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The social neuroscience of race-based and status-based prejudice

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The largely independent neuroscience literatures on race and status show increasingly that both constructs shape how we evaluate others. Following an overview and comparison of both literatures, we suggest that apparent differences in the brain regions supporting race-based and status-based evaluations may tap into distinct components of a common evaluative network. For example, perceiver motivations and/or category cues (e.g., perceptual vs. knowledge-based) can differ depending on whether one is processing race and/or status, ultimately recruiting distinct mechanisms within this common evaluative network. We emphasize the generalizability of this social neuroscience framework for dimensions beyond race and status and highlight how this framework raises new questions in the study of prejudice–reduction interventions.

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Introduction

Since Gordon Allport's seminal work on prejudice [1], racial bias has received considerable attention from social psychologists and neuroscientists. Notably, Allport identified other kinds of prejudice, including biases toward working-class individuals [1]. Such biases can contribute to individual [2] and institutional [3,4] discrimination, negatively impacting the safety and well-being of vulnerable groups [3,5]. As in the social psychological literature, neuroimaging investigations seldom consider both race and status biases [but see 6•,7•]. This is surprising because race is structurally and stereotypically linked with socioeconomic status (SES) [8,9]. In line with recent calls for greater intersectional research on perceived race and status [10,11••,12], we review and compare the largely parallel neuroimaging literatures on race-based and status-based evaluation. This is important because evaluative biases could be due to race or status or their combination. Moreover, a better understanding of the mechanisms underlying race-based and status-based evaluations is critical for predicting and diminishing bias. We argue that differences in perceiver motivation and the way race and status are conveyed may underlie apparent differences in their respective neural underpinnings. Ultimately, we propose that race-based and status-based evaluations recruit different components of a common social evaluation network (see Graphical Abstract).

Racial prejudice

Amygdala

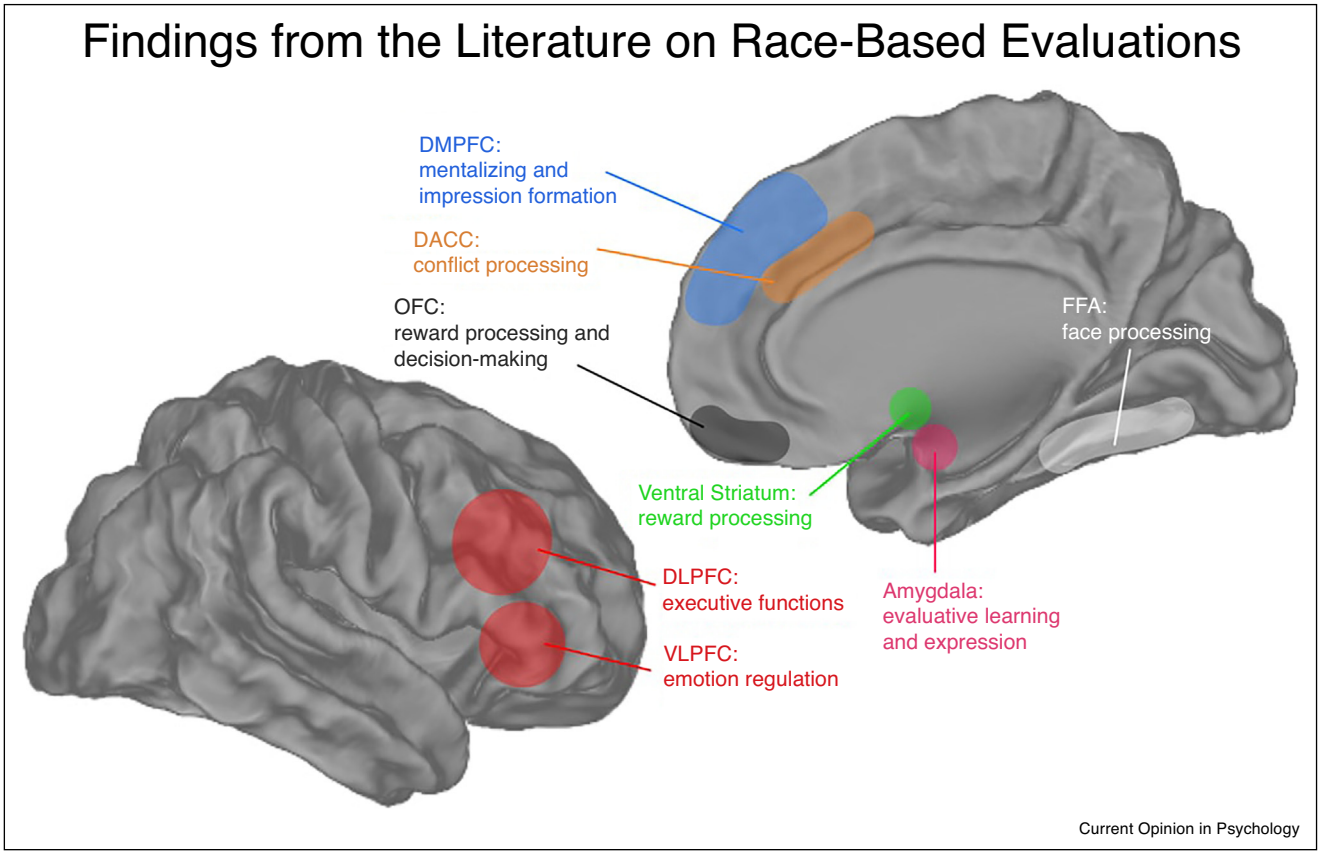
The amygdala is frequently reported in fMRI studies of race [13–17] (Figure 1). It comprises a small group of nuclei that are critical for the acquisition, storage, and expression of classical fear conditioning [18–20]. The amygdala also plays a broader role in rapidly detecting biologically relevant stimuli and in modulating attention and memory [21,22]. Race-based differences in amygdala response sometimes correlate with implicit (but not explicit) measures of racial bias [23].

Recent work has revealed considerable variability in the amygdala's sensitivity to race [24,25]. Indeed, preferential amygdala response is infrequently observed for Black faces when additional target information is made available (e.g., group membership or traits) [6•,26•,27]. Accordingly, our understanding of the amygdala's contribution to race-based evaluation is more complex and flexible than was previously thought. The current consensus suggests this region is not the main substrate of racial prejudice. Sensitivity to race in the amygdala (viz., Black > White) may reflect a number of factors from culturally learned associations (e.g., Black men = threat) [28,29] to the social threat of appearing prejudiced [6•,25]. Cultural associations in particular may vary across individuals depending on formative experiences. Consistent with this view, greater childhood interracial contact diminishes amygdala response to familiar (vs. unfamiliar) Black faces [30].

Control Network

Early work on the dorsal anterior cingulate cortex (DACC) implicated this region in detecting conflicts between prepotent and intentional response tendencies [31]. In recent years, new accounts of DACC function posit that this region is involved in computations of the expected value of engaging in cognitive control based on

Figure 1



Findings from the neuroimaging literature on race-based evaluations. The amygdala, OFC, and ventral striatum are thought to support race-related evaluations, decision making, and reward/salience, respectively. Activity in these regions is modulated by control signals originating from lateral prefrontal regions (DLPFC, VLPFC) that may facilitate regulation of racial bias. This process is also supported by DACC activity, which monitors for and regulates conflicts between egalitarian and biased responses. DMPFC is involved in the formation of individuated impressions. The FFA sometimes reflects race-based differences in face processing.

factors that include task difficulty, feedback, uncertainty, and reward [32]. In the race context, participants with greater implicit racial bias showed greater recruitment of brain regions supporting cognitive conflict and control for Black versus White targets (DACC, DLPFC — dorsolateral prefrontal cortex, VLPFC — ventrolateral prefrontal cortex) [33]. A recent study reveals implicit racial bias further enhances DACC activity for Black (vs. White) when faces are low in racial prototypicality (i.e., inconsistent with racial caricatures) [34•]. In the preceding studies, it is assumed that conflict arises from differences in the participants' implicit biases and their motivations to be and/or appear egalitarian. Consistently, race-based sensitivity in the DACC and other control-related regions is most reliably observed when stimuli are presented supraliminally [33,35–38] and when participants believe task responses indicate racial bias [36–38]. Research also finds that greater internal motivation to respond without prejudice may amplify cognitive conflict mechanisms [39–41], even when individuals are not explicitly instructed to control their racial bias [39].

Many studies showing race-based activation of the DACC also find a similar pattern in the DLPFC [33,42]. The DLPFC is involved in executive control of sensory and motor representations aligned with active goals [43] and in emotion regulation, modulating amygdala and striatum responses indirectly through connectivity with ventromedial prefrontal cortex (VMPFC) [44]. Recent work found that younger adults showed greater DLPFC activity when viewing Black (vs. White) faces than older adults (characterized by lower executive ability) [45]. Critically, individuals with greater executive ability (irrespective of age) showed greater DLPFC-amygdala connectivity when viewing Black (vs. White) faces. In summary, the DLPFC and DACC may work in concert in the motivated regulation of racial bias (or any other bias — see Graphical Abstract), with the DACC weighing conflicts between

explicit intentions and implicit associations and the DLPFC regulating implicit bias [24,25].

Other regions

Beyond the amygdala and control network, race-based activity in regions supporting reward, saliency detection, and learning has been observed in studies examining fear conditioning reversal [38] and value-based decision making [46]. For example, participants who overall trusted Blacks less than Whites showed greater ventral striatum activity to trusted Blacks [46], perhaps reflecting the salience of reward or reinforcement learning (irrespective of valence) in uncertain contexts [47]. Race-based differences in the fusiform face area (FFA) are occasionally found [15,35,42,48••], but this is not always the case [24]. Different aspects of the medial prefrontal cortex (VMPFC, DMPFC — dorsomedial prefrontal cortex, OFC — orbitofrontal cortex) may also show race-based differences in impression formation [7•,26•,49,50] and trust decisions [42]. In general, these regions are thought to support the processing of inferred idiosyncrasies, feelings, and motives (i.e., mentalizing) [51]. Consistent with work suggesting that intrinsic motivation may be an effective means of regulating race-based prejudice [39], one recent study found that intrinsic motivation to respond without racial prejudice predicted a diminished DMPFC response as participants formed impressions of Black and White targets paired with evaluatively incongruent traits (i.e., positive and negative, respectively) [26•]. In summary, brain regions involved in reward and mentalizing may show sensitivity to race, depending on available person knowledge [26•] and the perceiver's processing goals [52]. Indeed, one reason the regions surveyed in this section did not often emerge in earlier work may be that earlier studies relied on passive or incidental face processing [23,33,35,52].

Finally, recent event-related brain potential (ERP) research has found that perceiver characteristics including anxiety and power influence racial biases in early aspects of face processing [53,54]. Such differences in face processing can have implications for evaluative bias. For example, experimentally manipulated power (i.e., bogus feedback on leadership skills) resulted in an enhanced N170 (ERP component involved in face processing) to Black versus White faces during an evaluative priming task; this effect, in turn, mediated an increase in implicit racial prejudice [54]. This work is consistent with the notion that early visual processes are dynamically shaped by both the perceiver and social context [48••,55].

Status-based prejudice

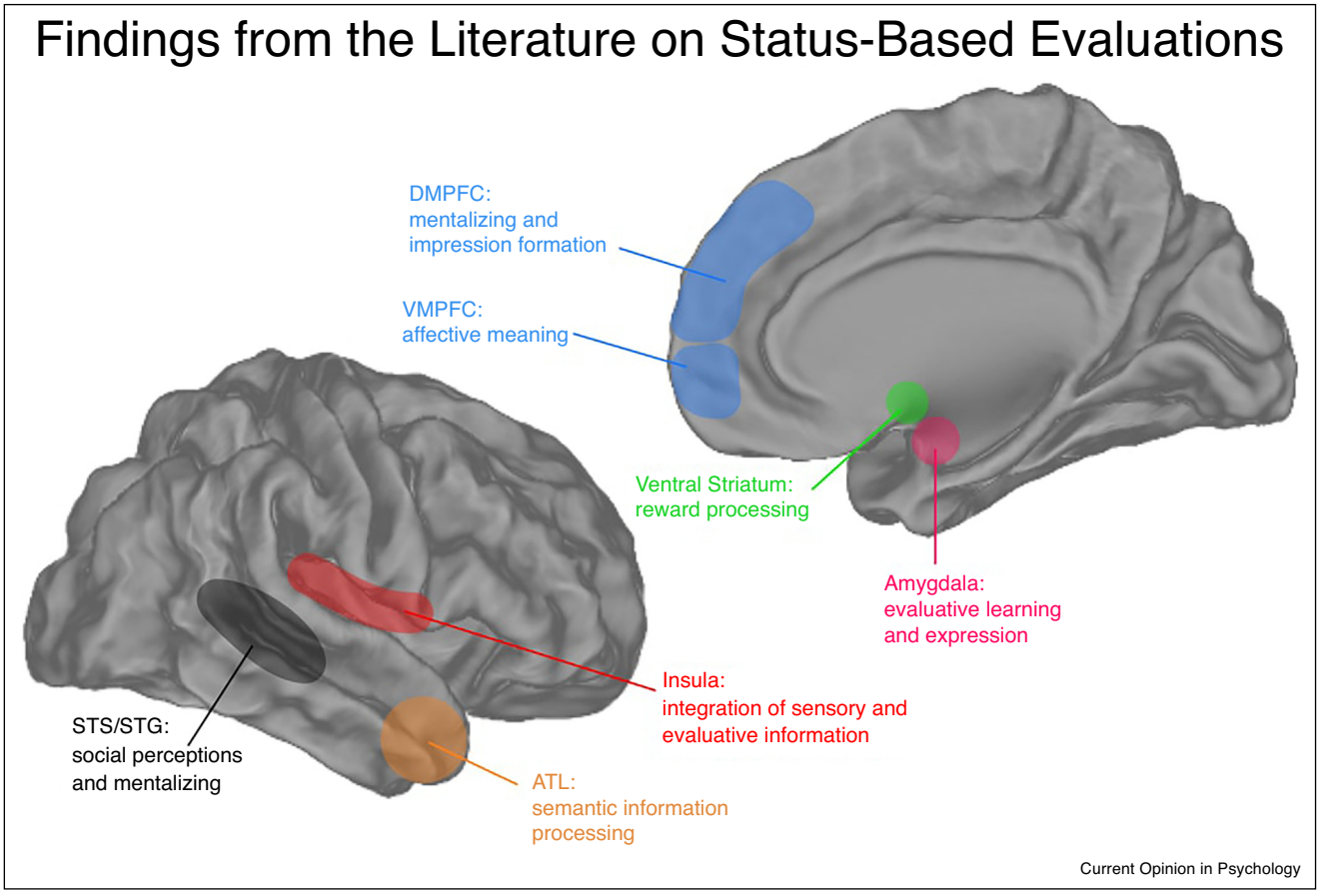
VMPFC

Insofar as status is conveyed through person knowledge, the neuroimaging literature on status-based evaluation (Figure 2) has focused on the VMPFC, a region involved in social evaluations and the generation of affective meaning [56,57]. Previous behavioral studies suggest that high-status individuals generally benefit from positive evaluations [11••,58]. However, neuroimaging work suggests that this may depend on the dimension(s) of status considered. In one study [59], the interaction between the target's presented status dimension (financial vs. moral) and status level (high, equal, or low) predicted VMPFC activity. VMPFC activity was greater when viewing targets with higher compared to lower moral status [see also 60]. However, the reverse was found for financial status. Complementing these findings, a recent ERP study observed a relationship between social status and the P300 (300–800 ms) [61]. The P300 is a component implicated in person evaluation [62] where enhanced amplitudes occur in response to negatively evaluated conspecifics [63]. Results revealed a dissociation of P300 amplitudes to faces varying in social status, such that greater P300 amplitudes were observed in response to high financial and low moral status targets, relative to low financial and high moral status targets, respectively. In summary, findings from both fMRI and ERP support the notion that status-based evaluations are sensitive to the status dimension under consideration [11••].

Ventral striatum

The ventral striatum (implicated in reward responses, saliency detection, and reinforcement learning) may also support status-based evaluations. For example, participants who viewed a confederate face ranking highly on task competence showed greater activity in the ventral striatum [64]. When immersed in a competitive context, participants who outperformed a confederate showed greater responses in the same region (see also VMPFC and amygdala) [65••]. Beyond the context of skill-based status, high status on other dimensions (e.g., moral standing) also tends to elicit striatal activity [66,67]. More recent fMRI studies have indicated that status-based reward or saliency may be sensitive to perceiver characteristics, including subjective status [68] and motivation [6•]. For example, one study showed greater ventral striatal activity when responding to questions about others with similar (vs. dissimilar) status to the participant's own self-reported status [68]. Another study examined the effects of participants' external motivation to respond without racial prejudice (EMS) as they formed impressions of targets varying in race and SES [6•]. Notably, EMS modulated responses to status but not race. Specifically, low-EMS participants showed the usual ventral striatal preference for high (vs. low) status. The opposite status effect was observed in high-EMS participants, suggesting that a pre-occupation with appearing racially prejudiced may have attenuated the value and/or salience of high SES, independent of perceived race. In summary, these neuroimaging results provide evidence that ventral striatal responses are sensitive to perceiver status and motivation, among other attributes.

Figure 2



Findings from the neuroimaging literature on status-based evaluations. Like for race, the amygdala is involved in evaluative learning and expression, and the ventral striatum supports status-based reward/salience. The medial prefrontal regions (VMPFC, DMPFC) are involved in shaping affective meaning, mentalizing, and impression formation during processing of social status. Temporal regions including the STS/STG and ATL are implicated in status-based mentalizing and semantic information processing, respectively. The insula is thought to support the integration of sensory with evaluative information about social status.

Other regions

Recent work indicates that the hippocampus as well as regions involved in affect (e.g., amygdala, insula) and mentalizing (e.g., DMPFC, STS/STG — superior temporal sulcus/gyrus, and ATL — anterior temporal lobe) may also contribute to status-based learning [20,69–71] and evaluation [6•,59,60,67], particularly when status is conveyed through person knowledge rather than visible features. Prior knowledge of a target's status may serve as a particularly rich source of information, ultimately recruiting a broader mentalizing network [72••]. Finally, the FFA is occasionally implicated in status-based evaluations [67], but this is not frequently observed across studies [11••].

Conclusions and future directions

The literatures on race-based and status-based evaluations suggest at first glance that distinct neural networks support these processes. For example, evaluations of race frequently implicate the frontal control network (e.g., DLPFC, VLPFC, DACC), presumably in the service of monitoring for and overriding implicit biases [25]. With few exceptions [64,73], these regions are relatively absent during status-based evaluations [11••]. However, this difference may be more apparent than real. For instance, the frontal control network may emerge when evaluating others based on any attribute if the context exerts a normative pressure to form non-biased evaluations [37]. Unlike for race-based evaluations, status-based evaluations frequently implicate regions known to support person evaluation (VMPFC) and reward/reinforcement learning (ventral striatum). Other regions involved in affective responses (e.g., amygdala, insula) and mentalizing (e.g., DMPFC, STS/STG, ATL) may be sensitive to status conveyed through person knowledge [11••]. Nonetheless, race-based differences also emerge in similar regions (viz., medial prefrontal cortex [7•,26•,42,49,50] and ventral striatum [46]) in tasks that require deeper processing of person knowledge.

In any attempt to account for apparent differences in the neuroimaging literatures on race and status, it is important to consider the antecedents conveying these constructs [11••,74]. Antecedents of any social category may be perceptual (e.g., skin tone, facial dominance) or knowledge-based (e.g., prior knowledge of race/status through names or ascribed attributes). Although antecedents may be described as direct category cues, this is not always the case. For example, cues of physical dominance may confer high status in some contexts (e.g., intergroup threat) but not in others (e.g., peace-time cooperation and coalition building). Importantly, the extent to which knowledge-based (vs. perceptual) antecedents of any social category can bias the neural substrates of person evaluation remains an empirical question. Although the social neuroscience of race has relied on perceptual antecedents,[3] status dimensions are conveyed by either perceptual or knowledge-based antecedents [11••]. For instance, status may be inferred from the simultaneous presentation of person knowledge (e.g., name, occupation) and perceptual cues (e.g., face, attire). Critically, someone's attire may be consistent or inconsistent with knowledge about that person's SES (person knowledge); a bellhop and a lawyer may both wear a suit despite their different SES. Based on our review of existing findings, we would predict that perceptual (vs. knowledge-based) antecedents of status should elicit greater activity in the amygdala and in regions associated with status differentiation (e.g., IPS — intraparietal sulcus) [11••,75]. On the other hand, status conveyed through person knowledge should elicit greater responses in most of the regions identified in the literature on status-based evaluations (e.g., VMPFC, ventral striatum: see Figure 2) and potentially in the broader mentalizing network. To the extent that participants are motivated to respond without status-based prejudice (e.g., due to anti-classist norms), greater activity should emerge in prefrontal control regions (see Graphical Abstract).

Although this review is situated in the race and status literatures, evaluations based on any social category are likely supported by a common network that is differentially sensitive to perceptual versus knowledge-based antecedents and perceiver motivations (see Graphical Abstract). For example, outside the race literature, the amygdala is frequently implicated in facial trustworthiness evaluations [76–79], consistent with its role in percept-based evaluations. Additionally, aspects of the control network have been implicated in the motivated regulation of prejudice for visible social dimensions besides race [37,80]. Finally, numerous studies on impression formation [72••,81,82] and social comparison [70,83,84] involving diverse forms of person knowledge report findings from the VMPFC and the mentalizing network. These regions map closely onto those identified in the literature on status evaluation from knowledge-based antecedents [11••,69,75].

In addition to examining the neural processing of perceptual and knowledge-based antecedents of category-based person evaluation, it will be important to investigate how both kinds of antecedents may influence and/or recruit neural mechanisms supporting attitude change. Despite recent evidence that lasting changes in implicit attitudes are difficult to achieve [85], some promising interventions have been identified [86]. In particular, fMRI studies on counterstereotypic imaging [23], intergroup contact [30], and individuation [50,52] indicate that these interventions may be effective in attenuating evaluative bias in the network supporting relatively superficial feature-based evaluations (e.g., reducing amygdala responses to Black vs. White faces). In addition, intergroup contact may also improve the efficiency of regions supporting the integration of person knowledge during evaluations [87]. Although these interventions are promising, more work needs to be done, particularly for group-based prejudice beyond the racial context. No fMRI studies to date have examined functional changes in evaluative bias following a perspective-taking manipulation [cf. 88]. Finally, recent work has shown that even strong implicit biases can be altered after receiving new person knowledge that fundamentally changes one's interpretation of prior knowledge [89]. It will be important for future work to uncover the neural mechanisms supporting such alterations in evaluations of others.

[3] Although race can also be cued with knowledge-based antecedents such as names and stereotypical descriptions [90], the neural substrates of such knowledge-based antecedents remain to be investigated.

Conflict of interest statement

Nothing declared.

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- •• of outstanding interest

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