

How Social Status Shapes Person Perception and Evaluation: A Social Neuroscience Perspective

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### Abstract

Inferring the relative rank (i.e., status) of others is essential to navigating social hierarchies. A survey of the expanding social psychological and neuroscience literatures on status reveals a diversity of focuses (e.g., perceiver vs. agent), operationalizations (e.g., status as dominance vs. wealth), and methodologies (e.g., behavioral, neuroscientific). Accommodating this burgeoning literature on status in person perception, the present review offers a novel social neuroscientific framework that integrates existing work with theoretical clarity. This framework distinguishes between five key concepts: (1) strategic *pathways* to status acquisition for agents; (2) status *antecedents* (i.e., perceptual and knowledge-based cues that confer status rank); (3) status *dimensions* (i.e., domains in which an individual may be ranked, such as wealth); (4) status *level* (i.e., one's rank along a given dimension); and (5) the *relative importance* of a given status dimension, dependent on perceiver and context characteristics. Against the backdrop of this framework, we review multiple dimensions of status in the non-human and human primate literatures. We then review the behavioral and neuroscientific literatures on the consequences of perceived status for attention and evaluation. Finally, after proposing a social neuroscience framework, we highlight innovative directions for future social status research in social psychology and neuroscience.

### Key Concepts in the Study of Social Hierarchy

**Social Hierarchy:** A coherent and generally agreed upon ranking of a group of individuals along one or more social dimensions bearing relevance to that group.

**Social Status:** The relative rank of an individual along one or more social dimensions within a given social hierarchy.

**Power:** One's degree of control over others' resources and/or outcomes.

**Prestige:** Freely conferred deference afforded to an individual on the basis of that individual's virtue or ability. Considered as a broad dimension of social status, individuals may be ranked based on their perceived level of prestige. Prestige can also represent a pathway or strategy to status acquisition.

**Dominance:** Intimidation of others based on physical or social threats. Considered as a dimension of social status, individuals may be ranked on their perceived level of dominance. Dominance can also represent a pathway or strategy to status acquisition.

**SES:** Socioeconomic status (SES) is a multidimensional construct usually based on objectively assessed dimensions such as income, occupation, and education level. Considered as a dimension of social status, individuals may be ranked based on their SES. Pursuit of wealth or education may also represent a pathway or strategy to status acquisition.

### Framework-Specific Concepts

**Pathway to Status Acquisition and/or Enhancement:** Strategic means of acquiring social rank through, for example, greater dominance, prestige, or SES.

**Status Antecedent:** The perceptual cues or person knowledge allowing perceivers to differentiate an individual's hierarchical rank.

**Status Dimension:** The domains in which an individual may be ranked such as dominance, prestige, or education/finances.

**Status Level:** A target's status rank on a single status dimension (e.g., low, middle, or high).

**Relative Importance of Status Dimension:** Dependent on the situation, perceiver, and target the weight given to one status dimension compared to another in the determination of a target's overall hierarchical rank.

## Overview

Social hierarchies are ubiquitous in everyday life and, indeed, have a profound impact on how we perceive others (Cheney & Seyfarth, 2008; Cloutier, Cardenas-Iniguez, Gyurovski, Barakzai, & Li, 2016; Fiske, 2010, 2015; Halevy, Chou, Cohen, & Livingston, 2012; Hare & Tomasello, 2004; Kraus, Tan, & Tannenbaum, 2013; Magee & Galinsky, 2008; Varnum, 2013, in press). However, even with the increased effort to understand how social status shapes cognitive development (Bradley & Corwyn, 2002; Duncan, Brooks-Gunn, & Klebanov, 1994; Hackman, Gallop, Evans, & Farah, 2015; Hoff, 2003; Noble, McCandliss, & Farah, 2007) and structural development of the brain (Brito & Noble, 2014; Hanson et al., 2013; Hanson, Chandra, Wolfe, & Pollak, 2011; Lawson, Duda, Avants, Wu, & Farah, 2013; Luby et al., 2013; Noble et al., 2015), the impact of perceived social status on social cognition and human brain function has received relatively little attention possibly as a consequence of challenges associated with defining this multifaceted construct (Cloutier et al., 2016; Fiske, 2015). In this review, we tackle these challenges and propose a framework that integrates across literatures and methodologies in order to gain better understanding of the constructs evoked in investigations of social status and to facilitate the development of increasingly robust predictions for future research.

We initially survey how the impact of social status on person perception is currently characterized in the non-human primate, social-behavioral, and brain-imaging literatures. Specifically, we review some of the theorized determinants of social status in non-human and human primates. In doing so, we emphasize the distinction between how status is acquired by social agents (i.e., strategic pathways to increase status) and the social dimensions conferring status on perceived social targets (i.e., status dimensions). We subsequently review some of the consequences of perceived status for how we attend to and evaluate others. In the course of this

review, we suggest that placing disproportionate importance on social status inferred from a single social dimension (e.g., dominance, competence, or wealth) can distort our understanding of the impact of social status on social cognition. Integrating research from different levels of inquiry (e.g., from non-human primates to human neuroimaging), we emphasize the importance of considering alternative social status dimensions (e.g., morality), in addition to the more frequently studied dimensions (e.g., dominance or finances).

In order to accommodate the emerging evidence that social status is both dynamic and derived from multiple sources, we ultimately propose a broad theoretical framework to investigate social status and its consequences for person perception and evaluation. For a schematic of the proposed framework, see Figure 1. Central to this framework is the distinction between how status is acquired, what social dimensions confer status, and the consequences of such status. From the perspective of the agent (i.e., horizontal axis of Figure 1), an individual may strategically acquire greater status by improving and/or shifting attention to his or her rank on one or more dimensions of status (e.g., competence, finances, morality). As discussed in greater detail in the section below on human status dimensions, a CEO adopting a prestige-based pathway to status may wish to present herself as more competent and/or moral relative to his or her peers. Another CEO adopting a dominance-based pathway to status may instead focus on other dimensions, such as physical formidability. Although not the main focus of this review, there has been considerable research on how agents acquire status (for a review, see Cheng & Tracy, 2014). The current review focuses instead on how social status guides the perceiver's attention to and evaluations of others (i.e., vertical axis of Figure 1). The first step in this process involves the perception of distinct cues (i.e., antecedents) that convey status. Antecedents for a given status dimension (e.g., dominance) may be visible (e.g., physical formidability) or

knowledge-based (e.g., awareness of the individual's influence over others). These antecedents ultimately allow the perceiver to rank others along dimensions of status (i.e., status differentiation). For example, after initial contact with a stranger, a perceiver may rank him as low in financial status based on his clothing and accent/diction (i.e., perceptual antecedents) and high in moral status based on the revelation (i.e., person knowledge, not perceptual) that he volunteers at an after-school program in a low-income neighborhood. Taken together, the stranger's relative rank along financial and moral status dimensions (among other dimensions) ultimately has consequences for how the perceiver will attend to and evaluate him. Finally, one dimension may hold greater influence over person perception, depending on its relative importance in the current context. For example, the stranger's moral status may matter more within a hierarchy of individuals involved in charitable activities, but perhaps less so in a hierarchy comprised of his co-workers at his day job as a mechanic.

Drawing on the above framework, we introduce some key terms that are intended to more clearly structure discussion of existing and future work on social status. Accordingly, this review differentiates: 1) the strategic *pathways* to status acquisition (i.e., means of acquiring higher rank through, for example, greater dominance, prestige, or wealth/education); 2) the *antecedents* of status inferences about others (i.e., the perceptual cues or person knowledge conferring hierarchical rank); 3) the *dimensions* of status (i.e., domains in which an individual may be ranked such as competence, morality, finances); 4) the *level* of status (i.e., a target's status rank on a single dimension such as low, middle, or high); and 5) the *relative importance* of a dimension for the perceiver in a given social context (e.g., moral status may be relatively more important than finances for status differentiation and status-based evaluation of religious leaders). The five distinctions outlined in the above framework are necessarily fluid. Depending

on the frame of reference (e.g., agent vs. perceiver), prestige may be construed as a pathway to status acquisition or as a dimension of perceived social status. Considering prestige as a pathway (i.e., horizontal axis of Figure 1), a researcher's focus would be on the agent's use of prestige-relevant behaviors in the strategic enhancement of her or his own status. Considering prestige as a status dimension during person perception (i.e., vertical axis of Figure 1), the focus would be on the perceiver's differentiation of prestige levels in others.

\* Insert Figure 1 Here \*

To make the above framework more concrete, let us consider a U.S. presidential election. Among politically engaged individuals, there is a general consensus that presidential candidates from both major political parties are high in status. Irrespective of any differences in their strategic pathways to acquire greater status, they are both ranked very high in the hierarchy of American politicians. However, the rich constellations of status levels along multiple dimensions (i.e., finances, competence, morality, dominance) that contribute to each candidate's overall status may vary dramatically. Moreover, depending on the context of the perceiver, these objectively high-status candidates may be viewed with contempt rather than receiving the deference commonly associated with prestige. This example illustrates the importance of taking a multidimensional approach to the study of status rather than defining status merely in terms of a single dimension (e.g., prestige). The following section provides a review of some possible dimensions of status in both non-human and human primate research.

Following an overview of the multiple dimensions of social status, the current review then examines the consequences of status in the social-cognitive domains of attention and person evaluation. We chose these domains as they have currently received the most attention in the relatively scarce psychological literature on social status. The proposed theoretical framework

will facilitate precision in operationalization by defining and outlining the distinction between how status is conferred and the consequences of status for person perception and evaluation. The framework will also integrate across literatures and methodologies, ultimately providing unique insights for future research. Future directions derived from this theoretical framework will be proposed to better integrate findings from ongoing behavioral and neuroimaging investigations of the impact of social status on person perception and evaluation.

### **Multiple Dimensions of Social Status and their Antecedents**

Whereas the ubiquity of status-based hierarchical social organization among animals and humans is generally agreed upon, it is a challenge to provide a precise and inclusive definition of social status. However, not directly tackling this challenge can lead researchers to rely on a host of generalized definitions of social status. Critically, a single and generalizable measure of social status is difficult to formulate because social hierarchies can be based on various social dimensions, and the relative importance of these dimensions may depend on characteristics of the individual and of the context. For some perceivers and contexts, status may be conferred by amount of disposable income (i.e., financial status). For others, physical characteristics, such as attractiveness (Bauldry, Shanahan, Russo, Roberts, & Damian, 2016; Vernon, Sutherland, Young, & Hartley, 2014) or fitness (Gurven & von Rueden, 2006; von Rueden, Gurven, & Kaplan, 2008), may carry greater weight in conferring status. Yet others may place greater value on occupational prestige demonstrating intellectual accomplishments (irrespective of remuneration) or by the possession and enactment of well-developed moral principles. These are but some examples of different dimensions of social status. In light of this diversity of status dimensions, a key objective of this review is to provide a framework to investigate how social

status can differentially shape person perception and evaluation while highlighting how the outcomes of such processes may vary depending on the dimensions conferring status in a given context. In the following section, we review both the non-human and human primate literatures to identify potential convergence and gain clarity about how status is acquired by individuals and perceived in others. In the interest of advancing future research directions, we also consider dimensions that have received less attention in these respective literatures.

### **Status Dimensions and Antecedents in Non-Human Primates**

Given the evolutionary importance of status in organizing the lives of various social organisms (Aquiloni, Gonçalves, Inghilesi, & Gherardi, 2012; Boehm, 2012; Chase, Tovey, Spangler-Martin, & Manfredonia, 2002; Chiao, 2010; Grosenick, Clement, & Fernald, 2007; Henrich & Gil-White, 2001), any framework on the antecedents and consequences of social status in humans would do well to also consider research on non-human primates. We briefly summarize this literature in the context of our proposed theoretical framework for the psychology of status (strategic pathways, antecedents, dimensions, level, and relative importance). For a more comprehensive review of the non-human primate literature within this framework, see the online supplemental material.

On the whole, the non-human primate literature on status is consistent with the possibility that multiple dimensions of status may guide social interactions in non-human primate species. Dominance is believed to play a central role in structuring primate hierarchies, with high-dominance individuals receiving greater access to scarce resources (Barrett, Gaynor, & Henzi, 2002; Barrett, Henzi, Weingrill, Lycett, & Hill, 1999; Henzi et al., 2003; Verderane, Izar, Visalberghi, & Fragaszy, 2013) and desired mating partners (Bulger, 1993; Cheney & Seyfarth, 2008; but see Bercovitch, 1986, 1991; Mitchell & Maple, 1985; Rowell, 1974; Strum, 1982).

Beyond dominance, alternative hierarchy dimensions may be related to the animal's affiliative tendencies and may be pursued via several pathways, including grooming behavior (Frank & Silk, 2009; Silk, Alberts, & Altmann, 2003), coalition formation (Bercovitch, 1988), tolerance for the physical proximity of conspecifics (Horner, 2010; Seyfarth, Silk, & Cheney, 2012; Silk et al., 2003). Other promising pathways/antecedents include social network size (Noonan et al., 2014; Sallet et al., 2011) and personality characteristics (Brent et al., 2014; Seyfarth et al., 2012; Weinstein & Capitanio, 2008). In light of the observed individual differences in affiliative tendencies, one exciting question is whether and how non-human primate species encode, store, and retrieve generalized knowledge about their conspecifics' relative propensities for affiliation.

Nonetheless, further research directly examining the interaction of affiliation- and dominance-related knowledge on overall social status is needed. In approaching this research, it will be important to develop means of assessing *overall social status* beyond the unidimensional dominance hierarchy that appears to be frequently assumed in non-human primate research. One possible means of assessing overall status may be to consider the social, physical, and reproductive well-being of each individual in addition to his or her dominance level (e.g., Silk et al., 2003). Although few studies have followed this line of inquiry, its pursuit is consistent with previous calls to consider multiple status hierarchy dimensions in the non-human animal literature (Bercovitch, 1988; Harding, 1980; Mitchell & Maple, 1985; Platt, Seyfarth, & Cheney, 2016).

Despite the present gaps in non-human primate research, there is considerable evidence to suggest that status is not a singular construct derived from a single dimension. Instead, status dimensions and the pathways to acquiring status along these dimensions vary within and between non-human primate species. Moreover, multiple antecedents (i.e., perceptual cues and

knowledge) may be used by perceivers to infer the status levels of conspecifics. These findings imply complexity in operationalizing status beyond the human species. In subsequent sections, we will revisit these findings, emphasizing the multidimensional nature of social status that may be common to all primate species (including our own) and highlighting any differences that may have emerged with *homo sapiens*.

### **Status Dimensions and Antecedents in Humans**

In this section, we review multiple social dimensions thought to confer status in human hierarchies. Given the complexity of human social hierarchies, it is perhaps unsurprising that the study of how social status shapes person perception and evaluation is characterized by a diversity of methodological and conceptual approaches. In this section, we integrate across these methodologies and literatures. Inspired in part by the non-human primate research reviewed above (see also the online supplemental material), this section begins with an examination of dominance as a key dimension of status before considering affiliative dimensions from which status may also be inferred. In contrast to the non-human primate literature, these affiliative dimensions are considerably more varied in the human literature. Indeed, whereas the non-human primate literature reviewed above suggests the potential for status dimensions based on affiliative tendencies, the human literature is more extensive in this regard. Possible affiliative dimensions conferring social status in humans are often referred to as prestige and, to a lesser extent SES, in addition to other less closely investigated status dimensions such as morality, warmth, and attractiveness.

In each of the following subsections, we emphasize the importance of distinguishing the strategic pathways by which status is achieved from the social dimensions conveying status. For example, whereas education is central to SES and a key determinant of social class (e.g., Curhan

et al., 2014; Snibbe & Markus, 2005), its pursuit in a given social group may be a pathway towards greater status on one dimension (e.g., artistic proficiency) but perhaps lower status on another dimension (e.g., finances). Throughout this section, we highlight the potential for interactions between social dimensions as well as the limitations of overreliance on single dimensions when investigating the impact of social status in human social cognition.

Before beginning our review of the human social status literature, it is important to place our framework in the context of an existing conceptual approach. Drawing on evolutionary theory (Henrich & Gil-White, 2001) and evidence from some of the non-human animal literature reviewed above, Cheng and colleagues have proposed two main pathways to status attainment in humans: dominance and prestige (Cheng & Tracy, 2014; Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013). They theorize that dominance- and prestige-related behaviors are independent *pathways* to human social status. However, dominance and prestige may also be considered as different social *dimensions* conveying status (e.g., Case & Maner, 2014), each with their own host of perceptual/knowledge-based antecedents and consequences for social cognition. Consistent with this conceptualization, the following section discusses dominance and prestige as umbrella terms that include potentially multiple social dimensions, each of which may confer status during person perception. Finally, we expand our review beyond dominance- and prestige-related dimensions to include other frequently studied dimensions of status such as wealth.

### **Dominance.**

*Dominance as a pathway.* As a part of our evolutionary heritage (see the preceding section and online supplemental material on the non-human primate literature), social dominance is thought to be a key pathway to status attainment in humans (C. Anderson & Kilduff, 2009b;

Case & Maner, 2014; Hamilton, Carré, Mehta, Olmstead, & Whitaker, 2015; Mazur & Booth, 1998). Dominance behavior can take the form of fear-based coercion, where subordinate individuals are obliged to defer to others with higher dominance levels or else suffer material or psychological harm (Cheng & Tracy, 2014). Although dominant individuals may seldom punish subordinates with overt sanctions or violence, threats or manipulation can serve to motivate subordinate behavior (Maner & Mead, 2010). For example, a dominant employer may threaten employees with dismissal or pay cuts if a desired objective is not met. Consistent with this scenario, some have proposed two kinds of dominance: aggressive dominance, characterized by physical formidability/intimidation, and social dominance, conceptualized as manipulative control over resources or outcomes (Cook, Den Ouden, Heyes, & Cools, 2014; Fiske, 1993; Hawley, 1999; Magee & Galinsky, 2008; Van Vugt, Hogan, & Kaiser, 2008)<sup>1</sup>.

*Dominance-related status antecedents.* In humans and non-human primates alike, a variety of perceptually available antecedents (e.g., faces and bodies) have been shown to efficiently confer impressions of physical dominance (Ellyson & Dovidio, 1985; Hall, Coats, & LeBeau, 2005; Todorov, 2011; Todorov, Said, Engell, & Oosterhof, 2008). Some (but not all) of these antecedents are correlated with aggressive tendencies observed in the real world. Examples from previous research include body weight (but not facial width-to-height ratio) in hockey players (Deaner, Goetz, Shattuck, & Schnotala, 2012) and diminished smile intensity in

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<sup>1</sup> Although power plays an important role in dominance-based status acquisition and maintenance, we nonetheless caution against equating dominance with power. Power implies a degree of control over material or social resources (Galinsky et al., 2015). However, control over resources may not necessarily be used to enhance one's own status. Individuals preferring a prestige-based approach to acquiring status may in fact avoid using their power to enhance or preserve status if it would be perceived as overt coercion or manipulation (Case & Maner, 2014; Henrich & Gil-White, 2001; Van Vugt, 2006).

professional fighters (Kraus & Chen, 2013). The ability to infer the formidability of others appears to develop from a young age (Hawley, 1999; Strayer & Strayer, 1976; Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011). For example, infants as young as 10 months infer the likely winner in an agonistic conflict of goals based on physical size (Thomsen et al., 2011). In adults, dominance is inferred from cues such as body posture (Freeman, Rule, Adams, & Ambady, 2009; Marsh, Blair, Jones, Soliman, & Blair, 2009; Tiedens & Fragale, 2003), emotional expression (Chiao et al., 2008; Haaker, Molapour, & Olsson, 2016; B. C. Jones, DeBruine, Little, Watkins, & Feinberg, 2011; Kraus & Chen, 2013), and facial dimensions/structure (Carré & McCormick, 2008; Carré, McCormick, & Mondloch, 2009; Hehman, Leitner, & Freeman, 2014; B. C. Jones et al., 2010; Oosterhof & Todorov, 2008; Perrett et al., 1998). Auditory cues such as deeper vocal pitch (Cheng, Tracy, Ho, & Henrich, 2016), more robust laughter (Oveis, Spectre, Smith, Liu, & Keltner, 2016), or eye contact while speaking versus listening (Dovidio & Ellyson, 1982) may also confer dominance.

Possibly influenced by the non-human primate literature where perceptual cues indicative of dominance are often presented as primary antecedents of social status, variation of physical dominance cues is at times used to operationalize “status” in psychological research with humans (Freeman et al., 2009; Marsh et al., 2009; Mehta, Jones, & Josephs, 2008; Neave, Laing, Fink, & Manning, 2003). However, physical dominance in humans is unlikely to be a strong antecedent of hierarchical status in many contexts. In a study of 48 unacquainted boys in the second grade (Dodge, 1983), it was found that peer popularity rankings after two weeks were associated with avoidance of aggression during free play (see also Coie & Kupersmidt, 1983) and greater social competence (see also Hazen & Black, 1989). This is consistent with extensive work showing that physical aggression has an increasingly negative impact on peer evaluations as children

mature (Cairns, Cairns, Neckerman, Gest, & Garipey, 1988; Coie, Dodge, & Coppotelli, 1982; Dodge, Coie, Pettit, & Price, 1990; Newcomb, Bukowski, & Pattee, 1993; Pettit, Bakshi, Dodge, & Coie, 1990). By the time children finish elementary school, physical intimidation appears to correlate negatively with peer ratings of status and likeability (Hawley, 1999). As social and cognitive abilities develop, children adopt more sophisticated strategic paths to facilitate dominance-based status acquisition such as intimidation or manipulation (Boulton, 1996; Garandeau & Cillessen, 2006; Olweus, 1993; Sutton, Smith, & Swettenham, 1999). Others may opt for more cooperative strategies (Edwards, 1994; French, Waas, Stright, & Baker, 1986; Kalma, Visser, & Peeters, 1993; Williams & Schaller, 1993). It would appear that the development of increasingly complex social cognitive abilities may be useful for acquiring and/or maintaining dominance vis-à-vis these more sophisticated social pathways (Cook et al., 2014). This acquired person-knowledge of dominance can then be stored in memory and organize future interactions, potentially becoming integrated with perceptual antecedents of dominance. Taken together, these findings suggest that physical dominance may play a small role in the way others' status is inferred relative to the influence of non-visual attributes such as influence (e.g., through social intimidation or competence).

In summary, it would appear that dominance (viz., physical formidability) is readily perceived from numerous verbal and nonverbal cues. Although visual dominance cues can and do influence person perception, our review of the non-human (see also the online supplemental material) and human primate literatures highlight that dominance is unlikely to be the major antecedent of social status in many contexts. Indeed, prestige-related social competencies (e.g., affiliative tendency, generosity, competence, reciprocity, morality) can play a crucial role in inferences of human social status levels across the life span (Cheng et al., 2013; Flynn, Reagans,

Amanatullah, & Ames, 2006; Hardy & Van Vugt, 2006; Hawley, 1999; D. C. Jones, 1984; La Freniere & Charlesworth, 1983; Lyle & Smith, 2014). In the following sections, we consider these prestige-related dimensions of human social status.

### **Prestige.**

*Prestige as a pathway.* In contrast to status conferred through physical formidability and social intimidation, status may also be achieved through demonstrations of skill (Gurven & von Rueden, 2006; von Rueden et al., 2008), knowledge (Reyes-Garcia et al., 2008), or generosity (Cheng, Tracy, & Henrich, 2010; Flynn et al., 2006; Hardy & Van Vugt, 2006; Lyle & Smith, 2014; Maner & Mead, 2010; Mead & Maner, 2012a). Such exceptional displays and attributes are thought to elicit perceptions of prestige. Although dominance and prestige both contribute to social status levels in humans, these dimensions are suggested to be independent and distinct in their psychological underpinnings (Cheng et al., 2013). Unlike with dominance, which is linked to intimidation, prestige is associated with a free conferral of deference by subordinates (Henrich & Gil-White, 2001). In turn, subordinates are thought to benefit directly or indirectly from the prestigious individual's competence or generosity (Henrich & Gil-White, 2001). In our evolutionary past, elevating the status of prestigious individuals is assumed to have facilitated a more rapid transference and accumulation of knowledge and goods, ultimately enhancing inclusive fitness of the group over time. Because prestige depends on the evaluation and transmission of skills and knowledge (i.e., social learning), it is thought that it may be unique to humans (Cheng & Tracy, 2014; Henrich & Gil-White, 2001). Nonetheless, we speculate that the affiliation-related behaviors in non-human primates (see the online supplemental material) may have served as a precursor for prestige (among other affiliation-related status dimensions) in our evolutionary history.

*Prestige-related status antecedents.* In contrast to dominance and to SES (discussed below), prestige may typically be inferable by fewer perceptual antecedents. Existing research has considered some perceptual antecedents of prestige such as prideful expressions (Martens & Tracy, 2012; Steckler & Tracy, 2014). This nonthreatening expression, universally observed following an important achievement (Tracy & Matsumoto, 2008), is recognized cross-culturally as a combination of nonverbal cues including a subtle smile, a slight backward head tilt, an expanded and erect posture, and arms either resting on the hips or raised above the head (Tracy & Robins, 2004; Tracy, Shariff, Zhao, & Henrich, 2013). Other possible perceptual antecedents of prestige include physical health (Reyes-Garcia et al., 2008; Reyes-García et al., 2009) and professional attire (DeWall & Maner, 2008; Freeman, Penner, Saperstein, Scheutz, & Ambady, 2011; Maner, DeWall, & Gailliot, 2008).

Beyond the somewhat limited perceptual antecedents of prestige, a considerable body of work has focused on knowledge-based antecedents of prestige. Across cultures, one key observation is that higher status is associated with greater perceived competence (Cuddy et al., 2009; Cuddy, Fiske, & Glick, 2008; Fiske, Cuddy, Glick, & Xu, 2002; Varnum, 2013), leading some to suggest that status and competence are overlapping constructs (Fiske, Cuddy, & Glick, 2007; Fiske, Dupree, Nicolas, & Swencionis, 2016). In line with the hypothesized link between prestige and competence (Gurven & von Rueden, 2006; Henrich & Gil-White, 2001; von Rueden et al., 2008; von Rueden, Gurven, & Kaplan, 2011), a number of competencies ranging from hunting skills (von Rueden et al., 2008) to advice-giving abilities (Cheng et al., 2010) have been found to correlate with impressions of prestige (but not dominance). Beyond skill-based competence, it is thought that social competence cues (e.g., displays of affiliation or wisdom) may also convey prestige (Cheng et al., 2010; for a review of other competencies, see Cheng &

Tracy, 2014). Existing work suggests that trade-offs exist between inferences of warmth and competence during general impression formation and management (Fiske et al., 2016; Holoien & Fiske, 2013; Kervyn, Judd, & Yzerbyt, 2009; Kervyn, Yzerbyt, & Judd, 2010; Kervyn, Yzerbyt, Judd, & Nunes, 2009; Swencionis & Fiske, 2016; Yzerbyt, Kervyn, & Judd, 2008). For example, individuals construed as high in warmth (absent any ascribed degree of competence) may be consequently perceived as low in competence. One as-yet-untested possibility is that the effect of warmth on perceived status level may be mediated by stereotypic warmth–competence correspondences<sup>2</sup>.

In addition to competence and warmth, prestige may be inferred from other knowledge-based antecedents such as perceived generosity (Cheng et al., 2010; Flynn et al., 2006; Hardy & Van Vugt, 2006; Lyle & Smith, 2014; Maner & Mead, 2010; Mead & Maner, 2012a) or moral reputation (Boehm, 2012; Cloutier et al., 2016; Fiske, 2010). Although one could suggest that generosity or morality overlap with warmth (Abele, Cuddy, Judd, & Yzerbyt, 2008; Cuddy et al., 2008), there is evidence to suggest that moral character is separable from warmth in its contribution to impression formation (Goodwin, Piazza, & Rozin, 2014). Indeed, it is thought that character-diagnostic aspects of behavior (e.g., moral intentions) receive greater weight during impression formation than the actual positive or negative outcomes of that behavior (Uhlmann, Pizarro, & Diermeier, 2015).

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<sup>2</sup> It may be tempting to consider warmth and competence as the key dimensions of human social status under which other social dimensions (e.g., prestige, dominance, wealth) are subsumed. Although warmth and competence have considerable explanatory power in impression formation, we would caution against the extreme view that antecedents of these two dimensions are the key predictors of social status. In some cases, judgments of warmth and competence may be better understood as key evaluative consequences of perceived status (e.g., defined in terms of SES) rather than antecedents of status. Nonetheless, information regarding warmth and competence may factor into the determination of an individual's status level. We consider some evidence for this in the current section on prestige.

In light of these findings, it is important to note that, as with dominance, prestige-related antecedents (e.g., competence, warmth, morality) may not necessarily indicate overall status, but merely the target's status level (i.e., rank) along a given dimension. Taken together with other status dimensions (e.g., financial wealth) and social contexts conveying the relative importance of each dimension (e.g., religious community vs. athletic team), these dimensions contribute to an individual's overall perceived status level. Thus, although prestige is sometimes equated with overall status, or as a particular kind of status (e.g., Halevy et al., 2012; von Rueden et al., 2011), it may be important to consider prestige (and dominance) as potential contributing dimensions to overall social status rather than as indicative of social status per se. As discussed above, this example underscores the importance of considering all components of status and their interactions when investigating the consequences of social status for person perception and evaluation.

In summary, prestige can be conceptualized as a status dimension, but also as one pathway to the acquisition of social status in humans (Cheng & Tracy, 2014; Henrich & Gil-White, 2001). Individuals adopting a prestige-based strategy of status acquisition rely on knowledge or visible displays of socially valued competencies and social consensus rather than intimidation (Case & Maner, 2014; Van Vugt, 2006; Van Vugt et al., 2008). As in the preceding discussion of dominance, it is important to consider prestige-related status antecedents as conveying status along some of many possible social dimensions that contribute to one's overall perceived status. The degree to which prestige-related antecedents influence perceived status likely depends on the salience of other status dimensions (e.g., wealth) and the social context in question. Importantly, such context sensitivity in status-based inference remains to be empirically explored.

**Wealth and education.** In the previous two sections, we reviewed social status dimensions inspired by two central pathways to status acquisition in humans: dominance and prestige (Cheng & Tracy, 2014; Cheng et al., 2013). However, we suggest that facets of socioeconomic status (SES), traditionally considered central to human social status, can also be considered both as pathways to and dimensions of social status. In this section, we consider one of the most frequent contemporary metrics of human social status: accumulated wealth and education. Indeed, wealth and education are considered to be facets of SES. SES is a multidimensional construct usually based on objectively assessed dimensions such as income, occupation, and education level. Income reflects the amount of resources available to an individual and may be assessed in a number of ways (e.g., personal, family, or adjusted income: see Brito & Noble, 2014; Duncan & Magnuson, 2012). Prima facie, one's employment may be associated with one's income level, but also with prestige (Fujishiro, Xu, & Gong, 2010; Touhey, 1974; Treiman, 1977) and perceived competence (Fiske et al., 2007, 2002; Imhoff, Woelki, Hanke, & Dotsch, 2013). Education is the dimension of SES thought to best capture the degree of cognitive stimulation in the home environment (Evans & English, 2002; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005) with important consequences for social status advancement (Breen & Jonsson, 2005; Fiske & Markus, 2012; Lareau & Conley, 2008) and well-being (Curhan et al., 2014; Herzog, Franks, Markus, & Holmberg, 1998; Ross & Van Willigen, 1997).

As with other status dimensions covered in this review, it is important to note that the separate dimensions comprising SES often reflect discrete past experiences and often may not be interchangeably used as proxies for one another (Bruto & Noble, 2014; Duncan & Magnuson, 2012) or as necessarily correlating with financial status. One solution may be to use composite

measures of SES, including a combination of two or more socioeconomic dimensions (see Cloutier et al., 2016, for a review). However, examining hierarchies separately for each dimension may provide a more fine-grained understanding of the antecedents and consequences of SES (e.g., Fujishiro et al., 2010).

***Wealth and education as pathways.*** Although they reflect discrete life experiences, income, occupation, and education do tend to correlate with one another and to predict status advancement (Fiske & Markus, 2012; Lareau & Conley, 2008). For example, the degree of educational attainment (e.g., years in school) has been linked to greater socioeconomic mobility (Breen & Jonsson, 2005) and greater perceived self-efficacy (Snibbe & Markus, 2005). It has also been shown that a lack of resources and personal support in early childhood can limit academic success, ultimately reinforcing socioeconomic inequality (Entwisle, Alexander, & Olson, 2005). In contrast to work on dominance and prestige, these studies rely primarily on longitudinal and correlational designs. Although this work reinforces the notion that wealth and education may be important pathways to the acquisition of status on a range of dimensions including competence and prestige, more work is needed to determine how SES-related cues impact person perception and evaluation in different contexts. We now turn to possible cues that may convey SES thereby serving as wealth-based antecedents of social status.

***Wealth-related status antecedents.*** Although the various dimensions of SES (i.e., financial and educational status) are often not accessible at first glance, SES may be inferred from a number of visually accessible antecedent cues, including clothing (Freeman et al., 2011; Kraus & Mendes, 2014; Nelissen & Meijers, 2011; Ratcliff, Hugenberg, Shriver, & Bernstein, 2011), car ownership (Dunn & Searle, 2010; Piff, Stancato, Côté, Mendoza-Denton, & Keltner, 2012), nonverbal signs of aloofness (Kraus & Keltner, 2009), and stereotypic environments (e.g.,

luxury vs. standard apartments: Dunn & Hill, 2014; see also Shriver, Young, Hugenberg, Bernstein, & Lanter, 2008). Although these cues most directly confer some form of financial status, other cues such as eyeglasses (e.g., Hellström & Tekle, 1994) or personal descriptions (e.g., Cloutier et al., 2012; Dalmaso, Pavan, Castelli, & Galfano, 2011) may convey greater educational, occupational, or intellectual status.

### **Summary**

Inspired in part by an extensive literature suggesting multiple pathways to status acquisition in humans, the research reviewed in this section suggests there are also multiple antecedents by which humans infer the status of others. Like our non-human primate relatives, we are able to discern the relative status of individuals based on cues conveying physical or social dominance. However, the use of relatively more affiliation-related status dimensions may be unique (and more important) to human social status due to our greater reliance on social learning and knowledge-based status antecedents. We note here that dimensions of social status (e.g., dominance and wealth) are frequently studied in parallel and in limited contexts. However, the relative importance of a given social dimension will most likely depend on the context, and the manner and degree to which social dimensions interact to convey status is seldom investigated. Furthermore, social dimensions that are not typically and explicitly associated with social status may nonetheless be central to the relative status level within certain social hierarchies. For example, in some cases, moral standing is necessary to maintain high status, and individuals believed to be immoral are assigned lower status (Boehm, 2012; Fiske, 2010; Hamlin & Wynn, 2011; Hamlin, Wynn, & Bloom, 2010). Finally, the present section does not presume to discuss all status dimensions relevant to human hierarchies. For example, social categories like race and gender, which are easily identifiable from unknown individuals, have been

suggested to be important antecedents of overall social status inference (Berger, Cohen, & Zelditch, 1972; Penner & Saperstein, 2008; Saperstein, Penner, & Light, 2013). Similarly, attractiveness (arguably a status dimension based on physical appearance) is suggested to facilitate status acquisition, especially in individuals from lower SES backgrounds (Bauldry et al., 2016). More work is needed to map the fundamental dimensions of status and the pathways to status acquisition across these dimensions in humans. We revisit these questions when discussing future directions in the final section of this review.

### **Consequences of Perceived Status in Attention**

Having outlined some of the many social dimensions on which status may be construed, we now consider the consequences of perceived status. In this section, we consider evidence from the behavioral and neuroimaging literatures relevant to status differentiation processes and the attentional consequences of perceiving targets varying in status dimensions and levels. Guided by the reviewed literature, we focus on the attentional consequences of status inferred from frequently studied social dimensions while highlighting the importance of considering other status dimensions in future research. In doing so, we attempt to illustrate that status-based attention is more complex than commonly thought, dependent on both the status dimension and social context in question.

#### **Behavioral Evidence of Status Differentiation and Status-Based Attention**

Initial research on status-based attention allocation suggests that high-dominance individuals garner greater attention than low-dominance individuals. Indeed, such tendency has been observed in non-human primates (Chance, 1967; Dalmaso et al., 2011; Deaner, Khera, &

Platt, 2005; Fiske, 2010; Shepherd, Deaner, & Platt, 2006). Similarly, human perceivers are thought to pay greater attention to dominant or otherwise high-status targets (Cheng et al., 2013; Dalmaso et al., 2011; Foulsham, Cheng, Tracy, Henrich, & Kingstone, 2010), especially if they are male (DeWall & Maner, 2008; Fiske, 1993; Maner et al., 2008). In preschoolers, dominant individuals appear to receive relatively greater visual attention (i.e., greater frequency of eye gazes: Abramovich, 1976; Hold, 1976; La Freniere & Charlesworth, 1983). Such heightened attention may be due to the possible greater consequences of engaging with individuals in powerful positions (Ames & Fiske, 2013; Cheng & Tracy, 2014; Fiske, 2010; Haaker et al., 2016). In support of this interpretation, fear conditioning (measured by skin-conductance recordings) has been found to be stronger during acquisition, more resistant to extinction, and more readily reinstated for high- versus low-dominance targets (Haaker et al., 2016). However, as previously discussed, perceived dominance is but one among many potential determinants of social status, and one should be careful when generalizing these findings to social status more broadly. Other possible dimensions of status (e.g., competence, wealth, morality) may shape attention differently, depending on the dimension's relative importance in a given context. Accordingly, in a year-long study of preschool children, it was found that directed gazes from other children during play time were more strongly associated with the pupil's degree of social competence (i.e., prestige) than with his physical dominance ranking (Vaughn & Waters, 1981; but see La Freniere & Charlesworth, 1983).

Using eye-tracking, Foulsham and colleagues (2010) presented passive observers with 20-s video clips depicting three individuals involved in a group decision-making task. Importantly, each individual in the recorded decision-making group subsequently rated each other on general status and influence that resulted in their classification as low, medium, and

high status. Results of this study revealed that passive observers (i.e., study participants) attended more to the eyes of high-status when compared to low-status members of the decision-making group, and visual attention positively correlated with pre-rated dominance and prestige of the recorded individuals (see also Cheng et al., 2013, Study 2). Similar attentional biases have been shown in a gaze following task. After reviewing a set of faces, each associated with a fictitious CV, participants tended to preferentially follow the gaze of individuals paired with high- versus low-SES occupations during a gaze cueing task (Dalmaso et al., 2011). Similar gaze-cueing bias has been observed for masculinized (i.e., high in perceived dominance: Perrett et al., 1998) compared to feminized (i.e., low in perceived dominance) faces (B. C. Jones et al., 2010), for leaders versus followers (Capozzi, Becchio, Willemse, & Bayliss, 2016), and for politicians perceived to have relatively greater influence within their coalitions (Liuzza et al., 2016). Taken together, this work suggests that individuals ranking highly along a number of dimensions (e.g., SES, prestige, dominance) may readily grab our attention. Furthermore, possibly as a result of greater attention allocation, the identities and physical locations (e.g., after a brief presentation of a  $4 \times 4$  array of faces) of high-SES faces have also been shown to be better remembered (Ratcliff et al., 2011; Shriver et al., 2008). Thus, researchers have posited that not only are high-status individuals more readily attended, they are also more deeply encoded and better remembered.

Some speculated that attention to high-status individuals may stem from their greater control over intellectual, material, and/or social resources (Galinsky, Rucker, & Magee, 2015; Magee & Galinsky, 2008), which may, in turn, increase the perceived motivational relevance of high-status people (e.g., Breton et al., 2014; Dalmaso et al., 2011). Although some work suggests that control over resources heightens a *perceiver's* attention to goal-relevant stimuli

(Keltner, Gruenfeld, & Anderson, 2003; Overbeck & Park, 2001, 2006), it is less clear whether the aforementioned attentional biases to high-status targets are driven by the high-status target's *perceived* control over resources or some other dimension of social status (e.g., prestige).

Moreover, it is unclear whether high status along any dimension is sufficient to draw attention or whether this may be restricted to certain status dimensions in relevant contexts.

As discussed, hierarchical rank along some dimensions may elicit increased attentional bias to high-status individuals. However, this may not always be the case. For instance, token minorities are thought to receive disproportionately greater attention, despite their stereotypically lower status (Kanter, 1977). Low-status individuals may also attract more attention if they are construed as threatening, either contextually or stereotypically. Threat has long been known to capture and hold our attention (Fox, Russo, Bowles, & Dutton, 2001; Fox, Russo, & Dutton, 2002; Koster, Crombez, Van Damme, Verschuere, & De Houwer, 2004). One instance where low-status individuals may be seen as threatening is in unstable hierarchies (Case & Maner, 2014; Maner & Mead, 2010; Mead & Maner, 2012b; Sapolsky, 2005; Tajfel & Turner, 1979). Indeed, individuals are generally highly motivated to maintain or enhance their status rank when opportunities arise (Hays & Bendersky, 2015; Maner, Gailliot, Butz, & Peruche, 2007; Sapolsky, 2004). When status hierarchies allow for upward mobility, low-status individuals are thought to become more competitive (Hays & Bendersky, 2015). Perhaps as a consequence, low-status targets receive greater attention from relatively high-status perceivers in unstable hierarchies who may feel their position in the hierarchy is threatened (e.g., Case & Maner, 2014; Mead & Maner, 2012b; Wilkins & Kaiser, 2014). Beyond the context of hierarchy instability, stereotypes may also lead to associations of threat with low-status targets (e.g., Correll, Wittenbrink, Park, Judd, & Goyle, 2011). Additionally, especially in the absence of an explicit relationship between

status and power, low-status individuals may be viewed as fellow members of the same social class by the majority of perceivers who are also of low or middling social rank and, therefore, preferentially hold perceivers' attention (Fiske, 2010; Mattan, Kubota, & Cloutier, under review). Direct examination of how threat and power independently modulate attention to social status awaits further study.

As a final caveat to the influence of social status on attention, innovative work using mobile eye-tracking suggests that attention to eyes and gaze direction in "real life" may not always converge with patterns observed in standard lab-based procedures that frequently rely on video or pictorial stimuli (Kuhn, Teszka, Tenaw, & Kingstone, 2016; Risko, Laidlaw, Freeth, Foulsham, & Kingstone, 2012). For instance, perceivers may not look at nearby individuals in the eye in the same way they would while watching a video or viewing a picture. Indeed, in live dyadic interactions, low-status human and non-human primates frequently avert their gaze from high-status conspecifics (Deaner et al., 2005; Exline, Ellyson, & Long, 1975; Shepherd et al., 2006). Further work is needed to clarify how different status dimensions affect attention allocation in ecologically valid scenarios and to determine how such attention translates into differences in memory.

In summary, current research indicates that high-status targets typically receive the greatest attention. However, in some scenarios low-status individuals prompt greater attention (e.g., token status, hierarchy instability, physical threat, or shared group membership). Ultimately, early attentional allocation may also lead to further downstream consequences, such as improved memory (Ratcliff et al., 2011; Shriver et al., 2008) and increased individuation (Ames & Fiske, 2013; Muscatell et al., 2012) for high-status targets. More research is needed to explore the consequences of status-based attention, to better understand the conditions that shape

attention and memory to low-status targets, and to identify the ways in which different status dimensions and their corresponding antecedents contribute to status-based attention.

### **Neuroimaging Evidence of Status Differentiation and Status-Based Attention**

The increasing use of neuroimaging methods in the study of social cognition has provided several advantages, including the ability to assess ongoing psychological processes without the intrusive questions and socially desirable responding typical of self-report methods (Amodio, 2010; Berkman & Cunningham, 2012; Cacioppo, Berntson, Sheridan, & McClintock, 2000; Cacioppo, Tassinary, & Berntson, 2007; Lieberman, 2007; Stanley & Adolphs, 2013). Moreover, neuroimaging methods offer sensitivity to the engagement of distinct psychological processes that underlie otherwise similar behavioral performance (Amodio, 2010; Berkman & Cunningham, 2012; Cacioppo et al., 2000, 2007; Lieberman, 2007; Stanley & Adolphs, 2013). More generally, in areas of research organized around competing theories, it is possible to develop neuroimaging experiments distinguishing theoretical alternatives (Amodio, 2010; Todorov, Harris, & Fiske, 2006). Even in areas characterized by limited theoretical development, neuroimaging findings can contribute to theoretical refinement through the judicious use of probabilistic reverse inference (Moran & Zaki, 2013; Poldrack, 2006). In the following sections, we review research on social status from the functional magnetic resonance imaging (fMRI) and, to a lesser extent, event-related brain potentials (ERP) literatures. As in the behavioral literature reviewed in the preceding section, we will review the neuroimaging literature in the context of our proposed theoretical framework with an emphasis on the progress afforded by adopting a social neuroscience approach to investigate how social status impact person perception and evaluation.

fMRI measures blood flow changes within regions of the brain. These changes in blood flow are thought to reflect an increased demand for oxygenated blood in populations of active neurons responding to psychological stimuli of interest to the experimenter (Heeger & Ress, 2002; Logothetis, 2008). Building on previous brain-imaging research, the use of this method helps researchers interested in social status to uncover the mechanisms by which social status impacts person perception and evaluation, and it provides anatomical mapping of these mechanisms with higher spatial resolution than other available techniques. It is important to note, however, that fMRI studies are correlational in nature. Due in part to the low temporal precision of fMRI, it is often unclear whether activity in certain brain regions is integral to the perception of perceived status antecedents, or if it is merely a consequence of status-related activity in other cortical regions (see section on limitations for further discussion).

Event-related brain potentials (ERP) measure electrical changes in the brain over time. More specifically, ERPs represent the synchronous and summated postsynaptic firing of neurons acquired at the surface of the scalp. ERPs provide millisecond-based temporal sensitivity not possible with fMRI. Therefore, ERP is well suited for mapping the time course of status-based attention (for a review of ERP and person perception, see Kubota & Ito, 2009). However, due to the poor spatial precision of ERPs, the anatomical origins of ERPs are not always clear (but see Becker et al., 2014; Song et al., 2015, for recent advances in EEG source localization).

**Differentiation and attention to perceptual antecedents of status.** Perhaps because dominance can be easily inferred from visual stimuli, the neuroimaging literature investigating how social status shapes person perception often focuses on this dimension. These fMRI studies typically rely on perceptual antecedents of dominance such as facial structure/expression (Chiao et al., 2008; Haaker et al., 2016) or body posture/position (Freeman et al., 2009; Marsh et al., 2009; Mason, Magee, & Fiske, 2014). In one fMRI experiment, Marsh and colleagues (2009) presented to perceivers photographs of actors varying their gaze orientations, body postures, and gestures to convey overall low, average, or high dominance. Greater activity in the lateral prefrontal cortex was observed in response to individuals displaying high-dominance cues, relative to neutral and low-dominance cues. In another study, perceivers reporting greater dispositional motivation to obtain power showed increased lateral prefrontal activity while viewing video clips of social interactions with power- or dominance-related themes (Quirin et al., 2013). Notably, lateral prefrontal activity in both studies included the dorsolateral prefrontal cortex (DLPFC) and ventrolateral prefrontal cortex (VLPFC). DLPFC activity associated with dominant targets has been suggested to index increased top-down attention (Marsh et al., 2009). Consistent with this view, subsequent work found greater DLPFC activity in the context of a conflict between two individuals of close (vs. distant) dominance levels (see Haaker et al., 2016, Experiment 3). The DLPFC's putative role in mediating top-down attention to dominance is in line with previous work implicating this region in active attentional control (Corbetta, Patel, & Shulman, 2008; Corbetta & Shulman, 2002). In contrast, VLPFC activity associated with dominant targets may index context-appropriate changes in behavior following status differentiation (Marsh et al., 2009). For example, the presence of a more dominant or otherwise high-status individual may necessitate a greater need to regulate one's behavior, inhibiting

inappropriate actions. This interpretation is consistent with research implicating the VLPFC in the inhibition of erroneous responses (Aron, Robbins, & Poldrack, 2004; Cools, Clark, Owen, & Robbins, 2002; Elliott, Friston, & Dolan, 2000; Levy & Wagner, 2011). In sum, the DLPFC and VLPFC may act in concert to support preparation for competition with dominant or potentially dominant individuals. Providing additional support, single-cell recording from the lateral prefrontal cortex (i.e., dorsal and ventral banks of the principal sulcus) in macaques revealed more sensitivity to conspecific than computer opponents during competitive game play (Hosokawa & Watanabe, 2012).

Collectively, the above findings imply that areas of the lateral prefrontal cortex are responsive to perceptual cues of dominance displayed by targets, perhaps especially in competitive contexts. Specifically, the DLPFC is thought to support controlled attention to dominant targets, whereas the VLPFC is thought to inhibit inappropriate responses in the presence of a dominant target. We nonetheless caution that the causal role of these regions has yet to be determined. Importantly, activity in the VLPFC is not consistently observed in fMRI studies using status dimensions other than dominance (cf. Chiao et al., 2009; Cloutier et al., 2012; Cloutier & Gyurovski, 2013; Farrow et al., 2011; Zink, Tong, Chen, Bassett, & Stein, 2008), implying that this region may be particularly sensitive to dominance antecedents or competition rather than status per se. Further work is needed to determine the conditions in which these regions of the lateral prefrontal cortex are responsive to other dimensions of social status beyond the context of dominance and competition.

Together with the lateral prefrontal cortex, regions of the inferior parietal cortex (e.g., inferior parietal lobule [IPL], intraparietal sulcus [IPS]) may also be associated with attention to dominant individuals (Freeman et al., 2009) as part of the greater frontoparietal attentional

network (Corbetta et al., 2008; Corbetta & Shulman, 2002). Particularly relevant to the study of status broadly construed, the inferior parietal cortex is believed to register status differences along diverse social dimensions (Chiao et al., 2009; Cloutier et al., 2012). BOLD activity in the inferior parietal cortex may also differentiate between different dimensions of social status during self-referential comparisons, possibly as a function of each dimension's relative importance to the self (Cloutier et al., 2012; Cloutier & Gyurovski, 2013). Indeed, some have suggested that this region may index attention to those most similar to the self during social comparison (Swencionis & Fiske, 2014). Other work found that the inferior parietal cortex is preferentially recruited when witnessing exemplary moral acts (Englander, Haidt, & Morris, 2012), suggesting that this region may also be implicated in attention to status-enhancing actions. Nonetheless, these possibilities have not been directly tested and await further research.

As mentioned at the beginning of this section, fMRI research on dominance relies heavily on visual cues such as body posture and facial expression. However, previous work from the social psychological literature suggests a number of visually accessible social categories that also influence perceived dominance, including age (Hehman et al., 2014; Karafin, Tranel, & Adolphs, 2004; Montepare & Zebrowitz, 1998), gender (Karafin et al., 2004; Marsh et al., 2009), and race (Hess, Blairy, & Kleck, 2000; Navarrete, McDonald, Molina, & Sidanius, 2010). At present, it is unclear the extent to which neural responses to others may be sensitive to the interaction between the above social dimensions and features conveying facial dominance, such as eye gaze (Mignault & Chaudhuri, 2003; Terburg, Hooiveld, Aarts, Kenemans, & van Honk, 2011; but see Richeson, Todd, Trawalter, & Baird, 2008) and facial width-to-height ratio (Carré & McCormick, 2008; Carré et al., 2009; Hehman et al., 2014). To better understand the relationship between perceived dominance and status-based attention, future work will also need

to examine the interaction between dominance-related visual antecedents and perceived status level along various social dimensions (e.g., prestige, wealth: Cheng & Tracy, 2013).

In summary, a number of fMRI studies have explored brain responses to perceptual antecedents conveying physical or social dominance (Chiao et al., 2008; Freeman et al., 2009; Haaker et al., 2016; Marsh et al., 2009; Quirin et al., 2013). Results from these studies suggest a network of brain areas responsive to social dominance that includes prefrontal regions (viz., VLPFC, DLPFC) and the inferior parietal cortex. Notably, some of these regions have also been found to differentiate individuals based on social status along dimensions not explicitly tied to dominance (Cloutier & Gyurovski, 2013, 2014; Farrow et al., 2011; Zink et al., 2008). In addition to the regions discussed above, other regions including the ventral medial prefrontal cortex (VMPFC), amygdala, and occipitotemporal regions (viz., middle/superior temporal and lingual gyri) have shown sensitivity to visual antecedents of dominance (e.g., Marsh et al., 2009). Due to a lack of convergence across studies, it is unclear whether these regions are responsive to the differentiation of and attention to dominance or some other aspect of the experimental paradigm. In the case of the VMPFC, damage to this area does not appear to affect the ability to differentiate dominance levels, but it may affect the normal use of social categories such as age and gender during judgments of dominance (Karafin et al., 2004). We revisit the role of this region when reviewing the neuroimaging evidence for status-based evaluation (see below). Finally, the precise relationship between the involvement of all aforementioned regions in the initial perception of dominance and its downstream consequences requires further investigation.

**Differentiation and attention to knowledge-based antecedents of status.** Although the neural correlates of perceptual antecedents of dominance have received considerable attention, relatively few fMRI studies have directly examined the neural response to alternative status dimensions. This is perhaps due to the fact that many dimensions like prestige or wealth are not always perceptually accessible, but rather depend on the availability and recall of person knowledge. One fMRI study by Zink and colleagues (2008) assigned status to participants and virtual confederate players based on task competence. Rather than dominance, social status was conveyed by skill level (e.g., one star for low skill status vs. three stars for high skill status) of fictitious players (depicted via a photograph) in an incentivized but non-competitive game. Results revealed greater activity in the right inferior parietal cortex (extending to occipital regions) as participants viewed higher relative to lower status players. As discussed in the previous section, this region has been implicated in attention to dominant individuals (Freeman et al., 2009) and to the differentiation of status more broadly (Chiao et al., 2009; Cloutier et al., 2012; Cloutier & Gyurovski, 2013). In addition to the inferior parietal cortex, the bilateral DLPFC, and ventral striatum also preferentially responded to high- versus low-status players. These regions are frequently implicated in attention or salience (Corbetta et al., 2008; Corbetta & Shulman, 2002; Zink, Pagnoni, Chappelow, Martin-Skurski, & Berns, 2006). Taken together, these results are consistent with behavioral findings implying that high-status individuals may be more readily identified and attended (Dalmaso et al., 2011; DeWall & Maner, 2008; Fiske, 2010; Foulsham et al., 2010; B. C. Jones et al., 2010; Liuzza et al., 2016; Maner et al., 2008; Ratcliff et al., 2011; Shriver et al., 2008).

As mentioned in the preceding section, regions within the inferior parietal cortex are thought to differentiate the status of others along a number of dimensions (Chiao, 2010; Chiao et

al., 2009; Cloutier et al., 2012; Cloutier & Gyurovski, 2013; Parkinson, Liu, & Wheatley, 2014; Yamakawa, Kanai, Matsumura, & Naito, 2009). Originally posited to support the representation of numerical magnitudes (Dehaene, Piazza, Pinel, & Cohen, 2003; Pinel, Dehaene, Rivière, & LeBihan, 2001; Pinel, Piazza, Le Bihan, & Dehaene, 2004; Shuman & Kanwisher, 2004), subsequent work has implicated the IPS in comparisons of both numbers and social status levels (Chiao, 2010; Chiao et al., 2009). Chiao and colleagues (2009) observed greater IPS activity for small versus large number/status differences. Another study comparing physical distance (e.g., which object is closer to you?) and social distance (e.g., which face would you prefer as an interaction partner?) found overlapping activity in bilateral superior parietal lobule (SPL) during both kinds of distance judgment (Yamakawa et al., 2009). A more recent study adopting a multivariate pattern analysis approach and looking at an even wider range of distance computations (viz., physical, social, and temporal) found that distributed patterns of local activity in the right IPL (i.e., angular and supramarginal gyri) predicted subjective distance judgments (e.g., nearer vs. farther) across all domains (Parkinson et al., 2014). Taken together, these findings suggest that hierarchy differentiation may be supported by a relatively more domain-general neural mechanism for distance computation in regions of the parietal cortex surrounding the IPS.

Although the studies above focused on explicit status comparisons, others have found that the parietal cortex is also sensitive to perceived social status when no explicit comparisons of status are required (Cloutier et al., 2012; Zink et al., 2008). These findings suggest that IPS activity may be indexing spontaneous status-based comparisons relative to the perceiver's own status (Cloutier & Gyurovski, 2013; Swencionis & Fiske, 2014). In line with this possibility, the visuospatial literature suggests that egocentric representations of object positions relative to the

self are associated with a nearby area of parietal cortex, the SPL (Naito et al., 2008; Neggers, Van der Lubbe, Ramsey, & Postma, 2006)<sup>3</sup>.

In sum, the above findings suggest that the tendency to spontaneously register the status of others within a given social hierarchy may be a fundamental component of navigating one's milieu. This process appears to be supported by parietal regions centering on the IPS, a region implicated in domain-general computations of numerical, physical, temporal, and social distance. Although the research reviewed here is promising, future work using larger samples to parametrically manipulate the relationship between the status (i.e., distance) of perceivers and targets is needed to confirm this hypothesis.

As discussed in our review of the non-human primate (see the online supplemental material) and human behavioral literatures, the way social status is attended may also depend on the nature of social hierarchical structures (Case & Maner, 2014; Hays & Bendersky, 2015; Maner et al., 2007; Sapolsky, 2004; Sapolsky & Share, 2004). In a pair of fMRI experiments exploring the hypothesis that hierarchy stability may shape neural responses (Zink et al., 2008), participants played a simple perceptual judgment game with other players varying in status (i.e., skill) level. The first experiment was characterized by a stable hierarchy. In the stable hierarchy context, participants always remained at the intermediate status level. The second experiment was characterized by an unstable hierarchy. In the unstable hierarchy context, participants'

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<sup>3</sup> This may explain the discrepancy observed in the neural correlates of distance judgments between the study by Yamakawa and colleagues (2009: SPL) and the study by Parkinson and colleagues (2014: IPL). Although both studies relied on comparative judgments, the judgments prompted by Yamakawa and colleagues (2009) were in reference to the self (e.g., "which of two objects/people is closer to the self?"). Judgements prompted by Parkinson and colleagues (2014) were in reference to locations of an anchor stimulus relative to a subsequent target stimulus (e.g., "is the object/timeframe/person in the target stimulus closer/farther than in the anchor stimulus?").

status levels were updated based on bogus task feedback. Results showed that in both stable and unstable hierarchies, high-status others elicited greater activity in a number of brain regions (inferior parietal cortex, DLPFC, ventral striatum) than low-status others. However, interestingly, additional regions were preferentially recruited in the unstable hierarchy context. Specifically, the amygdala and the MPFC (regions implicated in social salience and emotion processing) were preferentially responsive when viewing high-status versus low-status players in an unstable hierarchy. This pattern of activity was observed despite status level being conferred based on bogus performance feedback on a task that was not diagnostic of actual ability. These findings highlight that individuals may be more likely to experience heightened attention and emotional arousal stemming, for example, from perceived threats to their relative rank (Cheney & Seyfarth, 2008; Cloutier, Norman, Li, & Berntson, 2013; Fiske, 2010; Sapolsky, 2005). However, it is notable that increased attention to dominant or threatening others may not necessarily translate into learning and memory (Haaker et al., 2016).

In summary, a small but growing number of fMRI studies have explored the neural differentiation of and attention to others varying in status as inferred from person knowledge (Chiao et al., 2009; Cloutier et al., 2012; Cloutier & Gyurovski, 2013; Farrow et al., 2011; Zink et al., 2008). Results from these studies suggest an extensive network of brain areas implicated in the general differentiation of status and social distance (parietal cortex: IPS, IPL, SPL), attentional engagement (DLPFC), and social salience (MPFC, amygdala, ventral striatum). Notably, many of these regions have also been implicated in differentiation of and attention to dominance, with the parietal cortex and DLPFC responding most consistently to dominance. As previously mentioned, the IPS is thought to index social status differentiation (Chiao et al., 2009; Cloutier et al., 2012; Farrow et al., 2011), whereas the DLPFC has been implicated in top-down

attention to socially salient stimuli (Corbetta et al., 2008; Corbetta & Shulman, 2002; Zink et al., 2006). Other regions appear with less consistency across status dimensions (including the MPFC, amygdala, and ventral striatum), insinuating that activity in these regions may depend on the status dimension presented or on task particularities. Finally, other regions in the occipitotemporal cortex (viz., fusiform, STG/STS, lingual gyrus) have also been responsive to different knowledge-based antecedents of social status (e.g., Cloutier & Gyurovski, 2013; Zink et al., 2008). These regions may be involved in the perception of faces, commonly used as stimuli in existing work. However, the precise role of these regions requires further study.

As with dominance, it will be helpful for future work to uncover the precise relationship between the above regions and the processes supporting the perception, integration, and attention to status antecedents along multiple social dimensions varying in contextual importance. Given its presumed role in differentiating social distances and status, the IPS may be sensitive to relative status differences rather than the importance of one status dimension (e.g., financial status) over another (e.g., intellectual status). However, the evaluative consequences of considering information from multiple status dimensions may be integrated by other regions, such as the VMPFC, amygdala, and ventral striatum (see the section below on status-based evaluation for further discussion of these regions). Using functional connectivity analyses to explore the relationship between these regions, one study on dominance (Marsh et al., 2009) found positive functional connectivity between the VMPFC and superior temporal sulcus (STS) with the VLPFC. Although still speculative, one possibility is that the VLPFC inhibits inappropriate behaviors that may be especially costly in the presence of a dominant target. This possibility is consistent with previous work highlighting the role of the VLPFC in response inhibition (Aron et al., 2004; Cools et al., 2002; Elliott et al., 2000; Levy & Wagner, 2011).

Further work is needed to replicate and extend (e.g., to other status dimensions) these intriguing yet tentative initial findings.

**Time course of status-based differentiation and attention.** Although the preceding sections suggest that some headway is being made in delineating the anatomical correlates of perceived social status, there has been comparatively little research on the time course of status-based differentiation and attention. Although not the focus of this review, a number of studies have used ERP to explore the effects of *perceiver* SES on social-cognitive functioning (for a review, see Varnum, in press). Extant ERP work on *perceived* SES has focused primarily on hierarchies structured by competition (Breton et al., 2014; Santamaría-García, Burgaleta, & Sebastián-Gallés, 2015) or dominance (Chiao et al., 2008). In the present section, we review some of these findings and consider directions for further research.

Findings from the ERP literature indicate that differentiation of hierarchical rank may be observed as early as 150–220 ms, with higher status faces eliciting larger N170/N200 components (Chiao et al., 2008; Pineda, Sebestyen, & Nava, 1994; Santamaría-García et al., 2015). The N170 is thought to be responsive to the extent of identity-related processing in faces (Eimer, 2011). However, some have questioned the reliability of status-based differentiation at the N170, positing previous findings (e.g., Chiao et al., 2008) may have confounded status with gaze and head orientation (cf. Breton et al., 2014). Attempting to address this critique, a subsequent study by Santamaria-Garcia and colleagues (2015) presented participants with a photograph (i.e., a face with direct gaze and neutral expression) and status level information (i.e., one–three stars) of an individual immediately prior to competing against that person in a perceptual judgment trial. Results showed larger N170s in response to higher ranked competitors, providing initial evidence that ascribed status levels may affect early stages of face

processing. Future work should determine the N170's generalizability to other status dimensions outside of competitive contexts in which identity processing may prove more advantageous (e.g., moral status).

On the whole, research into the effects of status on early ERPs is still in its infancy. Two other early ERP components, the P200 and N200, have been implicated in impression formation. These components may prove especially relevant to understanding the relationship between status dimensions and antecedents on the one hand and attention and threat processing on the other. For example, greater P200 amplitudes have been shown to relate to vigilance processing of threatening and distinctive stimuli (Carretié, Martín-Loeches, Hinojosa, & Mercado, 2001; Eimer, Holmes, & McGlone, 2003; Halgren & Marinkovic, 1995; Ito & Bartholow, 2009; Kubota & Ito, 2009; Schutter, de Haan, & van Honk, 2004). When viewing faces, processing shifts at the N200 are thought to index greater selective attention to targets that one might benefit from processing more deeply, such as ingroup members (Kubota & Ito, 2016). Additional research is needed to determine the reliability of effects at this time window and the relevancy of these components to social status perception and evaluation.

In summary, the present ERP literature on the differentiation of social status in others and its downstream consequences is relatively limited compared to the fMRI literature. Due to the small number of studies, each relying on different experimental designs and operationalizations of status, definitive comparisons and integration across studies is still premature. As with fMRI studies, more careful consideration of the experimental context is needed when comparing across existing studies and in the development of future research (e.g., how is status being presented and processed by participants?). Future work may build on existing findings by considering the time course involved in the perception of targets varying in other dimensions of social status

beyond competition-related contexts and the possible interaction between such dimensions. Relatively few ERP studies have assessed how varying status antecedents shape the time course of attention (or evaluation). For example, a direct comparison of status-based differentiation and attention as a function of perceptual (Chiao et al., 2008) versus knowledge-based (Breton et al., 2014) antecedents may prove useful to interpret findings from previous and future work. Additionally, an integration of ERP work on perceiver status (for a review, see Varnum, in press) and perceived status in others (reviewed here and in the section below on the time course of status-based evaluations) represents a promising new horizon in research on the time course of social status perception (e.g., as a dyadic phenomenon: see Bergsieker, Shelton, & Richeson, 2010). Although the ERP literature on social status perception is presently limited, we are optimistic that the coming years will bring greater consensus in our understanding of the time course of status-based perception and attention.

### **Summary**

In this section, we considered behavioral and neuroimaging evidence for status-based differentiation and its possible consequences for social attention. Findings from the behavioral literature suggest that high-status individuals along a number of status dimensions (e.g., dominance, prestige, SES) frequently capture our attention and are better remembered. Nonetheless, in some contexts, low-status individuals may capture a larger share of attention, such as during hierarchy instability, when greater social status does not necessarily imply greater power, or when the perceiver's own status (e.g., as a low-status person) becomes salient. The behavioral literature is complemented by growing fMRI and ERP literatures on social status perception.

Findings from fMRI implicate an extensive network of regions associated with the differentiation of and attention to social status. This network is comprised of regions implicated in the general differentiation of status and social distance (parietal cortex: IPS, IPL, SPL), attentional control (DLPFC), and social salience (MPFC, amygdala, ventral striatum). As discussed in the following section, we suggest that the VMPFC, amygdala, and the ventral striatum are also involved in status-based evaluation. Given that these regions are inconsistently observed in studies of status differentiation and status-based attention reviewed in the present section, it is possible that these regions influence attention in a value-dependent manner (Marsh et al., 2009). When perceiving targets varying along the dominance dimension (vs. other dimensions of status), regions tied to attentional control (DLPFC) and inhibition (VLPFC) may be especially relevant. Finally, other regions in the occipitotemporal cortex (viz., fusiform, STG/STS, lingual gyrus) have been responsive to different knowledge-based antecedents of social status (e.g., Cloutier & Gyurovski, 2013; Zink et al., 2008). The precise role of these regions requires further study.

Although relatively more limited, the ERP literature suggests that perceived social status may affect stages of face processing as early as 170 ms post-stimulus onset. For a review of how status may affect later stages of face processing, see the section below on the time course of status-based evaluations. Future work may consider the anatomical correlates and time course of attending to individuals varying along multiple status dimensions as a function of antecedent type (e.g., perceptual vs. knowledge-based) and context (e.g., competitive vs. non-competitive). Having reviewed the attentional consequences of perceived status, we now turn to the consequences of status in the evaluative domain.

## Consequences of Perceived Status in Person Evaluation

### Behavioral Evidence of Status-Based Evaluation

Generally, high-status individuals are believed to be more positively evaluated than low-status individuals. This tendency has been observed from a young age (for a review, see Koski, Xie, & Olson, 2015). Notably, the importance of different social dimensions (e.g., dominance vs. prestige) in driving status-based evaluations appears to change over the course of development. In very young children (preschoolers), aggressive peers are more often imitated (Abramovitch & Grusec, 1978), judged as more attractive (Hawley, Johnson, Mize, & McNamara, 2007), and preferred as playmates (Hawley, 2002; D. C. Jones, 1984; La Freniere & Charlesworth, 1983; Strayer & Trudel, 1984) compared to less aggressive peers. However, as children mature, dominance defined in the classic sense of physical formidability appears to lose its appeal relative to other dimensions of status such as social competence (Hawley, 1999). Although it may depend on the dimension conferring social status, the relationship between high status and positive evaluations is often assumed to persist into adulthood. Supporting this assumption, individuals with higher status (typically operationalized in terms of dominance, power, or SES) are perceived as more competent and valued compared to individuals with relatively lower status (C. Anderson & Kilduff, 2009a, 2009b; Fiske, 2010; Flynn et al., 2006; Varnum, 2013). Moreover, the fashion choices of high-SES individuals are on average preferred over those of low-SES individuals (Galak, Gray, Elbert, & Strohming, 2016). This positivity bias for high-status individuals and their choices extends to high-status groups or institutions more generally (Fiske et al., 2016). In one study (Jost & Burgess, 2000: Study 1), university students from two different institutions were assigned to low- and high-status conditions through

bogus reports of their institution's typical graduate SES outcomes. In both conditions, participants rated individuals at the high-status institution more favorably on a number of attributes conveying competence (e.g., intelligence, work ethic, skill: cf. Oldmeadow & Fiske, 2007; Varnum, 2013). Notably, participants whose institution was ascribed with lower status nonetheless showed institutional favoritism when evaluations were based on traits like friendliness, honesty, and social appeal (see also Mullen, Brown, & Smith, 1992). Such attitudinal ambivalence among low-status individuals increases for individuals who believe the existing social class structure is legitimate (Ellemers, Wilke, & Van Knippenberg, 1993; Jost & Burgess, 2000; Jost & Hunyady, 2005).

Research on lay beliefs about social status (specifically, SES) provides some convergent evidence that high-status individuals are generally perceived to have positive attributes. However, there is considerable variability in the associations people make between various traits and SES (Varnum, 2013). These popular conceptions of status (at least in the U.S. context) are often not in line with more objective data. In one study comparing lay beliefs to objective indices, lay beliefs about correlates of SES ran contrary to objective data on 9 out of 21 variables (Varnum, 2013). Variables in which popular opinion deviated most strikingly from more objective indices included honesty, conformity, and collectivism. Participants perceived these variables to be positively correlated with SES despite these variables showing negative correlations in the objective data. Moreover, lay beliefs failed to show any reliable positive correlations between SES and negative attributes (e.g., indifference). These perceived correlations were relatively uniform across the wide spectrum of SES levels sampled in that study, implying some consensus that high-SES individuals possess more positive traits than they do in reality.

In contrast to the above research suggesting that high status is generally perceived in a positive light, other work indicates that high status may sometimes carry a negative rather than a positive association depending on the status dimension (Cloutier & Gyurovski, 2014; Fragale, Overbeck, & Neale, 2011). For instance, status conferred by moral standing, suggested to be integral to the maintenance of human social hierarchies (Fiske, 2010; Rai & Fiske, 2011), typically elicits positive evaluations from infancy (Hamlin & Wynn, 2011; Hamlin et al., 2010) through adulthood (Cloutier et al., 2012; Cloutier & Gyurovski, 2014; but see Pavarini & Schnall, 2014). However, when status is defined strictly in terms of wealth or power (i.e., control over resources), high-status individuals can be perceived more negatively than low-status individuals (Fiske et al., 2002; Fragale et al., 2011; Hoffman, McCabe, Shachat, & Smith, 1994), eliciting in some cases feelings of envy (Cuddy, Fiske, & Glick, 2007; Fiske et al., 2007). Consistent with the adoption of fear-based coercion in dominance-related pathways to status attainment and admiration-based deference in prestige pathways to status attainment, dominant individuals tend to be disliked whereas prestigious individuals tend to be liked (Cheng et al., 2013; Coie & Kupersmidt, 1983; Dodge, 1983; Hawley, 1999, 2002; Kalma et al., 1993). Moreover, dominance-oriented individuals demonstrate greater hubristic pride, narcissism, aggression, and disagreeableness in both peer- and self-report data (Cheng et al., 2010). Using the same measures, prestige-oriented individuals show greater authentic pride, agreeableness, and self-esteem in both peer- and self-report data.

Differences in status-based evaluations may also depend on the context in which we encounter others and on the relative importance of each status dimension in that context. For example, in the context of potential external threat, dominant individuals may be more positively regarded than in times of relative tranquility (Re, DeBruine, Jones, & Perrett, 2013; Spisak,

Dekker, Kruger, & Van Vugt, 2012; Van Vugt, 2006; Van Vugt et al., 2008; Van Vugt & Spisak, 2008). Additionally, greater financial status may lead to more positive evaluations in corporate environments than in academic environments. Future work may expand on these findings by considering alternative contexts in which other dimensions of social status may be favored and/or interact.

In summary, evidence from the behavioral literature indicates that high status typically elicits positive evaluations, particularly when status level is achieved through social competence or prestige (Cheng & Tracy, 2014; Hawley, 1999). However, there is considerable variability in the way status is evaluated, with overly positive popular conceptions sometimes at odds with objective indices (Varnum, 2013). Moreover, the evaluation of status may often depend both on the status dimension and relative importance of that dimension in a given context. Going forward, it will be important to provide a clearer understanding of how multiple status dimensions inform evaluations of others, together with more perceptually available social category information (e.g., race, age, gender: Fiske et al., 2016; Sanchez & Garcia, 2012).

### **Neuroimaging Evidence of Status-Based Evaluation**

As in our review of the neural correlates of status-based attention and differentiation, we now consider the potential neural substrates of status-based evaluation. We first consider neural responses during status-based evaluations from perceptual and knowledge-based antecedents of status. Unlike in our review of the neuroimaging literature on status-based differentiation and attention, we combine our review of perceptual and knowledge-based antecedents. This is because neuroimaging studies on status-based evaluation to date have relied heavily on knowledge-based antecedents of status. Surprisingly few studies examine the neural evaluation of status as gleaned from perceptual antecedents (for possible approaches, see Mende-Siedlecki,

Said, & Todorov, 2013; Vernon et al., 2014; Walker & Vetter, 2016). This represents one area that may be addressed in future research. In addition, because of the scarcity of ERP research on status, we present a limited amount of ERP research in this section. Finally, we consider the role of the reward network in the perception of social status cues.

**Status-based evaluation from perceptual and knowledge-based status antecedents.**

A number of fMRI investigations have implicated the ventromedial prefrontal cortex (VMPFC) in status-based evaluation (Cloutier et al., 2012; Cloutier & Gyurovski, 2014; Ly, Haynes, Barter, Weinberger, & Zink, 2011). Consistent with this region's integral role in social cognition (Adolphs, 2009; Flagan & Beer, 2013), lesion studies have linked the VMPFC to a range of abilities from theory of mind and empathy (Leopold et al., 2012; Shamay-Tsoory, Aharon-Peretz, & Perry, 2009; Shamay-Tsoory, 2011; but see Bird, Castelli, Malik, Frith, & Husain, 2004) to person and object evaluation (Croft et al., 2010; Fellows & Farah, 2007; Gläscher et al., 2012; Henri-Bhargava, Simioni, & Fellows, 2012; Karafin et al., 2004). Individuals with damage to the VMPFC show impairments in emotion recognition (Heberlein, Padon, Gillihan, Farah, & Fellows, 2008; Hornak, Rolls, & Wade, 1996), the use of social categories in the differentiation of dominance (Karafin et al., 2004), and in moral judgment (Croft et al., 2010). In fMRI studies on healthy participants, the VMPFC has been implicated in the generation of affective value in contexts ranging from purchasing preferences to approach-avoidance motivation (Adolphs, 2009; Berridge & Kringelbach, 2008; Chib, Rangel, Shimojo, & O'Doherty, 2009; Fellows, 2007; Frith & Frith, 2012; Roy, Shohamy, & Wager, 2012). Importantly, this region is also implicated in affective or moral evaluations of others (Adolphs, 2009; Cloutier et al., 2012; Cloutier & Gyurovski, 2014; Croft et al., 2010; Cunningham, Johnson, Gatenby, Gore, & Banaji, 2003; Singer, Kiebel, Winston, Dolan, & Frith, 2004) as well as oneself (Gusnard, Akbudak, Shulman, & Raichle, 2001; Izuma, Saito, & Sadato, 2010; Moran, Macrae, Heatherton, Wyland, & Kelley, 2006). Consistent with the evidence reviewed above, it is thought that VMPFC activity may reflect the integration of social information during person evaluation (Flagan & Beer, 2013; Roy et al., 2012).

In line with its putative involvement in social evaluations, evidence suggests that the VMPFC is sensitive to perceived social status. One fMRI study (Cloutier et al., 2012) found greater VMPFC activity when forming general impressions of faces previously paired with occupations varying in moral status (e.g., “is a tobacco executive” or “does cancer research”). In other words, the VMPFC was sensitive to the implied moral status of individuals and especially to targets paired with person knowledge denoting high (vs. low) moral status. In a subsequent study (Cloutier & Gyurovski, 2014), instead of using descriptive knowledge to convey social status, participants were presented with individual faces superimposed on colored backgrounds representing the individual’s level (high, equal, or low) along a given dimension (financial or moral) of social status. Results revealed that VMPFC activity was predicted by the interaction between the target’s presented status dimension (financial vs. moral) and status level. As previously reported (Cloutier et al., 2012), VMPFC activity was greater when viewing targets with higher compared to lower moral status. However, the reverse was found for the financial status dimension. Namely, VMPFC responses were greater for targets with *lower* compared to *higher* financial status. Post-scan ratings revealed that targets with low moral status were judged as less likeable than targets with similar or higher moral status. However, this explicit evaluative pattern was not reliably observed for the different levels of financial status. Taken together, these results challenge a common assumption in the behavioral literature reviewed above that high status individuals are evaluated positively, suggesting instead that status-based evaluations depend on the status dimension and the context.

Beyond the VMPFC, there are a number of brain regions that may be involved in the evaluation of perceived social status. Extant research suggest that the amygdala, superior temporal cortex (STS/STG), lateral prefrontal cortex, cuneus, parietal cortex, insula, and ventral

striatum may be components of networks recruited during the evaluation of social hierarchical information (Cloutier et al., 2012; Cloutier & Gyurovski, 2014; Mason et al., 2014; Singer et al., 2004). Recent reviews (Koski et al., 2015; Pornpattananangkul, Zink, & Chiao, 2014; Swencionis & Fiske, 2014; Watanabe & Yamamoto, 2015) provide some insight into anatomical connections and possible functional relationships between brain regions involved in status perception broadly (see also Marsh et al., 2009). However, much of our understanding of neural networks supporting status-based person evaluation remains somewhat tentative. In particular, more work is needed to characterize the interface of networks supporting status-based differentiation and attention versus status-based evaluation. The implementation network-based analyses such as partial least squares (PLS: McIntosh, Chau, & Protzner, 2004; McIntosh & Lobaugh, 2004) or psychophysiological interaction (PPI: Friston et al., 1997) in addition to traditional contrast-based analyses may lead to a better understanding of the neural networks supporting status-based evaluation, among other social cognitive processes (e.g., Cloutier, Li, Mišic, Correll, & Berman, in press).

**Subjective status and reward.** Social status may also affect person evaluations via reward processing. Consistent with studies on non-human primates linking high status with reward (J. R. Anderson, 1998; Andrews, Bhat, & Rosenblum, 1995; Deaner et al., 2005), human neuroimaging studies find that perceiving high-status individuals or improving one's own status elicits activity in brain regions associated with reward processing (e.g., Ly et al., 2011; Zink et al., 2006). The neural reward system is comprised of the dopaminergic ventral tegmental area and substantia nigra in the midbrain and the nucleus accumbens in the ventral striatum (Ikemoto & Panksepp, 1999; Schultz, 1998; Schultz, Dayan, & Montague, 1997; Wise & Hoffman, 1992; Wise & Rompre, 1989) as well as their cortical afferents. Here, we review work on sensitivity to social status in the ventral striatum, as the literature has focused primarily on this region. Notably, the ventral striatum and its main cortical afferents (e.g., orbitofrontal cortex, MPFC, amygdala) are thought to be relatively flexible in their responses to reward, showing sensitivity to multiple attributes of rewards, including their degree of relevance, anticipation, and enjoyment (e.g., Fareri & Delgado, 2014; Kirsch et al., 2003; Pessiglione, Seymour, Flandin, Dolan, & Frith, 2006; for reviews, see Berridge & Kringelbach, 2008; Ruff & Fehr, 2014).

Previous work has found striatal sensitivity to perceived high status in contexts where higher status individuals are not in direct competition with lower status individuals. In the previously discussed study by Zink and colleagues (2008), the participant's and virtual confederates' status levels were assigned based on task competence (e.g., one star for low status vs. three stars for high status) in an incentivized but non-competitive perceptual judgment game. It was found that viewing a high-status (vs. low-status) player's face and rank at the start of each trial elicited greater activity in the ventral striatum. Notably, this striatal preference for high-versus low-status co-players was observed under both stable and unstable hierarchical contexts.

One possibility is that participants were more motivated by the rewarding experience of outperforming the putatively more skilled high-status player. Indeed, in other similar incentivized non-competitive decision-making studies not explicitly involving social status, greater ventral striatal activity has been observed both for absolute individual gains but also when participants obtain better outcomes (e.g., win more money, lose less money) than another player (Bault, Joffily, Rustichini, & Coricelli, 2011; Dvash, Gilam, Ben-Ze'ev, Hendler, & Shamay-Tsoory, 2010; Fareri & Delgado, 2014; Fliessbach et al., 2007). Another example of status-based reward has been suggested to stem from the use of observed moral behavior during impression formation (Uhlmann et al., 2015). Although moral character or reputation are not necessarily used to infer status, they may be considered as such insofar as individuals are differentiated along a moral dimension (e.g., trustworthiness, integrity). Notably, both one's own acquired moral standing (Izuma, Saito, & Sadato, 2008; Izuma et al., 2010) and the perceived moral standing of others (Delgado, Frank, & Phelps, 2005; Singer et al., 2004) has been found to elicit greater striatal activity, suggesting that the moral dimension of social status may be closely tied to reward. However, direct contrasts of moral status with other dimensions of social status are needed. Taken together, these findings suggest that the ventral striatum may be particularly sensitive to favorable social comparisons that may elevate one's status along any social status dimension (for reviews, see Bhanji & Delgado, 2014; Swencionis & Fiske, 2014). Although receiving better outcomes than high-status targets is certainly rewarding in competitive contexts (e.g., schadenfreude: Cikara & Fiske, 2012, 2013), it appears this may be the case even when the perceiver is not in direct competition with others (Dvash et al., 2010; Takahashi et al., 2009; Zink et al., 2008). The degree to which this reward may vary as a function of status dimension and the perceiver's preferred pathway to status attainment remain open questions.

Although the preceding literature suggests that earning higher status and viewing higher status individuals elicits neural activity in the ventral striatum, the results of one fMRI study (Ly et al., 2011) suggest that status-based reward responses may also depend on perceiver characteristics, such as their subjective status. Ly and colleagues (2011) presented participants with two target faces in sequence. Each face was paired with a short statement ascribing low or high SES (e.g., “This is Jane. Jane’s status is lower than your status.”). After both faces were individually presented, participants viewed them again together and were required to make a status-relevant judgment (e.g., “Which person attended an Ivy League college?”). Results showed greater ventral striatal activity when responding to questions relevant to others with similar (vs. dissimilar) status relative to the participant’s own subjective status. For example, participants high in subjective status would typically show larger ventral striatum responses for the Ivy League example question provided above relative to a question more relevant to others with lower status (e.g., “Which person has been fired from more than one job?”). In contrast to work with non-human primates finding that high-status conspecifics typically elicit greater reward responses (J. R. Anderson, 1998; Andrews et al., 1995; Deaner et al., 2005), Ly and colleagues’ (2011) results indicate that individuals with a similar level of social status may be more rewarding. It remains to be determined whether this interaction is the result of in-group evaluative bias, status-specific tendencies for downward/upward comparison, or some combination of the two<sup>4</sup>. Nonetheless, these neuroimaging results once again provide evidence that high-status individuals may not necessarily elicit a positive or rewarding evaluation.

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<sup>4</sup> If findings from Ly and colleagues (2011) are due to the value of ingroup members, it is possible that a similar finding may also be observed in non-human primate species. One way to provide a clearer test of this hypothesis may be to replicate the above studies with ingroup and

**Time course of status-based evaluations.** In contrast to the fMRI literature exploring the relationship between social status and evaluation, there has been almost no research exploring the time course of status-based evaluations. However, two recent ERP investigations suggest a potential relationship between social status and downstream evaluative ERP components.

The P300 is a positive going deflection, occurring between 300 ms and 800 ms. Variation in this component has been linked to person evaluation (Cacioppo, Crites, Gardner, & Berntson, 1994) where enhanced amplitudes occur in response to negatively evaluated conspecifics (Bartholow, Fabiani, Gratton, & Bettencourt, 2001; Ito & Cacioppo, 2000; Kubota & Ito, 2007) or stimuli with greater motivational salience (Nieuwenhuis, Aston-Jones, & Cohen, 2005). Evidence for the potential involvement of the P300 in social status was found in recent research in our laboratory. To explore how social status dimensions and social status levels affect downstream ERP responses, we trained participants to associate targets with either high or low financial or moral status (Gyurovski, Kubota, Cardenas-Iniguez, & Cloutier, under review). Participants later viewed the targets during EEG collection and were instructed to identify their status level. The results revealed a dissociation of P300 amplitudes to targets varying in social status, such that greater P300 amplitudes were observed in response to high financial and low moral status targets, relative to low financial and high moral status targets, respectively. The research converges with previous fMRI social status research (Cloutier et al., 2012; Cloutier & Gyurovski, 2014) and is consistent with the idea that evaluations of high status targets are not necessarily positive (e.g., greater P300 amplitudes to high financial status targets). This research

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outgroup members varying in status. For non-human primates, ingroup and outgroup members may come from the perceiver's own group versus another kin group, respectively.

also underscores the importance of considering potential interactions between status dimensions and levels. In addition, contrary to ERP studies reviewed in the above section on the time course of status-based differentiation and attention, we did not observe any amplitude differences in early components implicated in selective attention (i.e., N100, P200, and N200), indicating these processes may manifest later. One notable factor about this study is that in contrast to the majority of ERP person perception and evaluation studies, social status was inferred from person knowledge rather than perceptual antecedents (i.e., faces were counterbalanced across conditions). Future ERP research should differentiate the influence of these status antecedents on person perception and evaluation in relation to the time course of social status processing.

Additional research also highlights the relationship between social status and ERP components relevant to person evaluations. In another study (Breton et al., 2014), participants learned their own rank and that of several competitors (each represented by a face) based on performance from several rounds of different cognitive tasks. ERPs were measured as participants passively viewed each competitor's face (absent status information) in preparation for a subsequent judgment of the competitor's status level relative to the participant's. A greater late positive potential (LPP: 400–700 ms window) was observed for high-status competitors compared to middle- and low-status competitors. The authors interpreted this finding as evidence of sustained cognitive processing, consistent with previous work on the LPP (Gable & Adams, 2013; Schupp et al., 2000). Although it is unclear the degree to which status sensitivity in the LPP is linked to motivated engagement with and/or more negative evaluations of high-status individuals, future studies systematically manipulating the reward value and level of status may prove helpful in delineating the role of the LPP in the time course of status perception.

Future work may also consider the extent to which two competing status dimensions may affect LPP response as a function of their relative importance.

### **Summary**

In this section, we considered behavioral and neuroimaging studies of status-based person evaluation. Findings from the behavioral literature indicate that high status typically elicits positive evaluations, particularly when status level is achieved through social competence or prestige. However, there is considerable variability in the way status is evaluated, with overly positive popular conceptions sometimes at odds with objective indices. Moreover, neuroimaging findings reveal that the evaluation of status depends both on the status dimension and its relative importance in a given context. Although more limited in scope, the fMRI literature on social status and reward highlights that high status in others may be perceived as rewarding, perhaps especially when the high status individual who is perceived reflects favorably on the perceiver (e.g., an ingroup member or a favorable social comparison). Future work may consider how different dimensions of status shape person evaluation and reward as a function of the social context and the perceiver's own social status.

Findings from fMRI implicate an extensive network of brain regions supporting status-based person evaluation. The VMPFC is thought to support the generation of affective value as a function of an individual's status (among other perceptual and knowledge-based characteristics). The ventral striatum may reflect the degree of reward value associated with the perception of targets varying in social status in distinct social contexts. Although not discussed at length in this section, other brain regions may also support status-based evaluations, including the amygdala, STS, and insula. However, these regions appear with less frequency across experiments and may be specific to the paradigms or stimuli used. Further work is needed to

better understand the role of these regions within the greater network of regions supporting status-based person evaluation.

The relatively scarce ERP literature converges with the fMRI literature, emphasizing the importance of considering how status dimensions may differentially shape status-based evaluations. From this literature it appears that social status affects later temporal stages capturing more sustained and evaluative cognitive processing (approximately 300–700 ms post-stimulus onset). The reviewed ERP research provides further evidence that high social status targets are not always evaluated positively. Future research should build upon this work to explore how the intersection of status antecedents, dimensions, and levels impacts the time course of status evaluation in different contexts.

### **Toward an Integration of Behavioral and Brain-Imaging Investigations of Status**

Research reviewed here suggests that across different social hierarchies, social status has a complex impact on the outcomes of person perception and evaluation. Although it can be said that great strides have been made by behavioral and brain-imaging investigations into the impact of social hierarchies and social status on how we perceive and evaluate others, this research area remains relatively underrepresented. For example, a simple search on the APA's PsycNET reveals 349 results for the search terms "race" and "social cognition" but only 92 results for the terms "social status" and "social cognition". In the neuroimaging literature, a similar difference exists. Searching "race" and "fMRI" yields 79 results, whereas searching "social status" and "fMRI" yields only 33 results. The disparity is even greater when searching for ERP instead of

fMRI (65 and 7 results, respectively)<sup>5</sup>. We suggest that the great variability in the constructs and approaches employed to explore the impact of social status on social-cognitive and evaluative processes may contribute to this state of affairs. Given the profound impact of social status on individuals and societies, it is paramount to move forward in our understanding of the pervasive influence it has on how we perceive, attend to, and evaluate others.

### **Reconceptualizing Status within a Social Neuroscientific Framework**

One contribution of the present review is to introduce a framework and common vocabulary for research on social status (see Figure 1). This framework differentiates *pathways* to status (i.e., strategies for the acquisition of social rank) from the different *dimensions* of status (i.e., social attributes on which others may be ranked such as competence, wealth, morality). Individuals may possess different *levels* of social status depending on the dimension in question (e.g., high in financial status, low in moral status). One's status level may be inferred and subsequently evaluated based on perceptual and/or knowledge-based *antecedents*. Finally, the *consequences* of an individual's level of social status on each dimension may be contingent on the *relative importance* of that dimension in the present social context or in a given social hierarchy. See Figure 2 for a detailed depiction of the multiple factors influencing status differentiation along a single dimension and for subsequent consequences in cognition, affect,

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<sup>5</sup> These search results do not differentiate between studies examining the race or status of the target versus that of the perceiver. The small number of studies on status overall suggests that more research is needed on both perceived status and the perceiver's status. However, our impression of the literature on status is that it is more frequently focused on the perceiver's status than on perceived status (for relevant reviews focused on the former, see Hackman, Farah, & Meaney, 2010; Pornpattananangkul et al., 2014; Swencionis & Fiske, 2014; Varnum, in press). This appears to be especially the case in structural brain imaging and developmental neuroscience research. As such, the relative lack of work on perceived status in social neuroscience may be even greater than the numbers cited here would suggest.

and behavior. This framework is important in that it clearly differentiates previous findings examining one aspect of status (e.g., strategic pathways) with findings more pertinent to another aspect of status (e.g., perceived level of status on a given dimension). In the present section, we attempt to contribute to the development of this framework by highlighting these conceptual distinctions and some limitations often overlooked in the literature and, in turn, suggesting promising future avenues of research in the area of social neuroscience.

**Summary of neuroimaging findings on perceived social status.** Despite the number of neuroimaging studies on social status, the diversity of operationalizations makes it difficult at this stage to provide a comprehensive neuroanatomical model of social status perception. Here, we attempt to sketch such a model, highlighting key opportunities for future study. We believe that investigating the neural correlates of processes pertinent to the strategic *pathways* to status acquisition, the *antecedents* of different status *dimensions*, the *level* of status; and the *relative importance* of a given dimension will provide critical opportunities to better understand the pervasive impact that social status has on our lives. Within the context of the present framework, we integrate existing work on the neural correlates of status attention and evaluation based on perceptual and knowledge-based antecedents. It is hoped that the present model will guide future research and theoretical refinement in the social neuroscience of status.

\* Insert Figure 2 Here \*

As addressed in this review, the consequences of social status for attention and evaluation are thought to be supported by largely distinct neural networks (see Figure 3). The identification of and attention to hierarchical rank (i.e., status levels) appears to be supported by frontoparietal (IPS, lateral PFC), amygdala, and occipitotemporal regions (occipitotemporal gyrus, ventral temporal cortex). As discussed in preceding sections, different regions within this network are

thought to support separate aspects of status-based differentiation and attention. Whereas the IPS is thought to index the differentiation of status levels or social distance (Chiao et al., 2009; Cloutier et al., 2012; Cloutier & Gyurovski, 2013; Parkinson et al., 2014; Yamakawa et al., 2009; Zink et al., 2008), frontal and temporal regions may support controlled attentional and behavioral adjustments required by the presence of a higher status individual, particularly if status is operationalized in terms of dominance (Haaker et al., 2016; Marsh et al., 2009). In the context of status hierarchy judgments, amygdala activity may contribute to learning, updating, and recall of status levels (see Haaker et al., 2016; Kumaran et al., 2012). It is unclear whether the amygdala is similarly responsive for other dimensions of social status.

Status-based evaluations appear to be supported by a distinct network including cortical midline regions (VMPFC), basal ganglia (caudate, ventral striatum), amygdala, temporal regions (STS/STG, ventral temporal cortex), and insular cortex. Similar to the network supporting status-based differentiation and attention, the different components of a status-based evaluation network may support different processes involved in person evaluation. Receiving reward-learning signals from midbrain efferents, the ventral striatum is thought to compute the expected reward value of individuals with varying status levels (Delgado et al., 2005; Singer et al., 2004; Zink et al., 2008). Consistent with its putative role in integrating different sources of information during person evaluation (Flagan & Beer, 2013; Roy et al., 2012), the VMPFC may serve to integrate status-related reward (from ventral striatum) and other information (e.g., status levels for other social dimensions) to compute the target's overall motivational value. Other regions such as the amygdala (see Singer et al., 2004; Yamakawa et al., 2009; Zink et al., 2008) and the superior temporal cortex (see Cloutier & Gyurovski, 2014; Mason et al., 2014; Singer et al., 2004) may facilitate attention to socially relevant characteristics of the target during evaluation,

such as status differentials between self and other, emotional expressions, and/or mental states. Finally, consistent with previous findings, activity in the insula (Singer et al., 2004) may reflect the degree of affective responses to targets varying in social status.

\* Insert Figure 3 Here \*

Although the two networks supporting status-based attention and evaluation are largely distinct, comparisons across studies suggest some potential overlaps, particularly in the ventral temporal cortex and the amygdala. The implication of ventral temporal cortex in both networks is perhaps unsurprising given that many neuroimaging studies have relied on the visual presentation of face stimuli. This suggests that the face processing network may be modulated by both the differentiation and the evaluation of a face's social status. The role of the amygdala across both status-based differentiation and evaluation is perhaps more varied. For studies of status-based differentiation, the amygdala appears to be most active for correct (and increasingly certain) judgments about recently learned dominance levels (Haaker et al., 2016; Kumaran et al., 2012). On the other hand, studies on status-based evaluation suggest the amygdala may be sensitive to likeable individuals (Singer et al., 2004; Yamakawa et al., 2009) but also when viewing high-status competitors in an unstable hierarchy (Zink et al., 2008). Both the attentional and evaluative scenarios are consistent with previous proposals indicating the amygdala is sensitive to the motivational relevance of the perceived social targets (Adolphs, 2010; Adolphs & Spezio, 2006; Buchanan, Tranel, & Adolphs, 2009).

**Insights from the neuroimaging literature on perceived social status.** The present review of the neuroimaging literature on the impact of status on person perception and evaluation highlights the advantages of adopting a social neuroscience perspective to advance our understanding of perceived social status above and beyond what has already been learned from the extensive behavioral literature. Nonetheless, because existing neuroimaging work on social status is also based on a variety of operationalizations and dimensions of status, further efforts will be required to go beyond the anatomical mapping of status-related processes (e.g., differentiation, attention, evaluation). The mapping of these neural substrates is nevertheless important, as it allows us to consider via reverse inference what neurocognitive mechanisms may be involved in the perception of status (Moran & Zaki, 2013; Poldrack, 2006). For example, fMRI studies have revealed that the differentiation of status is consistently supported by brain regions (e.g., IPS) that also support the differentiation of numeric, social, temporal, and physical distances (Chiao et al., 2009; Parkinson et al., 2014; Yamakawa et al., 2009), indicating that status may be represented in the brain as social or rank differences (Cloutier et al., 2012; Cloutier & Gyurovski, 2013, 2014). Such insights have informed our proposed model of status-based perception and evaluation (see Figure 1). Furthermore, guided by the proposed theoretical framework in our examination of the broader fMRI literature on status-based perception and evaluation we can parse existing studies as a function of their targeted status dimension. For example, we have identified brain regions (e.g., VLPFC and DLPFC) that may be uniquely recruited when differentiating others based on dominance levels and/or in the dominance-relevant context of competition (see Figure 3). A better understanding of the role of these regions in the perception of dominance could complement our understanding of perceived dominance from the existing behavioral literature.

Beyond facilitating brain mapping of status-related phenomena, we believe that an integrated social neuroscience framework for the study of social status will set the stage for more direct tests of competing accounts of how perceived social status affects attention and evaluation. For example, using both fMRI (Cloutier et al., 2012; Cloutier & Gyurovski, 2014) and EEG (Gyurovski et al., under review) our lab has found an interaction between status dimension (moral vs. financial) and status level (high vs. low) in VMPFC activity and the P300 ERP component, respectively. The data from these studies converge and ultimately challenge the frequent assumption that high social status always elicits similar (viz., positive) evaluations. Similarly, findings from Ly and colleagues (2011) showing that reward network responses are more sensitive to individuals closer in status to the perceiver's subjective status similarly provide evidence against the assumption that high status (in others) is always seen in a rewarding light. Finally, findings from Zink and colleagues (2008) highlight that different contexts (e.g., stable vs. unstable hierarchies) can alter the neural response to individuals of higher status in brain regions associated with social salience and emotion (e.g., amygdala).

Despite the numerous operationalizations of status in the literature, few neuroimaging studies have directly contrasted distinct dimensions or operationalizations of status as in the behavioral literature (e.g., Blader & Chen, 2012; Blader, Shirako, & Chen, 2016; Cheng & Tracy, 2014; Cloutier et al., 2016). One current assumption is that (high) status generally captures and guides attention, but it remains unclear if status inferred from distinct antecedents or based on any given dimension has such an effect. Moreover, even when similar status-based attentional effects are observed in behavior (e.g., response time, eye gaze), the psychological mechanisms underlying these effects may still differ (e.g., top-down control vs. inhibition). To illustrate, one dimension of status (e.g., prestige) could engage greater DLPFC activity (thought

to reflect top-down attentional control: Corbetta et al., 2008; Corbetta & Shulman, 2002) whereas another (e.g., dominance) may engage greater VLPFC (thought to reflect processes related to inhibition: Aron et al., 2004; Cools et al., 2002; Elliott et al., 2000; Levy & Wagner, 2011). A simultaneous examination of ERP components, such as the P200 which is known to reflect the processing of threatening and distinctive stimuli (Carretié et al., 2001; Eimer et al., 2003; Halgren & Marinkovic, 1995; Ito & Bartholow, 2009; Kubota & Ito, 2009; Schutter et al., 2004), may provide further insight into attentional differences as a function of different status antecedents and dimensions. As the literature on the consequences of perceived social status continues to grow, we are optimistic that the use of neuroimaging methods will greatly facilitate theoretical refinement in the domain of social attention and beyond.

**Current limitations in neuroimaging perceived social status.** The present review suggests the existence of partially separate networks supporting status-based differentiation/attention and status-based evaluation. Notably, these networks largely overlap with regions involved in differentiation/attention and evaluation of targets varying in dimensions other than social status. Because much of the work reviewed above relies on a correlational approach, it will be important for future work to explicitly test the potential relationships between these regions and their consequences for behavioral responses to targets varying in social status. One means of addressing this limitation is by using transcranial magnetic stimulation (TMS). Through the use of locally generated magnetic fields, TMS temporarily increases or decreases neural activity in a targeted cortical region (Hallett, 2007; Pascual-Leone, Walsh, & Rothwell, 2000; Wagner, Valero-Cabre, & Pascual-Leone, 2007). By experimentally manipulating neural activity in a particular cortical region, researchers are able to more precisely study the causal role of a given brain region in the context of a social hierarchy (e.g., Hogeveen, Inzlicht, & Obhi, 2014). As with TMS, the study of neuropsychological patients can also shed light on the contribution of a lesioned brain region to a given cognitive process (e.g., Karafin et al., 2004).

In light of our proposed framework, it is apparent that the number of studies using sufficiently similar operationalizations of status is limited. As a result, it is unclear whether neural networks reportedly responding to one dimension of social status are also implicated in the perception of other status dimensions. Nonetheless, with the exception of lateral PFC (see Figure 3), it appears that the network supporting status-based differentiation is relatively unaffected by the status dimension (for reviews, see Cloutier et al., 2016; Pornpattananangkul et al., 2014). However, it is less clear that this may be the case for status-based evaluation.

Finally, the development of more comprehensive neuroscientific models of the networks underpinning social status perception will require a better understanding of the processes involved in the perception of different status-based antecedents (e.g., perceptual vs. knowledge-based). The use of multivariate analyses such as PLS (Krishnan, Williams, McIntosh, & Abdi, 2011; McIntosh et al., 2004; McIntosh & Lobaugh, 2004) or representational similarity analysis (RSA: Kriegeskorte, Mur, & Bandettini, 2008; Nili et al., 2014) may be particularly useful for painting a clearer picture of distributed brain regions supporting the perception of different classes of status antecedents.

### **Future Directions in the Social Neuroscience of Status**

**Achieving greater clarity in experimental approaches to status.** By providing a conceptual framework emphasizing construct clarity, we hope to generate more precise hypotheses in future work towards an emerging social neuroscience model of social status. As reviewed above, one's status level along any dimension may be inferred from a number of antecedents (see Figure 2). Both perceptual features and person knowledge may provide useful information about an individual's social status level along a given status dimension. These antecedents are subsequently used to differentiate the status level of an individual within a social group. As discussed in this review, the perceived status level of an individual has important consequences for attention and evaluation, in addition to other social-cognitive processes. However, a growing body of evidence suggests that these consequences depend not only on status level but also on the dimension conveying social status (e.g., Cloutier et al., 2012; Cloutier & Gyurovski, 2013, 2014), the relative importance of that dimension to the perceiver and/or the immediate context (Freeman et al., 2009; Quirin et al., 2013), and the perceiver's status level (Cloutier et al., 2013; Kraus & Keltner, 2009; Ly et al., 2011).

To better illustrate these points, let us briefly consider dominance and prestige<sup>6</sup>. In the behavioral literature, dominance and prestige have been studied in a number of ways including via: (1) self-reported strategies for achieving higher social status (Case & Maner, 2014; Maner & Mead, 2010; Mead & Maner, 2012b); (2) perceptual cues such as race, physical formidability, attractiveness, or clothing (DeWall & Maner, 2008; Maner et al., 2008; Todorov, 2011; Todorov et al., 2008; Vernon et al., 2014); and (3) person knowledge regarding status-enhancing abilities

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<sup>6</sup> Although the present example relies on dominance and prestige, the above distinctions should be relevant when considering any dimension of social status (e.g., financial status).

and personality traits (Cheng et al., 2013, 2010, von Rueden et al., 2008, 2011). As previously discussed, these three operationalizations should correspond to different areas of investigation. Whereas the first approach to status examines pathways to status acquisition, the last two approaches examine distinct antecedents of status differentiation.

The diversity of ways in which dominance and prestige are operationalized needs to be considered by researchers wishing to study the impact of status both at the behavioral and the neural levels. For example, studies relying on visual cues of dominance or prestige (e.g., Marsh et al., 2009) may involve distinct networks of brain regions when compared to studies differentiating dominance or prestige based on person knowledge (e.g., Farrow et al., 2011). In such instance, an explicit consideration of the antecedents of status differentiation is required when interpreting the results. Furthermore, in both cases, responses to perceived dominance and prestige are likely modulated by the degree to which the perceiver or cultural context favors these dimensions as a means of status acquisition (cf. Freeman et al., 2009; Quirin et al., 2013). One intriguing direction may be to consider the childhood SES of the perceiver. Individuals from low SES (vs. high) backgrounds are thought to default to riskier strategies to maximize reward outcomes, particularly under stressful conditions (i.e., a fast life history: see Del Giudice, Gangestad, & Kaplan, 2015; Griskevicius et al., 2013; Griskevicius, Tybur, Delton, & Robertson, 2011). Given the relationship between subjective status and reward reviewed above, one possibility is that individuals from low-SES backgrounds may favor high-risk/high-reward pathways to higher status (e.g., dominance). To summarize, investigators interested in better understanding how social status shapes person perception and evaluation should carefully consider the social dimension conveying status and the perceiver-by-context interaction in which it is perceived before generalizing their findings to other status dimensions or contexts.

Apart from explicitly investigating the way status is inferred from different social dimensions and in different contexts, efforts should be devoted to better isolate the physiological correlates supporting status-based person perception and evaluation. For instance, variation in chronic social status has been linked to stress responses during social interactions among non-human and human primates (Mazur, 1985; Mazur & Booth, 1998; Sapolsky, 1993, 2004, 2005). Differences in attention allocation and evaluative responses typical of high- and low-status perceivers may help explain such phenomena (Cloutier et al., 2013; Ly et al., 2011; Muscatell et al., 2012) in concert with the activity of hormones such as testosterone and cortisol (Carré & Olmstead, 2015; Chiao, 2010; Hamilton et al., 2015; Mehta et al., 2008; Mehta & Prasad, 2015). In hierarchically organized species from Cichlid fish (Burmeister, Jarvis, & Fernald, 2005; Maruska & Fernald, 2010) to humans (Carré & Olmstead, 2015; Mazur & Booth, 1998), changes in status level bring about a host of physiological changes, especially in the context of competitive interactions. Notably, hierarchies allowing for a considerable degree of upward mobility have been linked to increased competitive behavior from low-status individuals (Hays & Bendersky, 2015). In the aftermath of such competition, testosterone levels and aggression especially in men tend to increase in victorious competitors and decrease in losing competitors (Carré, Campbell, Lozoya, Goetz, & Welker, 2013). It remains to be seen how readily and for how long the ensuing nonverbal changes (e.g., increased or decreased dominant posturing or pride expressions) are detected by perceivers outside the original competitive context. Additionally, future work may consider the physiological and nonverbal alterations brought about by status changes in less directly competitive contexts (e.g., Zink et al., 2008).

Finally, our proposed framework suggests rich possibilities for the study of interactions between dimensions of social status at the intersection of social categories such as age, gender,

and race. Although many consider perceptually available cues as important antecedents to status inferences (e.g., DeWall & Maner, 2008; Freeman et al., 2011; Maner et al., 2008; Shriver et al., 2008), the interaction of status and perceptually identifiable social categories are at present largely overlooked in the literature on person perception and evaluation. In the following section, we explore some possible directions in this vein.

**Status at the intersection of social dimensions and categories.** Primarily, this review has focused on how social status along isolated dimensions impacts person perception in the domains of attention allocation and person evaluation. However, our expanded theoretical framework implies that individuals who may be considered high status on one dimension (e.g., financial status) may not be considered high status along a different and perhaps equally important dimension (e.g., morality). At present, few have considered the intersection of multiple social dimensions in the differentiation of social status, much less how such a multiply determined rank may impact person perception and evaluation. Furthermore, as suggested in Figure 2, other social dimensions such as attractiveness (Bauldry et al., 2016; Vernon et al., 2014) may moderate the consequences of status level in perception and behavior, especially when these other social dimensions are made salient by virtue of their self-relevance or the prevailing social context (Takahashi et al., 2009). In summary, interactions between different social dimensions in the determination of social rank and its downstream consequences are still largely unexplored. We are hopeful that future work will build on this literature, focusing particularly on the intersection of traditional status-related dimensions (i.e., dominance, prestige, SES) with other social dimensions that have been shown to shape impression formation.

It is also important to consider how perceived social status may be shaped by an individual's perceived group of belonging (Fiske et al., 2016; Sanchez & Garcia, 2012). For

example, according to Status Characteristics Theory (Berger et al., 1972), higher social status is associated with certain groups, such as Whites, males, middle-aged, and educated individuals with substantial occupational prestige. Therefore, race and gender may also serve as visual and/or knowledge-based antecedents of social status, similar to dominance-related (or prestige-related, etc.) cues and knowledge. Importantly, these diverse status cues may interact with other status indicators during person perception and evaluation (Freeman et al., 2011). Indeed, in the context of contemporary American culture, social status and race are historically intertwined (Allport, 1954; Tajfel & Turner, 1979). Members of racial minority groups (e.g., Black Americans) are often assumed to be of low status, whereas White individuals are often assumed to possess high status (Wilkins & Kaiser, 2014). Future studies may benefit from exploring the interaction of race and gender with various indicators of social status to better understand the variables shaping the distributed network of brain regions involved in person perception. In approaching such interactions, it will be important to consider perceiver individual differences such as contact with racial outgroup members (Cloutier, Li, & Correll, 2014; Cloutier et al., in press) and endorsement of status-legitimizing beliefs (Oldmeadow & Fiske, 2007; Pratto, Stallworth, & Sidanius, 1997; Wilkins, Wellman, Babbitt, Toosi, & Schad, 2015). For example, research suggests that Whites endorsing status-legitimizing beliefs perceive rises in social status of Black individuals as threatening (Wilkins & Kaiser, 2014). Similarly, males who endorse social dominance orientation to a greater extent demonstrate greater gender differences in issues relevant to gender equity (Pratto et al., 1997). Accordingly, group membership (i.e., gender and race) in concert with beliefs about status more generally may impact the differentiation of social status and its attentional and evaluative consequences for person perception. In sum, research considering both the social status of targets and their salient social categories (e.g., gender and

race) represents important avenues to better understand how status shapes social interactions in our everyday lives. As race and gender based wealth inequality widens (Kochnar & Fry, 2014), it is paramount to adopt an intersectional approach to the study of social status to better understand the mechanism that give rise to social injustice to more accurately develop research supported disparity interventions.

### **Conclusion**

Counter to contemporary Western society values of fairness and equality, status hierarchies shape human social cognition with important consequences for everyday life (Fiske et al., 2016). Existing research tends to consider the effects of perceived status by focusing on differentiated status levels within a single hierarchical dimension (e.g., dominance). However evidence highlights that we readily infer the social status of others based on various social dimensions from a number of perceptual and knowledge-based cues. Moreover, depending on their relative importance in the current context, these status dimensions (and their corresponding antecedents) can impact the way we attend to, remember, and evaluate others to varying degrees. Beyond the present review's focus on the perception of others, one's own social status bears important consequences for social cognition and corresponding neural functioning. Specifically, existing social neuroscience investigations of variations in perceiver status suggests that lower SES is associated with neural activity indicative of greater mentalizing, empathy, motor resonance, and vigilance (for a review, see Varnum, in press). Additional research suggests that perceiver status also has important consequences for health and well being, with generally more favorable outcomes for high-status individuals (Erdem, Van Lenthe, Prins, Voorham, & Burdorf, 2016; Gianaros et al., 2007; Hackman & Farah, 2009; Hackman, Farah, & Meaney, 2010;

Hackman et al., 2015; Kim et al., 2013; McEwen & Gianaros, 2010; Reyes-Garcia et al., 2008; Reyes-García et al., 2009; Taylor, Eisenberger, Saxbe, Lehman, & Lieberman, 2006; Wilkinson & Pickett, 2009). In light of growing social inequalities (Gilbert, 2014; Kochnar & Fry, 2014), a clearer conceptualization of both perceived and perceiver social status and their consequences for social cognition is pressing. As emphasized in the current review, it is hoped that the adoption of a comprehensive social neuroscience framework integrating findings across disciplines and methodologies should both clarify our current knowledge of how social status shapes our social lives and push the frontiers of social status research.

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### Figure Captions

*Figure 1.* A schematic illustration of the proposed framework as it applies to perceivers (ascending blue boxes) and agents (red boxes, from left to right). Both processes depend on the dimension(s) of status in question (central purple box). Agents may acquire status vis-à-vis one or more dimensions of status (e.g., prestige, dominance). Perceivers infer the status of others along a given dimension on the basis of perceptual and knowledge-based antecedents. These antecedents may result in different status levels for each dimension. Consequences in attention and evaluation (among other processes) follow from target's perceived status level. Critically, context for both perceivers and agents may impact a status dimension's relative importance.

*Figure 2.* Differentiation of social status along a single dimension. This framework may be applied to the study of any dimension of social status (e.g., dominance, prestige, SES) and its consequences for diverse facets of person perception and social cognition. This framework posits that the target's and/or perceiver's status level along other social dimensions as well as each dimension's relative importance may moderate the consequences of perceived status for behavior. A dimension's relative importance may also impact attention to different antecedents of status as well as the differentiation of status levels.

*Figure 3.* Brain regions believed to support status-based differentiation and attention (red letters) and status-based evaluation (blue letters). Regions involved in both differentiation/attention and evaluation are represented by purple letters (D & F).