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Revisiting social identity theory from a neuroscience perspective

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Social Identity Theory (SIT) is one of the most influential perspectives on intergroup relations. We discuss how different neuroscientific models and methods (EEG, fMRI, cardiovascular measures) can illuminate insights into four core social identity constructs and processes: Social categorization, self-group overlap, ingroup bias, and coping with threat. We describe neuroscientific research that provides converging evidence for SIT. More specifically, we propose that social neuroscience provides more *direct measures* for core SIT-constructs (e.g., categorization, threat) that are difficult to measure with self-report measures, and *refines* SIT by identifying more subtle forms of ingroup bias in 'upstream' neural processing, and by testing more dynamic relationships between SIT constructs (e.g., considering categorization as a dependent variable, or examining social identity 'challenge', in addition to threat).

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Introduction

In this contribution we provide an overview of the recent wave of social neuroscience research examining processes related to social identity. We propose that by examining topics such as social categorization and coping with threat, the methods and models provided by social neuroscience further substantiate the importance of social identity in intergroup relations, and generate new directions for research testing social identity theory predictions (SIT; [1]).

Below we provide a brief primer on SIT, followed by a description of neuroscientific insights regarding what we see as four core SIT constructs: Social categorization, self-group overlap, ingroup bias, and coping with threat. We conclude by discussing the implications and venues for future research.

The social identity approach

Social identity is that part of the self derived from group membership (e.g., identity as 'female' or 'European'). The cognitive basis of social identity is reflected in self-categorization (seeing oneself as a member of the group) and social categorization (determining who is part of the ingroup and who is not). Social identity derives further meaning and valence by comparing the ingroup with relevant out-groups (e.g., 'female vs. male', 'European vs. Asian').

The motivational part of SIT entails that people strive for a *positive* social identity because this serves basic human needs for certainty, self-esteem, and meaning in life [1,2,3•]. A positive social identity stems from membership in groups that are positively distinctive from other groups and can be established through ingroup bias (see Otten, this issue). The early studies on the minimal group paradigm [4], which formed the basis of SIT, were revolutionary in showing that even very minimal categories (groups based on trivial criteria) induce intergroup discrimination and competition. SIT also describes how people respond to a negative social identity, stemming from for example membership in a group with a relatively low status, or by belonging to a group that is discriminated against [5].

The neuroscience of social identity

The term social neuroscience is used to refer to a range of neural, physiological and endocrine measures that are used to explain social behavior [6]. Neuroscience methods such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI) and measures of cardiovascular reactivity can provide invaluable insights into SIT processes as they can offer direct indices of psychological constructs (categorization, threat) that are more difficult to measure reliably using self-report measures either because people do not have conscious access to the construct, or because they react strategically or defensively [7•]. Additional advantages of neuroscientific measures for SIT are that they can be taken online and continuous, allowing for more dynamic views on how social identity processes (e.g., threat, ingroup bias) develop and emerge.

Social categorization

For example, social neuroscience methods allow for the measurement of *spontaneous* (rather than *induced*) social categorization enabling a more direct measurement of

this process than was previously possible. Because spontaneous social categorization has been difficult to assess, most research has either measured social categorization by *instructing* participants to do so [8], or *manipulated* categorization and measured its downstream consequences (e.g., ingroup favoritism, activation of stereotypes; [9,10]). However, there is a dearth of studies that examine the degree to which people *spontaneously* categorize their social world based on social categories.

EEG-measures are an excellent way to assess spontaneous forms of social categorization because they allow for measuring variations in the degree to which people's brains unconsciously distinguish between groups when processing faces belonging to different social categories (for fMRI studies on social categorization, see [11–15]). Social categorization based on race, gender, sexual orientation or religion is already visible in event-related brain potentials (EEG-waves to specific types of stimuli) that occur within 200 ms after a face is presented [16•,17–23].

EEG-studies reveal that our social identity affects the way we spontaneously categorize others around us [24]. For instance, Dutch students distinguish more strongly between pictures of women with and without a headscarf to the degree that their ethnic identification is high [16•]. Similarly, Muslim students who are reminded of religion-based discrimination show stronger social categorization in brain responses [16•]. Finally, threatening group distinctiveness [25] leads highly ethnically-identified Dutch students to show stronger social categorization of Dutch versus Moroccan faces in EEG-responses [26]. Combined, these studies add to our understanding of social identity process as they suggest a bidirectional model of social identity development: early forms of social categorization not only enhance downstream processes like group identification and perceptions of social identity threats, but that these downstream processes also feed back into unconscious forms of social categorization and induce people to more strongly perceive their world through the lens of their social identity.

Self-group overlap

Recent neuroscientific research has taken the conceptualization of social identity as an 'overlap between group and self' [27] one step further by providing evidence for a neural basis for the way personal and social identity are represented in the brain. More specifically, people who identify strongly with their group use similar neural structures to process information about the ingroup and the self. For instance, when people process words that represent their minimal ingroup (vs. their outgroup), they show increased activation in brain areas that are implied in self-referential processing, such as the prefrontal cortex [28•]. Importantly, and in line with SIT predictions, this pattern of brain activation in response to ingroup words is stronger for high identifiers [29,30•]. Similarly, students who strongly identified with their university showed similar patterns of brain activation when viewing pictures of themselves as when viewing pictures of unfamiliar students from their own university (but not from another university; [31]).

The fact that a self-group overlap can be traced back to the brain shows how fundamentally group and identity processes are intertwined. The finding is also methodologically important as it provides evidence for self-group overlap at a more implicit level, compared to the more traditional explicit Venn-diagram measures that are typically used to measure this construct [27].

Ingroup bias

Neuroscience research has also provided more direct evidence for a link between ingroup bias and neural markers of the self. According to SIT, ingroup bias is one of the main mechanisms to create positive group-distinctiveness (and thus a positive social identity). However, direct tests of the relation between bias and identity constructs (e.g., self-esteem) have yielded mixed results [32]. A study that integrated classic minimal group procedures into a brain-imaging study showed that participants who favored their minimal ingroup over an out-group when allocating resources showed stronger activation in self-relevant brain areas (the medial prefrontal cortex in particular; [30•]).

Apart from linking behavioral manifestations of bias to self-relevant neural networks, neuroscientific research has also identified more implicit forms of bias that are not possible to measure using traditional methods, but which can still be crucial for the development of a positive social identity. For example, when people meet new people their brain preferentially processes ingroup over outgroup faces (as evidenced by greater activation in the fusiform gyri, amygdala, orbitofrontal cortex and dorsal striatum), which relates to more liking for ingroup faces [15]. Similarly, people perceive hand movements by ingroup members as faster than hand movements of outgroup members [33]. Interestingly, this ingroup bias emerges already in the early phases of perception, as indicated by a stronger activation in the inferior parietal lobule, a brain area that is crucial for action perception.

Similar biases also appear in neural responses to observing other people's suffering [34–36]. For example, people show similar brain responses when they are sad *themselves* as when they *observe* sad ingroup (but not outgroup) members [37]. By contrast, seeing out-group members suffer yields patterns of neural activation related to positive affect (e.g., *schadenfreude*; [38,39]). In line with SIT predictions, ingroup bias in empathic responses is particularly strong for those highly identified with the group [[40,41], see also Chang *et al.*, this issue].

Together, this research examining the more implicit and upstream forms of ingroup bias demonstrates that

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