Neuroscience of Intergroup Communication

AARON CASTELÁN CARGILE
California State University, Long Beach, USA

Intergroup communication emerges when individuals perceive themselves or others as belonging to a social category. During most of the 20th century, scholars were left to infer this internal shift, from interpersonal to intergroup, based solely on external behaviors and self-reports. But technological advancements have more recently presented scientists with the capacity to peer inside the living human body, most particularly at the brain. As a result, neuroscientific research has mushroomed beyond the borders of medicine to offer a tantalizing and tentative look at internal events believed to be responsible for intergroup communication.

Neuroscience is the study of the nervous system, its roots extending to ancient Egypt and classical Greece. From that time up until the middle of the 19th century, nerves were considered to be hollow structures that allowed vital spirits to circulate through the body. But in 1887, the neuron doctrine began its ultimate ascent by promoting the view of neurons as cells constituting the nervous system and specializing in the transmission of information. Around the same time, the *localizationist view* (i.e., the presumption that mental abilities were localized to specific areas of the brain) was popularized and helped set the stage for contemporary research. In turn, the early 20th century witnessed the first detailed studies of neurons with the advent of the electron microscope. Despite this advance, neuroscientific observation remained limited to inanimate biological specimens for decades. But mid-century gave birth to two technologies that permitted examination of living specimens: magnetic resonance imaging (MRI) and electroencephalography (EEG).

MRI technology provided the first images of a live brain and thus allowed scientists to investigate differences in the size and structure of various functional areas within and between populations. Although a tremendous boon to clinical medical practice, magnetic resonance images made only limited contributions to the psychological study of brain activity due to their static nature. In contrast, EEG studies provided the first dynamic assessment of neural behavior. EEG recorded voltage fluctuations at the scalp which, despite tremendous noise, carried signals associated with specific neural events, most typically in the form of event-related potentials (ERPs). Modern ERP research began in the early 1960s and continues to this day. Although still valuable, EEG study has recently been eclipsed by another technology as the measure of choice in studies of brain activity—functional magnetic resonance imaging (fMRI).

Developed in the 1990s, fMRI extended earlier MRI technology by capturing changes in the magnetic properties between oxygen-rich and oxygen-poor blood (i.e., the blood

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oxygen level dependent signal, BOLD). Cerebral blood flow was established to co-occur with neural activity, thus fMRI was able to indirectly indicate areas of the brain in use within a window of a few seconds. The great advantage of this technology was its excellent spatial resolution (typically two millimeters) that allowed for detailed imaging of deep brain activity (otherwise not contained within EEG data). With the help of fMRI data in particular, scholars have now come to refine their appreciation of the role social categories play in the perception of and reactions to individual others.

Although neurons are distributed throughout the human body (including 100 million in the stomach), neuroscientific research has focused on the brain while utilizing a map of brain function grounded in evolution. As Panksepp (1998) argued in his seminal book, deep (i.e., subcortical) brain structures are evolutionarily antecedent to the human neocortex and thus help generate homologous, instinctual impulses in all mammals. Consequently, these ancient brain structures, the limbic system chief among them, have been viewed as the neural seat of powerful automatic and implicit processes. In contrast, the neocortex has been appreciated as the seat of reasoning, as well as other controlled and explicit processes. This basic dual-process approach has guided a wide array of neuroscientific research, including one early intergroup study by Hart et al. (2000). These researchers sought to illuminate the black box of social categorization by determining if behavioral differences observed in the processing of ingroup and outgroup faces were concordant with differences in neural activity. Specifically, the researchers wondered if the amygdala, a limbic structure linked to fear conditioning, would be automatically activated when participants were shown outgroup faces. Two scans taken two minutes apart revealed that although amygdala activity did not differ between outgroup and ingroup faces at time 1, there was significantly less activity at time 2 for the ingroup faces. This was interpreted by the authors as demonstrating a prolonged habituation period for outgroup faces (i.e., the amygdala remained more active when processing such faces) and by other researchers as evidence of perceptual stigmatization.

This early study by Hart et al. was paradigmatic in its attempt to understand perceptual shifts between *us* and *them* through a focus on amygdala activity. Subsequent studies have since strengthened the link between the amygdala and outgroup (racial) bias, suggesting that prejudice may be classically conditioned by fear in a manner unrelated to one's expressed attitude. A second, less robust pattern of findings suggests that because the amygdala also responds to arousing stimuli, heightened activity may be a function of identity threat created by the perceiver's own need not to appear prejudiced. Finally, in some cases increased amygdala activity has been tied to ingroup perception (including minimal group members), suggesting an interaction between the social context and implicit perceptual processes. Although these findings appear contradictory, they are consistent with an emerging picture of amygdala function as a hub for neural networks that help comprise the "social brain," including the "perception," "affiliation," and "aversion" networks.

Prior to the publication of Hart et al.'s study, review articles and meta-analytic studies began to synthesize a variety of functional brain networks, including the "social brain." Although considerable disagreements remain about specific networks and their constituent parts, neuroscience has nevertheless reliably distinguished between social and nonsocial cognition. Faculties such as categorization and memory operate differently on social and nonsocial stimuli, thus the idea of a "social brain" dedicated to social thought has been widely accepted. Moreover, a network is a useful heuristic for discussing a wide variety of findings. Thus, beginning with the "perception" network, it is believed that parts of the amygdala, the orbitofrontal cortex, and areas of the temporal cortex process the detection and decoding of social signals. One set of relevant findings centers on activity in the fusiform face area (FFA) of the inferior temporal cortex, an area surmised to specialize in facial recognition. Studies initially revealed that FFA activity was greater with own-race compared to other-race faces. Moreover, participants with the highest levels of differential activation typically demonstrated greater recall for own-race faces. This led scholars to speculate that perception may be biased by group categorization such that the faces of ingroup members are individuated through greater processing, while outgroup faces are literally seen in a less differentiated manner. This hypothesis was subsequently confirmed using minimal groups: FFA activity increased with the presentation of ingroup faces, compared to outgroup faces, and was additionally correlated with an ingroup bias in recognition memory (Van Bavel, Packer, & Cunningham, 2011). Based on this evidence, group categorization appears to encourage differential perceptual processing and subsequent behavioral biases toward individual others.

Research involving brain structures of the so-called affiliation network has also demonstrated the impact of group categorization. Brain structures in this network are believed to generate prosocial reactions to others, such as trust and empathy. Specifically, the medial prefrontal cortex (mPFC) has been associated with impression formation activity and has been described as one neural seat for humanization. Greater mPFC activity has been associated with the appraisal of esteemed group members, as well as judgments to rescue ingroup (but not outgroup) members. One interesting line of research has explored the link between mPFC activity and empathy for another's pain. Several studies have noted increased BOLD signaling in the mPFC when individuals are exposed to racial ingroup members in either physical or emotional pain, and this activity has been linked to greater reported empathy for one's ingroup. Extending this research, Contreras-Huerta, Hielscher, Sherwell, Rens, and Cunnington (2014) crossed racial and minimal groups in an EEG study of pain empathy and found a similar bias for racial ingroup members at N1, which is an ERP considered the earliest component of empathic activation. Minimal group membership, however, was not found to influence N1 activity. This finding, along with similar fMRI results, suggests that social categorization may be a necessary but insufficient condition for bias in some prosocial neural activity, such as empathy for pain observed in individual others.

Alongside the amygdala, a second deep brain structure has ascended to wider recognition with fMRI study: the insula. The insula is a deeply folded portion of the cerebral cortex that processes somatosensory states and is the presumed neural seat of disgust responses. As part of the so-called aversion network, the insula helps individuals avoid potential harm from others. In particular, stigmatized others (e.g., homeless individuals or drug users) have been found to trigger greater insula activity and correspondingly less mPFC activity. Given the presumed function of both brain structures, this patterned activity has been interpreted as neural dehumanization. One recent study, however, found this pattern of neural activity associated with a greater reported willingness to help and less expressed disgust for homeless individuals (Krendl, Moran, & Ambady, 2013), thus suggesting limits to the localizationist view. Such contradictory findings also point to other problems in neuroscientific research such as *reverse inference* (i.e., inferring cognitive processes on the basis of neural activation) and the *consistency fallacy* (i.e., the failure to consider data inconsistent with the researchers' claims). Indeed, insula and mPFC activity are not exclusively associated with disgust and empathy processing. Regardless, heightened insula activity has been reliably observed in conjunction with responses to racial, political, and minimal outgroup members.

Although many findings and interpretations offered within the neuroscientific literature are disputable, remarkable progress has been made in a short period of time. Scholars have moved from simple conjecture to robust, evidence-based models of brain function in a matter of mere decades. Social cognition is distinct, widely distributed, and a fundamental ability of human beings that is perhaps unique in its complexity. Though countless questions remain, neuroscientific research has already confirmed that social categories play an important role in the perception of and reactions to individual others. Despite this, outside of a handful of studies that have employed communication-related variables (e.g., nonverbal decoding or valenced language attention), this research has not yet taken a communicative turn. Nevertheless, data regarding the neural basis of intergroup communication should soon begin to accumulate. Moreover, as both the imaging and data-processing technologies continue to improve (allowing for more detailed as well as broader-scale investigations), the localizationist view will undoubtedly be supplanted by a network paradigm. These anticipated developments, in conjunction with continued theoretical progress, hold great promise for reshaping human understanding of intergroup communication.

SEE ALSO: Identity and Intercultural Communication; Intergroup Communication, Overview; Prejudice and Discrimination; Self-Categorization Theory

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Further readings

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Aaron Castelán Cargile is a professor of communication studies at California State University, Long Beach, USA. His research examines the roles of language, dialogue, and self-uncertainty processes in intercultural interactions. His recent work in these areas has been published in *International Journal of Intercultural Relations*, *Educational Forum*, *Journal of International and Intercultural Communication*, *Journal of Language and Social Psychology*, and in *Race and Social Problems*.