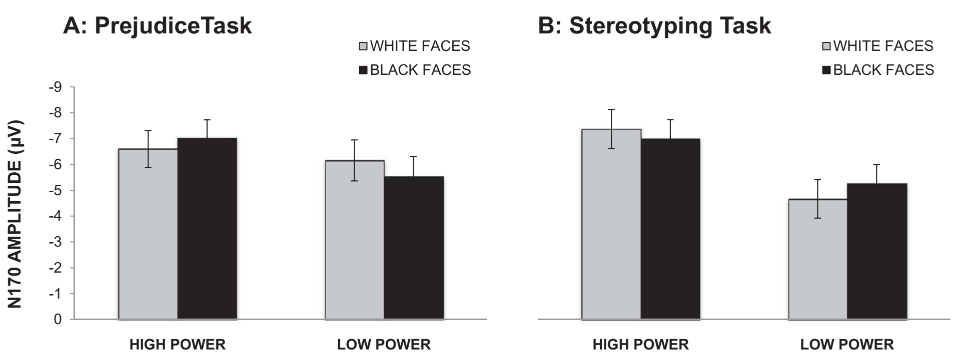

Figure 3. Average peak N170 amplitude scores on the implicit prejudice task (panel A) and implicit stereotyping task (panel B) as a function of participant power and race of prime face.

$\eta_p{}^2$s < .01. ERP waveforms illustrating the N170 components as a function of condition are presented in Figure 2, and peak N170 scores, used for analysis, are shown in Figure 3 (peak amplitude scores are typically larger than depicted in a grand-averaged waveform due to individual differences ERP component latency).

To decompose the three-way interaction, N170 scores were analyzed separately for participants who completed the prejudice and stereotyping tasks. An ANOVA on the *prejudice task* scores produced the predicted Power × Race interaction, $F(1,45) = 4.92$, $MSE = 1.29$, $p = .032$, $\eta_p{}^2 = .10$. A simple effect contrast comparing high-power participants' N170 responses to Black faces ($M = -7.02$, $SE = 0.70$) versus White faces ($M = -6.60$, $SE = 0.71$) did not reach significance, $t(45) = 1.32$, $MSE = 11.16$, $p = .191$, $d = .13$, but for low-power participants, the N170 responses to Black faces ($M = -5.53$, $SE = 0.78$) were marginally smaller (i.e., less negative) than White faces ($M = -6.15$, $SE = 0.79$), $t(45) = 1.73$, $p = .087$, $MSE = 8.63$, $d = 21$. Simple effect analyses between high- and low-power participants were not significant in response to White faces, $t(45) = 0.42$, $MSE = 13.20$, $p = .677$, $d = .14$, or Black faces, $t(45) = 1.42$, $MSE = 12.73$, $p = .158$, $d = .48$. Thus, the significant interaction reflected a relative effect of power on face processing, whereby high power *increased* N170 amplitude to Black vs. White face *relative* to low power—a pattern that was not driven by any specific simple effect.

The ANOVA conducted on N170 scores from the *stereotyping task* also produced a significant Power × Race interaction $t(45) = 4.11$, $MSE = 1.40$, $p = .048$, $\eta_p{}^2 = .08$, but in a different pattern. Contrasts revealed that high-power participants' N170 responses to Black faces ($M = -6.99$, $SE = 0.74$) and White faces ($M = -7.37$, $SE = 0.76$) did not significantly differ, $t(45) = 1.12$, $MSE = 23.48$, $p = .265$, $d = .08$, whereas low-power participants' N170 response was marginally greater to Black faces ($M = -5.27$, $SE = 0.73$) than White faces ($M = -4.66$, $SE = 0.74$), $t(45) = 1.82$, $MSE = 8.64$, $p = .073$, $d = .21$. When examining simple effects within each race condition, contrasts revealed that high-power participants exhibited significantly greater N170 amplitudes to White faces than low-power participants, $t(45) = 2.55$, $MSE = 13.20$, $p = .012$, $d = .69$, but did not differ in response to Black faces, $t(45) = 1.65$, $MSE = 12.73$, $p = .103$, $d = .45$, suggesting greater relative processing of ingroup faces. Again, this pattern suggests that the significant interaction was driven by a crossover pattern, such that high power *decreased* N170 amplitudes to Black versus White faces relative to low power.

N170 latency effects

To test whether power affected N170 latencies, a 2 (Power) × 2 (Race) × 2 (Task) ANOVA was conducted on N170 latencies. This ANOVA produced no significant effects, *F*s < 1.98, *p*s > .163, η_p^2*s* < .02.

Behavioral measures of racial bias

To test the effect of power on racial bias, accuracy scores were submitted to a 2 (Power) × 2 (Race) × 2 (Target Word) × 2 (Task) ANOVA. The key interactions were not significant: Race × Target Word interaction, $F(1,90) = 0.02$, $MSE < .01$, $p = .894$, $\eta_p^2 < .001$; Power × Race × Target Word interaction, $F(1,90) = 0.24$, $MSE < .01$, $p = .626$, $\eta_p^2 < .01$. This pattern of null results in behavior was not surprising given the very high accuracy in performance across tasks.

Although the tasks used in this study were unable to reproduce the typical pattern of implicit bias in error rates, given the high accuracy across groups, we examined effects in RTs. An ANOVA on log-transformed RT scores produced a significant Race × Target Word interaction, $F(1,90) = 4.11$, $p = .046$, $\eta_p^2 < .04$, indicating the typical racial bias effect across both tasks as suggested by simple effect analyses: Significantly faster responses were observed to positive and mental words after a White face prime ($M = 6.22$, $SE < .01$) than after a Black face prime ($M = 6.25$, $SE < .01$), $t(90) = 2.06$, $p = .042$, $MSE = 0.01$, $d = .16$. Response latencies to negative and physical words did not significantly differ as a function of the race prime (for White faces: $M = 6.23$, $SE < .01$; for Black faces, $M = 6.24$, $SE < .01$), $t(90) = 1.19$, $MSE = 0.01$, $p = .234$, $d = 0.09$. However, the Race × Target Word interaction was not moderated by power, $F(1,90) = 0.03$, $MSE < 0.01$, $p = .878$, $\eta_p^2 < .001$, replicating the pattern for RTs observed in Study 1.

Exploratory analyses of mediation

Although the measures of implicit bias used in this study were not as sensitive to the behavioral effects as in Study 1, we conducted an exploratory test to determine whether the power effect on visual processing of Black vs. White faces had indirect consequences for the expression of implicit bias. That is, we conducted a mediation analysis in which the N170 response to race was included as a mediator of the effect of power condition on implicit bias scores, using Hayes' (Hayes, 2013) mediation macro, with 95% confidence intervals (CI) and 10,000 bootstrapping resamples. Several difference scores were computed for this analysis. For the mediator, N170 amplitudes to White faces were subtracted from N170 amplitudes to Black faces, such that more negative scores reflected relatively greater processing of Black than White faces. For outcome variables, separate difference score indices of implicit prejudice and stereotyping were computed from log-transformed RTs. The prejudice difference score was computed as (Black/Positive – Black/Negative) – (White/Positive – White/Negative); the stereotype difference score was computed as (Black/Mental – Black/Physical) – (White/Mental – White/Physical). These scores corresponded to the Race × Target Word interaction effects on each task, with higher values indicating stronger racial bias.

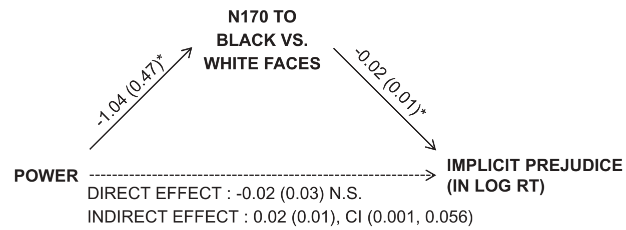

Figure 4. A mediation model illustrating an indirect effect of power on implicit prejudice through the enhanced N170 response to Black vs. White faces. Unstandardized coefficients and SEs are presented in parentheses. $*p < .05$.

For the prejudice task, manipulated power predicted a larger (more negative) N170 difference score, $p = .031$, replicating the effect reported above. In addition, larger N170 effects predicted stronger implicit prejudice, $p = .051$. Importantly, the indirect effect was significant *CI*(0.001, 0.056), suggesting that manipulated power affected the differential processing of Black and White faces, and that this pattern of face processing related to the expression of implicit prejudice. *B*s and *SE*s are shown in Figure 4.

For the stereotyping task, manipulated power predicted a more positive N170 difference score, $p = .048$, as reported above. This N170 score was not significantly related to greater implicit stereotyping ($p = .117$), although coefficients suggested a trend in this direction. The indirect effect did not reach significance, with the lower CI endpoint placed at 0, *indirect effect* = .01, *SE* = .01, *CI*(0.000, 0.036).

Discussion

Study 2 examined the effect of manipulated power in White participants on the early visual processing of ingroup vs. outgroup faces, as indexed by the N170 ERP component, in the context of completing either an evaluative or stereotype-based measure of racial associations. We found that high power increased the processing of Black relative to White faces during the evaluative prejudice task, as compared with low power. By contrast, during the non-evaluative stereotyping task, high power reduced the processing of Black relative to White faces, compared with low power. These findings provide initial evidence for an effect of power on the early visual processing of faces, and they offer suggestive, albeit preliminary, evidence for a role of early face processing in the effect of power on prejudice and stereotyping.

It appeared that power affected the processing of Black *relative* to White faces. The simple effects were generally nonsignificant and the power effect could therefore not be localized to specific responses to Black faces, as opposed to White faces, or only among the high-power group, as opposed to the low-power group. It is also possible that our experiment lacked sensitivity to more specific effects. While our results provide an initial demonstration of power effects on the early visual processing of Black and White faces, future research may be needed to detail the more specific components of this effect.

Although we observed effects of power on ingroup vs. outgroup face processing, the effect of power on the behavioral measures of implicit prejudice and stereotyping were weaker than in Study 1. It is important to consider that the design of Study 1 was optimized to test for the effect of power on behavioral tasks, whereas the design of Study 2 was optimized to test for the effect of power on early face processing. The design choices made in this study (e.g., use of two-tone faces, longer intertrial intervals), in addition to the increase in task engagement and performance accuracy typically observed in experiments involving physiological recording, constituted a tradeoff necessary for making stronger inferences from the ERPs.

Nevertheless, exploratory mediation analyses suggested the possibility that power could influence implicit prejudice, at least in part, through its effect on the visual processing of outgroup vs. ingroup faces. By contrast, this mediation pattern was not significant for implicit stereotyping. Indeed, because power effects on stereotyping are thought to involve a decrease in individuation of lower-status individuals, we would not expect our index of face processing to be strongly involved in the effect of power on implicit stereotyping. Stereotyping effects may instead rely more heavily on cognitive representations of the social group that we could not assess using our ERP measures (e.g., stereotype representations in the anterior temporal lobes; Amodio, 2014; Gilbert, Swencionis, & Amodio, 2012).

In previous research on the N170 response in the context of race perception, the N170 has not been found to predict behavior measures of implicit bias (He, Johnson, Dovidio, & McCarthy, 2009; Ito & Urland, 2005; Ofan et al., 2011, 2014). Thus, it is possible that very early face encoding, indexed by the N170, is too distal in the processing stream from the implementation of behavioral responses to have a strong direct effect. If this is the case, then other later processes, such as those related to response selection, might have more direct roles in the effect of power on implicit racial bias. It is also possible that the aspects of implicit associations measured by the behavioral tasks are not the same as those influenced by power effects on visual processing. Thus, it will be interesting for future research to test whether power effects on face processing directly influence other forms of race processing that may be more proximal in terms of mechanism.

The observation that power influenced early face processing across conditions was interesting in its own right. This finding adds to the burgeoning literature demonstrating that even the earliest stages of face perception may be influenced by goals and motivations (e.g., Amodio, 2010; Cassidy, Boutsen, Humphreys, & Quinn, 2014; Ofan et al., 2011; Ratner & Amodio, 2013; Senholzi & Ito, 2013; Wiese, Kaufmann, & Schweinberger, 2014). Until recently, theories of face perception assumed that this early processing stage was driven solely by bottom-up stimulus features (e.g., Bentin & Deouell, 2000; Eimer, 2000), and so the present findings offer additional evidence for the effects of top-down social factors on face processing.

General discussion

Power, and the drive to maintain it, is often implicated in the discrimination of subordinate outgroup members. Yet little research has examined the effects of power on the sociocognitive and perceptual processes that contribute to expressions of implicit bias. The present research sought to examine the effect of power on implicit forms of prejudice and stereotyping as well as its effect on the early visual processing of racial ingroup and outgroup members.

Study 1 examined the widely assumed, yet infrequently tested, relationship between power and implicit intergroup bias. In particular, theories of social power have emphasized its effect on stereotyping, such that power should increase the use of stereotypes during judgments of low-status group members. Yet research had not tested whether power actually affects the accessibility of racial stereotype associations. Study 1 provided important novel evidence for this proposal by showing that power increased implicit stereotyping, in addition to corroborating the previous finding that power increases implicit prejudice (Guinote et al., 2010).

Study 2 offered an initial exploration of how power may affect the early visual processing of faces representing members of high- vs. low-status racial groups. Power was found to alter the processing of ingroup and outgroup faces depending on the type of judgment. When making evaluative judgments during an implicit prejudice task, high power enhanced N170 responses to Black relative to White faces, compared with low power. By contrast, when making non-evaluative trait-based judgments during an implicit stereotyping task, high power reduced N170 responses to Black faces than White faces, relative to low power. Furthermore, the effect of power on face processing in the evaluative context contributed to greater expressions of implicit prejudice in behavior. Face processing in the stereotype context did not significantly relate to implicit stereotyping in behavior, presumably because power effects on stereotyping involve a reduction in individuation, making face processing less relevant, and instead relying more on conceptual representations of the target group (Amodio, 2014). Together, these findings suggest that power effects can reach relatively low-level components of the social perception process, and that early visual processes may play a role in its effect on expressions of implicit bias.

Implications for intergroup bias and power

Power has long been thought to increase discrimination, but research on this topic has been silent regarding the sociocognitive processes through which this might occur. Our findings suggest that power is associated with the stronger activation of implicit evaluative and stereotyping associations regarding Black people, relative to White people. Whereas past research showed that high-power people were more likely to seek out stereotype-confirming information about lower-status group members (Goodwin et al., 2000), our results revealed that existing stereotype knowledge was also more highly activated among high-power participants. More generally, our studies integrate theories that have previously focused either on prejudice or stereotyping. That is, we showed that power enhanced both prejudice and stereotyping, but possibly for different reasons and through different mechanisms.

Potential interactions between prejudice and stereotyping in context of power

Although the present research concerned a distinction between prejudice and stereotyping processes in the context of power, these aspects of intergroup bias likely have interactive effects. A focus on negative stereotypes, as in much past research, obscures the potentially interesting interplay of prejudice and stereotyping processes. For example, it is possible that the endorsement of negative stereotype information by a high-power perceiver would serve the purpose of justifying existing power hierarchies, whereas the endorsement of positive stereotypes may be less effective in doing so (cf. Kay & Jost, 2003 on complementary stereotypes). In line with this reasoning, past research found that when forming impressions of outgroup members, high-power participants attended to negative but not positive stereotypical information about target individuals (Rodríguez-Bailón et al., 2000). Moreover, these effects only occurred when participants' high-power status was threatened. This finding suggests that evaluative concerns, such as the potential threat to power, may take precedence in outgroup judgments—a hypothesis that merits investigation. Conversely, power may enhance the stereotyping of outgroup members in a way that could sensitize the perceiver to group-based threat, subsequently inducing greater prejudice.

More broadly, our results suggest a new way in which the theoretical distinction between prejudice and stereotyping matters. Although the definitional distinction between prejudice and stereotyping is longstanding, its functional implications continue to be explored. Past research has shown that prejudices and stereotypes may uniquely predict affect-based and cognition-based outcomes, respectively (Amodio & Devine, 2006; Dovidio et al., 1996), and these effects have been linked theoretically to distinct learning and memory systems and neural substrates (Amodio & Ratner, 2011). The present work highlights a different, complementary aspect of this functional distinction, whereby prejudice and stereotyping tasks may elicit different patterns of person perception in the context of power.

Relative effects of high and low power on implicit intergroup bias

A potential limitation of our studies is that we did not include a control condition. This choice was made because of the difficulty in creating a truly comparable "baseline" condition. As a result, the observed effects for the high-power condition must be interpreted as relative to those of the low-power condition. Thus, despite the tendency in the literature to focus on the effects of high power, it is useful to consider effects from the perspective of low power as well. In Study 1, low-power participants did not show the typical pattern of racial bias, which is consistent with previous findings (Guinote et al., 2010). This may suggest that low power actually reduces the expression of implicit bias compared with the levels of bias typically observed in the literature. However, research on stereotyping found that high power increased participants' time spent on reading stereotype-consistent information compared to a control condition, suggesting an effect driven by high power (Goodwin et al., 2000). It is thus possible that high power increases and low power attenuates implicit intergroup bias, but that specifics of an experimental design may determine whether an effect is driven by high or low power.

Link between power effects on implicit bias and response control

Research on responses in non-social contexts (e.g., the Stroop task) suggests that high power enhances controlled processing (Schmid, Kleiman, & Amodio, 2015; Smith, Jostmann, Galinsky, & Van Dijk, 2008). This finding does not necessarily contradict our present studies, as it is possible that power increases racially biased implicit associations while simultaneously enhancing response control. Importantly, research suggests that effects of power on control occur in a goal-congruent manner (Goodwin et al., 2000; Schmid et al., 2015). Thus, when one's explicit goal is to respond without prejudice, power may enhance the inhibition of implicit bias. However, in cases where the expression of implicit bias is congruent with one's goal, the power effect on control would enhance the expression of bias. Or, if one's goals are irrelevant to intergroup concerns, the effect of power on control might have no influence on the expression of implicit bias.

Conclusion

The goal of this research was to investigate the effect of power on implicit prejudice and implicit stereotyping and to explore how power affects early face encoding in the context of evaluative as opposed to stereotyping judgments. We found that power increased both forms of implicit intergroup bias, and that it appears to also alter the early visual encoding of Black compared with White faces. Together, these studies offer new evidence for the expression of power in implicit racial bias and begin to suggest a role of early face processing in this effect.

Disclosure statement

No potential conflict of interest was reported by the authors.

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