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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

favoring the ingroup is not a conscious choice. Instead, people automatically and preferentially process information related to their ingroup over the out-group.

Coping with social identity threat

Although it has proven difficult to reliably measure social identity threat with self-reports measures, psychophysiological research has offered more reliable and online assessments of threats to social identity. For example, the awareness of group devaluation or negative stereotypes is reflected in higher levels of cortisol (a main stress hormone) and a cardiovascular response pattern indicative of threat [[42–44,45•,46], see also Matheson *et al.*, this issue]. Evidence for the implication of social identity in these effects comes from work showing that these physiological responses are strongest for those who identify strongly with the group [42,43]. This is important as it shows that group identification not only determines how people cope with threat, but also the extent to which people are threatened in the first place.

Psychophysiological research has also distinguished threat from challenge as responses to group devaluation. By means of the biopsychosocial model [47–49], it is possible to distinguish a cardiovascular response-pattern indicative of threat (low cardiac performance, high vascular resistance) from a cardiovascular response-pattern indicative of challenge (high cardiac performance, low vascular resistance). Although the cardiovascular threat pattern is predictive of long-term negative health outcomes [47,50], the cardiovascular challenge pattern is predictive of more 'healthy' ways of coping with a negative social identity, like actively working for social change. In the context of negative gender stereotypes, an opportunity to affirm a positive aspect of one's gender identity (group affirmation), led in particular among highly-identified women to a cardiovascular response indicative of *challenge* [42]. Moreover, cues that the intergroup status hierarchy is insecure because it is unstable and/or illegitimate turns the threat of low group status into challenge, which in turn predicted the willingness to engage in collective action to improve the position of the group [44,45•].

Conclusions

In this contribution we aimed to show how social neuroscience research has provided converging evidence for SIT by examining how social identity emerges through (self)categorization, via the creation of positive group distinctiveness through ingroup bias, to how people cope with threats to social identity. That is, concepts such as categorization, self-group overlap, ingroup bias, and threat can also be found in biological assessments.

These biological assessments, however, come with additional advantages. For example, social categorization is virtually impossible to measure with self-reports as asking about (the self-relevance of) social categories automatically makes these categories salient. Similarly, the concept of threat is difficult to measure using self-reports because of defensive responding. Cardiovascular measures provide the opportunity to assess the conditions under which social identity threat arises, and to test interventions that may relieve it.

Apart from providing converging evidence using sophisticated methodology, social neuroscience also helps to refine SIT, and generate new questions. One example is the consideration of social categorization as a dependent variable, thereby moving beyond categorization as a starting point of social identity and intergroup relations, which has been the case in much previous work in this domain. Considering categorization as an outcome allows for a more dynamic perspective on social identity, by which an established social identity and contextual variables that threaten this identity feed back into the degree to which social categories become salient when perceiving others.

Another way in which EEG-measures open up new opportunities to better test the role of categorization in social identity processes concerns assessing recategorization interventions (e.g., common ingroup identity approach). Specifically, are intergroup relations improved following such intervention because social categorization is reduced, or because such intervention trigger positive downstream consequences (such as a more positive evaluation of the out-group).

A third example of how neuroscience research helps to refine our understanding of social identity processes relates to how it allows for the examination of challenge as a new and qualitatively different construct to explain how people deal with a negative social identity. Stretching up the motivational spectrum from threat to challenge helps to further theorize and test predictions about the circumstances under which members of low status group respond in a more healthy and constructive ways to their group's social position.

A final example of conceptual refinement comes from the discoveries of neural forms of ingroup bias, like bias in person- and movement perception, and biases in empathy. These results suggest that, although self-report and behavioral measures provide ample evidence for the idea that people are motivated to see their group in a positive light, these visible forms of ingroup favoritism may only be the tip of the iceberg. Assuming that people's need for a positive social identity is served by unconscious as well as conscious forms of ingroup favoritism, these findings suggest that ingroup favoritism in people's perception may already help to achieve a positive social identity. In order to determine whether this is the case, future research should look at the interaction between unconscious and conscious forms of ingroup serving biases in perception and behavior.

We hope that the current review will inspire other social identity (and neuroscience) researchers to apply neuroscience methodology to come to a better understanding of the psychology of social identity and intergroup relations, and thereby the factors underlying some of the most pressing social problems of our times.

Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. Daan Scheepers, also on behalf of Belle Derks.

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