

The Role of Physical Formidability in Human Social Status Allocation

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Why are physically formidable men willingly allocated higher social status by others in cooperative groups? Ancestrally, physically formidable males would have been differentially equipped to generate benefits for groups by providing leadership services of *within-group enforcement* (e.g., implementing punishment of free riders) and *between-group representation* (e.g., negotiating with other coalitions). Therefore, we hypothesize that adaptations for social status allocation are designed to interpret men's physical formidability as a cue to these leadership abilities, and to allocate greater status to formidable men on this basis. These hypotheses were supported in 4 empirical studies wherein young adults rated standardized photos of subjects (targets) who were described as being part of a white-collar business consultancy. In Studies 1 and 2, male targets' physical strength positively predicted ratings of their projected status within the organization, and this effect was mediated by perceptions that stronger men possessed greater leadership abilities of within-group enforcement and between-group representation. Moreover, (a) these same patterns held whether status was conceptualized as overall ascendancy, prestige-based status, or dominance-based status, and (b) strong men who were perceived as aggressively self-interested were not allocated greater status. Finally, 2 experiments established the causality of physical formidability's effects on status-related perceptions by manipulating targets' relative strength (Study 3) and height (Study 4). In interpreting our findings, we argue that adaptations for formidability-based status allocation may have facilitated the evolution of group cooperation in humans and other primates.

Keywords: cooperation, dominance, hierarchy, prestige, status

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Hierarchy is a salient dimension of social organization in group-living primate species (Boehm, 1999; de Waal, 1982; Flack, de Waal, & Krakauer, 2005), including humans (Anderson, Hildreth,

& Howland, 2015; Boehm, 1999; Price & Van Vugt, 2014). Indeed, hierarchies are a universal feature of human societies (Anderson et al., 2015; Brown, 1991), and they are established spontaneously within cooperative groups ranging from small-scale subsistence communities (von Rueden, Gurven, & Kaplan, 2008) to task-focused teams in modern organizations (Anderson, Ames, & Gosling, 2008; Flynn, Reagans, Amanatullah, & Ames, 2006). Hierarchies are defined by rank-ordered differences between individuals in their relative levels of *social status*—respect, influence, or deference within a group (Anderson & Kilduff, 2009a; Boehm, 1999; von Rueden et al., 2008). In turn, variation in social status has significant reproductive consequences; for example, being high in relative status within a group brings greater influence over collective decisions (Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Maner & Mead, 2010), priority of access to contested resources (Patton, 2000), coalitional support (von Rueden et al., 2008), and success in mating and reproduction (Chagnon, 1988; von Rueden, Gurven, & Kaplan, 2011). Given the importance of status in regulating these fitness-related outcomes, it makes functional sense that individuals represent status itself as a valuable resource and play an active role in its allocation among individuals

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in a group (Anderson et al., 2008, 2009b; Cheng et al., 2013; Kyl-Heku & Buss, 1996; Sugiyama & Sugiyama, 2003; von Rueden, Gurven, Kaplan, & Stieglitz, 2014).

Evolutionary (and other functionalist) theories of social status acquisition posit the existence of psychological mechanisms designed for allocating status to others in a way that promotes successful cooperation within collective actions and coalitions—which in turn results in higher net benefit accrual for all members of a group, regardless of relative status (Anderson & Willer, 2014; Blaker & Van Vugt, 2014; Cheng & Tracy, 2014; Holbrook, Piazza, & Fessler, 2014; Tiedens, 2001; Van Vugt & Tybur, 2015; von Rueden, 2014). For example, in a task-focused group working to build a bridge, individuals with superlative skill in engineering should be afforded higher status because of their ability to help map out a bridge design and strategically break the plan down into individual subtasks for delegation. According to similar logic, individuals who excel in producing resources that can be shared with others via hunting, gathering, or horticulture would be allocated higher status within a small-scale subsistence community (Gurven & von Rueden, 2006; Sugiyama & Sugiyama, 2003). Consistent with this, much evidence indicates that high status is allocated to others who possess knowledge, skills, or abilities that increase the capacity to generate benefits for a group (Anderson, Willer, Kilduff, & Brown, 2012; Anderson & Kilduff, 2009a, 2009b; Barclay, 2006, 2013; Chagnon, 1988; Chapais, 2015; Cheng, Tracy, & Henrich, 2010, 2013; Cheng & Tracy, 2014; Flynn et al., 2006; Hardy & Van Vugt, 2006; Henrich & Gil-White, 2001; Kyl-Heku & Buss, 1996; Little & Roberts, 2012; Patton, 2000; Sugiyama & Sugiyama, 2003; Van Vugt & Tybur, 2015; von Rueden et al., 2008, 2014; Willer, 2009).

Given the expectation that greater status will be allocated to others who are perceived as being able to generate collective benefits, it is surprising that people appear to willingly confer status upon men with greater *physical formidability*—which is defined by the ability to inflict physical damage on others in hand-to-hand combat (Sell et al., 2009). For example, among egalitarian forager-horticulturalists in the Bolivian Amazon, men's upper-body strength positively predicts community-wide status and influence, and this association is explained by the fact that strong men attract greater social support from others (von Rueden et al., 2008, 2014). A large body of anthropological, psychological and sociological evidence indicates that these observations conform to a general trend across human societies, past and present, wherein physically dominant males differentially tend to occupy positions of high status within cooperative groups (for reviews, see Blaker & Van Vugt, 2014; Murray, 2014; von Rueden, 2014). Notably, this association between formidability and status exists despite the fact that human groups almost always devalue and disrespect the use of intimidation and aggression in community affairs (Gintis, van Schaik, & Boehm, 2015; von Rueden, 2014)—especially when such tactics are deployed in the service of status acquisition (Anderson et al., 2008; Romero, Pham, & Goetz, 2015).

These considerations thus frame the question: Why do members of cooperative groups confer higher status upon more physically formidable men? Here, we suggest, it becomes relevant to consider that one of the most important status-worthy contributions that can be made to collective actions and coalitions is the provisioning of effective *leadership* (Maner & Mead, 2010; Price & Van Vugt,

2014; Tooby, Cosmides, & Price, 2006; von Rueden et al., 2014). Recent research has demonstrated that individuals with taller stature are perceived as possessing greater leadership ability (Blaker et al., 2013; Holbrook & Fessler, 2013; Murray & Schmitz, 2011; Re et al., 2012; Re, DeBruine, Jones, & Perrett, 2013; Re, Hunter, et al., 2013; Stulp, Buunk, Verhulst, & Pollet, 2013). To the extent that physical strength is associated with height, these perceptions may help explain why formidable men are afforded higher status. However, this research leaves unclear which specific capacities define “leadership ability” and how such perceptions relate to the psychology of formidability-based social status allocation. Additionally, as discussed below, height is a relatively weak correlate of physical strength (Sell, Tooby, & Cosmides, 2009), and the functional significance of this morphological dimension extends beyond its link with formidability (Blaker & Van Vugt, 2014; Stulp & Barrett, 2015). In short, although the extant literature implicates a potential role for perceived leadership ability, it does not contain a clear explanation for the link between men's formidability and attained social status.

In the current article, we advance the hypothesis that psychological adaptations for social status allocation are designed to interpret men's physical formidability as a cue to the ability to perform specific leadership-related services for cooperative groups: *within-group enforcement* and *between-group representation*. In particular, we test whether higher social status is allocated to more physically formidable men and, if so, whether this is mediated by specific leadership-related perceptions. Before describing four empirical studies on the psychology of social status allocation, we motivate our main predictions by considering the functional relationship of men's formidability with leadership and social status within cooperative groups.

Physical Formidability, Leadership, and Status Allocation in Cooperative Groups

Humans are unusual among group-living primates in the extent to which we are adapted to cooperate within collective actions and coalitions (Barclay, 2013; Gintis et al., 2015; Jaeggi & Gurven, 2013; Kurzban & Leary, 2001; Krasnow, Delton, Cosmides, & Tooby, 2015; Tomasello, Carpenter, Call, Behne, & Moll, 2005). Collective action occurs when multiple individuals pay the cost of contributing to a group project and share in the resulting benefit—which generates fitness-enhancing outcomes that could not be produced cost-effectively by individuals acting alone (Boyd & Richerson, 1992; Delton, Cosmides, Guemo, Robertson, & Tooby, 2012; Panchanathan & Boyd, 2004; Price, Cosmides, & Tooby, 2002). Coalitions are enduring cooperative groups that permit members to benefit from iterated rounds of collective action with familiar individuals over time, and range from perennial work teams to war parties to stable coresidence communities who systematically coordinate activities on a daily basis (Cimino & Delton, 2010; Geary, Byrd-Craven, Hoard, Vigil, & Numtee, 2003; Kurzban, Tooby, & Cosmides, 2001; McDonald, Navarrete, & Van Vugt, 2012; Patton, 2000; Pietraszewski et al., 2014; Tooby et al., 2006). Although it is not generally valid to conflate different forms of collective actions and coalitions, the arguments we present herein apply fairly evenly across distinct types of cooperative groups.

Adaptations for group cooperation were elaborated in primates—and became a hallmark of the human species—because collective action can generate net benefits for all participants (Darwin, 1872; Delton et al., 2012; Flack, de Waal, et al., 2005; Jaeggi & Gurven, 2013; Krasnow et al., 2015; Tomasello et al., 2005; Tooby et al., 2006). However, group cooperation is also undermined—rendered evolutionarily unstable or individually disadvantageous—by several logistical problems. For example, in a group project, multiple individuals must coordinate their activities within complex tasks—which makes such projects vulnerable to discoordination and thus failure, especially when group size is large (Anderson & Willer, 2014; Price & Van Vugt, 2014; Tooby et al., 2006; Van Vugt, Hogan, & Kaiser, 2008; von Rueden et al., 2014). Group cooperation is likewise undermined by free-riders and rule violators, whose existence can disincentivize individual contribution and disfavor cooperation (Boyd & Richerson, 1992; Delton et al., 2012; Fehr & Gächter, 2002; Hooper et al., 2010; Krasnow et al., 2015; Panchanathan & Boyd, 2004; Price et al., 2002; Willer, 2009; Yamagishi, 1986). Moreover, to the degree that groups are composed of distantly related individuals (i.e., nonkin), the mere physical proximity required for group living and cooperation opens individuals up to potential exploitation by self-interested others (Boehm, 1999; de Waal, 1982; Flack, de Waal, et al., 2005). Finally, the existence of multiple coalitions makes way for potentially beneficial between-group cooperation—but also sets the stage for dangerous between-group conflict (Ackerman et al., 2006; Chagnon, 1988; Geary et al., 2003; McDonald et al., 2012; Patton, 2000). In order for cooperative groups to succeed, therefore, these sorts of problems must be solved or minimized.

Leaders are individuals who pay the personal costs of solving these sorts of collective action problems for cooperative groups and thereby, when successful, increase the group's effectiveness in generating net benefits for members (Price & Van Vugt, 2014; Tooby et al., 2006; Van Vugt et al., 2008; von Rueden et al., 2014). In return for providing these services, effective leaders are compensated with greater relative status by group members (Patton, 2000; Price & Van Vugt, 2014). One class of service provided by leaders we refer to as *within-group enforcement*, which might entail, for example, directly intervening in fights or disagreements between subordinates to reduce intragroup conflict (Flack, de Waal, et al., 2005); implementing punishment of free-riders or rule violators who threaten the social order (Barclay, 2006; Krasnow et al., 2015; Kurzban, De Scioli, & O'Brien, 2007; O'Gorman et al., 2009; Yamagishi, 1986); or promoting successful coordination by keeping others on task (Anderson & Willer, 2014; Maner & Mead, 2010). Another functionally important service provided by leaders we refer to as *between-group representation*, which might, depending on the context, entail engaging in face-to-face negotiations with representatives of other coalitions during between-group cooperation (Spisak et al., 2012; Stirrat & Perrett, 2012); or serving the interests of one's coalition in between-group conflict or even warfare (Chagnon, 1988; Halevy, Chou, Cohen, & Livingston, 2012; Holbrook & Fessler, 2013; Little, 2014; Maner & Mead, 2010; Patton, 2000; Sell, Tooby, & Cosmides, 2009).

We propose that, under ancestral human conditions, physical formidability would have been a key determinant of one's ability to cost-effectively perform these within-group enforcement and between-group representation functions of effective leadership. For example, people are relatively unlikely to aggress against

others who are physically formidable (Fessler et al., 2014; Pietraszewski & Shaw, 2015; Sell, Tooby, & Cosmides, 2009), and stronger individuals would therefore have been able to implement punishment of free-riders or rule violators with a lower probability of conflict escalation than is faced by weaker individuals (O'Gorman et al., 2009; von Rueden & Gurven, 2012; von Rueden et al., 2014). For the same reason, stronger individuals would have been able to cost-effectively keep the peace by intervening in others' conflicts and enforcing collectively sanctioned policies (Blaker & Van Vugt, 2014; Flack, de Waal, et al., 2005; von Rueden et al., 2015). Likewise, because physical formidability increases interpersonal bargaining power (Lukaszewski, 2013; Pietraszewski & Shaw, 2015; Sell et al., 2009; Sell, Tooby, & Cosmides, 2009), greater physical strength would have enhanced one's effectiveness in negotiating social exchanges and conflicts with (potentially hostile) representatives of other groups (Chagnon, 1983; Holbrook & Fessler, 2013; Little et al., 2007; McDonald et al., 2012; Murray, 2014; Patton, 2000).

If relative formidability was in fact ancestrally predictive of individuals' ability to perform within-group enforcement and between-group representation functions of leadership, it follows that natural selection would have favored psychological adaptations that allocate high status and leadership to physically stronger group members. If such mechanisms exist, this predicts that physically stronger people will be (a) perceived as being better equipped to implement within-group enforcement and between-group representation for collective actions and coalitions, and therefore (b) allocated greater social status. Importantly, if these predicted patterns do indeed reflect the outputs of evolved psychological mechanisms, such effects should obtain even in modern settings wherein physical conflict is extremely rare and practically irrelevant to leadership responsibilities.

Additionally, our adaptationist reasoning implies that formidability-based perceptions of specific leadership abilities (and downstream status allocation) do not reflect a generalized halo effect, wherein stronger individuals are perceived as being generically more competent than their weaker counterparts. For example, although the possession of intelligences or other skills that enhance one's ability to contribute to group goals through leadership should result in higher status (Anderson & Willer, 2014; Chapais, 2015; Henrich & Gil-White, 2001), there is no theoretical reason to believe that greater physical strength should influence perceptions of others' mental abilities (or other competencies that are not ultimately grounded in the ability to efficiently inflict costs on others when necessary).

We further hypothesize that the effects of physical formidability on status conferral are sex-specific, applying to men but not women. Owing ultimately to sex differences in obligatory parental investment (Trivers, 1972), there has been, and continues to be, more variance in reproductive success among men than among women (Lippold et al., 2014). Because of this, men have been subjected to stronger selection pressures related to direct intrasexual competition over human evolution (Puts, 2010), and have therefore evolved much greater average physical formidability than women (Lassek & Gaulin, 2009) as well as a greater willingness to risk interpersonal conflict in the pursuit and maintenance of social status (Griskevicius et al., 2009; Van Vugt, De Cremer, & Janssen, 2007). Moreover, within the context of small-scale societies such as those of our ancestors, males had more to gain (and

less to lose) by participating in between-group conflicts than females (see McDonald et al., 2012; Van Vugt et al., 2007; Wrangham & Peterson, 1996). Consistent with this, community leaders, warriors, and between-group negotiators within small-scale societies are almost always males (Chagnon, 1988; Keely, 1996; McDonald et al., 2012; Patton, 2000; Van Vugt et al., 2008). For these reasons, physical formidability may be uniquely relevant for assessing men's (but not women's) ability to implement within-group enforcement and between-group representation functions of leadership.

Does Physical Formidability Promote Dominance- or Prestige-Based Status?

The increasingly influential “dominance-prestige model” of social rank acquisition (Cheng et al., 2010, 2013; Cheng & Tracy, 2014; Henrich & Gil-White, 2001) has distinguished between different forms of status, with special attention to the difference between status acquired through aggressive intimidation of rivals in pursuit of self-interest (dominance-based status) and that achieved by generating benefits for a group (prestige-based status). Above, we have laid out the hypothesis that physically formidable men are allocated higher status by others because of their perceived ability to generate specific leadership-related benefits for cooperative groups—which, in the context of the dominance-prestige model, means that formidability promotes prestige-based status that is willingly granted by others. However, greater formidability would also plausibly increase a man's ability to aggressively intimidate others into ceding him higher dominance-based status, regardless of his ability to generate benefits for the group (Blaker & Van Vugt, 2014; Van Vugt & Tybur, 2015). Under this alternative hypothesis, the link between men's formidability and attained social status should be explained not by perceptions of leadership abilities, but rather by the perception that formidable men are likely to inflict costs on others in pursuit of their own self-interest.

From our perspective, the greater social rank attained by formidable men is more likely a function of their perceived benefit generation capacity (prestige) than their aggressive intimidation of rivals and subordinates (dominance). Counter to the dominance-prestige model, aggressive domination of others is probably not, on its own, a viable route to high status within most human groups—especially when members can exit the group voluntarily and form alliances against aggressive status seekers (Anderson et al., 2008; Barclay, 2013; Chapais, 2015; Gintis et al., 2015; Holbrook et al., 2014; Price & Van Vugt, 2014). Indeed, individuals who pursue status through aggressive tactics are generally disliked and disrespected by group members (Anderson et al., 2008; Anderson & Willer, 2014; Romero et al., 2014), and even a small number of subordinates are together more formidable than almost any imaginable aggressive, but undeserving, status-seeker. Because humans form alliances with ease, recent theorists have argued that the collective ability of subordinates to depose even very formidable leaders greatly limits the extent to which status can be acquired or maintained via aggressive tactics that do not serve the group's interests (Boehm, 1999; Chapais, 2015; Gintis et al., 2015; Holbrook et al., 2014; Price & Van Vugt, 2014; von Rueden et al., 2014). For these reasons, although physically formidable men may be (accurately) perceived as more aggressive

and entitled than weaker men on average (Sell, Tooby, & Cosmides, 2009), this perception should not explain why members of cooperative groups confer higher status and influence upon stronger men.

In this context, it is important to note that we are not arguing that physically formidable or high status individuals never behave aggressively, pursue self-interest, or inflict costs on rivals. Indeed, the prerogative to pursue self-interest (more so than others) is one of the fitness-linked benefits of having high status (Anderson & Kilduff, 2009a; Cheng & Tracy, 2014; Maner & Mead, 2010; Kyl-Heku & Buss, 1996). At the same time, interpersonal aggression can promote one's fitness interests independent of status, for instance via success in dyadic contests over resources (Holbrook et al., 2014; Petersen et al., 2013; Puts, 2010; Sell et al., 2009). What our reasoning does suggest is that the self-interested intimidation of rivals and subordinates is not, as posited by the dominance-prestige model, the *source* of formidable individuals' status. On the contrary, as argued above, we hypothesize that higher status—and its associated prerogatives—will be conferred on physically stronger men to the degree that they are viewed as being likely to use their formidability to generate benefits for the group via within-group enforcement and between-group representation.

Effects of Physical Strength Versus Height

Thus far, we have been conceptualizing physical formidability in terms of physical strength, which is the most influential morphological determinant of the ability to win contests in many species, including humans (Sell et al., 2012). As noted above, height is associated with some of the same perceptions and outcomes as is strength. For example, individuals with taller stature are perceived as better leaders (Blaker et al., 2013; Holbrook & Fessler, 2013; Murray & Schmitz, 2011; Stulp et al., 2013; Re et al., 2012; Re, DeBruine, Jones, & Perrett, 2013; Re, Hunter, et al., 2013, 2013b) and attain higher status within a wide variety of modern political and organizational contexts (Judge & Cable, 2004; Little & Roberts, 2012; Stulp et al., 2013).

It is currently unclear whether the associations of height with leadership and status outcomes are driven by perceptions of physical formidability (as opposed to other height-related characteristics). Height is weakly to-moderately correlated with physical strength (Sell et al., 2009), but the information carried by height is more multidimensional than that conveyed by strength, in that stature jointly reflects factors such as thermoregulatory tradeoffs, energetic constraints on developmental growth trajectory, and the early adoption of a slow, growth-oriented life history strategy characterized by somatic investments in future reproduction (Stulp & Barrett, 2015; Walker et al., 2006). Overall strength, on the other hand, may in part reflect developmentally fixed differences in adult size and stature, but it is also influenced greatly by one's recent history of physical activity, energy balance, and hormone-mediated investment in muscle growth (Ellison, 2001). Consistent with these differences between strength and height, the observed associations of height with status outcomes diverge in some important ways from the logic of our hypotheses. For example, height appears to be positively associated with perceived intelligence, perceived leadership ability, and actual occupational success among both men and women (Blaker et al., 2013; Blaker & Van Vugt, 2014; Judge & Cable, 2004; Murray & Schmitz, 2011). Our

hypotheses regarding formidability-based status allocation only predict certain of these associations.

Despite these complexities, height is nonetheless one component of physical formidability, and we therefore expect that at least some of height's associations with status outcomes in men derive from its correlation with strength. Although the current research does not attempt to put forth a comprehensive theory of height's status-relevance, we hypothesize that height will have the same effects on leadership perceptions and status allocation as does strength—but only to the degree that taller stature increases men's apparent strength. Height may have other effects (e.g., on perceived intelligence) that are neither predicted by the logic of our hypotheses nor mediated via perceptions of strength. Given the prevalence of findings regarding height and status-related outcomes within the extant literature (for recent reviews, see [Blaker & Van Vugt, 2014](#); [Little & Roberts, 2012](#)), an auxiliary goal of the current research was to clarify the role of height in formidability-based status allocation.

The Present Research

We conducted a series of studies to evaluate these hypotheses regarding the role of physical formidability in human social status allocation. To this end, we leveraged standardized photographs of male and female research subjects (targets) whose physical strength had been measured previously. Across all studies, these photo stimuli were employed in a rating task, wherein raters were told that they would be forming impressions of a large group of recent college graduates who had just been hired at a business consultancy. This coalitional context was chosen because it possesses a number of important features from the standpoint of our hypotheses. The organization we describe is composed of face-to-face work teams who function as enduring coalitions as they work to solve complex problems via collective action. As such, raters should perceive this context as one in which effective leadership is paramount for organizational success. According to our adaptationist reasoning, men's physical strength should influence leadership perceptions and status allocation even in this modern white-collar organizational setting—wherein physical conflict is presumably nonexistent. Therefore, the use of this context provides us with both a conservative test of our hypothesis and one that is representative of many modern-day cooperative groups.

Taken together, the arguments put forth above suggest seven main predictions:

Prediction 1. Physically stronger male (but not female) targets will be perceived as possessing greater leadership abilities of within-group enforcement and between-group representation.

Prediction 2. Physically stronger male (but not female) targets will be projected to attain higher social status within the organization.

Prediction 3. The positive effect of men's physical strength on status allocation will be mediated via perceptions of within-group enforcement and between-group representation.

Prediction 4. Targets' physical strength will not correlate with perceptions of their task-specific intelligence (although

perceptions of task-specific intelligence will positively predict status allocation).

Prediction 5. Physically stronger male targets will be perceived as being more likely to inflict costs on the organization by forcefully pursuing self-interest. However, such perceptions will not explain the association of men's strength with status allocation.

Prediction 6. When different potential 'forms' of status are specified, the positive effects of targets' physical strength on status allocation (as mediated via perceived leadership abilities) will obtain for prestige-based status as well as general organizational ascendancy. Whether this will apply to ratings of dominance-based status was left as an open question.

Prediction 7. Targets' height will have the same effects on leadership perceptions and status allocation as does strength—but only to the extent that taller stature increases targets' apparent strength.

In what follows, we describe four empirical studies testing these predictions. Two of these studies employ correlational designs that examine associations of targets' actual physical strength with raters' status-related perceptions (Studies 1 and 2). The other two studies experimentally manipulate targets' strength (Study 3) and height (Study 4), respectively, to establish the causality implied by our hypotheses.

Study 1

In Study 1, male and female target photos were rated on dimensions of within-group enforcement ability, between-group representation ability, task-specific intelligence, and projected social status. This design permitted tests of Predictions 1–4, which collectively posit a sex-specific association of male targets' strength with projected status that is selectively mediated via perceptions of within-group enforcement ability and between-group representation ability.

Another goal of Study 1 was to evaluate a potential alternative explanation for the predicted associations. Specifically, because (a) greater physical strength is part of what makes men attractive ([Sell et al., 2012](#)) and (b) attractiveness is a positive predictor of social status ([Anderson, John, Keltner, & Krings, 2001](#)), it could be suggested that any effects of strength on status perceptions are merely effects of attractiveness. As such, in addition to providing focused tests of our predictions, we employed physical attractiveness ratings of the targets to test whether men's strength predicts status-related perceptions above and beyond its association with attractiveness.

Method

Participants.

Target individuals. Target individuals in the photos were 131 men (M age = 18.8; SD = 1.32) and 48 women (M age = 18.8; SD = 1.17) who were part of a prior study at a large university on the west coast of the U.S. Male targets were on average 70.2 in. tall (SD = 2.91) and weighed 163.72 pounds (SD = 27.71); female targets were on average 64.84 in. tall (SD = 2.79) and weighed

135.32 pounds ($SD = 19.76$). Targets' physical strength was measured via procedures validated with weightlifting machines by Sell et al. (2009; for details, see Lukaszewski & Roney, 2011). Two strength measures were obtained using a Jamar hydraulic dynamometer (in the metric of kg/force): chest/arm strength (men: $M = 44.89$, $SD = 12.05$; women: $M = 14.00$, $SD = 5.58$) and (dominant arm) grip strength (men: $M = 42.31$, $SD = 7.58$; women: $M = 22.06$, $SD = 6.82$). These two measures were z -scored (within sex) before being averaged to form a physical strength composite for each target ($\alpha = .71$). Photos were taken from a standardized distance against a solid white wall, and targets were depicted from just above the knee up wearing identical tank-top undershirts with a neutral facial expression.

Raters. Two samples of raters were employed. The first rater sample rated the targets on within-group coordination ability, between-group representation ability, and task-specific intelligence. The second rater sample rated targets on projected social status only.

Rater Sample 1 comprised 103 undergraduates who participated in exchange for partial course credit (M age = 19.7; $SD = 1.13$). Sixty of these participants (22 men) rated the sample of male targets, and 43 (16 men) rated the sample of female targets. Rater Sample 2 comprised 113 different undergraduates who participated in exchange for partial course credit (M age = 20.1; $SD = 1.11$). Sixty-one of these participants (27 men) rated the sample of male targets, and 52 (18 men) rated the sample of female targets.

For the auxiliary analyses pertaining to physical attractiveness as an alternative explanation, we additionally employed attractiveness ratings of the targets that had been collected for a different study (Lukaszewski & Roney, 2011). Specifically, the target photos were rated on "overall physical attractiveness" by eight undergraduates (five women; three men), who were in high agreement ($\alpha = .94$), and whose ratings were therefore combined into a unit-weighted composite.

Procedures. Before viewing and rating the target photos, raters read the following prompt on a computer screen:

In what follows, you will be asked to form impressions of a large group of men (women) who have just graduated from college as business majors. These men (women) have been hired on by a new business consultancy that was recently started up by several members of their graduating college class. The function of this consultancy is to help various for-profit and nonprofit organizations improve their efficiency and/or effectiveness by providing cutting-edge business solutions.

As employees of this consultancy, the men (women) will work in teams of 10 to analyze and solve problems for various organizations. For a given account, each team member will typically be responsible for a specific analytic task, although some will be more involved than others in presenting the overall set of solutions to potential clients at face-to-face meetings. It is not yet known what specific roles these men (women) will play within their teams.

Target photos were displayed to participants on a computer screen, and each photo was rated on the following dimensions using 1 (*lower than others*) – 5 (*higher than others*) Likert scales:

Within-group enforcement ability (Rater Sample 1). "Rate this person's ability to make his (her) team members do what they are supposed to do."

Between-group representation ability (Rater Sample 1). "Rate this person's ability to represent his (her) team to others at face-to-face meetings."

Task-specific intelligence (Rater Sample 1). "Rate this person's ability to analyze problems and come up with effective business solutions."

Projected social status (Rater Sample 2). "Compared with the others, how much social status would this man (woman) achieve within the consultancy?"

The order of targets was randomized across participants, and participants were self-paced in making their ratings.

Results

Intraclass correlation coefficients ($ICCs$) for each rated item indicated that raters were in high agreement regarding their perceptions of the targets, with $ICCs$ ranging from .94 to .98 across individual rated items. As such, for all four rated items, raters' responses were averaged to form a single score for each target.¹

Zero-order correlations demonstrated that perceptions of targets' task-specific intelligence, within-group enforcement ability, and between-group representation ability were each, as predicted, highly correlated with projected social status among both male and female targets (see Table 1). In general, these patterns support the premise that individuals who are seen as being able to make valuable contributions to group functioning will be afforded higher social status on this basis.

In support of our predictions, male targets' physical strength positively predicted raters' perceptions of their within-group enforcement ability, between-group representation ability, and projected social status—but not perceptions of their task-specific intelligence (see Table 1). However, these same associations were not at all evident for female targets, whose physical strength did not associate with any status-related dimension (see Table 1). Sex \times Physical Strength interactions were tested in moderated regression, wherein sex was dummy coded (0 = female; 1 = male) and strength was continuous (Cohen et al., 2003). These analyses confirmed the sex-specificity of the influence of targets' physical strength on raters' status-related perceptions [β s = .26–.55, $ps \leq .05$; see S1 in supplemental online materials for complete simple slopes analyses].

To test the prediction that the association of male targets' physical strength with projected status would be mediated by perceptions of specific leadership abilities, ratings of within-group enforcement ability and between-group representation ability—which were highly correlated in both sexes—were first averaged into a composite variable.² We labeled this composite "potent leadership" (see Table 1) to capture the idea that leadership abil-

¹ Across all studies, the results were nearly identical when using data from male or female raters. As such, ratings were collapsed across sex for all analyses reported in the current article.

² Throughout Studies 1 through 3, we test mediation of the link between formidability and projected status using the potent leadership composite (in part because within-group enforcement and between-group representation were too strongly correlated to be treated as competing predictors, given multicollinearity issues). However, results were very similar when we ran the path models using only within-group enforcement ability or between-group representation ability, respectively, as the leadership-related mediator variable.

Table 1
Correlations Among Targets' Physical Strength and Status-Related Perceptions (Study 1)

Variable	1	2	3	4	5	6
1. Target physical strength	—	-.02	.24**	.38***	.32**	.37***
2. Task-specific intelligence	-.13	—	.80***	.54***	.69***	.60***
3. Between-group representation ability	-.15	.64***	—	.86***	.96***	.84***
4. Within-group enforcement ability	.09	.33**	.78***	—	.96***	.83***
5. Potent leadership (Composite of 3 & 4)	-.04	.52***	.95***	.94***	—	.86***
6. Projected social status	-.28	.40***	.70***	.60***	.69***	—

Note. Effects for men are above the diagonal; effects for women are below the diagonal.
** $p < .01$. *** $p < .001$.

ities of within-group enforcement and between-group representation are theoretically underwritten by the apparent capacity to leverage force in the service of common goals. The multivariate path model depicted in Figure 1 was employed to test the direct and indirect effects implied by our predictions. Specifically, standardized path coefficient estimates were computed in AMOS and tested with maximum likelihood bootstrapping techniques (5,000 bootstrap iterations) and bias-corrected 95% confidence intervals (Preacher & Hayes, 2008). Given the predicted (and observed) sex-specificity in the effects of physical strength on status-related perceptions, we specified a multigroup model wherein path coefficients were permitted to vary freely for male and female targets.

Results of the path analyses confirmed our predictions (see Figure 1): Men's physical strength had a direct effect on potent leadership, but showed no unique association with task-specific intelligence. Moreover, there was a significant indirect effect of men's physical strength on projected social status that was mediated through potent leadership. Women's physical strength had no direct or indirect effects on any status-related perceptions. Finally, task-specific intelligence explained no unique variance in projected social status over and above the effects of potent leadership in either sex.

Male targets' rated physical attractiveness was positively correlated with their physical strength, $r = .26, p < .01$, consistent with prior research (Lukaszewski, 2013; Lukaszewski & Roney, 2011). However, in support of the claim that men's strength explains

variance in status perceptions over and above its association with attractiveness, partial correlation analyses controlling for rated attractiveness confirmed that male targets' physical strength remained significantly correlated with their potent leadership composite scores ($partial\ r = .26, p < .01$) and projected social status ($partial\ r = .31, p < .001$).

Discussion

Findings supported the hypothesis that adaptations for social status allocation are designed to (a) confer higher status on more physically formidable men because (b) such men are perceived as being especially equipped to perform within-group enforcement and between-group representation functions of effective leadership. Additionally, the fact that male targets' physical strength did not associate with ratings of their task-specific intelligence indicates that our findings do not reflect a generalized halo effect, wherein stronger men are seen as being generically more competent than weaker men. Finally, female targets' strength was not associated with any status-related perceptions, which supports the prediction that formidability-based status allocation is a sex-specific phenomenon.

Auxiliary analyses also falsified a possible alternative explanation for our findings: that the association of male targets' physical strength with status allocation simply reflects the fact that stronger men are more physically attractive. Specifically, men's strength

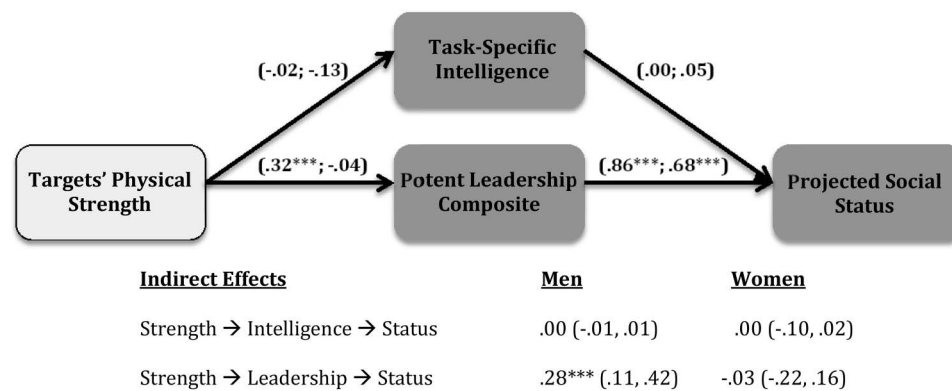


Figure 1. Path analysis examining standardized direct and indirect effects of targets' physical strength on status-related perceptions (Study 1). Direct effects for men are on the left within parentheses; direct effects for women are on the right within parentheses. Indirect effects are inset, presented along with 95% confidence intervals. *** $p < .001$.

explained unique variance in status-related perceptions even when controlling for previously collected physical attractiveness ratings of the same targets. This is a very conservative test of this alternative hypothesis, given that physical strength (Sell et al., 2012) and status potential (Buss & Schmitt, 1993) are both important determinants of men's attractiveness. Relatedly—and more importantly—attractiveness should not likely be considered a viable *alternative* explanation for our findings in the first place. This is because, upon inspection, “attractiveness” is not a precisely defined construct; instead, it essentially functions as a conceptual catch-all for the output(s) of psychological mechanisms designed to integrate various cues in order to estimate one's value as a friend, mate, ally, or leader (see Sugiyama, 2005). The functional logic of cue-based attractiveness judgments is thus itself in need of elucidation. From this vantage point, then, the highly specific patterns of formidability-based status allocation we predict (and observe)—wherein men's physical strength is taken as a cue to particular status-worthy leadership abilities—can actually be seen as helping to provide a functional explanation for *why* physically strong men are more socially attractive. Given these empirical findings and theoretical issues, we do not give this alternative explanation further consideration in Studies 2 through 4.

Study 2

We designed Study 2 to replicate and extend the findings from Study 1 regarding formidability-based status allocation among male targets (female targets are henceforth excluded, given the lack of any evidence of strength's relevance for the allocation of status to women). In terms of theoretical extension, our primary goal was to distinguish between status that is ceded to others because they aggressively dominate their rivals (i.e., dominance-based status) and status that is willingly allocated to others by virtue of their perceived ability to generate benefits for the group (i.e., prestige-based status). Thus, in Study 2, we measured the same rated dimensions from Study 1, and also multiple additional rated dimensions: forceful pursuit of self-interest, dominance-based status, and prestige-based status. As entailed by predictions 5 and 6, we expected that although physically stronger men would be rated as more likely to forcefully pursue self-interest at the expense of the group's interests, this perception would not mediate the association of targets' physical strength with their projected status. Rather, we predicted that raters' perceptions of targets' potent leadership abilities would selectively mediate formidability-based status allocation (whether status was operationalized as prestige-based status or generalized ascendancy).

In Study 2, we also evaluated an as yet untested assumption: that raters' judgments of targets' *abilities* of within-group enforcement and between-group representation are highly correlated with raters' perceptions of their *willingness* to implement behaviors associated with these abilities. This was important to establish because the conferral of status upon physically formidable men only makes functional sense to the degree that they are perceived as being both able and willing to pay the personal costs of providing leadership services that solve problems for the group. Theory and evidence suggest that the psychology of human cooperation includes a default expectation that others will behave prosocially in social exchange situations (Delton et al., 2011)—an expectation that would be down-regulated upon exposure to specific cues indicat-

ing a lack of cooperativeness (Nettle et al., 2014). Indeed, trait perception research confirms that the average person is viewed, at zero acquaintance, as possessing the qualities of a trustworthy cooperator (Wood & Furr, 2015). If people are generally assumed to be cooperators, it follows that they should tend to be perceived as being willing to make particular group contributions to the degree that they are able to do so cost-effectively. Thus, given that men's physical strength positively predicts the cost-benefit ratio of behaviors that entail potential conflict, stronger men should be viewed as more able and (therefore) willing to provide prosocial leadership services, especially when elevated status is a potential reward (Lukaszewski & Roney, 2011; Sell, Tooby, & Cosmides, 2009; von Rueden et al., 2015). For these reasons, we predicted that (a) raters' perceptions of targets' ability and willingness, respectively, to implement status-relevant behaviors would be highly correlated, and (b) the same pattern of formidability-based status allocation would emerge whether raters were asked to evaluate targets' ability or willingness.

Method

Participants.

Target individuals. Target individuals in the photos were identical to those employed in Study 1 ($n = 131$ men).

Raters. Two rater samples participated in exchange for partial course credit. The first rater sample comprised 127 undergraduates (58 men) at a private university on the west coast of the United States (M age = 19.24; $SD = .96$) and the second rater sample comprised 91 undergraduates (22 men) at a large public university in the southern midwest of the United States (M age = 20.44; $SD = 1.11$). Rater Sample 1 was divided into subgroups who rated within-group enforcement ability ($n = 24$; 11 men), between-group representation ability ($n = 20$; 7 men), task-specific intelligence ($n = 12$; 6 men), forceful pursuit of self-interest ($n = 18$; 8 men), dominance-based status ($n = 14$; 6 men), prestige-based status ($n = 18$; 11 men), or projected social status ($n = 21$; 9 men). Rater Sample 2 was divided into subgroups who rated targets' *willingness* to implement within-group enforcement ($n = 22$; 6 men), between-group representation ($n = 23$; 5 men), task-specific intelligence ($n = 23$; 9 men), or forceful pursuit of self-interest ($n = 24$; 2 men).

Procedures. Raters read the same business consultancy prompt from Study 1, before being asked to rate each target photo in a randomized order of presentation. Operational definitions for rated variables were as follows (word changes for items adapted for “willingness” ratings are in parentheses):

Within-group enforcement (2 items). “Rate this man's ability (willingness) to make his team members do what they are supposed to do”; “Rate this man's ability (willingness) to punish others when the group deems necessary.”

Between-group representation (2 items). “Rate this man's ability (willingness) to represent his team to clients at face-to-face meetings”; “Rate this man's ability (willingness) to represent his team to other organizations.”

Task-specific intelligence (2 items). “Rate this man's ability (willingness) to analyze problems and come up with effective business solutions”; “Rate this man's (likelihood of being known by his team members as) (willingness to be) ‘the brains of the operation.’”

Forceful pursuit of self-interest (2 items). “Rate this man’s likelihood of pursuing (willingness to pursue) his interests at the expense of the group’s interests”; “Rate this man’s likelihood of inflicting (willingness to inflict) costs on the group to benefit himself.”

Projected dominance-based status (2 items). “Compared with the other men, how much would this man likely achieve status within the consultancy that is obtained by forcefully imposing his agenda on other group members?”; “Compared with the other men, how much would this man likely achieve influence within the consultancy that is obtained by forcefully imposing his agenda on other group members?”

Projected prestige-based status (2 items). “Compared with the other men, how much would this man likely achieve status within the consultancy that is based on respect he has earned from other group members?”; “Compared with the other men, how much would this man likely achieve influence within the consultancy that is based on respect he has earned from other group members?”

Projected social status (4 items). “Compared with the other men, how much status would this man achieve within the consultancy?”; “Compared with the other men, how much influence would this man achieve within the consultancy?”; “Compared with the other men, how much money would this man make?”; “Compared to the other men, how quickly would this man ascend in position within the consultancy?”

Results

Raters were in high agreement regarding their perceptions of the targets, with ICCs ranging from .90 to .99 across individual rated items. As such, for all rated items, raters’ responses were averaged to form a single score for each target. Within each rated dimension, items were very highly intercorrelated (interitem $r_s > .79$). Thus, we created unit-weighted composite scores for each target that represent the average of the 2 to 4 items tapping each dimension.

As expected, ratings of targets’ *ability* and *willingness* were highly intercorrelated for perceptions of within-group enforcement, $r = .88, p < .001$, between-group representation, $r = .77, p < .001$, task-specific intelligence, $r = .69, p < .001$, forceful pursuit of self-interest, $r = .76, p < .001$, and the potent leadership

composite, $r = .88, p < .001$. Thus, we conduct all further analyses for ratings of both ability and willingness, in parallel, to demonstrate that this distinction does not alter the findings.

Zero-order correlations (see Table 2) demonstrated that perceived within-group enforcement, between-group representation, task-specific intelligence and forceful pursuit of self-interest were each positively correlated with projected dominance-based status, prestige-based status, and social status. Patterns were similar whether mediators were rated in terms of targets’ ability (above the diagonal in Table 2) or willingness (beneath the diagonal in Table 2). In addition, the three projected status variables were very highly positively intercorrelated ($r_s > .77$). For further hypothesis testing, as in Study 1, we created a potent leadership composite (see Table 2) that represented the average of within-group enforcement and between-group representation.

Consistent with multiple of the hypotheses under examination, targets’ physical strength did not associate with perceived task-specific intelligence, but was positively correlated with ratings of within-group enforcement, between-group-representation, forceful pursuit of self-interest, and the potent leadership composite (see Table 2). These correlations were evident whether raters evaluated the relevant items in terms of targets’ ability or willingness. In addition, targets’ physical strength positively predicted projected dominance-based status, prestige-based status, and social status (see Table 2).

Path models were used to examine the meditational effects implied by the competing hypotheses described above. Within the models (see Figure 2), physical strength has potential direct effects on possible perceptual mediators of status allocation (task-specific intelligence, potent leadership, and forceful pursuit of self-interest). In turn, these possible mediators of physical strength’s effect on status allocation compete to explain variance in projected status. For both ability and willingness ratings, respectively, this model was run three different times: once predicting projected social status, once predicting prestige-based status, and once predicting dominance-based status. As in Study 1, standardized direct and indirect effects were estimated in AMOS with maximum likelihood bootstrapping techniques (5,000 bootstrap iterations) and bias-corrected 95% confidence intervals.

Table 2
Correlations Among Targets’ Physical Strength and Status-Related Perceptions (Study 2)

Variable	1	2	3	4	5	6	7	8	9
1. Target physical strength	—	-.05	.34***	.26**	.42***	.36***	.36***	.32***	.20*
2. Task-specific intelligence	.08	—	-.12	.48***	.22**	.40***	.46***	.40***	.59***
3. Forceful self-interest	.33***	-.23*	—	.30**	.65***	.49***	.42***	.39***	.25**
4. Between-group representation	.22*	.77***	-.08	—	.68***	.94***	.88***	.82***	.88***
5. Within-group enforcement	.45***	.34***	.67***	.44***	—	.89***	.76***	.74***	.68***
6. Potent leadership (Composite of 4 & 5)	.41***	.64***	.37***	.83***	.87***	—	.90***	.85***	.86***
7. Projected prestige-based status	—	.68***	.24**	.75***	.70***	.76***	—	.83***	.88***
8. Projected dominance-based status	—	.62***	.25**	.68***	.69***	.87***	—	—	.77***
9. Projected social status	—	.75***	.09	.76***	.55***	.77***	—	—	—

Note. For values above the diagonal, italicized variables were rated in terms of targets’ *ability*; for values beneath the diagonal, italicized variables were rated in terms of targets’ *willingness*.
* $p < .05$. ** $p < .01$. *** $p < .001$.

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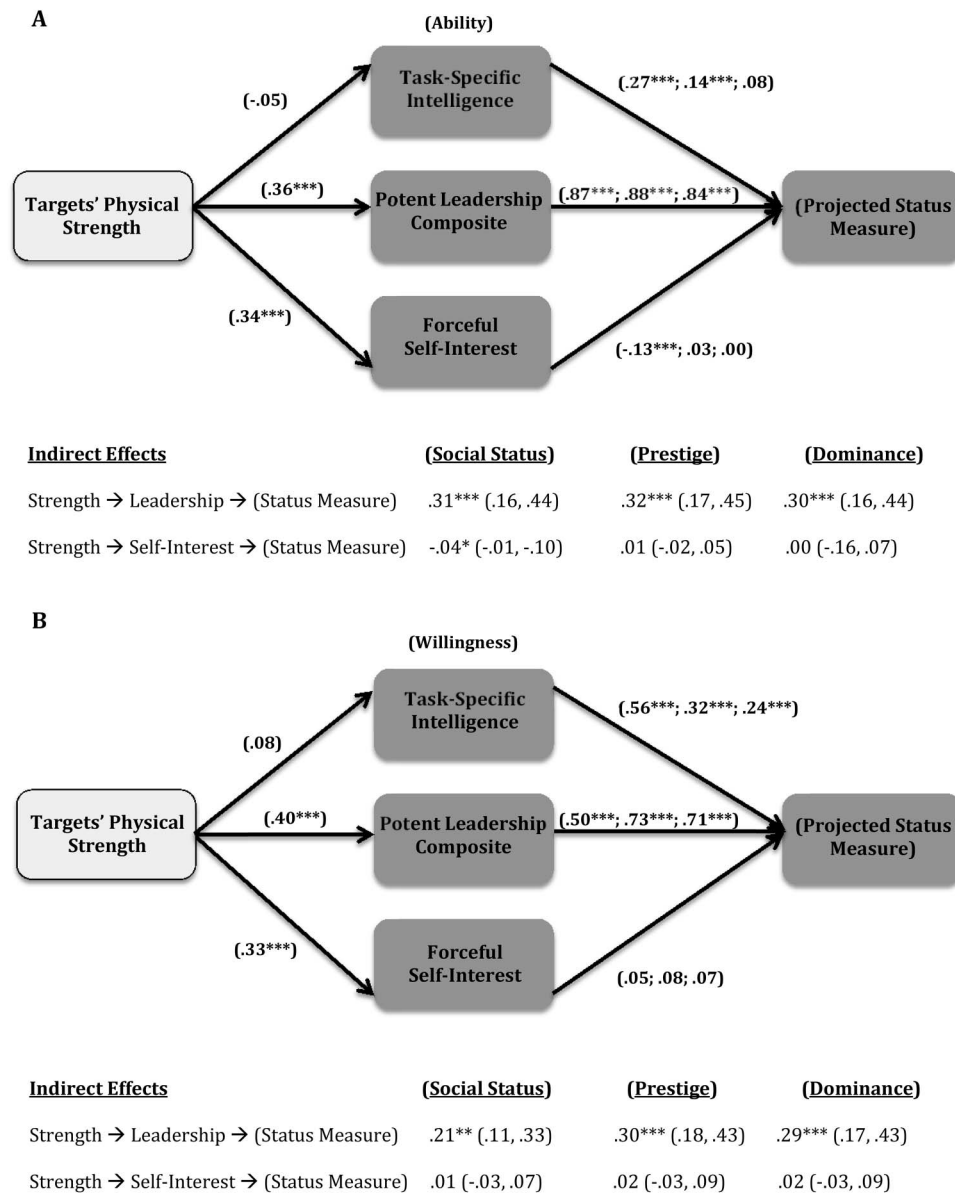


Figure 2. Path analyses examining standardized direct and indirect effects of male targets' physical strength on status-related perceptions (Study 2) when mediators were rated in terms of targets' ability (A) and willingness (B). Models were run three times with different projected status measures; direct effects for status measures within parentheses are, from left-right, for projected social status, projected prestige-based status, and projected dominance-based status. Indirect effects are inset, presented along with 95% confidence intervals. * $p < .05$; ** $p < .01$; *** $p < .001$.

Results of the path analyses using ratings of targets' abilities as the potential mediators are presented in Figure 2A. These analyses demonstrated that targets' physical strength had positive direct effects on potent leadership ability and forceful pursuit of self-interest, but no effect on perceived task-specific intelligence. When the final dependent variable in the model was projected social status, both potent leadership and task-specific intelligence had positive direct effects on projected status. Additionally, perceived forceful pursuit of self-interest had a negative direct effect on projected social status. Finally, targets' physical strength had

both a positive indirect effect (mediated through potent leadership) and a negative indirect effect (mediated through forceful pursuit of self-interest) on projected social status (Figure 2A, inset).

When the final dependent variable in the model was projected prestige-based status or dominance-based status, respectively, the findings were nearly identical to those for projected social status (Figure 2A). However, there were a few exceptions to this. First, forceful pursuit of self-interest had a null (rather than negative) effect on both prestige- and dominance-based status. Thus, targets' physical strength also had a null indirect effect through forceful

pursuit of self-interest on prestige- and dominance-based status (Figure 2A, inset).

Results of the path analyses using ratings of targets' willingness as the potential mediators are presented in Figure 2B. These analyses replicated all the patterns discussed above pertaining to ratings of targets' abilities, except for the fact that the willingness to forcefully pursue self-interest had a null (rather than negative) effect on all projected status variables (Figure 2B).

Discussion

The findings from Study 2 supported Predictions 1–6 and, in so doing, provided a number of insights into the functional logic of adaptations for social status allocation. Consistent with Study 1, the current findings suggest that physically formidable men are allocated higher social status because they are perceived as having greater ability—and willingness—to implement within-group enforcement and between-group representation. The data supported this conclusion whether projected status was conceptualized in terms of general ascendancy and success within the organization, or explicitly in terms of prestige- or dominance-based status. On average, physically stronger men were also perceived as being more likely to inflict costs on the group in pursuit of self-interest—but this perception always had a null (or even negative) effect on status allocation when controlling for perceived leadership qualities. As such, these findings together underscore the principle that higher status in cooperative groups will only be allocated to physically formidable men to the degree that such men are perceived as being likely to use their strength and assertiveness to generate benefits through leadership—and to the extent that they are *not* perceived as possessing an unfavorable combination of self-interested aggressiveness and low leadership potential. This pattern of outputs is exactly what should be expected from an evolved psychology designed to allocate status in a way that promotes successful group cooperation.

It is noteworthy that our “projected dominance-based status” variable produced results that were very similar to those observed for projected prestige-based status and projected social status. This likely reflects the content of the items used to assess projected dominance-based status, which referred to status and influence obtained by “forcefully imposing an agenda on others in the group.” The ability and willingness to forcefully impose an agenda on others could be employed in a way that differentially serves either one's own interests or the group's interests. Given the very large intercorrelations among all projected status measures, it appears raters assumed that the forceful imposition of an agenda on other group members would only result in higher status if such behavior was deployed in a way that promoted the group's interests. Indeed, the effect of strength on dominance-based status was mediated through raters' perceptions of targets' potent leadership abilities—and not via the perceived likelihood of forcefully pursuing self-interest (whose item content most closely corresponds to the description of dominance-based status within the dominance-prestige model). We return to these issues in the General Discussion when we consider the implications of our findings for the dominance-prestige model.

Study 3

It was both a strength and a limitation of Studies 1 and 2 that we employed as stimuli standardized photos of targets in conjunction with actual measurements of their physical strength. On the one hand, this methodology generated novel and compelling evidence that status-related perceptions accurately track visual cues to male group members' physical strength. On the other hand, however, the correlational design of these studies did not permit conclusive establishment of the causality implied by our hypotheses—wherein group members are perceived as better leaders and allocated higher status *because* of their greater physical formidability.

In Study 3, therefore, we conducted an experiment wherein we manipulated the relative body strength of targets in photos to determine the causal impact of this variable on status-related perceptions and affordances. This was accomplished by (a) selecting physically strong and physically weak male targets, (b) creating strength-manipulated images by switching the bodies of strong-weak target pairs, and (c) having both unmanipulated and strength-manipulated target photos rated on task-specific intelligence, within-group enforcement ability, between-group representation ability, forceful pursuit of self-interest, and projected social status. (Dominance- and prestige-based status were not included, given the lack of any evidence from Study 2 that target strength associates differentially with any particular conceptualization of social status.)

Method

Participants.

Targets (and strength manipulation). From the set of target photos used in the previous studies, we selected four physically strong male targets (in the top strength decile) and four physically weak male targets (in the bottom strength decile). Strong targets were on average 1.59 standard deviations above the mean on strength, and weak targets were on average 1.46 standard deviations below the mean on strength.

We manipulated body strength by switching the bodies of strong-weak target pairs using Adobe Photoshop. First, each strong target was paired with a weak target (the pairs were selected on the basis of their realistically interchangeable neck morphology and complexion). Next, for each strong-weak pair, we altered the photos such that a weak target's head was depicted on a strong target's body, and vice versa. Thus, for all eight targets (four strong; four weak), there were two versions of each photo: unmanipulated and strength-manipulated. In the unmanipulated condition, targets were depicted with their own bodies. In the strength-manipulated condition, targets were depicted with another person's body. Sample stimuli can be found in S2 in supplemental online materials.

Raters. We recruited 466 raters (268 men; M age = 30.5, SD = 6.89) via Amazon Mechanical Turk, who were paid \$2 in exchange for participation. The survey software (Qualtrics) randomly assigned 214 raters to rate the unmanipulated photos on all rated dimensions, and 252 raters to rate the strength-manipulated photos on all rated dimensions.

Procedures. Raters read the same business consultancy prompt from the previous studies, before being asked to rate all eight (unmanipulated or strength-manipulated) target photos on multiple dimensions sequentially. Specifically, raters evaluated all

eight target photos on task-specific intelligence, within-group enforcement ability, between-group representation ability, forceful pursuit of self-interest, and projected social status. The order of rated variables was randomized (except projected social status, which was always rated last), as was the order of targets within each rating block.

Operational definitions for rated variables were the same as those used in Study 2, with two exceptions. First, the task-specific intelligence item “Rate this man’s likelihood of being known by his team members as ‘the brains of the operation’” was replaced with “Rate this man’s ability to think up novel ways to improve the efficiency of a business.” Second, projected status was assessed with the two items from Study 1 (rather than the four-item composite from Study 2).

Results

Raters were in high agreement regarding their perceptions of the targets, with ICCs ranging from .73 to .87 across individual rated items. As such, for all rated items, raters’ responses were averaged to form a single score for each target, which were then used to create unit-weighted composite scores for each dimension. To test our hypotheses, we created composites that represented the average ratings across the four strong targets and the four weak targets. Experimental condition was dummy coded with unmanipulated ratings coded 0 and strength-manipulated ratings coded 1.

As predicted, 2×2 mixed ANOVAs revealed that there were significant interactions between rating condition (unmanipulated vs. strength manipulated) and target strength (weak vs. strong) on raters’ perceptions of within-group enforcement ability, $F(1, 463) = 513.64, p < .001, \eta^2 = .53$, between-group representation ability, $F(1, 463) = 190.57, p < .001, \eta^2 = .29$, the potent leadership composite, $F(1, 463) = 508.02, p < .001, \eta^2 = .52$, forceful pursuit of self-interest, $F(1, 463) = 112.21, p < .001, \eta^2 = .20$, and projected social status, $F(1, 463) = 560.80, p < .001, \eta^2 = .55$. Also as predicted, the interaction was small and nonsignificant for task-specific intelligence, $F(1, 463) = 3.81, p > .05, \eta^2 = .01$. Independent-samples t tests were employed to

decompose these interactions by testing the effect of photo rating condition (the strength manipulation) on each rated variable among weak and strong targets, respectively (see Table 3). Consistent with predictions, the strength manipulation had inverse effects across weak and strong targets on within-group coordination ability, within-group representation ability, the potent leadership composite, forceful pursuit of self-interest, and projected social status. Among weak targets, being depicted with a stronger body increased ratings on these dimensions; among strong targets, being depicted with a weaker body decreased ratings on these dimensions. The strength manipulation had no effects on ratings of targets’ task-specific intelligence.

A multivariate path model was employed to examine the mediational effects implied by our predictions. Within the model, the strength manipulation (0 = unmanipulated; 1 = strength-manipulated) has potential direct effects on the possible mediators (task-specific intelligence, potent leadership, and forceful pursuit of self-interest), which in turn compete to explain variance in projected social status. Because the effects of the strength manipulation went in opposing directions for weak and strong targets, respectively, we specified a multigroup model wherein path coefficients were permitted to vary freely for weak and strong targets. As in the previous studies, standardized direct and indirect effects were estimated in AMOS with maximum likelihood bootstrapping techniques (5,000 bootstrap iterations) and bias-corrected 95% confidence intervals.

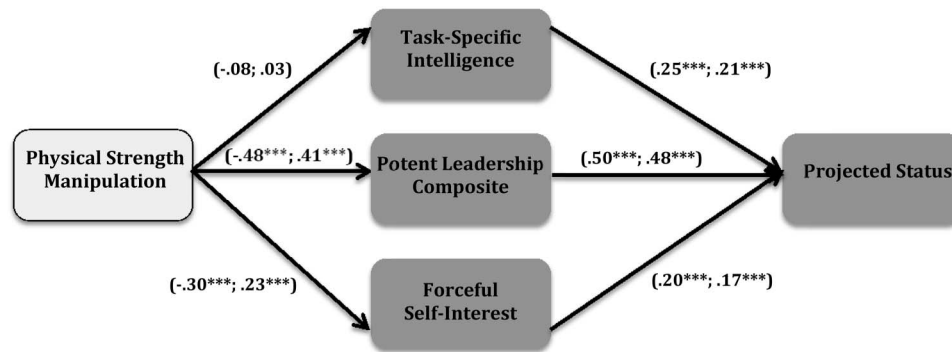
Results of the path analyses (see Figure 3) demonstrated that there were direct effects of the strength manipulation on both potent leadership and forceful pursuit of self-interest that ran in opposing directions for strong and weak targets, respectively. As predicted, the positive effect of being depicted with a stronger (vs. weaker) body on projected status was largely mediated via the potent leadership composite among both weak and strong targets (Figure 3, inset). Additionally, among both strong and weak targets, there was an unpredicted—though much smaller—positive indirect effect of being depicted with a stronger body on projected

Table 3
Effects of Physical Strength Manipulation on Raters’ Perceptions of Weak and Strong Targets (Study 3)

Rated variable	Target strength	Photo rating condition		Effect of rating condition
		Unmanipulated Mean (SD)	Strength-manipulated Mean (SD)	
Task-specific intelligence	Weak	2.89 (.67)	2.92 (.60)	$d = -.05$
	Strong	3.06 (.59)	3.01 (.59)	$d = .05$
Within-group enforcement	Weak	2.49 (.60)	3.14 (.60)	$d = 1.08^{***}$
	Strong	3.39 (.59)	2.66 (.55)	$d = -1.28^{***}$
Between-group representation	Weak	2.40 (.60)	2.70 (.62)	$d = .49^{***}$
	Strong	2.94 (.65)	2.54 (.56)	$d = -.66^{***}$
Potent leadership composite	Weak	2.44 (.54)	2.92 (.52)	$d = .94^{***}$
	Strong	3.16 (.53)	2.60 (.47)	$d = -1.12^{***}$
Forceful pursuit of self-interest	Weak	2.81 (.64)	3.11 (.61)	$d = .48^{***}$
	Strong	3.10 (.66)	2.72 (.56)	$d = -.62^{***}$
Projected social status	Weak	2.55 (.53)	3.22 (.54)	$d = 1.25^{***}$
	Strong	3.38 (.49)	2.76 (.52)	$d = -1.21^{***}$

Note. Effects of rating condition were examined using independent samples t tests ($df = 463$).

*** $p < .001$.



<u>Indirect Effects</u>	<u>Strong Targets</u>	<u>Weak Targets</u>
Strength Manipulation → Leadership → Status	-.24*** (-.18, -.29)	.19*** (.13, .24)
Strength Manipulation → Self-Interest → Status	-.05* (-.03, -.09)	.04* (.02, .07)

Figure 3. Path analysis examining standardized direct and indirect effects of physical strength manipulation on status-related perceptions (Study 3). Direct effects for strong targets are on the left within parentheses; direct effects for weak targets are on the right within parentheses. Indirect effects are inset, presented along with 95% confidence intervals. * $p < .05$; *** $p < .001$.

status that was mediated via forceful pursuit of self-interest (Figure 3, inset).

Discussion

In employing a photographic manipulation of targets' physical strength, Study 3 successfully established the causality of the patterns documented in the first two studies. The strength manipulation had a causal impact on status allocation, and this was largely mediated by strength's effects on perceptions of targets' abilities of within-group enforcement and between-group representation. In addition, the strength manipulation had no impact on raters' perceptions of targets' task-specific intelligence, which confirms that the strength's effects on leadership perceptions and status allocation do not arise from a generalized halo effect.

The only finding that was not consistent with predictions—or with the patterns from the correlational studies—was the positive indirect effect of the strength manipulation that was mediated through forceful pursuit of self-interest. This indirect path was very small, though, and explained *much* less variance in the strength-status relationship than did the path operating via the potent leadership composite. It seems likely that this unpredicted result arose from the extreme bimodal distribution of target strength in the current study. Specifically, because the group of targets presented to raters consisted of only very strong and very weak men, some raters may have implicitly assumed that the strong men could succeed in using tactics of aggression and intimidation in order to elicit (at least some) deference from much weaker men, regardless of their ability to provide leadership. Although this latter explanation is admittedly speculative, we consider the primary importance of Study 3's findings to be that they established the causality of men's physical strength on status allocation, while also conceptually replicating the most theoretically important patterns predicted by our hypotheses.

Study 4

The first three studies supported Predictions 1–6, which pertain to the role of men's physical strength in status allocation. However, they were not useful for assessing Prediction 7, which posits that height will have the same pattern of effects on status-related perceptions as strength—but only to the degree that taller stature increases men's apparent strength. Study 4 therefore examined effects of height on raters' perceptions of male targets. To this end, we (a) created visual stimuli wherein targets' height was experimentally manipulated, such that individuals were presented as being either short, tall, or equal in stature, relative to others; and (b) had targets rated on perceived physical strength, task-specific intelligence, within-group enforcement ability, forceful pursuit of self-interest, and projected social status.

If Prediction 7 is correct, the height manipulation will have positive effects on raters' perceptions of targets' physical strength, within-group enforcement ability, and projected social status. Additionally, height's influence on perceived strength will explain the effect of the height manipulation on projected status (as mediated via within-group enforcement ability). As discussed above, previous research suggests that the height manipulation may also have positive effects on perceptions of targets' task-specific intelligence, but this effect should be independent of height's effects on perceived strength.

Method

Participants.

Targets. Targets in the photos were 128 of the 131 men from Studies 1 and 2 (three men were excluded to create 32 equal groups of four).

To create the height-manipulated stimuli (see Figure 4), we first divided the 128 targets into 32 groups of four. Using Adobe Photoshop, we inserted an image of each member of a group onto a white background, so that the four men were depicted as standing side-by-side in a lineup. For each four person group, three versions

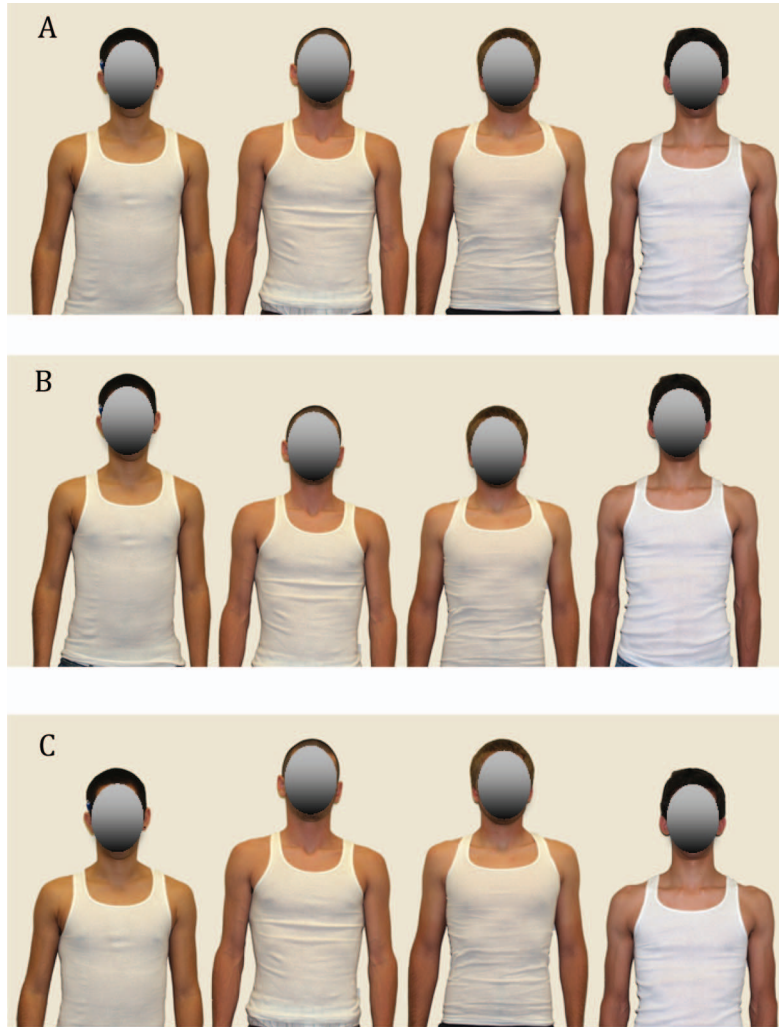


Figure 4. Example of height-manipulated stimuli from Study 4. The same four men are depicted as being (A) equal in height; (B) tall, short, short, tall; and (C) short, tall, tall, short. Note that targets' faces were not concealed from raters in the actual experiment. See the online article for the color version of this figure.

of these images were generated: One in which two of the men were shorter than the other two, one in which this height differential was reversed, and one in which all four men were of equal height. To guard against the possibility that certain positions in the right-left lineup would tend to be perceived differently, we uncorrelated height with position across target groups by assigning each four person group to one of three positional configurations. In sum, for each target, there was a stimulus photo wherein he was pictured as being short, tall, and equal height, respectively, and relative height in the photos was uncorrelated with right-left position in the lineup across target groups.

Raters. Two rater samples were employed, both of which participated in exchange for partial course credit at private universities on the west coast of the United States. Rater Sample 1 comprised 146 participants (53 men; M age = 18.86; SD = 1.18), and Rater Sample 2 comprised 74 participants (17 men; M age = 20.05; SD = 1.36). Rater Sample 1 rated targets on all status-related dimensions, whereas Rater Sample 2 rated targets on phys-

ical strength only. In each case, raters were randomly assigned to one of three versions of the survey, which depicted each target in one of three height conditions (short, tall, or equal).

Procedure. Raters read the same business consultancy prompt from the previous studies, before being asked to rate each target. Status-related rating dimensions were operationalized using items from Studies 1 and 2. However, in this study, as in Study 1, each dimension was tapped by a single item, given that the findings were so similar whether we used single or multiple items for each construct. In addition, we excluded between-group representation ability, because it produced the same pattern of results as within-group enforcement ability in the previous studies.

Task-specific intelligence (Rater Sample 1). "Rate this man's likelihood of being known by his team members as 'the brains of the operation.'"

Within-group enforcement ability (Rater Sample 1). "Rate this person's ability to make his team members do what they are supposed to do."

Forceful pursuit of self-interest (Rater Sample 1). “Rate this man’s likelihood of pursuing his own interests at the expense of the group’s interests.”

Projected social status (Rater Sample 1). “Compared with the others, how much social status would this man achieve within the consultancy?”

Perceived physical strength (Rater Sample 2). “Compared with the others, how physically strong is Person X?”

Rater Sample 1 first rated each target individual on projected social status. To this end, a group of targets was presented on the screen, and each man in the lineup was labeled above the photo as, from left-right, A, B, C, or D. Raters were first asked to rate man A, then man B, then man C, then man D. The survey then moved the rater on to the next four person target group, and so on until all groups had been rated. After raters finished rating all targets on projected social status, they were taken through the same survey once more, this time rating each man simultaneously on within-group enforcement ability, task-specific intelligence, and forceful pursuit of self-interest. Rater Sample 2 followed this same procedure, but only rated targets’ physical strength.

Results

Raters were in high agreement regarding their perceptions of the targets, with ICCs ranging from .77 to .91 across individual rated items. As such, for all four rated items, raters’ responses were averaged to form a single score for each target.

Repeated measures ANOVAs were employed to test effects of the height manipulation on raters’ perceptions of the targets (see Table 4). Each ANOVA was set up to compare perceptions of each target with himself across the three height conditions: short, equal, and tall. Consistent with predictions, manipulated height had positive linear effects on perceptions of targets’ physical strength, $F(2, 254) = 152.10, p < .001, \eta^2 = .55$, within-group enforcement ability, $F(2, 254) = 57.79, p < .001, \eta^2 = .31$, task-specific intelligence, $F(2, 254) = 41.33, p < .001, \eta^2 = .24$, and projected social status, $F(2, 254) = 56.80, p < .001, \eta^2 = .31$. Additionally, although not specifically predicted, manipulated height had a linear *negative* effect on ratings of forceful pursuit of self-interest, $F(2, 254) = 19.88, p < .001, \eta^2 = .14$.

Tests of within-subjects contrasts (see Table 4) indicated that there were significant stepwise differences between all height conditions for all rated dimensions. The only partial exception to this was within-group enforcement ability, for which the difference

between the equal and tall height conditions was only marginally significant ($p = .08$).

To test whether the effects of height on raters’ perceptions were driven in the predicted ways by the height manipulation’s effect on perceived strength, we employed a cross-sectional mediation analysis incorporating three simultaneous mediators (Selig & Preacher, 2008). In the analysis, the independent variable was targets’ perceived strength scores when presented as short versus tall—which essentially captures the influence of the height manipulation on perceived strength for each target. We tested whether this height-manipulated perceived strength variable had indirect effects on projected status via the possible competing mediators (task-specific intelligence, within-group enforcement ability, and forceful pursuit of self-interest). Confidence intervals for the mediation effects were created using bias-corrected bootstrapping with 20,000 iterations (Selig & Preacher, 2008). Results showed that within-group enforcement ability [indirect effect = .58 (95% CI: .45, .70)] and task-specific intelligence [indirect effect = .05 (95% CI: .02, .11)] each mediated the positive association of perceived strength with projected status, whereas there was no evidence that forceful pursuit of self-interest mediated the effect of perceived strength on projected status [indirect effect = $-.03$ (95% CI: $-.07, 0$)]. For the complete analysis of direct and indirect effects, see S3 in supplemental online materials.

Discussion

Consistent with previous research suggesting that height may be subject to a general competence-based halo effect in both sexes (Blaker et al., 2013; Judge & Cable, 2004), manipulated height had positive effects on perceptions of targets’ task-specific intelligence, within-group enforcement ability, and projected social status; whereas it had a negative effect on perceptions of targets’ likelihood of forcefully pursuing self-interest. However, in support of Prediction 7, the difference in targets’ apparent physical strength when presented as short versus tall had an indirect positive association with projected status that was largely mediated via within-group enforcement ability. There was also an unpredicted indirect association of perceived strength with projected status that operated via task-specific intelligence, but this effect was tiny in comparison with that for within-group enforcement ability. Thus, although the functional basis of the perceptual associations of height with a range of socially desirable characteristics (e.g., intelligence; unselfishness) remain largely mysterious (Blaker &

Table 4
Effects of Height Manipulation on Raters’ Perceptions of Targets (Study 4)

Rated variable	Height condition Mean (SD)			Short vs. tall effect size
	Short	Equal	Tall	
Task-specific intelligence	3.67 (.54) _a	3.73 (.51) _b	3.92 (.49) _c	$d = .47^{***}$
Within-group enforcement	3.71 (.53) _a	3.93 (.55) _c	3.98 (.52) _c	$d = .50^{***}$
Forceful pursuit of self-interest	3.86 (.42) _a	3.78 (.36) _b	3.68 (.38) _c	$d = -.45^{***}$
Projected social status	3.38 (.65) _a	3.69 (.69) _b	3.96 (.68) _c	$d = .85^{***}$
Perceived physical strength	2.85 (.48) _a	3.03 (.54) _b	3.21 (.46) _c	$d = 1.48^{***}$

Note. Means with different subscripts are significantly different at $p < .05$ as determined by repeated measures ANOVAs.

*** $p < .001$.

Van Vugt, 2014), the current findings suggest that the logic of formidability-based status allocation explains at least part of the relationship of men's height with leadership and status outcomes.

General Discussion

A large body of research suggests that members of human groups willingly allocate higher social status to more physically formidable men (Blaker & Van Vugt, 2014; von Rueden, 2014), and convergent social-cognitive evidence indicates the existence of a deep implicit mental association between concepts of physical size and social rank (Duguid & Goncalo, 2012; Holbrook & Fessler, 2013; Hwang & Matsumoto, 2014; Yap et al., 2013; Zanolie et al., 2012). However, the extant literature has heretofore lacked an accepted explanation for this formidability-status relationship. The current research has advanced the hypothesis that, (a) under ancestral conditions, physical formidability would have predicted men's ability to implement within-group coordination and between group-representation functions of successful leadership, and therefore (b) psychological adaptations for social status allocation are designed to confer greater status upon physically stronger men in cooperative groups, all else equal.

Four empirical studies supported seven predictions derived from this hypothesis. In Study 1, men's (but not women's) actual physical strength positively predicted the extent to which group members were seen as possessing abilities of within-group coordination and between-group representation, and these leadership-related perceptions statistically mediated greater projected allocation of status to physically stronger men. Study 2 replicated these patterns among male targets, and further demonstrated that perceived leadership qualities statistically mediated strength-based status allocation regardless of whether status was operationalized in terms of overall ascendancy, prestige-based status, or dominance-based status. By employing an experimental manipulation of male targets' physical strength, Study 3 established the causality of strength's effects on status allocation. Finally, Study 4 manipulated male targets' relative height and thereby demonstrated that height had a similar pattern of selective effects on leadership perceptions and status allocation as strength—but only to the degree that men were perceived as physically stronger when depicted as taller (vs. shorter) than other group members.

By including task-specific intelligence and forceful pursuit of self-interest as competing mediators of the relationship between targets' physical strength and projected status, we were able to rule out alternative explanations. Perceptions of targets' task-specific intelligence were positively correlated with leadership-related perceptions and status allocation. However, across Studies 1 through 3, men's physical strength did not associate with perceptions of their task-specific intelligence—which falsifies the hypothesis that formidability-based status allocation arises from a general halo effect. By contrast, the findings from Study 4 suggest that height not only plays a role in formidability-based status allocation (via its effect on perceived strength), but also appears to be taken as a cue to the possession of various socially desirable qualities, including greater intelligence and unselfishness. In Studies 1 through 3, perceptions of male targets' likelihood of forcefully pursuing self-interest played a negligible (and directionally inconsistent) role in explaining the relationship between physical strength and projected status.

Study 4 provided further support for this conclusion, in that the height manipulation's influence on targets' apparent strength had no indirect association with projected status via forceful pursuit of self-interest ratings.

In sum, these correlational and experimental findings collectively supported our hypotheses regarding the functional logic of formidability-based status allocation. In what follows, we briefly flesh out the implications of our findings for theory and research on the evolution of collective action and hierarchical leader-follower dynamics, before identifying several additional outstanding questions pertaining to the generality of our conclusions.

Formidability-Based Status Allocation as a Solution to Collective Action Problems in Humans and Other Species

We have argued that adaptations for formidability-based status allocation were selected for over human evolutionary history because the outputs of such mechanisms provide a solution to collective action problems, including the existence of free riders, exploitative group members, potential discoordination, and the need for effective representation in negotiations and conflicts with other groups. Consistent with this, parallel examples have been characterized in other group-living primates. Particularly illustrative examples are provided by the pigtailed macaque (*Macaca nemestrina*) and the chimpanzee (*Pan troglodyte*), respectively. Members of these species live in hierarchical groups within which individuals reap various benefits from collective defense and cooperation with both kin and nonkin (Boehm, 1999; de Waal, 1982; Flack, de Waal, et al., 2005). However, the maintenance of beneficial cooperative networks within these groups is dependent on the existence of "policemen"—specific leader-like individuals who actively intervene to prevent conflicts between group members, and who attempt to implement a relatively egalitarian resource distribution policy (Flack, de Waal, et al., 2005; Flack, Krakauer, & de Waal, 2005; Flack, Girvan, de Waal, & Krakauer, 2006; von Rohr et al., 2012). Experimental removal of these policemen from the group enables conflicts between group members to escalate unchecked, which causes cooperative networks to destabilize and splinter into smaller kin-based groups (Flack et al., 2006; Flack, Krakauer, et al., 2005). Importantly, policemen are formidable males, and policing efforts by these individuals are therefore seldom met with reactive aggression (Flack, de Waal, et al., 2005; von Rohr et al., 2012). Although it is not entirely established how these policemen are incentivized to perform their prosocial leader-like functions, it is likely that they benefit indirectly by gaining political support from other group members, which is critical for holding onto their positions of high social rank when they are challenged by rivals and upstarts (Boehm, 1999; de Waal, 1982). Conversely, if high-ranking individuals permit group-destabilizing conflict to flourish, subordinates (including females) can easily form alliances to collectively depose even very individually formidable males (Boehm, 1999; de Waal, 1982). Thus, in these nonhuman primate species, physically formidable males do not appear to maintain high rank solely by aggressively dominating their subordinates—but also by using their formidability to provide leadership services that facilitate cooperation among followers, which is rewarded, in turn, with high social rank and its associated benefits.

Research in small-scale human societies likewise illustrates the importance of formidability-based status allocation in facilitating group cooperation. Most small-scale societies (e.g., hunter-gatherers and forager-horticulturalists) are “egalitarian” not in the sense that women and children have equal status to adult males—which is extremely rare—but in that adult men are granted equal *de jure* rights within the community (Boehm, 1999; von Rueden, 2014). Within these egalitarian societies, male status hierarchies are ubiquitous, and physical formidability is among the characteristics that predict leadership emergence and high social status. Even more so than is the case for nonhuman primates, physically formidable men do not acquire or maintain their high community-wide status through aggressive domination of their rivals. Instead, they lead by consensus to facilitate successful collective action (Boehm, 1999; Chagnon, 1988; Patton, 2000; von Rueden et al., 2014; Wrangham & Peterson, 1996). If physically strong leaders become corrupt or fail to provide within-group coordination and between-group representation services effectively, followers will either collectively depose them or “vote with their feet” by moving to a different village (von Rueden, 2014). Conversely, if they are seen as effective in facilitating group cooperation, they will maintain greater social status and reap its associated reproductive benefits (Chagnon, 1988; von Rueden et al., 2011).

In sum, these considerations suggest that male formidability-based status allocation has a deep evolutionary history, although it is unclear whether homology or convergent evolution is responsible for the similarity of humans and other primate species. In either case, it appears that the allocation of greater status to physically formidable males within hierarchical cooperative groups functions to promote effective leadership along dimensions of within-group coordination and between-group representation—which in turn may have provided an important part of the solution to collective action problems that threatened the stability of group cooperation.

Implications for the Dominance-Prestige Model of Social Status Acquisition

The dominance-prestige model of social status acquisition (Cheng et al., 2013; Cheng & Tracy, 2014; Halevy et al., 2012; Henrich & Gil-White, 2001) has become increasingly influential in recent research on hierarchy in humans. Our findings suggest that members of cooperative groups *willingly* grant higher status to formidable individuals because of their apparent capacity to *provide beneficial leadership services*. This is clearly a description of prestige-based status, even though it incorporates elements that intuitively seem like dominance behaviors exhibited by species without prestige-based forms of status. Thus, the findings from the present research challenge the dominance-prestige model by suggesting that formidability-related prestige may often be mistaken for dominance-based status.

In this context it is important to note that the primary evidentiary basis for the putative viability of aggressive dominance as a strategy for ascending human hierarchies is that some high-ranking individuals appear to acquire and maintain their status through physical formidability, assertive behavior, and sanctioning of subordinates (Cheng et al., 2013; Cheng & Tracy, 2014). However, the hypothesis of formidability-based status allocation predicts these same patterns of association. Indeed, Study 2 employed an operational definition that described dominance-based status as

that which is “attained by forcefully imposing an agenda on others in the group,” and this variable produced the same pattern of results as prestige-based status and generalized status. As such, it appears raters assumed that forcefully imposing an agenda on others would only lead to higher status if such assertive behavior was perceived to benefit the group. This interpretation is bolstered by Anderson and Kilduff’s (2009b) finding that individuals in face-to-face groups who behaved assertively were granted higher status because such behavior increased the perception that they were “competent.” Our findings may elucidate the sense in which these assertive individuals were competent: they were perceived as possessing the capacity to implement within-group enforcement and between-group representation functions of successful leadership.

At the very least, our findings illustrate how the existence of dominance-based status, as previously conceptualized in the dominance-prestige model, is unnecessary to explain why formidable and assertive men tend to acquire high status in groups. Moreover, our data suggest that formidable individuals who pursue status in a way that inflicts costs on other members—which is essentially the definition of dominance in the dominance-prestige model—will not be willingly granted higher status. This makes theoretical sense: As reviewed above, in both humans and nonhuman primates, the ability of subordinates to form alliances against aggressively self-interested group members effectively prevents such individuals from acquiring high social status that is not justified by their ‘job performance’ as defined by within-group coordination or between-group representation (Anderson et al., 2015; Boehm, 1999; Chapais, 2015; de Waal, 1982; Flack, de Waal, et al., 2005; Gintis et al., 2015; von Rueden, 2014). Of course, just because aggressively dominant individuals are not willingly granted high status by others, this does not preclude the possibility that they might forcefully extract it from others in some limited circumstances. For example, Price and Van Vugt (2014) theorize that pure dominance-based status and coercive leadership can potentially emerge in sedentary groups wherein resources can be monopolized and followers have limited exit options—conditions that were virtually never met over humans’ evolutionary history as nomadic hunter-gatherers (Kelly, 1995). Nonetheless, given that the psychology of prestige-based status was likely derived from a more ancient psychology designed to navigate ‘pure’ dominance hierarchies (Holbrook et al., 2014; Holbrook & Fessler, 2015; Hwang & Matsumoto, 2014), future research should continue to examine the extent to which aggressive dominance stays with us as a viable pathway to high status in human groups.

Outstanding Questions

There are several questions raised by our findings that suggest directions for future inquiry. First, our focus here was on the role of men’s formidability in the allocation of social status, but our findings leave unclear whether women’s formidability would ever be relevant in determining status outcomes. In Study 1, women’s strength did not associate with raters’ status-related perceptions of them. The context we described, however, portrayed an organization that was implicitly composed only of female employees (as none of the targets presented were male). As such, it remains possible that women’s strength would play a role in status allocation within mixed-sex groups or groups composed mostly of men.

This seems unlikely, though, given that upper-body strength distributions for men and women typically exhibit little overlap. Nonetheless, it would be fruitful for future investigations to determine whether formidability-based status allocation is modulated by the composition of the group.

More generally, our findings do not directly demonstrate that men's strength influences status allocation across a wide range of group contexts. Recent research has proposed that different characteristics are preferred in leaders under differing social conditions. These studies have found that people prefer leaders with masculine faces in times of war but (relatively) feminine faces in times of cooperation or reconciliation (e.g., Laustsen & Petersen, 2015; Little, 2014; Spisak et al., 2012). The current study did not address the role of specific facial features. We note, though, that whatever information is contained within "facial masculinity" is almost certainly multidimensional and not isomorphic with physical strength. Strength can be validly judged from the face, but is estimated much more accurately from cues in the body (Sell et al., 2009). At the same time, the facial architectures that are perceived as prototypically masculine are theorized to reflect the organizing influence of androgen levels at earlier developmental stages—which could explain why men with masculinized faces tend to be perceived as being aggressive, cold, and uncooperative (Carre et al., 2009; Perrett et al., 1998). Given that humans appear to possess ancient formidability assessment adaptations that equate physical size and strength with potential threat (Fessler et al., 2012; Holbrook & Fessler, 2015; Sell et al., 2009), it may be seen by group members as imperative that a formidable leader does not also manifest cues to low warmth and prosociality. These considerations suggest the need for research that examines the interactive effects of personality-linked facial attributes and cues to strength on status-related perceptions. However, they provide no reason to expect that the influence of men's strength on status allocation should be absent within relatively peaceful scenarios.

Indeed, in the current study, we specifically chose to employ a peaceful and cooperative scenario—a business consultancy in the modern world—to provide a conservative test of our hypotheses. Men's strength influenced status conferral even in this white-collar organizational context, within which physical confrontation is presumably neither common nor a viable route to ascendancy. It therefore seems likely that formidability-based status allocation would be even more pronounced within group settings that explicitly entail potential physical violence. Because the specter of conflict is ever-present within and between human groups (Cottrell & Neuberg, 2005; Keely, 1996; Kurzban & Leary, 2001; McDonald et al., 2012), we expect that the human mind is biased against assuming that any coalitional context is without the need for conflict management. Consistent with this, a recent study found that modern subjects self-reported a preference for "physically strong" and "dominant" leaders during times of war, peace, cooperation, and unspecified social conditions (Murray, 2014).

A final question is whether formidable male leadership actually promotes successful collective action. In the only empirical study that has addressed this question directly, von Rueden et al. (2014) assigned Amazonian forager-horticulturalists to participate in experimental coordination tasks, and found that the groups with physically stronger men as leaders performed better than groups with weaker leaders. They also found that mixed-sex villages with stronger men as leaders were both larger and more productive.

However, it is unclear whether physically formidable men continue to promote organizational effectiveness in modern industrialized societies. One possibility is that adaptations for male formidability-based status allocation are an example of an "evolutionary mismatch" with the modern world (Price & Van Vugt, 2014). Another possibility is that physically formidable men continue to excel in providing leadership services. Extant data are at least consistent with the latter possibility: People in industrialized societies prefer leaders with faces that appear "competent" and "powerful" (Todorov et al., 2005), and companies with CEOs who possess such faces do indeed have higher profits (Rule & Ambady, 2008). Whether such findings would also apply to leaders' physical strength is a straightforward question for future research.

Conclusions

We have advanced the hypothesis that adaptations for social status allocation are designed to take men's physical formidability as a cue to specific leadership-related abilities, which results in the conferral of greater status upon relatively formidable men. Our findings are buttressed by converging lines of evidence from the anthropological (Blaker & Van Vugt, 2014; von Rueden, 2014), comparative (Boehm, 1999; de Waal, 1982; Flack, de Waal, et al., 2005), and organizational (Judge & Cable, 2004) literatures, which are replete with real-world evidence of male formidability-based status allocation. If our logic is correct, men's physical formidability, unlike other more task-specific determinants of social value, will prove to be a fairly consistent determinant of status allocation across different types of groups and societal contexts.

Our hypothesis implies that formidability-based status allocation may have been a crucial part of the solution to collective action problems that threatened the evolution of humans' hallmark cooperativeness. This, in turn, would pose challenges for the conceptualization of "dominance" as status that is usurped by inflicting costs on rivals and subordinates (Cheng et al., 2013; Cheng & Tracy, 2014; Henrich & Gil-White, 2001). Although our findings do not falsify the existence of this form of status, they do demonstrate that this explanation is unnecessary to explain manifest correlations among physical formidability, assertive behavior, and attained social rank. Rather, formidable high status men may often behave assertively in an effort to generate benefits for groups by leveraging their strength in order to provide valuable services of within-group enforcement and between-group representation (Stirrat & Perrett, 2012). If so, much of what appears superficially to be assertive status jockeying among formidable males could actually be a form of group-beneficial "competitive altruism" (Barclay, 2004) wherein individuals compete to provide leadership services in exchange for high status positions (von Rueden et al., 2015). Whether physically formidable leaders actually continue to promote collective action in the modern world is an important question, given its clear implications for issues of gender equality and organizational effectiveness.

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