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How social neuroscience can inform theories of social comparison

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ABSTRACT

Social comparison pervades our interactions with others, informing us of our standing and motivating improvement, but producing negative emotional and behavioral consequences that can harm relationships and lead to poor health outcomes. Social neuroscience research has begun to illuminate some mechanisms by which status divides lead to interpersonal consequences. This review integrates core findings on the neuroscience of social comparison processes, showing the effects of comparing the self to relevant others on dimensions of competence and warmth. The literature converges to suggest that relative status divides initiate social comparison processes, that upward and downward comparisons initiate pain- and pleasure-related neural responses, and that these responses can predict people's kindly or aggressive intentions toward one another. Across different types of comparisons, brain regions involved in mentalizing are also sometimes involved. Along with future work, the research reviewed here may inform efforts to mitigate negative outcomes of constant social comparisons.

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Q3 1. Why study social comparison?

A longstanding literature in social psychology tells us that humans are never done comparing. Status hierarchies are ever-present, and not only in obvious places like military organizations and corporations; even non-human primates organize themselves hierarchically, and easily interpret signs of social rank (Fiske, 2010). By Festinger's (1954) account, there is good reason why it might be unavoidable for people to compare constantly: judging our own abilities and beliefs relative to others' provides information about where we stand, and motivates us to change. Although we might prefer more objective indicators of our own standing for purposes of accurate self-evaluation, in many parts of social life our standing may have meaning only in a comparative sense.

However, these constant social comparisons can be dangerous. Judging ourselves relative to others high in social status has known consequences, especially for members of stigmatized groups, who endure social stress as a result of hierarchies. Social stress involved in cross-status and cross-race interactions engenders a physiological threat response, hindering performance on tasks in the short term (Mendes, Blascovich, Lickel, & Hunter, 2002; Mendes, Blascovich, Major, & Seery, 2001; Richeson et al., 2003) and gradually amassing negative health effects through emotional and physiological processes in the long term (Gallo and Matthews, 2012; Mays, Cochran, and Barnes, 2007; McEwen, 2000; Sapolsky, 2005). Understanding the processes of social comparison involved in status hierarchies is thus an important goal in psychology, and social cognitive affective neuroscience has a critical role to play in figuring out how status hierarchies operate. This review addresses neuroscience advances in our understanding of how social comparison processes begin, and how comparisons initiate the sequence of emotional and behavioral consequences that result from status divides (see Fiske, 2011, for an earlier, broader review).

Critical in formulating social comparisons between self and other, two dimensions, competence and warmth (or liking) drive both evaluations of the self (e.g., Tafarodi & Swann, 1995) and

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evaluations of others (Fiske, Cuddy, & Glick, 2006; Fiske, Cuddy, Glick, and Xu, 2002). As described in various models in social cognition including the stereotype content model (SCM), competence and warmth consistently appear in our judgments of individuals and groups (Abele & Wojciszke, 2007; Fiske et al., 2006, 2002; Wojciszke, 2005). In regard to others, dimensions of warmth and competence may have evolved to answer two basic survival questions regarding another person: does the other person intend to help or harm? Is the other person capable of acting on those intentions? (Fiske et al., 2006) Directly relating to social hierarchies, the degree of interdependence between people predicts perceived warmth, and their status predicts perceived competence (Fiske et al., 2006). Because these dimensions are so fundamental in assessing the self and others, this review is organized around social comparisons on dimensions of competence and warmth (and closely related dimensions).

For a process so universal and so fundamental to how we think about ourselves and others, little integrated theory describes the neural processes involved in social comparisons. Focusing on the last decade of social neuroscience research using neuroimaging methods in humans, this review seeks to integrate findings on how we compare ourselves to others along competence and warmth dimensions, and how neural signatures of different comparison types may relate to the emotional and behavioral consequences of social comparisons. The review focuses on studies that investigate comparing the self to another person, as opposed to studies that involve comparing other people to each other, because comparisons that involve the self are instrumental in gaining information to assess or improve the self, and in generating other-regarding feelings such as envy (for a review that focuses on neural processes involved in inferring ordinal rank, see Chiao, 2010). Of the studies reviewed here, the majority use "social comparison" to mean comparing one's own competence, ability, possessions, status, or literal hierarchical rank to those of others, whether those others rank higher or lower on a relevant dimension. We will argue that these types of comparisons are involved in thinking about others in terms of power, or control over valuable resources or outcomes (for a detailed discussion of different concepts of power and status, see Fiske, 2010). While comparison processes related to resource control may be the prototype of social comparison as people typically conceive it, we will argue for the equal importance of considering how humans compare ourselves to others on other social dimensions.

Specifically, the SCM finds interpersonal warmth/trustworthiness in addition to competence to be critical in comparative social cognition (Fiske et al., 2006, 2002). When seeking truth or validation by comparing ourselves to others, the good or ill intentions of those others should matter at least as much as their competence, or ability to act on those intentions, in determining how we respond to the comparison ("Am I as liked as that other person?" "Am I as trusted?"). The studies that do take a comparison target's warmth, or morality, into consideration are mostly investigations of interpersonal empathy, taking on somewhat different tasks than those that involve more straightforward comparisons of abilities or possessions.[1] Before making that jump, however, the review will begin by discussing the social neuroscience of ability and resource comparisons, and then will move on to the more limited literature investigating comparisons more closely related to interpersonal warmth, or a combination of the two dimensions.

In interpreting results involving social comparisons on both competence and warmth dimensions, we have focused on neural responses that tend to accompany experiences of social reward and social pain, as well as mentalizing and self/other processing. Refining our understanding of how people experience and respond to rewarding and painful experiences, discussions between economists and psychologists have framed many questions about how people assign value in absolute versus relative terms. Research in social neuroscience provides a new angle from which to ask these questions. Framed in terms of pleasure and pain-related processes in the human brain, these studies compare how different social scenarios activate the brain's reward network, including the ventral striatum (VS) and orbitofrontal cortex (OFC), known to respond to rewards such as money and food (for a review, see Berridge & Kringelbach, 2008); and the pain-affect network, including dorsal anterior cingulate cortex (dACC) and insula, known to respond to noxious stimuli (Rainville, 1997; Sawamoto et al., 2000). These brain regions have similarly been implicated in social pleasures and pains (Eisenberger, 2012; Eisenberger & Lieberman, 2004; Lieberman & Eisenberger, 2009), extending the range of interpretations from brain activity in pleasure and pain networks.

Across studies reviewed here, considering one's relative social standing does appear to influence pleasure- and pain-related responses. To make an especially useful contribution to theories of social comparison and its consequences, some of the studies reviewed here use brain activations as predictors of subsequent emotional or behavioral outcomes resulting from upward and downward comparisons, showing these responses may play an integral role in kind or aggressive intentions toward others.

In addition to responses related to social pleasures and pains, social comparisons also engender responses implicated in mentalizing, or considering another person's mental state, particularly both dorsal and ventral medial prefrontal cortex (dmPFC and vmPFC) and precuneus/PCC (Amodio & Frith, 2006; Mitchell, 2009; Van Overwalle, 2009). In particular, bolstering social psychological theories of resource control, competition and impression formation (e.g., Erber & Fiske, 1984; Neuberg & Fiske, 1987; Ruscher & Fiske, 1990) people may focus more on the intentions of others who are higher versus lower in power and status (Ames & Fiske, 2013; Muscatell et al., 2012). In addition to elaborating on the role of social standing in impression formation, these regions are also involved in various other studies reviewed here, and future work will be needed to continue to elucidate their roles. For a simplified overview of findings summarized in this review, see Table 1.

2. Sizing up: comparing on competence

Recent studies have investigated the brain networks involved in interpersonal comparisons of competence, resource control, or social hierarchies assigned numerical ranks. Beginning with ability and resources, in a clear manipulation of comparing based on resource ownership, Fliessbach et al. (2007) had two participants at a time compete in a dot estimation game during fMRI scanning in two separate scanners (hyperscanning). On each trial, both participants found out whether they and their partner had answered correctly or incorrectly, and how much money they both had won, allowing direct comparison of their estimation abilities and monetary rewards. Important for replicating past work on value and reward, absolute gains in participants' pay did produce expected activity in ventral striatum (VS; in addition to

[1] Moral status, or morality, is part of the warmth dimension in work on the SCM (Fiske, Xu, Cuddy, & Glick, 1999), is part of related dimensions like communality in Wojciske and colleagues' work on social perception (e.g., Wojciszke & Abele, 2008; Wojciszke, 2005), and is noted to fall on the same general dimension as warmth, though it may be considered a subset of all characteristics that tend to fall under warmth (Leach, Ellemers, & Barreto, 2007).

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