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Intergroup Neuroscience

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Intergroup neuroscience investigates the neural basis of group-based responses, such as prejudice and stereotyping—that is, the neural processes through which group identity influences perception, judgment, decision-making, and behavior. Intergroup neuroscience integrates ideas and methods from social psychology, cognitive neuroscience, and psychophysiology, along with several social sciences, and it examines all forms of identity- and group-based effects, including those related to race and ethnicity, gender, sexual preference, nationality, political ideology, and arbitrary (e.g., minimal) categories. By illuminating the neural and cognitive mechanisms underlying intergroup bias, this approach aims to inform basic theory on intergroup bias in the mind and behavior and potential interventions. Major topics include the neural bases of implicit prejudice and stereotyping and intergroup effects on face processing, emotion and empathy, and social judgment and decision-making. Methods include neuroimaging and psychophysiological techniques (e.g., functional magnetic resonance imaging [fMRI], electroencephalography [EEG]) in combination with behavioral experiments, self-report measures, and computational modeling.

History

The origins of intergroup neuroscience trace back to the mid-1950s: as changing norms in the US increasingly proscribed overt expressions of prejudice, researchers began to use physiological measures, such as skin conductance and facial electromyography (EMG), to assess prejudiced responses unobtrusively (e.g., [Rankin & Campbell, 1955](#); [Vidulich & Krevanick, 1966](#); for review, see [Guglielmi, 1999](#)). Guided by this unique challenge—to assess responses that people may be unaware of or actively concealing—intergroup researchers were among the first social psychologists to adopt physiological methods.

The contemporary field of intergroup neuroscience emerged in the late 1990s, as researchers shifted from using psychophysiological methods as a means of unobtrusive measurement to investigating the neural substrates of prejudiced attitudes, judgments, and behaviors. At that time, there was intense interest among social psychologists in the cognitive basis of implicit bias—an indirect, often unconscious, form of prejudice that was difficult to measure. Was it rooted in emotion and threat or instead in semantic associations? Was it automatic, or did it stem from deliberative decision-making? At the same time, new work emerged on the neural basis of emotion, with a focus on the amygdala (i.e., Pavlovian fear; [LeDoux, 1996](#)), which, to intergroup researchers, suggested a potential substrate of implicit prejudice. It was also at this time that fMRI became more widely available, along with advances in EEG and physiological methods for inferring neural function. This confluence of factors, and the collaborations it inspired, produced the first studies in intergroup neuroscience, on the neural bases of implicit prejudice ([Amodio et al., 2003](#); [Hart et al., 2000](#); [Phelps et al., 2000](#)), intergroup face processing ([Golby et al., 2001](#); [Ito & Urland, 2003](#)), and prejudice control ([Amodio et al., 2004](#); [Richeson et al., 2003](#)).

Today, this field continues to explore the neural basis of intergroup bias from diverse perspectives and with myriad methods. Notable shifts in the field include moves toward understanding how networks of neural processes, rather than single structures, contribute to intergroup bias ([Amodio, 2014](#); [Stolier & Freeman, 2017](#)) and toward probing the implications of neural functions for higher-level intergroup process including the perception of social hierarchies, transmission of bias between individuals and social systems, and prejudice reduction ([Cikara & Van Bavel, 2014](#); [Lantos & Molenberghs, 2021](#); [Mattan et al., 2018](#); [Rösler & Amodio, 2022](#)) [see [Social Cognitive Neuroscience](#)].

Core concepts

Groups and group identity

A social group is a collection of individuals who share an identity; an identity can be based on any characteristic (e.g., race, gender, geography, common goals, or an arbitrary classification). Social identity has been associated with activity in multiple neural structures, including the medial prefrontal cortex, fusiform, and amygdala ([Cikara & Van Bavel, 2014](#); [Mitchell et al., 2006](#); [Rilling et al., 2008](#)).

Prejudice

Prejudice is an attitude (or evaluation) regarding a group and its members, involving a belief, affect, and/or behavioral tendencies. A complex response, it emerges from interacting neural substrates associated with affect and evaluative processing, including the amygdala striatum, insula, orbitofrontal cortex, and anterior temporal lobe ([Amodio, 2014](#)).

Stereotypes

Stereotypes are attributes linked to a group and its members within a culture. Stereotypes are a form of semantic knowledge represented primarily in the anterior temporal lobes and, during social judgment, in the dorsal prefrontal cortex ([Contreras et al., 2012](#); [Gilbert et al., 2012](#)).

Intergroup bias in face processing

Face processing is a critical component of group perception: It often conveys cues to a person's social identity and its associated trait attributes [see [Face Perception](#)]. Group-based effects on face processing have been observed in the fusiform gyrus and reflect modulatory inputs from regions including the anterior temporal lobe and orbitofrontal cortex ([Freeman et al., 2020](#); [Golby et al., 2001](#)).

Intergroup emotion and empathy

Prejudiced responses are often rooted in emotion, such as fear or disgust toward outgroup members or empathy and other positive emotions toward ingroup members [see [Affective Neuroscience](#)]. Social neuroscientists study the neural correlates of these processes to better understand their roles in ingroup favoritism, dehumanization, and bias reduction ([Han, 2018](#); [Vollberg & Cikara, 2018](#)).

Questions, controversies, and new developments

As the field advances, researchers are asking increasingly complex questions about the cognitive origins of prejudice, its multilevel effects between individuals and society, and its impact on targets. These include:

- What are the neural processes through which individuals interface with prejudice in higher-level social structures, such as social hierarchies and systems? Prejudice is more than merely an evaluation; it is an evaluation embedded within a social hierarchy that favors some groups over others. Understanding the neural basis of this interface will shed light on how the brain guides behavior within multilevel social structures.
- What are the roles of specific learning and memory systems in the formation and expression of prejudice? With advances in computational approaches to detail precise mechanisms of prejudice formation, intergroup neuroscience can better predict how prejudice is expressed in behavior and reduced through intervention.
- How does the brain support real dyadic intergroup interactions in vivo? Addressing this question requires methods for assessing brain activity in two or more individuals simultaneously, in conjunction with new analytical methods. Doing so will further illuminate the neural mechanisms that support complex social behavior.
- Do the neural substrates of intergroup bias vary across sociocultural contexts (i.e., beyond the White, American, university-based populations in which most research has been conducted)? Such questions will inform effects of culture and context on neural functions.
- What are the neural responses to being a target of prejudice? Research on the neuroscience of stigma can further our understanding of how prejudice affects the cognition, decisions, social relations, and health among those subjected to it.

Broader connections

Intergroup neuroscience interfaces with many related fields. Within cognitive neuroscience, it provides a high-level context for examining basic processes of face processing, learning and memory, emotion (including threat and reward processing), and cognitive control. Within psychology, it contributes to mechanistic theories of social cognition, particularly in the context of implicit bias, social decision-making, impression formation, and socio-cognitive development [see [Cognitive Development](#)]. More broadly, intergroup neuroscience informs research and scholarship in philosophy, cultural anthropology, political science, economics, and sociology, as well as research in biology and social ecology on the basis of social behavior.

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