Looming large in others' eyes: Racial stereotypes illuminate dual adaptations for representing threat versus prestige as physical size

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Abstract

We hypothesize that, paralleling the evolution of human hierarchies from social structures based on dominance to those based on prestige, adaptations for representing status are derived from those for representing relative fighting capacity. Because both violence and status are important adaptive challenges, the mind contains the ancestral representational system as well as the derived system. When the two representational tasks conflict, owing to the exigent nature of potential violence, the former should take precedence over the latter. Indeed, separate literatures indicate that, despite the fact that threatening traits are generally deleterious to prestige, both threatening individuals and high-status individuals are conceptually represented as physically large. We investigated the interplay between size-based representations of threat versus prestige by examining racial danger stereotypes. In three studies, we demonstrate that (a) judgments of status only positively correlate with envisioned body size for members of groups stereotyped as safe, (b) group-based inferences of interpersonal threat are mediated by representations of physical size, (c) controlling for perceived threatening aggressiveness reduces or reverses non-positive correlations between status and size, and (d) individuating information about relative threat or status attenuates the influence of group danger stereotypes. These results support our proposal that ancestral threat-representation mechanisms and derived mechanisms for representing social rank coexist – and sometimes compete – in the mind.

Keywords: intergroup bias; prejudice; formidability; status; threat detection

1.0 Introduction

All social species exhibit hierarchies in which position is a determinant of fitness. Selection can therefore be expected to have crafted mechanisms that enhance decision-making in hierarchical interactions. Nonhuman social hierarchies are principally based on dominance, the supplanting of rivals through force or the threat of force. In contrast, while violence plays a role in some human interactions, many human hierarchies are built on prestige, deference granted by admirers to those whom they esteem (Barkow, 1975, 1989; Henrich & Gil-White, 2001). Although there is debate over the extent to which some non-human primates also display elements of prestige-based status (Chapais, 2015), humans are undoubtedly unique in the extent to which prestige eclipses dominance as the foundation of social rank. Natural selection operates through the modification of existing features. Given that dominance is the ancestral basis of social organization while prestige is the derived basis, it is likely that prestige-representing adaptations were derived from dominance-representing adaptations. Because existing design often constrains the range of subsequent possibilities, derived adaptations frequently share a mix of conserved ancestral components in addition to novel features (Marcus, 2008). This suggests that the mechanisms used in reasoning about prestige-based forms of social rank will share conceptual structure with a preceding dominance psychology that involves assessments of physical threat (Clark, 2010a; Fessler & Gervais, 2010; Fessler & Holbrook, 2013; Holbrook, Piazza, & Fessler, 2014).

Psychological adaptations are hypothesized to often take the form of serial homologies characterized by neural reuse (Clark, 2010a, 2010b; Barrett, 2012; Holbrook, in press; van Parkinson & Wheatley, 2013), meaning that derived traits are created by amending existing neural networks such that both the original network and the newer network, though distinct,

share much of the same neurocognitive architecture. This is particularly likely when, as in the case of agonistic conflict, the ancestral challenge continues to exist, as serial homology allows the organism to possess both the ancestral trait and the derived trait (Holbrook & Fessler, 2015).

Taken together, the above considerations predict that i) the mind contains mechanisms that assess the threat posed by a potential antagonist; ii) the mind contains mechanisms that assess an individual's position in a prestige-based social hierarchy; iii) the latter mechanisms exhibit features of the former.

In humans, success in combat derives from numerous attributes of oneself and one's potential foes: armaments, access to allies, martial skill, health, etc. Reflectively weighing such factors would be problematically time-consuming given the need for quick decisions in agonistic contexts (Pietraszewski & Shaw 2015). However, complex computations over many parameters can be streamlined via heuristic summary representations (e.g., Albrecht & Scholl, 2010; Murphy, 2002). Our research group has previously proposed that, because physical size and strength are phylogenetically ancient determinants of relative fighting capacity, these form the basis for a representation that summarizes the relative tactical assets and liabilities of both parties: the *formidability representation hypothesis* holds that mental representations of prospective foes become either larger or smaller, and more or less muscular, contingent on cues of the potential to inflict harm (Fessler, Holbrook, & Snyder, 2012).[1]

Conceptualizing the danger posed by others in terms of their size and strength should be intuitive, as these physical traits have predicted the outcomes of violent conflict throughout both phylogenetic history and ontogenetic experience (Archer, 1988; Sell et al., 2009; Unnever & Cornell, 2003). Supporting the existence of a system that represents threat using envisioned physical formidability, estimated size and strength are influenced by the possession of weapons

(Fessler et al., 2012), the presence of allies (Fessler & Holbrook, 2013a), synchronizing with potential allies (Fessler & Holbrook, 2014), cues of the propensity to take physical risks (Fessler, Tiokhin, Holbrook, Gervais, & Snyder, 2013; Fessler, Holbrook, Tiokhin, & Snyder, 2014), individual differences in physical strength (Fessler, Holbrook, & Gervais, 2013), physical incapacitation (Fessler & Holbrook, 2013b), parenthood of vulnerable children (Fessler, Holbrook, Pollack, & Hahn-Holbrook, 2014), risk that sexual assault will result in pregnancy (Fessler, Holbrook, & Fleischman, in press), and the leadership quality of enemy coalitions (Holbrook & Fessler, 2013).

Consonant with the thesis that the mechanisms undergirding prestige assessment are derived from those responsible for dominance assessment, a parallel literature documents that physical size is also used in reasoning about social hierarchies (Higham & Carment, 1992; Marsh, Yu, Schechter, & Blair, 2009; Masters, Poolton, & van der Kamp, 2010). Many languages and practices equate size with social rank (Fiske & Fiske, 2007). In experiments conducted in Western university settings, participants made to feel of elevated status underestimate another's size and weight, whereas participants made to feel of reduced status overestimated these attributes (Yap et al. 2013). Likewise, participants induced to feel socially powerful overestimate their own height and underestimate others' (Duguid & Goncalo, 2012). Students estimate a target individual to be taller when he is described as a professor than when he is said to be a student (Wilson, 1968), and perceptions of the height of political candidates track electoral success or failure (Sorokowski, 2009). Words semantically related to high or low status prime related verticality schemas (Zanolie et al., 2012). Lastly, members of low-status ethnic groups not stereotyped as dangerous are perceived to be physically smaller (Koulak & Tuthill, 1972). Thus, convergent evidence indicates that conceptualizations of physical size are

deployed in reasoning about relative status, in a *status representation system* that operates similarly to the formidability representation system.

In serial homologies with neural reuse, simultaneous activation of both the ancestral trait and the derived trait is possible. When the output of each trait is congruent with that of the other, no conflict occurs in simultaneous activation. However, in general, the coercive, threatening tactics central to dominance are antithetical to prestige–-prestigious individuals are admired, not feared, by members of their in-group (Henrich & Gil-White, 2001). The inverse relationship between dominance and prestige therefore poses a functional conflict, as the mechanisms addressing dominance and those addressing prestige share a common representational output. If assessing the target as dangerous leads to a conceptualization of the individual as physically large and muscular, yet, by virtue of the deleterious effects of coercive threat on prestige, the same information leads to an assessment of the individual as of low status—and thus to a conceptualization of the target as physically small and weak—then the functional utility of both summary representations is undermined. While selection may be constrained by the kludgy limitations of serial homologies, it can establish priorities to resolve potential conflicts arising from shared architecture. Because agonistic conflict is a more exigent adaptive challenge than prestige assessment, it is likely that, if the networks that facilitate navigating these two contexts are shared, then that which addresses dominance will have priority over that which addresses prestige. Thus, we predict that, when threat is salient, the formidability representation function will take precedence, and envisioned size and strength will be used primarily to summarize target individuals' potential for violence. Conversely, when physical threat is of less concern, envisioned size and strength will be used to summarize relative social status.

Note that framing status representation as deriving from formidability representation does not imply that the former is a mere by-product of the latter. Were the status representation system no more than a by-product, then the two functions would operate identically (e.g., information indicating that a target is antisocially threatening would increase the target's conceptualized status as well as size). To the contrary, the status representation system, though plausibly derived from and sharing structure with the antecedent formidability representation system, appears to have evolved unique features over time (e.g., conceptualizing non-violent, prosocial status-holders as being of greater physical size). Alternatively, the two systems may have arisen via entirely independent pathways and be instantiated in non-overlapping proximate mechanisms, including resources that analogously represent threat and status in terms of bodily traits. Encapsulated formidability and status representation analogues could generate the anticipated pattern of results (e.g., cues that a target poses socially undesirable danger could decrease the target's envisioned physical size/strength within a status representation system, but increase the target's envisioned physical size/strength within a discrete formidability representation system, yielding a net increase in estimates of the target's conceptualized size/strength). However, given the centrality of size and coercive threat in determining rank within ancestral status hierarchies, coupled with the inherent advantages of efficiently re-using neurocognitive resources rather than redundantly duplicating them, it appears more parsimonious to suppose that the status and threat assessment functions are mental homologues.

1.1 Threat, Status, and Racial Stereotypes

Humans are reliant on socially transmitted information in navigating their physical and social environments. Both threat assessments and status assessments should therefore take as input cultural information regarding the expected attributes of particular others as a function of

their group membership. Indeed, humans should be highly attuned to information regarding group membership, as hunter-gatherer bands frequently conflicted with neighboring groups in the ancestral past (Bowles, 2009; Keeley, 1996; Manson & Wrangham, 1991; McDonald, Navarrete, & van Vugt, 2012), and as subcoalitions within larger groups likely vied for material and social resources (e.g., Chagnon, 1992; Wrangham & Glowacki, 2012). Therefore, for redundant reasons, selection favored equipping our ancestors with coalition-detection mechanisms that should be sensitive to observable features (e.g., attire, accent, behavior patterns) that reliably predict affiliation, potentially including race in settings wherein race tracks affiliation (Kurzban, Tooby, & Cosmides, 2001; Pietraszewski, Cosmides, & Tooby, 2014). In the contemporary U.S., despite progress in reducing race-based inequality, stereotypes depicting Black men as violent remain pervasive. Stimuli depicting Black men have consistently been shown to evoke implicit fear reactions (e.g., Cunningham et al., 2004; Donders, Correll, & Wittenbrink, 2008; Navarrete et al., 2009; Olsson, Ebert, Banaji, & Phelps, 2005; Phelps et al., 2000) and automatic associations with violence (e.g., Amodio et al., 2004; Biernat, Collins, Katzarska-Miller, & Thomspon, 2009; Payne, 2001; Duncan, 1976; Sagar & Schofield, 1980). Hispanic men are similarly stereotyped as prone to violence (Marin, 1984; Jackson, 1995; Weaver, 2005).

Here, we investigate the relations of the hypothesized formidability and status representation systems to conceptualizations of Black men relative to White men (Studies 1 and 2) and to conceptualizations of Hispanic men relative to Asian men (Study 3) in the United States. This allows us to both explore the theoretical framework linking threat and status assessment, and shed light on an important and pernicious feature of American life.

1.2 Predictions

We have hypothesized that both formidability and status are conceptualized in terms of bodily size/strength, and that formidability representation will take precedence over status representation when threat is salient. This hypothesis generates four predictions:

- Individuals belonging to groups stereotyped as threateningly violent will be envisioned as more physically formidable—despite being regarded as lower in status.
- Differences in envisioned physical formidability will mediate differences in attributions of physical aggressiveness (i.e., propensity for violence).
- Envisioned physical formidability and status will positively correlate in judgments of target individuals whose group is stereotyped as non-threatening, but not in judgments of target individuals whose group is stereotyped as threatening.
- Controlling for group differences in perceived aggressiveness will reduce or eliminate differences in the correlation between physical formidability and status

1.3 Analysis plan. To streamline our presentation, here we describe the analytic approach used across all studies.

1.3.1 Preliminary analyses of target name, perceived masculinity, and participant sex differences. We confirmed that there were no significant effects of the particular name employed on any of the primary dependent variables (physical formidability, aggressiveness, or status; *p*s > .10 in all studies). To rule out the possibility that observed relationships between cues of race, perceived physical formidability, and aggressiveness were driven by stereotypes of masculinity (Johnson, Freeman, & Pauker, 2012), we included a measure of masculinity associated with the target name (see SOM, Table 9), and controlled for differences in name masculinity when testing the effect of race conditions on perceived physical formidability, aggressiveness, or status.[2]

We also assessed potential sex differences. In Study1, we observed a significant effect of sex on estimated aggressiveness, $F(1, 244) = 7.97$, $p < .01$, $\eta^2_p = .03$, 95% CI = [-.34, -.02]. Male participants attributed greater aggressiveness to the target ($M = .14$, $SD = .90$) than did female participants ($M = -.17$, $SD = .14$). However, no other significant effects of sex, nor interactions between sex and condition, were observed for estimates of physical formidability, aggressiveness, or social status in Studies 1-3, *p*s .09 - .99.[3]

1.3.2 Mediation and suppressor analyses. To assess whether the heightened aggressiveness attributed to a target group was mediated by attributions of physical formidability, we conducted mediation tests utilizing the bias-corrected bootstrapping procedure (5,000 samples) in the INDIRECT macro for SPSS (Preacher & Hayes, 2008). The experimental condition was the independent variable, aggressiveness was the dependent variable, and physical formidability scores were the mediating variable, with name masculinity included as a covariate.[4] Following Cheung and Lau's (2007) recommendation for assessing potential suppressor variables in large samples, we used a similar bootstrapping procedure to test whether perceived aggressiveness suppresses a latent positive association between status and physical formidability within a given condition: envisioned physical formidability was entered as the independent variable, status was entered as the dependent variable, and aggressiveness was entered as the mediating variable.

1.3.3 Moderation analyses. We assessed whether our experimental manipulations moderated the relationships between envisioned formidability, status, and aggressiveness by entering condition, the other predictor (e.g., estimated aggressiveness), and the interaction between condition and that variable into a simultaneous regression. When assessing potential

three-way interactions, we entered the three predictors, the interactions between these variables, and the three-way interaction term into a simultaneous regression.

1.3.4 Detailed descriptives and further analyses. Detailed descriptives and comparisons of the individual items used to measure envisioned physical formidability, aggressiveness, and social status are provided in the SOM.

2.0 Study 1

In Study 1, we measured the envisioned physical formidability, aggressiveness, and social status of men depicted as having either stereotypically Black or White names. We predicted that, consonant with the status representation hypothesis, envisioned size and strength would positively correlate with status for White targets, but, due to the conflict with formidability representation, not for Black targets, who we expected to be perceived as lower in status despite being imagined as physically larger. We also predicted that race would moderate the association between the envisioned physical aggressiveness and social status of the protagonist. Specifically, we predicted that envisioned aggressiveness and status would negatively correlate for Black targets to a greater degree than for White targets, as the extent to which a person's propensity toward physical aggressiveness detracts from their social status should index the extent to which that person is viewed as prone to counternormative violence. Finally, insofar as differences in perceived threat drive differences in the evaluation of Black and White targets, controlling for envisioned aggressiveness should attenuate the negative correlation between envisioned physical formidability and status predicted for Black targets.

Men are disproportionately responsible for violence the world over (Daly & Wilson, 1988), and, correspondingly, most prior work on stereotypical fear of Black individuals has focused on fear of Black men. Therefore, although the effects of race on estimations of physical

formidability, aggression and status may occur in assessments of both sexes (Fessler et al., 2014), we limited our present investigations to male targets. A prestudy confirmed that race categorization could be manipulated by employing names selected from lists of names associated with Black and White men (Levitt & Dubner, 2006) and employing those rated as prototypical (see Supplementary Online Material, SOM).

2.1 Methods

2.1.1 Participants and overview of procedure. 300 U.S. participants were recruited via Amazon's MechanicalTurk.com survey platform in exchange for $0.50. Data were pre-screened for completeness, repeat participation, and correctly answering a "catch question". The final sample consisted of 249 adults (43.8% female; 71.9% White) ranging in age from 18 to 65 (M = 31.53, SD = 11.43).[5]

In a between-subjects design, participants were randomly assigned to read a vignette about a fictional man with either a stereotypically White name (Wyatt, Connor, or Garrett) or a stereotypically Black name (Jamal, DeShawn, or Darnell) who engages in everyday activities culminating in a potential confrontation with an antagonistic stranger who verbally abuses him after being inadvertently bumped (see SOM); participants rated "How likely is [NAME] to get into a fistfight with the man in the bar?" on a 9-point scale (1 = *Not at all likely*; 9 = *Very likely*). Next, participants estimated the target's bodily traits in fixed order: height, muscularity, and size. These dimensions are robustly correlated and have been related to fighting ability, although the relative importance of each varies somewhat between studies (Sell, Hone, & Pound, 2012; von Rueden, Gurven, & Kaplan, 2008). Height was estimated in feet and inches; muscularity and size were estimated using 6-point pictorial arrays (see Figure 1). Estimated physical

formidability was composited using standardized values for estimated height, overall size, and muscularity (α = .68).

Participants then rated the target's propensity for aggression using the Physical Aggression subscale from Buss and Perry's Aggression Questionnaire (1992), reframed to apply to the target and using a 7-point scale (1 = *Extremely uncharacteristic of him*; 7 = *Extremely characteristic of him;* α = .89). Target aggressiveness was measured as the mean of the standardized values (z-scores) of estimated trait physical aggressiveness and the standardized values of the estimated likelihood of fighting the antagonist (α = .78).

Envisioned status was measured as the mean of the standardized values for four items (α = .83). The target was first ranked using the MacArthur Scale of Subjective Social Status (Adler, Epel, Castellazzo, & Ickovics, 2000). Participants then answered three single-item questions: "How financially successful do you think [NAME] is, relative to other people in his community?" (1 = *Not at all successful; 9 = Highly successful*); "How influential do you think [NAME] is, relative to other people in his community?" (1 = *Not at all influential; 9 = Highly influential*); "How respected do you think [NAME] is in his community?" (1 = *Not at all respected [almost no one admires him]; 9 = Highly respected [almost everyone admires him]*). Participants next rated the subjective masculinity versus femininity of the target's name (1 = *Very feminine; 9 = Very masculine*).

Finally, participants answered demographic items and a suspicion probe, and were debriefed.

2.2 Results

2.2.1 Envisioned physical formidability and aggressiveness. As hypothesized, the target individual's envisioned physical formidability and aggressiveness were both greater for

targets with Black names than for those with White names (see Table 1). Also as predicted, envisioned target physical formidability was positively correlated with perceived aggressiveness, $r(249) = .29$, $p < .001$. The association between physical formidability and aggressiveness was not moderated by race condition, $p = .61$.

2.2.1.1 Mediation analysis. Consistent with the formidability representation hypothesis, perceptions of relatively greater physical formidability mediated the effects of the race condition on aggression. The direct effect of race on aggressiveness ($b = .30$, $SE = .11$, $\beta = .16$, $p = .01$) was no longer significant with physical formidability included in a bootstrap model ($b = .17$, $SE = .11$, $\beta = .10$, $p = .12$), whereas the indirect effect of physical formidability on estimated aggressiveness remained significant ($b = .22$, $SE = .08$, $\beta = .19$, $p < .01$), and the confidence intervals did not overlap with zero (95% CI = [.01, .13]).

2.2.2 Envisioned status. As predicted, targets with Black names were envisioned as of lower status than targets with White names (see Table 1).

2.2.2.1 Envisioned status and envisioned physical formidability. Envisioned status was not significantly correlated with envisioned physical formidability in the sample as a whole, $r(249) = .10$, $p = .12$. However, as predicted, the regression model assessing moderating effects of race was statistically significant, $p < .001$, and there was a significant Race × Envisioned Formidability interaction, $b = -.72$, $SE = .13$, $\beta = -1.14$, $p < .001$. Within the White name condition, envisioned physical formidability was positively correlated with status, $r(113) = .45$, $p < .001$. The reverse held within the Black name condition, in which envisioned physical formidability was negatively correlated with status, $r(136) = -.18$, $p < .04$ (see Figure 2).

2.2.2.2 Envisioned status and envisioned aggressiveness. Envisioned status was negatively correlated with envisioned aggressiveness in the sample as a whole, $r(249) = -.13$, p

< .05. We next assessed whether the race condition moderated the relationship between envisioned status and envisioned aggressiveness. As predicted, the regression model assessing moderating effects of race was significant, $p < .001$, and there was a significant Race × Status interaction, $b = -.44$, $SE = .14$, $\beta = -.58$, $p < .01$. Within the White name condition, status was not significantly correlated with aggressiveness, $r(113) = .07$, $p = .46$, whereas status was negatively correlated with aggressiveness in the Black name condition, $r(136) = -.29$, $p = .001$.

2.2.2.3 Aggressiveness suppresses a positive association between status and formidability. Consistent with the prediction that perceived aggressiveness can suppress latent, more positive associations between envisioned physical formidability and status, the direct effect of physical formidability on the estimated status of Black targets ($b = -.16$, $SE = .07$, $\beta = -.18$, $p < .04$) was no longer significant with aggressiveness controlled for in a bootstrap model ($b = -.09$, $SE = .08$, $\beta = -.10$, $p = .23$), whereas the indirect effect of aggressiveness on estimated status remained significant ($b = -.19$, $SE = .07$, $\beta = -.26$, $p < .01$), and the confidence intervals did not overlap with zero (95% CI = [-.15, -.01]). Perceptions of relatively greater aggressiveness thus mediated the negative correlation between physical formidability and envisioned status within the Black name condition. Controlling for aggressiveness attenuated the negative correlation in a manner consistent with a suppressor variable, although accounting for perceived aggressiveness did not completely reverse the relationship between physical formidability and status to produce a positive correlation akin to that observed in the White condition.

2.3 Discussion

In Study 1, we investigated the conceptual links among the envisioned physical formidability, aggressiveness, and social status of men depicted as having stereotypically Black versus White names. Consistent with predictions, Black name cues increased estimations of

physical formidability, and this heightened envisioned physical formidability mediated perceptions of these men as more prone to physical aggression. Our predictions regarding the conceptual association between physical size and status were also supported. In a significant interaction, envisioned physical formidability was positively correlated with status for targets assigned White names, but not for targets assigned Black names. To the contrary, we observed a negative correlation between status and imagined physical size in the Black condition. This appears to be due to a difference in perceptions of the threat posed by Black men relative to White men, as status was negatively correlated with perceived aggressiveness in the Black condition (but not the White condition), and controlling for the suppressing effects of perceived aggressiveness eliminated the negative correlation between envisioned physical formidability and status in the Black condition.

Because Black and White men in the U.S. do not differ in average height (both are approximately 5'10"; Konlos & Lauderdale, 2007; McDowell, Fryar, Ogden, & Flegal, 2008; Ogden, Fryar, Carroll, & Flegal, 2004), the increase in envisioned size as a function of race is not explicable in terms of participants' objective observations of phenotypic differences between races. Nonetheless, skeptics might reasonably contend that the findings of Study 1 are attributable to stereotypes transmitted via mass media (e.g., large, muscular, and aggressive athletes). However, this interpretation implies that envisioned bodily formidability and social status should positively correlate in Black men, as stereotypes regarding athleticism and size typically involve financial affluence and celebrity. To the contrary, we anticipated and observed the reverse. Thus, the results of Study 1 are consistent with the proposal that specialized systems utilize representations of physical formidability to conceptualize social status and threat via distinct pathways with respect to perceived interpersonal danger.

3.0 Study 2

Racial stereotypes can be thought of as a first-pass assessment device; observers can be expected to heavily weight direct evidence regarding a target individual, even to the point of disregarding stereotypes (Neel, Neufeld, & Neuberg, 2013). Therefore, in Study 2, we manipulated information indicating that the target was relatively high in either status or threat. The formidability representation and status representation hypotheses respectively predict that both the threatening and high-status target individuals will be rated as more physically formidable than those described in the neutral condition. To the extent that individuating information overcomes the influence of group-based stereotypes, race condition should not interact with the threat or status manipulations. Apart from illuminating the impact of individuating information on racial biases, the Status/Threat manipulation also provides a direct test of the hypothesis that high-status individuals are conceptualized as physically formidable via a pathway distinct from that by which threatening individuals are thus conceptualized. Specifically, we predict that conceptualized physical size and aggressiveness will be positively associated for threatening individuals, but not for high-status individuals.

3.1 Methods

3.1.1 Participants and overview of procedure. 500 U.S. participants were recruited via Amazon's MechanicalTurk.com survey platform in exchange for $0.50. Data were pre-screened using the same criteria as in Study 1. The final sample consisted of 419 adults (42.5% female; 80.2% White) ranging in age from 18 to 74 (M = 33.26, *SD* = 11.20).

Race was manipulated as in Study 1. The target individual was portrayed as either high-status (i.e., a successful local business owner) or threateningly dangerous (i.e., a man convicted of aggravated assault), using modified versions of the vignette used in Study 1 (see SOM). In the

control condition, the target was described using the same vignette as in Study 1. Thus, the study employed a two (White / Black) by three (High Status / Threatening / Neutral) between-subjects design. Physical formidability ($\alpha = .62$), aggressiveness (trait physical aggressiveness, $\alpha = .90$; composite aggressiveness, $\alpha = .81$), and status ($\alpha = .93$) were measured and composited as in Study 1.

3.2 Results

3.2.1 Envisioned physical formidability. Replicating the findings of Study 1, the target's envisioned physical formidability was greater for targets with Black names than for those with White names (see Table 2). There was also a significant main effect of Status/Threat condition, $F(2, 412) = 12.88$, $p < .001$, $\eta^2_p = .06$. As hypothesized, the target's envisioned physical formidability was greater in the threat condition relative to the neutral condition, $p < .001$ (see Table 3; for mean estimated physical formidability ratings within each subcondition, see SOM Table S4). The threatening targets were also estimated to be more physically formidable than the high-status targets, $p < .001$. The high-status targets were envisioned as somewhat more physically formidable than the neutral targets, but, against predictions, this difference did not reach significance, $p = .13$. There was no significant Race × Status/Threat interaction, $p = .41$.[6]

3.2.2 Envisioned aggressiveness. As in Study 1, the target's envisioned aggressiveness was significantly greater for targets with Black names than for those with White names (see Table 2). There was also a significant main effect of Status/Threat condition on estimated aggressiveness, $F(2, 412) = 145.07$, $p < .001$, $\eta^2_p = .41$. Consistent with predictions, the target's envisioned aggressiveness was markedly greater for targets described as threatening than for those in either the high-status or control conditions, ps $< .001$; conversely, the high-status targets

were rated as less aggressive than the neutral targets, $p < .001$ (see Table 3; for mean estimated aggressiveness levels within each subcondition, see SOM Table S4). There was no significant Race × Status/Threat Condition interaction, $p = .29$.

3.2.2.1 Envisioned aggressiveness and envisioned physical formidability. As in Study 1, estimated physical formidability was positively correlated with aggressiveness in the entire sample, $r(419) = .39$, $p < .001$. As anticipated, there was a significant Status/Threat × Envisioned Formidability interaction, $F(2, 413) = 3.89$, $p = .02$, $\eta^2_p = .02$. Envisioned physical formidability was positively correlated with aggression within the neutral condition, $r(123) = .47$, $p < .001$, and within the threat condition, $r(142) = .31$, $p < .001$, but not within the high-status condition, $r(154) = .11$, $p = .19$. As in Study 1, we detected no Race × Envisioned Formidability interaction, $p = .18$, and no significant Race × Status/Threat Condition × Envisioned Formidability interaction, $p = .22$.

3.2.2.2 Mediation analysis. Consistent with the formidability representation hypothesis, perceptions of relatively greater physical formidability mediated the effects of race condition on aggression. The direct effect of race on aggressiveness ($b = .18$, $SE = .09$, $\beta = .10$, $p < .05$) was no longer significant with physical formidability included in a bootstrap model ($b = .04$, $SE = .09$, $\beta = .02$, $p = .68$), whereas the indirect effect of physical formidability on estimated aggressiveness remained significant ($b = .46$, $SE = .06$, $\beta = .38$, $p < .001$), and the confidence intervals did not overlap with zero (95% CI = [.08, .23]).

3.2.3 Envisioned status. As in Study 1, the target individual's envisioned status was significantly lower for targets with Black names than for those with White names (see Table 2). There was a significant main effect of Status/Threat condition on estimated status, $F(2, 412) = 302.88$, $p < .001$, $\eta^2_p = .60$. As intended, the target individual's envisioned status was greater for

targets described as high-status than for those in either the threat or neutral conditions, *p*s < .001; conversely, and, as hypothesized, the threatening targets were rated of lower status than the neutral targets, $p < .001$ (see Table 3; for mean estimated status levels within each subcondition, see SOM Table S4). There was no significant Race × Status/Threat Condition interaction, $p = .14$.

3.2.3.1 Envisioned status and envisioned physical formidability. In the sample as a whole, there was a significant negative correlation between envisioned physical formidability and status, $r(419) = -.18$, $p < .001$. As anticipated, there was a significant Status/Threat × Envisioned Formidability interaction, $F(2, 413) = 4.21$, $p < .02$, $\eta^2_p = .02$. Envisioned physical formidability was positively correlated with status within the high-status condition, $r(154) = .18$, $p < .03$, but not within the neutral condition, $r(123) = -.16$, $p = .08$, nor within the threat condition, $r(142) = -.02$, $p = .81$.

We detected no Race × Envisioned Formidability interaction, $p = .74$, and no significant Race × Status/Threat Condition × Envisioned Formidability interaction, $p = .29$. However, the design of Study 2, including threat and status manipulations predicted to exert strongly divergent effects on envisioned status, might obscure moderating effects of race within the neutral condition. Therefore, to test the replicability of the findings of Study 1, we assessed interactions between race and envisioned physical formidability within only the neutral condition. Replicating Study 1, the association between envisioned physical formidability and status was moderated by race condition within this subsample, $F(1, 119) = 6.70$, $p = .01$, $\eta^2_p = .05$. Within the neutral White condition, envisioned physical formidability was positively correlated with status, $r(55) = .27$, $p < .05$, whereas envisioned physical formidability was negatively correlated with status in the neutral Black condition, $r(68) = -.25$, $p < .04$ (see Figure 2).

3.2.3.2 Envisioned status and aggressiveness. Estimated status and aggressiveness were strongly negatively correlated in the sample as a whole, $r(419) = -.61$, $p < .001$. We observed no significant Status/Threat × Envisioned Aggressiveness interaction, $p = .45$, nor a Race × Envisioned Aggressiveness interaction, $p = .41$.

We next assessed whether the interaction observed in Study 1 replicated by assessing the effects of race on the correlation between status and aggression within only the neutral Status/Threat condition. As in Study 1, the Race × Envisioned Aggressiveness interaction was significant, $F(1, 119) = 9.56$, $p < .01$, $\eta^2_p = .07$. Envisioned aggressiveness was not correlated with status within the White neutral condition, $r(55) = -.07$, whereas envisioned aggressiveness was significantly negatively correlated with status in the Black neutral condition, $r(68) = -.45$, $p < .001$.

3.2.3.3 Aggressiveness suppresses a positive association between status and formidability. Envisioned status and physical formidability were negatively correlated in the entire sample – an evident side effect of the threat condition. We therefore tested whether, as hypothesized, estimated aggressiveness suppressed a latent positive correlation between envisioned physical formidability and status in the entire sample. Indeed, the initial negative relationship between physical formidability and status in the entire sample ($b = -.21$, $SE = .06$, $\beta = -.18$, $p < .001$) became (nonsignificantly) positive with aggressiveness controlled for in the bootstrap model ($b = .09$, $SE = .05$, $\beta = .07$, $p < .09$), the indirect effect of aggressiveness on estimated status remained significant ($b = -.64$, $SE = .04$, $\beta = -.64$, $p < .001$), and the confidence intervals did not overlap with zero (95% CI = [-.39, -.21]). Thus, perceptions of aggressiveness appear to have suppressed a latent positive correlation between physical formidability and envisioned status in the entire sample.

Recalling that, within the neutral Status/Threat condition, race moderated the link between envisioned status and physical formidability, we tested whether estimated aggressiveness suppressed a latent positive correlation between envisioned physical formidability and status in the Black neutral condition. Somewhat consistent with expectations, the initial negative relationship between physical formidability and status (b = -.23, SE = .11, β = -.25, $p < .04$) became null with aggressiveness controlled for in the bootstrap model (b = -.05, SE = .11, β = -.06, p = .64), the indirect effect of aggressiveness on estimated status remained significant (b = -.42, SE = .12, β = -.42, p = .001), and the confidence intervals did not overlap with zero (95% CI = [-.36, -.04]). Thus, perceptions of greater aggressiveness appear to have driven the negative association between physical formidability and envisioned status within the Black neutral condition in a manner consistent with a suppressor variable, although, as in Study 1, accounting for perceived aggressiveness in this model did not produce a significantly positive correlation.

3.3 Discussion

In Study 2, in addition to manipulating race, we also manipulated information framing the targets as high in status, threatening aggressiveness, or neither (in a control condition identical to Study 1). The Status/Threat manipulation served two functions: i) to experimentally assess the premise that, independent of considerations of race, high-status individuals are conceptualized as physically formidable via a pathway distinct from that by which threatening individuals are conceptualized as physically formidable, and ii) to explore the extent to which individuating information attenuates reliance on racial stereotypes in participants' evaluations.

Replicating the results of Study 1, Study 2 found that Black targets were envisioned as physically larger, more aggressive, and lower in status than White targets, and the difference in

envisioned aggressiveness was mediated by the difference in envisioned size. Within the neutral condition, the link between envisioned status and envisioned bodily formidability was once again moderated by race, with a positive correlation observed in White targets and a negative correlation observed in Black targets. However, we observed no interaction between race and the positive association between envisioned body size and social status within the high-status condition subsample, suggesting that individuating information framing Black men as prestigious nullified the effects of danger stereotypes in suppressing this positive link. Similarly, Black and White targets framed as threatening were viewed as comparably high in aggression and low in social status (see SOM Table S4). These findings agree with prior work exploring individuating processes in interpersonal judgment that mitigate the effects of social categorization (e.g., Kunda & Sherwin-Williams, 1993).

The results of Study 2 support the premise that status and threat are represented in terms of physical formidability via distinct pathways with respect to interpersonal aggressiveness. On the one hand, envisioned physical formidability mediated assessments of greater aggressiveness, yet, on the other hand, aggressiveness suppressed an underlying positive association between physical formidability and status in the entire sample. Consonant with the supposition that prestige and interpersonal aggressiveness are generally antithetical, high-status targets in Study 2 were rated as less aggressive than neutral targets, and envisioned physical formidability was not correlated with aggression in the high-status condition. In contrast, and consistent with the formidability representation hypothesis, physical formidability was positively correlated with aggression in both the neutral and threat conditions.

In support of the status representation hypothesis, envisioned physical formidability and status were significantly positively correlated within both the high-status condition and the White

subsample of the neutral condition. However, against predictions, high-status targets were not rated as significantly more physically formidable than neutral targets. By contrast, targets in the threat condition were envisioned to be more physically formidable than targets in both the neutral and high-status conditions. This result should not be taken as convincing evidence that representations of physical formidability primarily function to conceptualize threat rather than social prestige, as alternative manipulations that assign greater status to the target would likely inflate envisioned physical formidability more dramatically than the relatively anemic "successful local business owner" manipulation utilized here (see Holbrook, Fessler, & Navarrete, in preparation).

4.0 Study 3

We have argued that representations of Black men as dangerous contribute to perceptions of them as physically larger than White men despite the fact that the two groups are of equivalent average height in the U.S. Nevertheless, the inflated estimates of bodily traits observed in Studies 1 and 2 may derive from media-driven stereotypes. Tall, muscular Black men are disproportionately represented in professional sports in which size and strength are advantageous (Hoberman, 1997). It is therefore possible that the enhanced bodily trait ratings we observed reflect prevailing stereotypes regarding athleticism and competitiveness (Stone, Perry, & Darley, 1997) rather than violence per se. Moreover, given the empirical association between male strength and male aggressiveness (Sell et al. 2009), it is possible that the stereotypes of aggressiveness associated with Black men are driven by media depictions of Black men as exceptionally tall and strong. We therefore sought to replicate the effects of prejudicial racial threat observed in Study 1 with alternate racial groups, neither of which are in actuality physically large, nor are they depicted in the media as such.

Both Hispanic and Chinese and Japanese (hereafter, per vernacular use, "Asian") men are, on average, 5'7" (Ogden et al., 2004; Yang et al., 2005; Japanese Ministry of Education, Culture, Sports, Science and Technology, 2011). Like Black men, Hispanic men in the U.S. are stereotyped as physically violent (Marin, 1984; Jackson, 1995; Weaver, 2005). Conversely, in the U.S., despite being negatively stereotyped as unsociable and excessively industrious, Asians are not viewed as violent (Lin, Kwan, Cheung, & Fiske, 2005). Thus, we predict that i) Hispanic targets will be envisioned as more physically formidable and aggressive than Asian targets; ii) the relative status attributed to the target will positively correlate with envisioned physical formidability only in the case of Asian targets; and iii) controlling for perceived aggressiveness will shift the correlation between the envisioned physical formidability and status of Hispanic targets in a positive direction. In sum, we expect that the overall pattern of results obtained using White versus Black targets in Study 1 and in the neutral Status/Threat condition of Study 2 will replicate in Study 3 using Asian versus Hispanic targets, despite the fact that neither of these ethnic groups are prominent in mass-media sports in which size and strength are advantageous.

4.1 Methods

4.1.1 Participants and overview of procedure. 300 adult U.S. participants were recruited via MechanicalTurk.com for a survey of "Social Intuitions from Limited Information" for $0.50. Data were pre-screened as previously. The final sample consisted of 279 adults (32.3% female; 74.9% White) ranging in age from 18 to 62 (M = 31.12, *SD* = 10.15).

Participants were randomly assigned to read the vignette employed in Study 1, modified to include either a stereotypically Asian name (Chen, Hikaru, or Zhiyuan) or a stereotypically Hispanic name (Juan, Santiago, or Jorge) (see SOM). The physical formidability ($\alpha = .62$),

physical aggressiveness (trait physical aggression subscale α = .84; composite aggressiveness α = .66), and status items (α = .83) were measured and composited as in Study 1.

Participants then answered demographic items and a suspicion probe, and were debriefed.

4.2 Results

4.2.1 Envisioned physical formidability and aggressiveness. As predicted, the target individual's envisioned physical formidability was greater for targets with Hispanic names than for those with Asian names (see Table 4). Estimated physical formidability positively correlated with aggression in the entire sample, $r(279) = .34$, $p < .001$. The association between physical formidability and aggressiveness was not moderated by race condition, $p = .13$.

4.2.1.1 Mediation analysis. Consistent with the formidability representation hypothesis, perceptions of relatively greater physical formidability partially mediated the effects of the race condition on aggression. The direct effect of race condition on aggressiveness ($b = .42$, $SE = .10$, $\beta = .24$, $p < .001$) was reduced with physical formidability included in the bootstrap model ($b = .25$, $SE = .11$, $\beta = .14$, $p < .03$), the indirect effect of physical formidability on estimated aggressiveness remained significant ($b = .35$, $SE = .08$, $\beta = .31$, $p < .001$), and the confidence intervals did not overlap with zero (95% CI = [.09, .28]).

4.2.2 Envisioned status. As predicted, envisioned status was greater for targets with Asian names than for those with Hispanic names (see Table 4).

4.2.2.1 Envisioned status and envisioned physical formidability. Envisioned status and physical formidability were not correlated in the sample as a whole, $r(279) = .04$, $p = .54$. However, we predicted that the race manipulation would moderate the relationship between envisioned physical formidability and envisioned status. Against predictions, the Race × Envisioned Formidability interaction was statistically nonsignificant, $p = .25$. Nonetheless, an

exploratory follow-up test revealed that envisioned status and physical formidability were significantly positively correlated within the Asian name condition, $r(147) = .23$, $p < .01$, but not within the Hispanic name condition, $r(132) = .08$, $p = .39$ (see Figure 3).

4.2.2.2 Envisioned status and envisioned aggressiveness. Envisioned status and aggressiveness were negatively correlated in the sample as a whole, $r(279) = -.28$, $p < .001$, with no significant Race × Status interaction, $p = .26$.

4.2.2.3 Aggressiveness suppresses a positive association between status and formidability. We tested whether perceived aggressiveness suppressed a latent positive association between envisioned physical formidability and status. Consistent with predictions, the previous null effect of physical formidability on status in the entire sample ($b = .04$, $SE = .07$, $\beta = .04$, $p = .54$) became significantly positive with aggressiveness controlled for in the bootstrap model ($b = .16$, $SE = .07$, $\beta = .15$, $p < .02$), the indirect effect of aggressiveness on estimated status was significant ($b = -.31$, $SE = .06$, $\beta = -.33$, $p < .001$), and the confidence intervals did not overlap with zero (95% CI = [-.21, -.07]). Thus, as in the prior studies, perceived aggressiveness appears to have suppressed a latent positive association between envisioned formidability and status.

Although the race manipulation did not significantly moderate the relationship between envisioned status and physical formidability, we nonetheless observed a significant positive correlation between these two variables for Asian, but not Hispanic, targets. Therefore, as an exploratory follow-up test, we assessed whether aggressiveness ratings suppressed a latent positive correlation between status and physical formidability within the Hispanic target subsample. Indeed, the previous nonsignificant association between physical formidability and status in the Hispanic condition ($b = .09$, $SE = .11$, $\beta = .08$, $p = .39$) became significant with

aggressiveness controlled for in the bootstrap model (b = .22, SE = .11, β = .18, p < .05), the indirect effect of aggressiveness on estimated status was significant (b = -.28, SE = .08, β = -.33, p < .001), and the confidence intervals did not overlap with zero (95% CI = [-.27, -.04]). Thus, perceived aggressiveness appears to have suppressed a latent positive association between envisioned bodily formidability and status in the Hispanic condition comparable to that observed in the Asian condition.

4.3. Discussion

In a replication of Study 1, which manipulated stereotypically White versus Black names, Study 3 compared intuitions about target men assigned Asian versus Hispanic names. A similar pattern of findings to that obtained in Study 1 was observed. Men with Hispanic names were envisioned as physically more formidable and aggressive than were men with Asian names, and, consistent with the formidability representation hypothesis, the difference in conceptualized aggressiveness was partially mediated by the difference in conceptualized bodily formidability. In addition, men with Hispanic names were perceived to be lower in status than men with Asian names, for whom, like the White targets in Study 1, there was a significant positive correlation between envisioned status and envisioned bodily formidability. In contrast, a significant positive correlation between envisioned status and bodily formidability only emerged for Hispanic targets after controlling for perceived aggressiveness.

In addition to the similarities between the results of Study 1, we also detected differences. In Study 1 (as well as in the neutral condition of Study 2), we found a negative correlation between envisioned status and envisioned physical formidability for Black targets, whereas the Hispanic targets in Study 3 showed a null correlation. This may indicate that, consonant with prior research (Qullian & Pager, 2001), the Hispanic targets were conceptualized as somewhat less threatening than the Black targets. Finally, there was a negative correlation between

envisioned status and aggressiveness for both Asian and Hispanic targets in Study 3, whereas there was no such correlation between envisioned status and aggressiveness for the White targets of Study 1. This dissimilarity may owe to the fact that, from the point of view of our predominantly White participants, the Asian targets, while considered relatively non-violent, are nevertheless considered somewhat antagonistic outgroup members (Lin et al., 2005), causing signs of aggressiveness to be categorized as relatively threatening and hence antithetical to prestige.

Overall, Study 3 provides evidence that the basic interplay between perceived threat, size, and status observed in the prior studies extends beyond White and Black targets. This is noteworthy given that Hispanic men are not depicted as unusually large in the mass media. Thus, the results support our hypotheses with regard to formidability and status representation, and do not appear to be explained by reliance on media-driven stereotypes. In addition, as the protagonists described in both of the experimental conditions of Study 3 belong to racial outgroups from the perspective of our predominantly White sample, the general pattern of results observed in our prior studies does not appear to be contingent on shared group identification with the individual perceived to be less threatening. This finding articulates with prior work showing that participants automatically track third-party group affiliations, not merely membership in their own in-groups versus out-groups (e.g., Pietraszewski et al., 2014).

5.0 General Discussion

The formidability representation hypothesis posits that the relative threat that someone poses is represented according to a conceptual metaphor of physical size and strength. The status representation hypothesis posits that the relative status that someone possesses is also represented in terms of physical size and strength. Here, we have framed the status representation

system as an adaptation derived via serial homology from a system designed to assess relative threat, and attempted to test this model by placing the two representational systems in conflict using racial danger stereotypes. Our primary prediction was that membership in racial categories stereotyped as dangerous would constitute a boundary condition determining whether representations of physical size and strength would be employed to represent status or threat. Indeed, we consistently found that fictional Black or Hispanic men are envisioned to be physically larger, higher in aggression, and lower in status. Moreover, and also in accord with the formidability representation hypothesis, we found that conceptions of Black or Hispanic men as physically large mediate representations of their heightened aggressiveness.

Consistent with the status representation hypothesis, White and Asian men show a positive association between envisioned bodily formidability and envisioned social status. However, reflective of the power of implicit threat associations, the envisioned social status of Black men negatively correlates with their physical size under default conditions (Studies 1 and 2), with a null correlation in conceptualizations of Hispanic men. Lending further support to the proposal that a positive conceptual association between envisioned size and status is suppressed by competing associations with threat, the correlation consistently shifts in a positive direction if perceived aggressiveness is statistically controlled for. Individuating information can evidently also overcome this race-based negative association, as the high-status targets in Study 2 showed a positive association between envisioned size and status that was not moderated by race. These overall results accord with the hypothesis that assessments of threat and status derive from distinct systems that mutually utilize representations of size/strength, such that, when placed into conflict (i.e., assessing a person of low status but high threat), the older and more exigent threat representation function is activated while the status representation function is down-regulated.

The status versus threat manipulations of Study 2 yielded direct support for dual functional systems, as size was positively associated with aggressiveness for threatening—but not prestigious—targets, whereas size was positively associated with status for prestigious—but not threatening—targets. In baseline contexts wherein neither interpersonal threat nor status are salient, the dual representational systems appear to operate simultaneously, and orthogonally, such that envisioned size/strength can conceptualize propensities for both aggressiveness and status.

Group differences in the strength and direction of the association between status and aggressiveness appear diagnostic of attributions of interpersonal threat. Our findings indicate that, for members of racial categories stereotyped as threatening—but not members of racial categories stereotyped as safe—tendencies toward aggressiveness are perceived as contrary to status. For example, White targets' envisioned propensities for physical aggressiveness were compatible with their (uncorrelated) envisioned status, whereas Black targets' envisioned propensities for physical aggressiveness were antithetical to their (negatively correlated) envisioned status. However, the patterns of association between envisioned status, aggressiveness, and bodily formidability are likely sensitive to context. Future research may find that, in situations wherein aggressiveness is compatible with status or even valorized (e.g., military combat or full-contact sports), aggressiveness and status can be positively correlated, regardless of membership in racial categories stereotyped as threatening. Whether aggressiveness can enhance status may be contingent on whether aggression is directed toward out-group adversaries.

Although we have characterized our status measures as assessing attributions of prestige in opposition to dominance, it should be acknowledged that prestigious individuals are also

inherently capable of inflicting costs on others by virtue of their rank. For example, instructors may not physically aggress against undergraduates, but can assign low grades. Likewise, respected persons can typically damage others' reputations merely by expressing criticism publically. In this sense, elements of dominance are retained in prestige-oriented status, as captured in relatively encompassing constructs of status such as "power" (e.g., Yap et al. 2013; Duguid & Goncalo, 2012). Some may argue that it is this latent threat that is represented in terms of physical formidability rather than the non-coercive characteristics that differentiate prestige from dominance. However, defining prestige as entirely distinct from the capacity to inflict costs overlooks prosocial contexts of defense or deterrence (e.g., policing services; King, Johnson, & van Vugt, 2009). Indeed, punishing transgressors is essential to fostering cooperation and the maintenance of public goods (e.g., Balliet, Mulder, & van Lange, 2011; Boyd, Gintis, Bowles, & Richerson, 2003), positive outcomes that are closely related to effective leadership. Prestige mechanisms thus appear to refine homologous dominance mechanisms to produce relatively nuanced, other-regarding, and often (but not always) non-violent punitive responses. From this perspective, the conceptual association between physical formidability and status may indeed be driven by representations of the potential to inflict costs, yet still properly pertain to prestige. Interestingly, the present findings suggest that physical formidability is conceptually associated with aspects of status that are not overtly related to the potential to inflict costs, as exploratory analyses reveal that this positive correlation consistently holds for the item assessing the extent to which the target individual is admired by others in the "safe" group conditions of Studies 1-3, (*r*s .17 - .34, *p*s .04 - .001). Future studies manipulating the extent to which a target individual is capable of inflicting costs are needed to assess the extent to which

the link between envisioned physical formidability and prestige is contingent on implicit connotations with punitive power.

5.1 Conclusion

Parochial prejudices are particularly intense toward outgroups regarded as threatening (McDonald et al., 2012). The present work indicates that prevailing impressions of Black and Hispanic men as large and muscular are connected to perceptions of physical aggressiveness, and that associations with danger are detectable via patterned differences in the conceptual links between physical size, status, and aggressiveness. At the level of method, measuring these links provides a promising new way of assessing stereotype-based ideation concerning violence and aggression. At the level of theory, these findings are a first step in illuminating the representation algorithms at the root of the reckoning of social status. While we acknowledge that the present data are also consistent with postulating non-overlapping formidability representation and status representation systems, both utilizing the dimensions of bodily size and strength, but each arising via otherwise unrelated phylogenetic and/or ontogenetic pathways, it is more parsimonious to presume that these systems share structure due to shared history, particularly given the synonymity of coercive threat and social rank throughout much of human evolution.

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Footnotes

[1] Importantly, this formidability representation hypothesis need not entail perceptual biases. The claim pertains to a conceptual representation of the opponent's physical characteristics, not to online perceptual representations fed by visual input—indeed, accurately perceiving potential agonists is vital, as both combat and flight demand veridical representations.

[2] Note that, as masculinity proxies core dimensions of concern here—bodily formidability and physical aggressiveness (Helgeson, 1994)—controlling for differences in perceived masculinity is a highly conservative way of assessing differences related to race-based perceptions. The effects of race condition are consistently more pronounced across all of the present studies when perceived name masculinity is not controlled for.

[3] The male warrior hypothesis (McDonald et al., 2012) suggests that men may be both more sensitive to cues of outgroup threat and more prone to outgroup stereotyping, and hence potentially more susceptible to our manipulations. However, we only observed one sex difference across all three studies: male participants in Study 1 attributed greater aggressiveness to the target (in both race conditions). Speculatively, the absence of observed sex differences may owe to the selective pressures of outgroup male violence and sexual coercion operating on women (Navarrete, Fessler, Fleischman, & Geyer, 2009), which may have sensitized female threat assessment systems to attribute greater threat to outgroup male targets for precautionary reasons that complement those described in the male warrior hypothesis.

[4] In this paper, the hypothesized mediating variables were measured rather than manipulated. Convergent results were obtained in follow-up studies which experimentally manipulated threat or status in addition to race (Holbrook, Fessler, & Navarrete, in preparation).

[5] We included in our studies the small proportion of participants (~5%) who identified themselves as Black, on the premise that these participants might also be susceptible to acquired cultural stereotypes (e.g., Devine, 1989). Omitting Black participants from the analysis does not change the overall pattern of results, and the sample of Black participants was too small to allow for meaningful comparisons between this class of participants and others.

[6] As linear regression models treat categorical variables as though they were continuous, and as the Status/Threat condition contained three levels, moderation tests for Study 2 were conducted using the general linear model command in SPSS. This analysis appropriately treats the Status/Threat variable as categorical.

Table 1

Mean Estimated Physical Formidability, Aggressiveness, and Status (Study 1)

	White	Black				
	Mean (SD)	*Mean (SD)*	*F*	*P*	η^2_p	95% CI
Physical Formidability	-.18 (.73)	.15 (.79)	8.09	<.01	.03	-.44, -.08
Aggressiveness	-.16 (.88)	.13 (.91)	4.07	<.05	.02	-.44, -.01
Status	.13 (.91)	-.11 (.69)	7.04	<.01	.03	.07, .47

Note. $N = 249$. Means reflect standardized variables (z-scores). Analyses control for covarying differences in perceived masculinity. For the effects of condition on the individual measures making up these composite scores, see SOM.

Table 2

Mean Estimated Physical Formidability, Aggressiveness, and Status by Race Condition (Study 2)

	White	Black				
	Mean (SD)	*Mean (SD)*	*F*	*P*	η^2_p	95% CI
Physical Formidability	-.17 (.76)	.15 (.72)	14.36	<.001	.04	-.37, -.12
Aggressiveness	-.10 (.90)	.09 (.92)	4.72	.03	.01	-.28, -.01
Status	.08 (.89)	-.07 (.92)	6.94	<.01	.02	.04, .27

Note. $N = 419$. Means reflect standardized variables (z-scores). Analyses control for covarying differences in perceived name masculinity.

Table 3

Mean Estimated Physical Formidability, Aggressiveness, and Status by Status/Threat condition (Study 2)

	Neutral *M (SD)*	Status *M (SD)*	Threat *M (SD)*
Formidability	-.26[a] (.78)	-.08[a] (.66)	.31[b] (.74)
Aggression	-.23[a] (.70)	-.57[b] (.69)	.81[c] (.70)
Status	.11[a] (.55)	.74[b] (.62)	-.90[c] (.59)

Note. $N = 419$. Means with different superscripts are significantly different with alpha at .05.

Table 4

Mean Estimated Physical Formidability, Aggressiveness, and Status (Study 3)

	Asian	Hispanic				
	Mean (SD)	*Mean (SD)*	*F*	*p*	η^2_p	95% CI
Physical Formidability	-.29 (.72)	.32 (.66)	36.24	<.001	.12	-.65, .-.33
Aggressiveness	-.20 (.75)	.23 (.93)	16.34	<.001	.06	-.63, .-.22
Status	.20 (.78)	-.22 (.80)	27.04	<.001	.09	.31, .69

Note. $N = 279$. Means reflect standardized variables (z-scores). Analyses control for differences in perceived masculinity.

Figure 1. *Top:* Array used by participants to estimate overall size. *Bottom:* Array used by participants to estimate muscularity. Modified with permission from Frederick & Peplau (2007).

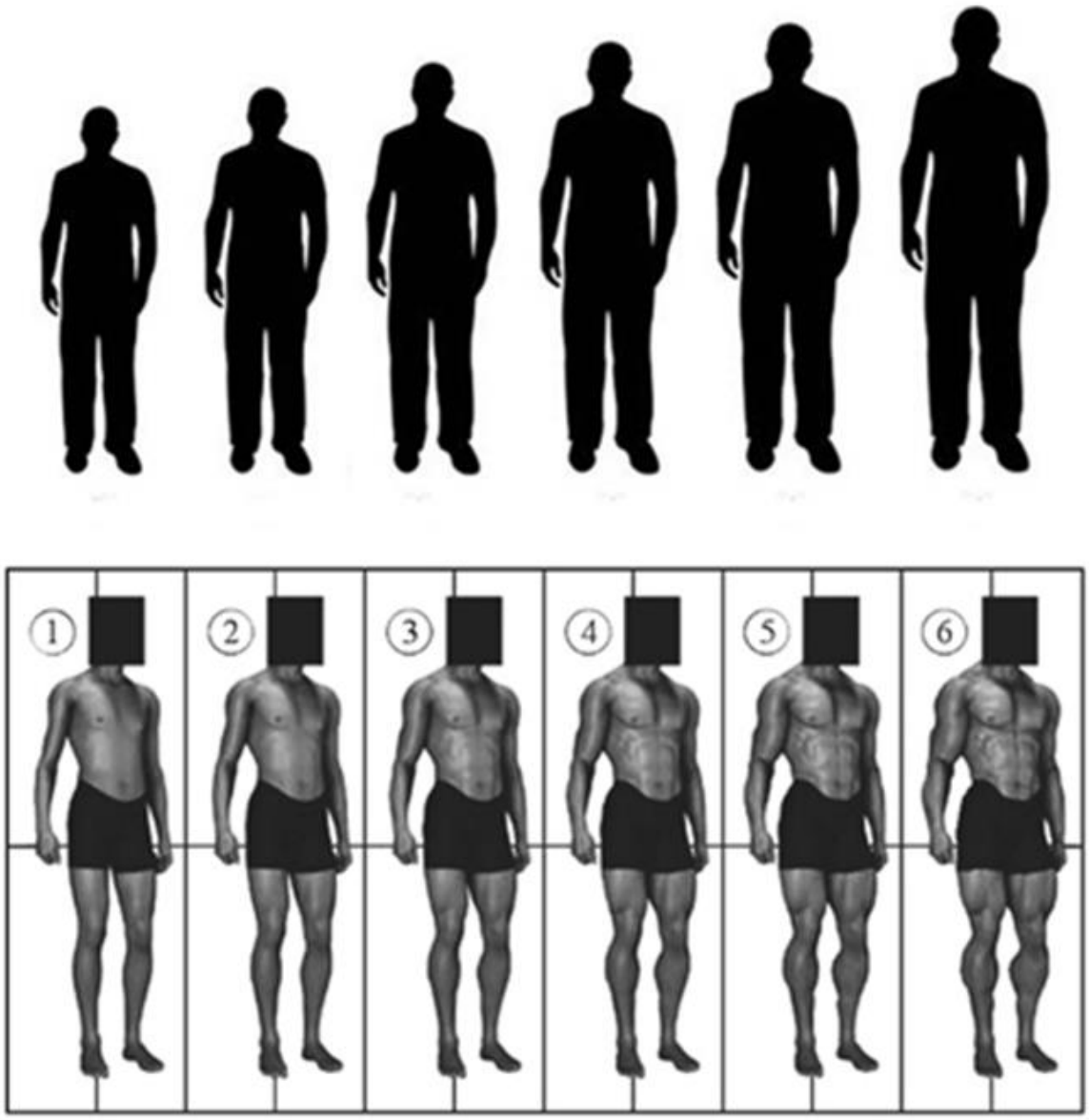


Figure 2. Race moderates the correlation between envisioned physical formidability and status in Study 1, a pattern which replicates within the identical neutral Status/Threat subcondition of Study 2. The correlation is significantly positive for White targets, but significantly negative for Black targets. In both Studies 1 and 2 (neutral condition), the negative correlation between envisioned physical formidability and status in the Black condition reduces to a null correlation when perceived aggressiveness is controlled for (see text for details). The envisioned status and physical formidability measures are z-scores.

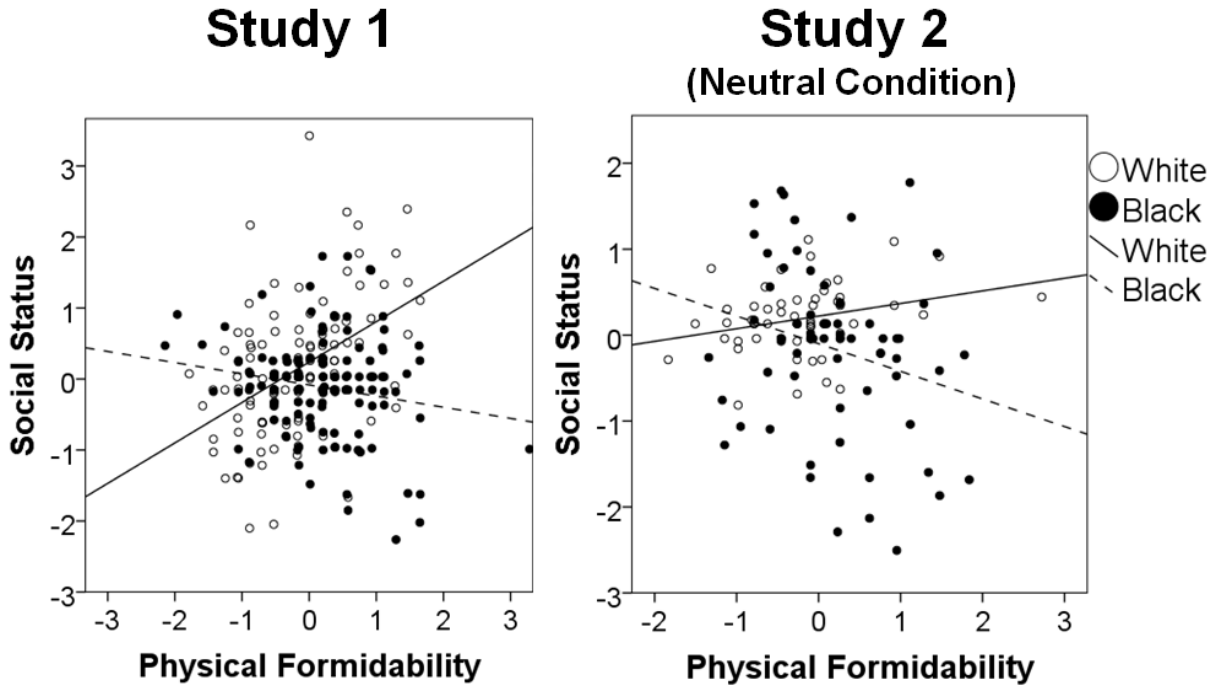
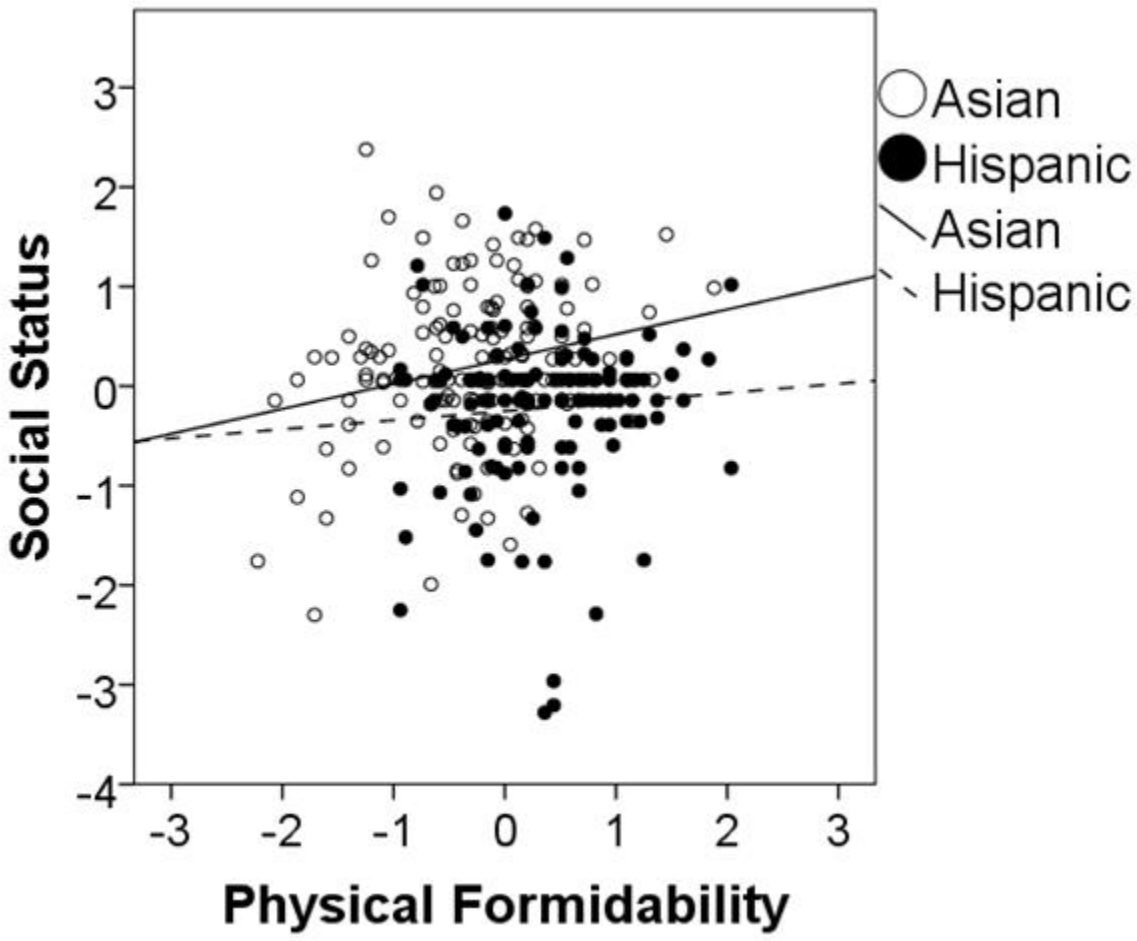


Figure 3. In Study 3, the correlation between envisioned status and physical formidability was significantly positive for Asian targets, but not for Hispanic targets (unless perceived aggressiveness is controlled for—see text for details). The envisioned status and physical formidability measures are z-scores.



Online Supplemental Material

to accompany

Stature or danger? Racial stereotypes illuminate dual adaptations for representing status versus threat as physical size

Colin Holbrook, Daniel M. T. Fessler, and Carlos D. Navarrete

- Vignette Texts
- Pre-study
- Tables
    - *Table S1:* Mean Estimated Height, Size, and Muscularity (Pre-study)
    - *Table S2:* Mean Estimated Height, Size, Muscularity, Likelihood of Fighting if Challenged, and Trait Physical Aggressiveness (Study 1)
    - *Table S3:* Mean Estimated Status Rank, Financial Success, Social Influence, and Community Respect (Study 1)
    - *Table S4:* Mean Estimated Physical Formidability, Aggressiveness, and Status by Subcondition (Study 2)
    - *Table S5:* Mean Estimated Height, Size, Muscularity, Likelihood of Fighting if Challenged, and Trait Physical Aggressiveness (Study 2)
    - *Table S6:* Mean Estimated Status Rank, Financial Success, Social Influence, and Community Respect (Study 2)
    - *Table S7:* Mean Estimated Height, Size, Muscularity, Likelihood of Fighting if Challenged, and Trait Physical Aggressiveness (Study 3)
    - *Table S8:* Mean Estimated Status Rank, Financial Success, Social Influence, and Community Respect (Study 3)
    - *Table S9:* Mean Estimated Name Masculinity (Studies 1-3)
- References

Vignette Texts

We selected stereotypical White and Black names by pre-testing 16 names taken from lists of names frequently associated with Black and White men (Levitt & Dubner, 2006). We then selected three names for each category that were closely matched in perceived masculinity, and which over 90% of participants identified as matching the intended group (White names: Wyatt, Connor, and Garrett; Black names: Jamal, DeShawn, and Darnell). In Study 3, we used the same approach to pre-test and select stereotypical Asian and Hispanic names from an initial pool of 16 names generated by the first author on the basis of Internet searches (Asian names: Chen, Hikaru, and Zhiyuan; Hispanic names: Juan, Santiago, and Jorge).

Studies 1 and 3:

> [NAME] woke up Saturday morning and began his day by brushing his teeth and taking a shower. After eating breakfast, [NAME] watched TV for a while and talked on the phone. Then [NAME] went to a nearby store and bought some groceries. Once he had gotten home, [NAME] received a text message from a friend inviting him to go out later. That night, [NAME] went out to meet his friends at a bar. As he entered the crowded bar, he brushed against the shoulder of a man walking the other direction. The man turned, glared at [NAME], and angrily said "Watch where you're going, asshole!"

Study 2: Study 2 utilized the vignette above in the Neutral condition. The following opening sentences were added in the Status versus Threat conditions:

Status Condition: "[NAME] is a college graduate. After college, [NAME] went on to become a successful local business owner."

Threat Condition: "[NAME] was convicted of aggravated assault. After prison, [NAME] took a part-time job at a local business."

Pre-study

Methods

Participants and overview of procedure. 600 adult participants were recruited via Michigan State University's study pool to take part in a study advertised as an online survey of "Personality and Preferences" in exchange for course credit. Data were analyzed solely for participants who completed all survey items relevant to this study, did not take the survey more than once, self-identified as a U.S. citizen, and did not provide obviously questionable responses (e.g., claiming to be over 100 years old). The final sample consisted of 566 adults (62.2% female; 77.9% White) ranging in age from 18 to 59 (M = 21.07, SD = 5.04).

In this within-subjects design, participants read short biographical vignettes about two men, one of whom had a stereotypically Black-sounding name, and one of whom had a stereotypically White-sounding name. The two vignette conditions were presented in random order, and varied only in the name of the protagonist described:

> [NAME] is a college student in his early twenties, and usually earns average grades. In addition to his studies, he works part-time in a retail store near his apartment. During most weekends, [NAME] enjoys watching movies and hanging out with friends.

Participants then reported their intuitions about the target individuals' physical traits in fixed order: size, height, and muscularity. Size was rated using a 6-point silhouette array; height was rated in feet and inches according to an 11-point scale (1 = *Below 4'10''*, 2 = *4'10''-5'0''*, 3 = *5'0''-5'2''*, 4 = *5'2''-5'4''*, 5 = *5'4''-5'6''*, 6 = *5'6''-5'8''*, 7 = *5'8''-5'10''*, 8 = *5'10''-6'0''*, 9 = *6'0''-6'2''*, 10 = *6'2''-6'4''*, 11 = *Over 6'4''*); muscularity was rated using a 6-point array of computer-generated images (see Figure 1). Estimated physical formidability was composited using

standardized values for the measures of height, size, and muscularity ($\alpha = .69$). After completing additional studies unrelated to the pre-study (e.g., related to moral judgment), participants completed demographic items and were debriefed.

Results

Envisioned physical formidability. Preliminary tests for order effects of condition revealed that the targets with stereotypically Black names were rated as taller, larger, and more muscular when the target with the typically White name was rated first, $ps < .02$. There was no effect of order on ratings of the targets assigned typically White names, $ps > .2$. Order was therefore statistically controlled for. As predicted, targets with stereotypically Black names were estimated to be more physically formidable than targets with stereotypically White names (see Table S1).

SOM Table 1

Mean Estimated Height, Size, and Muscularity (Pre-study)

	Black	White			
	M (SD)	*M (SD)*	*F*	*p*	η^2_p
Height	7.56 (1.17)	7.22 (1.02)	44.92	<.001	.07
Size	4.31 (.80)	3.99 (.79)	16.02	<.001	.03
Muscularity	3.07 (1.19)	2.66 (1.04)	89.04	<.001	.14

Note. $N = 566$.

SOM Table 2

Mean Estimated Height, Size, Muscularity, Likelihood of Fighting if Challenged, and Trait Physical Aggressiveness (Study 1)

	Black	White				
	M (SD)	*M (SD)*	*F*	*p*	η^2_p	95% CI
Height	70.51 (1.92)	69.75 (1.77)	7.38	<.01	.03	-1.06, -.17
Size	4.05 (.90)	3.92 (.95)	.33	.57	.00	-.29, .16
Muscularity	2.56 (.92)	2.16 (.82)	9.97	<.01	.04	-.55, -.13
Likelihood of Fighting	4.04 (1.72)	3.46 (1.70)	5.07	<.03	.02	-.90, -.06
Trait Aggressiveness	3.55 (1.09)	3.30 (1.10)	1.89	.17	.01	-.46, .08

Note. $N = 249$. Estimated heights are in inches. Analyses control for covarying differences in perceived masculinity.

SOM Table 3

Mean Estimated Status Rank, Financial Success, Social Influence, and Community Respect (Study 1)

	Black	White				
	M (SD)	*M (SD)*	*F*	*p*	η^2_p	95% CI
Status Ladder	5.26 (1.26)	5.70 (1.52)	7.12	<.01	.03	.12, .82
Financial Success	4.93 (.99)	5.27 (1.20)	7.56	<.01	.03	.11, .65
Social Influence	4.71 (1.03)	4.88 (1.36)	2.04	.16	.01	-.08, .51
Community Respect	5.33 (.99)	5.51 (1.22)	2.72	.10	.01	-.05, .51

Note. $N = 249$. Analyses control for covarying differences in perceived masculinity.

SOM Table 4

Mean Estimated Physical Formidability, Aggressiveness, and Status by Subcondition (Study 2)

	White Neutral	White Status	White Threat	Black Neutral	Black Status	Black Threat
	M	*M*	*M*	*M*	*M*	*M*
	(SD)	*(SD)*	*(SD)*	*(SD)*	*(SD)*	*(SD)*
Formidability	-.47 [a]	-.30 [a, c]	.22 [b, d]	-.08 [b, c, d]	.12 [b, d]	.38 [d, e]
	(.77)	(.59)	(.76)	(.74)	(.65)	(.71)
Aggression	-.39 [a]	-.66 [b]	.81 [c]	-.10 [d]	-.48 [a, b]	.82 [c]
	(.68)	(.57)	(.66)	(.69)	(.78)	(.74)
Status	.25 [a]	.82 [b]	-.90 [c]	.00 [d]	.67 [b]	-.89 [c]
	(.28)	(.55)	(.61)	(.68)	(.67)	(.58)

Note. $N = 419$. Means with different superscripts are significantly different with alpha at .05.

Analyses control for covarying differences in perceived masculinity.

SOM Table 5

Mean Estimated Height, Size, Muscularity, Likelihood of Fighting if Challenged, and Trait Physical Aggressiveness (Study 2)

	White Neutral *M* (*SD*)	White Status *M* (*SD*)	White Threat *M* (*SD*)	Black Neutral *M* (*SD*)	Black Status *M* (*SD*)	Black Threat *M* (*SD*)
Height	69.67 [a] (2.03)	70.11 [a, b] (1.81)	70.75 [b, c] (2.20)	70.53 [b, c] (1.94)	70.90 [c] (2.06)	71.08 [c] (2.14)
Size	3.73 [a] (.95)	3.89 [a] (.71)	4.25 [b] (.76)	4.03 [a, b] (.90)	4.23 [b, c] (.78)	4.36 [c, d] (.91)
Muscularity	2.11 [a] (.88)	2.20 [a, b] (.74)	3.00 [c] (1.02)	2.47 [b] (.94)	2.66 [b, d] (.73)	3.17 [c, e] (.90)
Likely to Fight	3.36 [a] (1.50)	2.84 [a, b] (1.42)	5.27 [c] (1.73)	3.87 [a] (1.64)	3.16 [a, b] (1.76)	5.30 [c] (2.06)
Aggression	3.27 [a] (1.08)	2.89 [b] (.85)	5.29 [c] (.95)	3.75 [d] (1.02)	3.17 [a, b] (1.15)	5.32 [c] (.93)

Note. $N = 419$. Estimated heights are in inches. Means with different superscripts are significantly different with alpha at .05. Analyses control for covarying differences in perceived masculinity.

SOM Table 6

Mean Estimated Status Rank, Financial Success, Social Influence, and Community Respect (Study 2)

	White Neutral *M* (*SD*)	White Status *M* (*SD*)	White Threat *M* (*SD*)	Black Neutral *M* (*SD*)	Black Status *M* (*SD*)	Black Threat *M* (*SD*)
Status Ladder	5.80 [a] (1.28)	6.49 [b] (1.37)	3.41 [c] (1.28)	4.90 [d] (1.48)	6.11 [a, b] (1.42)	3.12 [c] (1.28)
Financial	5.11 [a] (.85)	6.28 [b] (1.05)	3.33 [c] (1.07)	4.81 [a] (1.21)	6.11 [b] (1.29)	3.17 [c] (1.06)
Influential	4.87 [a] (.90)	6.04 [b] (1.18)	3.02 [c] (1.41)	4.63 [a] (1.45)	5.85 [b] (1.34)	3.19 [c] (1.46)
Respected	5.44 [a] (1.14)	6.34 [b] (1.16)	3.44 [c] (1.23)	5.10 [a] (1.17)	6.06 [b] (1.31)	3.76 [c] (1.22)

Note. $N = 419$. Means with different superscripts are significantly different with alpha at .05. Analyses control for covarying differences in perceived masculinity.

SOM Table 7

Mean Estimated Height, Size, Muscularity, Likelihood of Fighting if Challenged, and Trait Physical Aggressiveness (Study 3)

	Hispanic	Asian				
	M (SD)	*M (SD)*	*F*	*p*	η^2_p	95% CI
Height	69.07 (1.73)	67.59 (2.28)	25.08	<.001	.08	-1.72, -.75
Size	3.67 (.86)	3.09 (.91)	20.26	<.001	.07	-.70, -.27
Muscularity	2.16 (.78)	1.76 (.73)	10.79	.001	.04	-.48, -.12
Likelihood of Fighting	3.59 (1.63)	3.03 (1.31)	9.85	<.01	.03	-.93, -.21
Trait Aggressiveness	3.43 (.92)	2.97 (.88)	14.47	<.001	.05	-.64, -.20

Note. $N = 279$. Estimated heights are in inches. Analyses control for covarying differences in perceived masculinity.

SOM Table 8

Mean Estimated Status Rank, Financial Success, Social Influence, and Community Respect (Study 3)

	Hispanic	Asian				
	M (SD)	*M (SD)*	*F*	*p*	η^2_p	95% CI
Status Ladder	5.14 (1.18)	5.75 (1.16)	23.13	<.001	.08	.41, .98
Financial Success	4.86 (1.11)	5.40 (1.02)	21.78	<.001	.08	.36, .87
Social Influence	4.58 (1.01)	4.93 (1.01)	11.96	.001	.04	.19, .68
Community Respect	5.11 (.88)	5.45 (1.01)	13.58	<.001	.05	.20, .66

Note. $N = 279$. Analyses control for covarying differences in perceived masculinity.

SOM Table 9

Mean Estimated Name Masculinity (Studies 1-3)

	Condition 1	Condition 2				
	M (SD)	*M (SD)*	*F*	*p*	η^2_p	95% CI
Study 1 (1 = White; 2 = Black)	6.56 (1.38)	6.92 (1.37)	4.18	<.05	.02	-.70, -.01
Study 2 (1 = White; 2 = Black)	6.54 (1.49)	6.95 (1.48)	7.68	<.01	.02	-.69, -.12
Study 3 (1 = Asian; 2 = Hispanic)	5.55 (1.45)	6.34 (1.50)	19.97	<.01	.07	-1.14, -.44

References

Levitt, S.D., & Dubner, S.J. (2006). *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything (Revised and Expanded Edition)*. New York: Harper Collins.