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Two signals of social rank: Prestige and dominance are associated with distinct nonverbal displays

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Abstract

Converging evidence suggests that high rank is communicated through various nonverbal behaviors (e.g., expansiveness) but prior studies have not examined whether two distinct forms of high rank—known as *prestige* and *dominance*—are communicated through distinct nonverbal displays. Given the divergent messages that prestigious and dominant leaders need to send in order to attain and retain their place in the social hierarchy, theoretical accounts would suggest that individuals use distinct sets of nonverbal behaviors to communicate these two forms of high rank. In the present research, we tested this hypothesis in seven studies, using carefully controlled experimental designs (Studies 1, 2, 3, 4a, and 4b) and the assessment of spontaneously displayed nonverbal behaviors that occurred during a lab-based group interaction (Study 5) and a real-world political contest (Study 6). Results converged across studies to show that prestige and dominance strategies are associated with distinct sets of nonverbal behaviors, which are largely consistent with theoretical predictions. Specifically, prestige, or the attainment of rank through earned respect, and dominance, or the use of intimidation and force to obtain power, are communicated from different head positions (i.e., tilted upward vs. downward), smiling behaviors (i.e., presence vs. absence of a symmetrical smile), and different forms of bodily expansion (i.e., subtle chest expansion vs. more grandiose space-taking). These findings provide the first evidence for two distinct signals of high rank, which spontaneously emerge in social interactions and guide social perceptions and the conferral of power.

Keywords: Dominance; Prestige; Nonverbal Display; Signalling

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Two signals of social rank: Prestige and dominance are associated with distinct nonverbal displays

Many species across the animal kingdom use distinctive, readily interpreted nonverbal displays to signal high social rank (Ballentine, Searcy, & Nowicki, 2008; de Waal, 2007; deCarvalho, Watson, & Field, 2004; Goodall, 1986). Humans, too, convey their rank through easily understood nonverbal behaviors, such as increased bodily expansiveness and expressions of pride (Tracy & Matsumoto, 2008; Shariff & Tracy, 2009; Gifford 1991; Hall et al., 2005). In humans, however, high rank appears to come in more than one form (Henrich & Gil-White 2001). A growing body of research suggests that people attain social rank via two different strategies, both of which effectively promote influence over others and shape others' attention, yet which result in notably different forms of leadership (Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Cheng, Tracy, & Henrich, 2010; Maner & Case, 2016; von Rueden, Gruven, Kaplan, 2008). These strategies have been labeled *prestige*, which involves the demonstration of knowledge and expertise to earn respect and freely chosen followership, and *dominance*, which involves the use of aggression and intimidation to induce fear and forced deference (Cheng et al., 2010; Cheng & Tracy, 2014; Henrich & Gil-White, 2001). Both strategies have been shown to be positively related to a third, distinct construct: generalized high rank, also known as social influence, or the possession of power over others (Cheng et al., 2013).

Although a large body of research has examined the nonverbal behaviors that humans use to communicate generalized high rank (e.g., Hall et al., 2005), these studies have tended to amalgamate prestige and dominance, along with several other rank-related terms, such as status, influence, leadership, wealth, verticality, and SES (see Cheng et al., 2013; Cheng & Tracy, 2013; Ellyson & Dovidio, 1985; Hall et al., 2005). In contrast, no prior studies of which we are aware

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have tested whether these two distinct forms of high rank are associated with distinctive behavioral displays. Although there are likely adaptive benefits to communicating generalized high rank, there are also evolutionary reasons to expect prestige and dominance to be associated with discriminable nonverbal displays (Henrich & Gil-White, 2001; Panchanathan, 2010).

Why Communicate High Rank?

Across species, a variety of adaptive benefits accrue to those who effectively send and receive signals of high rank through readily identified nonverbal displays. Individuals who can successfully communicate their own deservedness of power are likely to receive increased social influence and attention (Cashdan, 1998; Cheng et al., 2013; Foulsham, Cheng, Tracy, Henrich, & Kingstone, 2010), a greater allocation of potentially scarce resources (Brown & Maurer, 1986; Cole, 1981), higher quality mates (Apicella, Feinberg, & Marlowe, 2007; Vacharkulksemsuk et al., 2016; von Rueden & Jaeggi, 2016; von Rueden, Gurven, & Kaplan, 2010), and deference (Fromme & Beam, 1974; Holland, Wolf, Looser, & Cuddy, 2017; Sell, Cosmides, & Tooby, 2014; von Rueden et al., 2010). Conversely, an ability to recognize high rank in others can help avoid potentially costly agonistic encounters (Ellyson & Dovidio, 1985; Lieberz et al., 2017; Stirrat, Stulp, & Pollet, 2012; Třebický et al., 2015; Třebický, Havlicek, Roberts, Little, & Kleisner, 2013) as well as facilitate social learning opportunities (Birch, Akmal, & Frampton, 2010; Chudek, Heller, Birch, & Henrich, 2012; Martens, Tracy, & Shariff, 2012; Martens & Tracy, 2014; Over, Carpenter, Spears, & Gattis, 2013), the identification of desirable mates (Fink, Neave, & Seydel, 2007; Havlicek, Roberts, & Flegr, 2005), and power maneuvering (Muller & Mazur, 1997; Todorov, 2005).

A large body of research suggests that humans reliably communicate high rank to conspecifics using two overlapping sets of nonverbal behaviors (Hall et al., 2005; Shariff &

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Tracy, 2009; Tiedens & Fragale, 2003; Tracy & Matsumoto, 2008).¹ First, high ranking individuals tend to show open and expansive bodily displays, including chest expansion, arm movements extended outward, open leg positions, wide stances, hands behind the head with elbows out, and other physically enlarging behaviors (Hall et al., 2005). These same behaviors are perceived as indicative of high-rank by signal receivers, and result in rank conferral (Anderson & Kilduff, 2009; Marsh, Yu, Schechter, & Blair, 2009; Tiedens & Fragale, 2003). Furthermore, expansive nonverbal behaviors have been shown to communicate high rank across diverse populations (Bente, Leuschner, Issa, & Blascovich, 2010; Hwang, Matsumoto, Yamada, Kostić, & Granskaya, 2016) and in several different species, including chimpanzees (Goodall 1986; de Waal, 2007), great tits (Verbeek, Boon, & Drent, 1996), and dome spiders (deCarvalho, Watson, & Field, 2004). These findings suggest that, at a broad level, bodily expansion may be an evolved signal of high rank—likely as a result of a more ancient association between sheer size and coercive power (Blaker & van Vugt, 2014; Marsh et al., 2009; Stulp, Buunk, Verhulst, & Pollet, 2015).

Second, individuals who have increased in rank also tend to display the emotion expression of pride, which features arms extended out from the body, with hands either on hips or raised above the head with clenched fists, chest expanded, head tilted slightly upward, and a small smile (Tracy & Matsumoto, 2008; Tracy & Robins, 2004; 2007a; 2008). Given that pride is a prototypical emotional response to success, and may function in part as an internal barometer of success (Weidman, Tracy, & Elliott, 2016), it is not surprising that this display is automatically and cross-culturally associated with perceptions of high rank (Fessler 1999; Shariff, Tracy, & Markusoff, 2012; Shariff & Tracy, 2009; Tracy, Shariff, Zhao, & Henrich, 2013). Furthermore, the pride expression has been shown to trigger automatic associations with

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concepts related to the possession of knowledge and expertise (Martens, 2014; Martens & Tracy, 2013; Birch, Akmal, & Frampton, 2010), and, presumably because those who possess knowledge make good social models (Henrich & Gil-White, 2001; Panchanathan, 2010), the pride expression cues copying and social learning (Martens & Tracy, 2013). Although expansiveness is an important part of the pride expression, Shariff and Tracy (2009) found that perceptions of high rank made on the basis of pride expressions do not emerge solely as function of observed expansiveness.

There is thus good evidence to suggest that expansive behavioral displays in general and the pride expression in particular evolved to communicate high rank. In all of these prior studies, however, social rank has been treated as a uni-dimensional construct. Researchers have assessed rank perceptions using a variety of terms (e.g., power, dominance, status), but often in inconsistent ways and without providing clear definitions (for reviews, see Cheng et al., 2013; Cheng & Tracy, 2014; Ellyson & Dovidio, 1985). This practice likely resulted from a longstanding absence of clearly defined rank-related constructs within the psychological or behavioral science literature. However, in light of recent research delineating two distinct forms of high rank, the time is ripe to examine whether these different patterns of rank attainment and leadership are associated with distinct nonverbal displays.

Why Might Humans Use Distinct Signals to Communicate Prestige and Dominance?

Signaling to conspecifics one's dominance or one's prestige, as opposed to sending a message of undifferentiated high rank, is likely to confer specialized adaptive benefits.

According to evolutionary accounts, prestigious leaders tend to be empathic and helpful toward followers (Henrich, Chudek, & Boyd, 2015; Henrich, 2015); in fact, their status is often directly predicated on their willingness to share what they know with subordinates (Cheng et al., 2013;

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Cheng et al., 2010). As a result of their kindness and generosity, these leaders tend to be adored or revered by followers, who willingly defer to them (Cheng et al., 2010; Henrich & Gil-White, 2001; Maner & Case, 2016; Maner & Mead, 2010; von Rueden et al., 2008). By communicating their prestige to followers through a recognizable nonverbal display, these individuals might effectively inform others that they possess knowledge or skills that should be copied, and also that they are likely to treat followers with warmth and compassion.

In contrast, dominant leaders' power derives primarily from intimidation or coercion; group members typically defer to dominants not because they want to, but because they feel threatened by the potential consequences of non-compliance (Cheng et al., 2013; Cheng et al., 2010; Cheng & Tracy, 2014; von Rueden et al., 2008). In order to retain their influence, dominants therefore need to induce fear in followers; if subordinates do not perceive them as threatening, they will not grant them power.² By communicating a willingness to inflict harm without actually engaging in an agonistic encounter, dominance signalers might acquire a boost in rank while avoiding the costs of physical altercations (assuming a subordinate decides not to challenge the dominant). In fact, numerous species use nonverbal signals of dominance to attain rank while avoiding unnecessary agonistic encounters (Blaker & van Vugt, 2014; Johnstone & Norris, 1993; Smith & Price, 1973).

Given the distinct social messages that prestigious and dominant leaders need to send in order to retain their power – kindness, empathy, and knowledge or competence on the one hand, and threat, intimidation, and strength on the other— it is likely that these two forms of leadership would be associated with distinct signals, including nonverbal ones. This expectation is further supported by the fact that prestigious leaders would suffer costs from inadvertently communicating dominance: fearful followers would avoid them rather than seek them out as

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social models, resulting in a loss of status earned from freely chosen deference. Correspondingly, dominant leaders who inadvertently communicate prestige would undercut their ability to elicit fear and intimidation by instead conveying warmth and approachability.

It would likewise be adaptive for subordinate group members to reliably distinguish between leaders' displays of prestige and dominance. Group members benefit from copying and therefore closely following prestigious leaders, but that is less likely to be the case for dominants. In fact, those who copy a dominant leader may be perceived by the leader as a threat or source of competition, which could generate an aggressive response (Maner & Mead, 2010). Furthermore, copying a dominant's aggressive tendencies could have high physical costs if the subordinate does not possess the physiological prowess to win fights (Sell, Hone, & Pound, 2012; Sell, 2011). Correspondingly, although in a dominance hierarchy subordinates' survival is often predicated on their ability to appease leaders while simultaneously avoiding them to evade conflict, avoiding a prestigious leader results in lost learning opportunities (Maner & Case, 2016). In short, correctly identifying distinct displays of dominance and prestige would allow observers to engage in appropriate approach or avoidance responses toward high-ranking individuals.

Given these potential benefits of displaying and recognizing prestige and dominance through distinct nonverbal displays, we predict that these two forms of leadership will be associated with distinct sets of recognizable nonverbal behaviors, which will be spontaneously displayed during social interactions, and used by observers to form accurate impressions of leaders' particular rank-attainment strategy. Although a large body of research has identified a number of behaviors that communicate high rank, and one set of studies found that dominant (but not prestigious) individuals effectively use distinct vocal cues (dynamically lowering their

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pitch over the course of an interaction) to convey their particular form of high rank (Cheng, Tracy, Ho, & Henrich, 2016), no prior studies have examined whether prestige and dominance are communicated with visually distinct nonverbal displays.

What should Distinct Nonverbal Displays of Prestige and Dominance Look Like?

One way to conceptualize the distinction between prestige and dominance is with the interpersonal circumplex of agency and communion (Wiggins, 1979; Wiggins, Trapnell, & Phillips, 1988). Both prestige and dominance are highly agentic strategies, as both involve the attainment of influence and power over others (Cheng et al., 2013; Cheng, Tracy, & Henrich, 2010). The two strategies differ, however, in communion. Prestige involves the demonstration of warmth, caring, and prosociality (i.e., highly communal behaviors), whereas dominance involves aggressive, apathetic and antisocial behaviors (i.e., low communal behaviors; Cheng et al., 2010; DesJardins, Srivastava, Kufner, & Back, 2015; Locke & Heller, 2017; Waal-Andrews, Gregg, & Lammers, 2015). Building on this account, we would expect both dominance and prestige to be communicated from behaviors that convey high agency, but differ in their association with behaviors that convey communion.

Nonverbal Behaviors Related to Both Dominance and Prestige

Given the large body of evidence showing a strong association between high rank and expansiveness or size (Hall et al., 2005; Yap, Mason, & Ames, 2013), we expect expansive bodily displays to be a signal of agency, and thus associated with both prestige and dominance. Furthermore, expansive displays function to increase the apparent physical size of displayers (Marsh et al., 2009), and larger individuals are perceived as both more prestigious and more dominant (see Blaker & van Vugt, 2014). Studies have shown, for example, that larger individuals are perceived as more intelligent and better leaders, consistent with prestige

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strategists (Blaker & van Vugt, 2014; Blaker et al., 2013; Case & Paxson, 2008; Lukaszewski, Simmons, Anderson, & Roney, 2016), but also as possessing an increased likelihood of winning agonistic encounters, consistent with dominance (Archer & Thanzami, 2007; Olweus, 1994; Parker, 1974; Thomsen, Frankenhuys, Ingold-Smith, & Carey, 2011; Matsumoto & Hwang, 2012). Expansive and enlarging behaviors that are likely to communicate agency include body and arm movements that increase the physical size of the signaler, such as arms extended outward from the body with hands on hips or raised in the air (Shariff & Tracy, 2009; Tracy & Matsumoto, 2008; Tracy & Robins 2004; 2007a), as well as widened stance, expansive chest, and extending one's legs out from the body (Gifford, 1991, 1994; Hall et al., 2005; Rule, Adams Jr, Ambady, & Freeman, 2012; Tracy & Robins 2004; 2007a).

Nonverbal Signals of Prestige

We expect that behaviors known to communicate high communion or warmth will be part of a distinct prestige display. The most prototypical nonverbal signal of communion is smiling, which we broadly define as symmetrical activation of Action Unit 12 (i.e., AU 12, or zygomatic major; Ekman & Friesen, 2002). Smiling has been shown to increase perceptions of warmth and liking (Bayes, 1972; Gifford, 1994; Guerrero, 2005; Krumhuber et al., 2007; Lau, 1982), and is used to convey closeness among interactants (Mehrabian, 1971; Martin, Rychlowska, Wood & Niedenthal, 2017). Smiling has also been shown to precipitate prosocial behavior (Mehu, Grammer, & Dunbar, 2007) and signal affiliative motivations (Fridlund, 1991; Kraut & Johnston, 1979). Finally, smiling decreases perceptions of aggression and hostility (Kraus & Chen, 2013), which must be avoided by those who wish to communicate prestige (Cheng et al., 2013; but see Ketelaar et al., 2012).

A second potential prestige behavior is upward head tilt, which is also likely to increase

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perceptions of communion and affiliation. Individuals who tilt their heads upward are perceived as experiencing greater happiness and less sadness (Mignault & Chaudhuri, 2003), both of which increase interpersonal liking (Lyubomirsky, King, & Diener, 2005). Upwards head tilt also increases recognition rates for several positive emotions, including happiness, excitement, and pride (in contrast, shifting one's head downward can *decrease* recognition of these positive emotions; Beck, Canamero, & Bard, 2010; Tracy & Robins 2004; 2007a, Witkower & Tracy, 2018a; Witkower, Tracy, & Lange, 2018). Furthermore, in addition to conveying warmth and communion, an upwards head tilt automatically and cross-culturally increases perceptions of high-rank (Bente et al., 2010; Mignault & Chaudhuri, 2003; Rule et al., 2012). Although this last finding could indicate that upwards head tilt should be part of a dominance display as well (see also, Sullivan et al., 1991), the evidence linking this behavior to positive emotions suggests that it is more likely to be a unique signal of prestige.

It is noteworthy that the combination of behaviors hypothesized to be associated with prestige (i.e., expansiveness, smiling, and upwards head tilt) are identical to the combination of behaviors repeatedly found to be critical to the nonverbal expression of pride (Tracy & Robins, 2004; 2007a; Tracy & Matsumoto, 2008). This similarity may be due to the strong association between authentic pride—the form of pride based on hard-earned accomplishments and genuine feelings of self-esteem—and prestige (Cheng et al., 2010; Liu, Lu, Yu, Chen, 2012). Although the pride expression has been found to communicate both authentic and hubristic pride—the latter being the more arrogant, self-aggrandizing version of the emotion (Tracy & Prehn, 2012; Tracy & Robins, 2007b)—there is evidence to suggest that this expression is more strongly associated with authentic pride (Martens, 2014; Martens et al., 2012; Martens & Tracy, 2013; Tracy & Prehn, 2012). Furthermore, several studies suggest that there may be a somewhat

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different recognizable display of hubristic pride, which includes different head movements that suggest lower communion (Lange & Crusius, 2015; Nelson & Russell, 2014; Witkower et al., 2018).

Nonverbal Signals of Dominance

Given that smiling and upwards head tilt communicate warmth and affiliation, we expect dominance to be communicated with the opposite set of behaviors as those reviewed above for prestige. Specifically, a dominance display is likely to include a reduction or absence of smiling, and head tilted downward with eye gaze directed forward. Indeed, studies have found that smiling decreases perceptions of toughness and aggression—both traits positively associated with dominance (Kraus & Chen, 2013). Although dominant individuals who successfully rise to power are likely to experience pride and happiness, and smile as a consequence of such victories, we do not expect that smiling would cause individuals to acquire power via dominance.

It is noteworthy, though, that past research has found smiling to both decrease and increase perceptions of dominance (Hareli, Shomrat & Hess, 2009; Hess, Beaupré, & Cheung, 2002; Hess, Blairy, & Kleck, 2000; Rychlowska et al., 2017; Kraus & Chen, 2013; Keating & Bai, 1986). Many of the studies suggesting increased perceptions of dominance from smiling, however, conceptualize dominance as generalized high rank or agency, often using the Interpersonal Adjective Scale (Wiggins et al., 1988). As noted above, we would expect agency – a generalized form of high rank – to be positively related to both prestige and dominance, so prior findings suggesting a positive association between smiling and “dominance” assessed as agency may be due to the importance of smiling to prestige displays. In other words, prior inconsistent findings on this front may be due to a positive association between smiling and one form of high rank – prestige – and negative associations between smiling and another form of

high rank – dominance.³

In addition to being the opposite of upward head tilt, which we expect to be associated with prestige, tilting one's head downward also increases the recognition of negative emotions and decreases recognition of positive emotions (Beck et al., 2010; Mignault & Chaudhuri, 2003, Witkower & Tracy, 2018; Witkower et al., 2018); these effects suggest that a downward head tilt may decrease perceptions of communion and affiliation. Furthermore, individuals who are trying to appear intimidating spontaneously tilt their heads downward, and observers reliably perceive this behavior as intimidating (Hehman, Leitner, & Gaertner, 2013). A downward head tilt may even have a specific adaptive function in the context of an agonistic encounter: it might help protect the neck and its jugular vein, one of the most vulnerable parts of the human body (Hehman et al., 2013). Importantly, however, a downward head tilt combined with downward eye gaze has been found to reliably and cross-culturally communicate shame, submission, and low status (Keltner, 1995; Keltner & Haidt, 1999; Shariff & Tracy, 2009; Tracy & Robins, 2008; Tracy, Robins, & Schriber, 2009, Zivin, 1977) – so to effectively communicate dominance we expect a downward head tilt to be combined with a forward-directed gaze.

The Present Research

In sum, we expect that prestige and dominance will be associated with distinct, readily interpreted, and reliably distinguished nonverbal displays. More specifically, we predict that displays which include bodily expansion, smiling, and upwards head tilt will be used by prestige strategists to signal their particular form of high rank and thereby increase prestige conferrals, and also by observers to form impressions of targets' prestige. In contrast, displays that include bodily expansiveness, reduced smiling, and a downwards head tilt with directed eye gaze will be used by dominance strategists to signal their particular form of high rank and thereby increase

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dominance conferrals, and also by observers to form impressions of targets' dominance.

To test these hypotheses, we conducted seven studies using both experimental and correlational methods. In Study 1, we experimentally manipulated head tilt, expansiveness, and smiling of a target individual, and examined observer judgments of dominance and prestige. In Studies 2 and 3, we replicated and extended the results of Study 1 using additional targets, and also tested whether perceptions of prestige and dominance formed from the hypothesized displays are based on perceptions of high agency and high and low communion, respectively. In Studies 4a and 4b, we replicated and extended the results of Studies 2 and 3 using a broader range of targets.

In Study 5, we assessed the nonverbal displays shown spontaneously by individuals working together in small groups, where dominance and prestige hierarchies naturally emerged. We assessed dominance and prestige on the basis of peer and outside-observer ratings, and tested whether these consensual judgments mapped onto the predicted sets of nonverbal behaviors. We also examined whether these behaviors predicted influence over the group. Finally, in Study 6 we tested whether these distinct sets of nonverbal behaviors were displayed by dominant and prestigious individuals outside of the lab: specifically, the two most recent U.S. presidential candidates as they faced off during the three televised U.S. presidential debates held in 2016.

It is noteworthy that in examining nonverbal displays of high rank, researchers commonly distinguish between displays spontaneously shown by individuals who possess high rank (as determined by criteria such as actual social influence, control over resources, or rank conferrals or deference from others) and displays (often posed) that are perceived by observers as conveying high rank. Here, we take both approaches. In Studies 1, 2, 3, 4a, and 4b we examine perceptions of rank from posed displays, and in Studies 5 and 6 we code the spontaneous

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displays shown by individuals who possess high rank (based on several objective criteria). Together, these studies are the first to test whether distinctive sets of behaviors are used to communicate dominance and prestige, and to do so by: (a) examining rank judgments made in response to tightly controlled posed nonverbal displays, and (b) assessing the behaviors individuals naturally display while competing with others for rank in a group interaction and in a real-world one-on-one political contest.

Study 1

The goal of Study 1 was to determine whether the predicted permutations of nonverbal behaviors elicit distinct perceptions of prestige and dominance. We hypothesized that displays with an upwards head tilt, smile, and expansive posture would be perceived as prestigious, whereas displays with a downwards head tilt, no smile, and expansive posture would be perceived as dominant. We also expected that each of these behaviors, separately, would contribute to the respective prestige or dominance perceptions.

Method

Participants

One hundred and forty-four U.S. workers were recruited from Amazon Mechanical Turk (MTurk). Twenty-three participants were excluded because they failed an attention-check item [See Supplemental Online Materials (SOM)]. The final sample thus consisted of 121 participants (55% men; M age = 33.23 years; SD = 10.33 years; 86% White). Given our within-subjects design, this sample size is substantially larger than what would be required to detect a moderate effect ($f = .10$) with 80% power (given no correction for sphericity and a correlation among repeated measures of $r = .50$).

Materials

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Stimuli. Stimuli were generated using Poser Pro 2014 software. Computer-generated avatars provide a highly controlled environment where precise manipulations of behaviors can be made without any incidental movements; they also allow for the control of potentially relevant human features like attractiveness. A generic male with an average-to-athletic build and no unusual distinguishing features was used for all stimuli in Studies 1 and 2 (see Figure 1). Each display was systematically manipulated to vary on three nonverbal behavior dimensions: expansiveness (expansive versus neutral), smiling⁴ (smile versus no smile), and head angle (tilted upward, level, downward). Expansiveness was operationalized by the arms extended out from the body and hands placed on the hips to expose the chest. Head angle (i.e., head pitch, or AUs 53 and 54 of the Facial Action Coding System, or FACS; Ekman et al., 2002) was adjusted to be 10 degrees upward or downward, with eye gaze directed towards the camera as if posers were looking at an observer. In total, 12 displays were constructed by varying each of these three behaviors into all possible permutations (see Figure S1).

Perceptions of Prestige and Dominance. Participants evaluated the perceived prestige and dominance of each target using a shortened version of the previously validated Prestige and Dominance scales (Cheng et al., 2010); items were chosen that had the highest factor loadings on each dimension across the two studies that were originally used to validate the full scale (see Cheng et al., 2010). Specifically, prestige was measured with the four items: “This person would be considered an expert on some matters”, “This person’s unique talents and abilities would be recognized by others”, “People would seek this person’s advice on a variety of matters”, and “Members of this person’s group respect and admire him” (inter-item α s across targets $\geq .88$). Dominance was measured with the following four items: “This person would enjoy having control over others”, “This person would be willing to use aggressive tactics to get their way”,

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“This person would often try to get his way regardless of what people may want”, and “This person would try to control others rather than permit them to control him” (inter-item α s across targets $\geq .92$). Participants rated each item on a 7-point Likert scale ranging from 1 (Not at all) to 7 (Very much).

Procedure

Participants viewed all 12 nonverbal displays in a randomized order, and rated each on prestige and dominance in a self-paced manner. They then completed an attention check measure used in past research (see SOM; Hauser & Schwarz, 2016; Oppenheimer, Meyvis, & Davidenko, 2009), before being debriefed and compensated.⁵

Results and Discussion

Perceptions of Prestige

We first conducted a 2 (expansiveness) X 2 (smiling) X 3 (head tilt) repeated-measures ANOVA on perceptions of prestige. Supporting our hypotheses, main effects emerged for smiling, $F(1, 120) = 4.67, p = .03, \eta_p^2 = .04$, expansiveness, $F(1, 120) = 41.61, p < .001, \eta_p^2 = .26$, and head tilt, $F(2, 240) = 41.41, p < .001, \eta_p^2 = .26$, suggesting that prestige perceptions increased as targets displayed a smile, expansiveness, and head tilted upward or level (for all means and 95% confidence intervals for main effects, see Figure 2 and Table 1). No significant difference emerged between targets with heads tilted upward versus level ($p > .99, d = .05$). The target displaying the configuration of most prestigious components was judged as most prestigious overall ($M = 5.00, SD = 1.01, 95\% CI: [4.82, 5.18]$; see Table 1).⁶

These main effects were qualified by a head tilt by expansiveness interaction, $F(2, 242) = 5.86, p = .003, \eta_p^2 = .05$, as well as a 3-way interaction with smiling, $F(2, 242) = 5.19, p = .006, \eta_p^2 = .04$, indicating that when targets were not smiling, upwards head tilt significantly increased

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perceptions of prestige ($p = .001$, $d = .32$), but only if targets were also displaying expansiveness, $F(2,240) = 11.24$, $p < .001$, $\eta_p^2 = .09$. When non-smiling targets were also not expansive, upwards head tilt decreased perceptions of prestige compared to a neutral head angle ($p = .03$, $d = -.24$), and did not differ significantly from downwards head tilt ($p = .13$, $d = .19$). However, if targets were smiling, an upwards head tilt and neutral head angle were both significantly more prestigious than a downward head tilt ($ps < .001$, $ds \geq .46$), but not significantly different from each other ($ps > .99$, $ds \leq .09$), regardless of whether the target was expansive or not. These results suggest that upwards head tilt increases or maintains perceptions of prestige, compared to a level head, if it is paired with at least one other nonverbal behavior relevant to prestige (e.g., smiling, expansiveness, or both smiling and expansiveness; see Figure S2). An exploratory 4-way ANOVA predicting perceptions of prestige from smiling, expansiveness, head tilt, and participant gender indicated that the above 3-way interaction did not significantly vary across participant gender, $F(2,238) = 1.87$, $p = .16$.

Perceptions of Dominance

We next conducted a similar 2 (expansiveness) X 2 (smiling) X 3 (head tilt) repeated-measures analysis of variance (ANOVA) on perceptions of dominance. Supporting our hypotheses, main effects emerged for expansiveness, $F(1, 120) = 42.39$, $p < .001$, $\eta_p^2 = .26$, smiling, $F(1, 120) = 56.73$, $p < .001$, $\eta_p^2 = .32$, and head tilt, $F(2, 240) = 60.08$, $p < .001$, $\eta_p^2 = .33$, indicating that dominance perceptions increased as targets showed increased expansiveness, no smile, and head tilt downward (for all means and 95% CIs for main effects, see Figure 2 and Table 1). Again, no significant difference emerged between targets with their head tilted up versus level ($p = .10$, $d = .19$). The target displaying the configuration of most dominant features

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(i.e., expansiveness, no smile, and a downwards head tilt) was perceived as most dominant overall ($M = 5.15$, $SD = 1.21$, 95% CI:[4.93, 5.36]).

In addition to these main effects, we observed a head tilt by expansiveness interaction, $F(2, 240) = 7.56$, $p = .001$, $\eta_p^2 = .06$, as well as a head tilt by smiling interaction, $F(2, 240) = 8.82$, $p < .001$, $\eta_p^2 = .07$. The head tilt by expansiveness interaction indicated that although a downwards head tilt always increased perceptions of dominance when compared to a neutral and upwards head angle ($ps < .05$, $ds \geq .53$), for expansive targets the magnitude of this effect was smaller. In addition, an upwards head tilt decreased perceptions of dominance when paired with expansive posture ($p = .012$, $d = .44$), but not when paired with a neutral posture ($p = .39$, $d = .07$). The head tilt by smiling interaction indicated a similar pattern: a downwards head tilt always increased perceptions of dominance when compared to a neutral and upwards head angle ($ps < .05$, $ds \geq .49$), but for non-smiling targets the magnitude of this effect was smaller. These two-way interactions likely emerged as a result of a ceiling effects; the absence of a smile or the presence of expansive posture increased perceptions of dominance, reducing the potential impact of a downwards head tilt on such perceptions (see Figures S3 and S4). An exploratory 4-way ANOVA predicting perceptions of dominance from smiling, expansiveness, head tilt, and participant gender indicated that the above 3-way interaction did not significantly vary by participant gender, $F(2, 238) = 1.34$, $p = .27$.

Study 2

In Study 2 we sought to replicate the results of Study 1 and extend them by testing whether the two configurations of behavioral components identified in Study 1 are perceived as distinct signals. More specifically, we tested whether the prestige display found in Study 1 is judged as significantly more prestigious than the dominance display, a neutral display, and a

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smiling display (i.e., the prestige display without expansiveness and upwards head tilt), and whether the dominance display found in Study 1 is judged as significantly more dominant than all of these displays. We also assessed perceptions of agency and communion, to test whether the two target displays differ in perceived communion, as expected, but show similar levels of perceived agency.

Method

Participants

One hundred and twenty-six U.S. workers were recruited from MTurk. Fourteen participants were excluded because they failed the attention-check item. A power analysis using G*Power was conducted to determine the necessary sample size that would ensure 80% power to detect the smallest effect likely given the means and standard deviations uncovered in Study 1 (i.e., the difference in perceptions of prestige from the prestige display versus the smiling display; $f = .20$), assuming traditional power estimation parameters (correlation among repeated measures = .50, alpha = .0125 planning a Bonferroni correction, and no correction for sphericity). This analysis suggested that we needed fewer than 50 participants; however, following recommendations from Simmons (2014), we elected to collect more than twice this required sample, resulting in a final sample of 112 participants (55% men). Participants were roughly the same age as in Study 1 ($M = 35.21$ years; $SD = 11.50$ years), and primarily White (82.1%).

Materials

Stimuli. Four of the 12 stimuli used in Study 1 were selected for inclusion (see Figure 1). The prestige display portrayed expansiveness, a slight smile, and head tilted upwards. The dominance display portrayed expansiveness, no smile, and head tilted downward. These two

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displays were selected based on our hypotheses and the results of Study 1 showing that, when the effects of these behaviors were considered independently, they led to the highest levels of perceived prestige and dominance, respectively. We also included two additional displays: one featured the target with no expansiveness, no smile, and his head at a neutral angle (i.e., a neutral expression), and the other featured the target with no expansiveness, smiling, and his head at a neutral angle (i.e., a smiling display). The neutral-expression condition was included to ensure that the prestige and dominance displays increased perceptions of prestige and dominance, respectively, compared to a baseline neutral display. The smiling condition was included to assess whether the prestige display would elicit greater impressions of prestige compared to smiling alone.

Perceptions of Prestige and Dominance. Participants judged each target's prestige (inter-item α s across targets $\geq .88$) and dominance (inter-item α s across targets $\geq .91$) using the same scales as in Study 1.

Perceptions of Agency and Communion. Participants evaluated the agency and communion of each target using items from the interpersonal circumplex (Wiggins, 1979; Wiggins et al., 1988), and with several items used to assess liking and influence in past research (Cheng et al., 2010). More specifically, to assess agency we combined four items assessing agency from the interpersonal circumplex (participants indicated how "Self-Assured", "Assertive", and "Self-confident" they perceived each target to be; Wiggins, 1979; Wiggins et al., 1988) with 3 items previously used to assess influence or generalized high rank ("I would pay attention to this person", "This person is a leader", and "This person is influential"; Cheng et al., 2010). Participants rated each item on a 7-point Likert scale ranging from 1 (Not at all) to 7 (Very much), and all six items were averaged together to form a single measure of agency (α s

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across targets $\geq .89$). Similarly, we combined four items assessing communion from the interpersonal circumplex (participants indicated how “Tender”, “Accommodating”, “Gentlehearted”, and “Kind” they perceived each target to be; Wiggins, 1979; Wiggins et al., 1988) with a single-item measure of liking: “I would like this person”. Participants rated each item on a 7-point Likert scale ranging from 1 (Not at all) to 7 (Very much), and all five items were averaged together to form a single measure of communion (α s across targets $\geq .87$).

Procedure

Participants viewed all four nonverbal displays (dominance, prestige, neutral, smiling) presented in a random order, and provided ratings of prestige, dominance, agency, and communion for each display. Dominance and prestige items were intermixed (in a random order), as were agency and communion items. Participants then completed the same attention check item used in Study 1 before being debriefed.

Results

Perceptions of Prestige

We first conducted a one-way repeated measures analysis of variance (ANOVA) on perceptions of prestige. Supporting our hypothesis, the prestige display was perceived as significantly more prestigious than each of the other displays, $F(3,333) = 15.39, p < .001, \eta_p^2 = .12$, all d s $\geq .46$; see Figure 3. Importantly, the dominance display was perceived as no more prestigious than the neutral or smiling display (p 's $\geq .99, d \leq .11$), suggesting that the signal sent by the prestige display is distinct to that display. Interestingly, the smiling display was not perceived as significantly different in prestige compared to the neutral display ($p = .24, d = .17$), suggesting that participants did not infer prestige from the presence of a smile alone. No participant gender by nonverbal display interaction emerged, $F(3,330) = .36, p = .76, \eta_p^2 = .003$.

Perceptions of Dominance

Next, we conducted a one-way repeated measures analysis of variance (ANOVA) on perceptions of dominance. Again supporting our hypotheses, the dominance display was perceived as significantly more dominant than each of the other displays, $F(3,333) = 37.05$, $p < .001$, $\eta_p^2 = .25$, all $ds \geq .79$; see Figure 3. The prestige display was perceived as no more dominant than the neutral or smiling display ($ds \leq .25$, $ps \geq .13$), suggesting that the signal sent by the dominance display is distinct to that display. A significant difference in dominance perceptions also emerged between the smiling display and the neutral display ($d = .37$, $p < .003$), indicating that smiling reduces perceptions of dominance. No participant gender by nonverbal display interaction emerged, $F(3,330) = .31$, $p = .81$, $\eta_p^2 = .003$.

Perceptions of Agency

We next conducted a one-way repeated measures analysis of variance (ANOVA) on perceptions of agency. Supporting our hypotheses, the prestige display was perceived as significantly more agentic than the neutral display and the smiling display, $F(3,333) = 24.37$, $p < .001$, $\eta_p^2 = .18$, both $ds \geq .62$; see Figure 4. The dominance display was also perceived as significantly more agentic than the neutral display and the smiling display, $ps < .001$, both $ds \geq .52$. The prestige and dominance displays were not perceived as significantly different from each other in agency, $p > .99$, $d = .09$, suggesting that both displays were considered to be highly agentic. Again, we found no participant gender by nonverbal display interaction, $F(3,330) = .60$, $p = .60$, $\eta_p^2 = .005$.

Perceptions of Communion

Finally, we conducted a one-way repeated measures analysis of variance (ANOVA) on perceptions of communion. Supporting our hypotheses, the prestige display was perceived as

significantly higher in communion compared to the neutral display and the dominance display, $F(3,333) = 54.52, p < .001, \eta_p^2 = .33$, both $ps < .001, ds \geq .42$, but no different in communion from the smiling display, $p = .44, d = .17$; see Figure 4. In contrast, the dominance display was perceived as significantly lower in communion compared to all other displays, all $ps < .001, ds \geq .56$, supporting the expectation that the prestige and dominance displays differ in communion. Again no participant gender by nonverbal display interaction emerged, $F(3,330) = .17, p = .92, \eta_p^2 = .001$.

Are Dominance and Prestige Impressions Based on Perceptions of Agency and Communion?

We next tested whether the prestige and dominance perceptions that emerged from these displays were constituted by perceptions of agency and communion. More specifically, we expected that judgments of prestige would be formed on the basis of perceptions of high agency and high communion, and judgments of dominance would be formed on the basis of perceptions of high agency and low communion. However, it is important to note that we in fact assume that all of these perceptions likely occur at the same time in a fairly holistic manner. For this reason, the mediation results presented here should not be taken to indicate definitive causality, but rather to demonstrate how these perceptions are interlinked.

First, to test whether perceptions of agency and communion mediated the effect of the prestige display on judgments of prestige, we ran a multiple mediator model with nonverbal display as the focal predictor (coded neutral display = 0, prestige display = 1), perceptions of agency and communion as two simultaneous mediators, and perceptions of prestige as the criterion (using the MEMORE; Montoya & Hayes, 2017; see Figure 5). Results showed, first, that the prestige display increased judgments of prestige, $b = .71, t = 5.37, p < .001, 95\% CI: [.45,$

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.97]. Second, supporting our expectations, the prestige display also increased perceptions of agency, $b = .73$, $t = 4.98$, $p < .001$, 95% CI:[.44, 1.02], and perceptions of communion, $b = .47$, $t = 4.26$, $p < .001$, 95% CI:[.25, .68]. Agency perceptions, $b = .73$, $t = 14.23$, $p < .001$, 95% CI:[.63, .84], and communion perceptions, $b = .35$, $t = 5.04$, $p < .001$, 95% CI:[.21, .49], in turn, both predicted increases in prestige judgments. Finally, as hypothesized, the indirect effect of the prestige display on prestige judgments was non-zero and positive via agency perceptions, $b = .53$, 95% CI:[.31, .78], and communion perceptions, $b = .16$, 95% CI:[.07, .28]. In fact, perceptions of agency and communion together fully mediated the effect of the prestige display on judgments of prestige; the direct effect of the prestige display on perceptions of prestige was indistinguishable from zero, $b = .01$, $t = 0.12$, $p = .91$, 95% CI:[-.17, .20] (see Figure 5).

Next, to test whether perceptions of agency and communion mediated the effect of the dominance display on judgments of dominance, we ran a multiple mediator model with nonverbal display as the focal predictor (coded neutral display = 0, dominance display = 1), perceptions of agency and communion as mediators, and judgments of dominance as the criterion (using the MEMORE; Montoya & Hayes, 2017; see Figure 6). As expected, the dominance display increased judgments of dominance, $b = 1.07$, $t = 7.04$, $p < .001$, 95% CI:[.77, 1.37], and perceptions of agency, $b = .62$, $t = 5.19$, $p < .001$, 95% CI:[.39, .86], but decreased perceptions of communion, $b = -.62$, $t = -6.16$, $p < .001$, 95% CI:[-.81, -.42]. Increased agency perceptions in turn predicted increased judgments of dominance, $b = .42$, $t = 5.17$, $p < .001$, 95% CI:[.26, .59], whereas communion perceptions predicted decreased judgments of dominance, $b = -.97$, $t = -9.91$, $p < .001$, 95% CI:[-1.16, -.77]. Finally, as hypothesized, the indirect effect of the dominance display on dominance judgments was non-zero and positive via agency perceptions, $b = .27$, 95% CI:[.10, .51], and communion perceptions, $b = .60$, 95% CI:[.37, .85]. Once again,

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perceptions of agency and communion largely mediated the relationship between the dominance display and judgments of dominance; the direct effect of the dominance display on dominance judgments was reduced to $b = .21$, $t = 1.65$, $p = .10$, 95% CI:[-.04, .46].

Discussion

Results from Study 2 provide strong support for our hypotheses. The prestige display (expansiveness, smiling, head tilted upward) was judged as more prestigious than the dominance display, and also more prestigious than the two control displays. In addition, the dominance display (expansiveness, no smile, head tilted downward) was judged as more dominant than the prestige display, and also more dominant than the two controls. The dominance and prestige display were both perceived as significantly more agentic than the two controls, but not significantly different in agency from each other—suggesting that both displays effectively communicated high rank, and did so to a similar extent.

In addition, the dominance display was perceived as lower in communion than the prestige display and both controls, supporting the expectation that dominant individuals attain their form of high rank despite—or, partly because of—the dislike they engender in others. In contrast, the prestige display was seen as highly communal, indicating that prestigious individuals are well liked, and that their high rank may be partly predicated on their high levels of communion. Finally, mediation analyses demonstrated that perceptions of prestige formed from the prestige display were comprised of perceptions of increased agency and communion. In contrast, perceptions of dominance formed from the dominance display were largely comprised of perceptions of increased agency and decreased communion. Interestingly, the indirect effect of the prestige display on perceptions of prestige was larger via agency than via communion, whereas the indirect effect of the dominance display on perceptions of dominance was not

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meaningfully larger via agency versus communion.

These results support our hypothesis that dominance and prestige are communicated through distinct nonverbal displays. Furthermore, these displays are based on distinct sets of nonverbal behaviors that are associated with high agency, and with high versus low communion. Importantly, we cannot know, from these results, whether perceptions of agency and communion shape perceptions of prestige and dominance; in fact, based on evolutionary theory, it may be more likely that individuals' tendency to perceive the prestige and dominance displays as high in agency and high or low in communion, respectively, is partly attributable to an evolved association between these perceptions and prestige and dominance. Given that these impressions are likely formed automatically and holistically, it is important to consider the mediation results presented here within a cross-sectional, correlational framework, rather than as indicating a causal process.

Study 3

Although Studies 1 and 2 support our hypothesis that the prestige and dominance rank attainment strategies are associated with distinct nonverbal displays, both studies relied on perceptions made about computer-generated avatars, rather than actual humans. In Study 3 we tested whether these perceptions would emerge for nonverbal displays posed by human targets, and also whether displayer's gender influenced perceptions. Given that men tend to engage in more aggressive behavior (Barlett & Coyne, 2014; Bettencourt & Miller, 1996; Archer & Lloyd, 1985; Tomada & Schneider, 1997; Archer, 2004) and are lower in communion (Abele, 2003; Diekmann, Clark, Johnston, Brown, & Steinberg, 2011) than women, and this pattern is stereotypic of dominance, one might expect dominance to be a uniquely male strategy, and perceptions of each strategy to therefore vary depending on the gender of the target showing the

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display. However, prior studies on dominance and prestige have found that both strategies can be effectively wielded to increase influence by both men and women, when used within same-gender groups (Cheng et al., 2013; Maner & Case, 2016). Given these findings, as well as the result from both Studies 1 and 2 that the prestige display reliably communicated prestige when shown by a male (avatar) target, we expected that both the prestige and dominance displays would effectively communicate prestige and dominance (respectively), along with increased agency and high or low communion (respectively), when shown by both men and women.

Participants

Two hundred and eighty-five U.S. workers were recruited from MTurk. A power analysis using G*Power was conducted to determine the necessary sample size that would ensure 80% power to detect the smallest effect, given the means and standard deviations, akin to that observed in Study 1, rather than the larger effect size observed in Study 2 (i.e., $f = .20$ for the difference between prestige ratings made about the prestige versus smiling display) assuming traditional power estimation parameters (correlation among repeated measures = .50, alpha = .0125 planning a Bonferroni correction, and no correction for sphericity). This analysis suggested that we needed fewer than 100 people, but given that we were using new stimuli and less tightly controlled human targets, we opted to include a substantially larger sample, again following recommendations from Simmons (2014). After sixty-five participants were excluded for failing attention-check item, the final sample consisted of 220 participants (50% men). Participants were roughly the same age as in Studies 1 and 2 ($M = 34.49$ years; $SD = 11.17$ years), and also mostly White (78.6%).

Materials

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Stimuli. One male and one female actor posed nonverbal displays of prestige, dominance, a neutral expression, and a smiling display. Actors wore a plain white t-shirt and jeans, and were photographed from just below the waist to above the head. Both actors were asked to remove jewelry and eyewear. Both actors were White, to match the expected demographic of our sample.

Actors posed four displays (shown in Figure 7) following detailed verbal instructions provided by the first author: prestige (expansiveness, symmetrical closed mouth smiling, and head tilt up), dominance (expansiveness, neutral facial expression, head tilt down), neutral (neutral bodily expansion, neutral facial expression, level head angle), and smiling (neutral bodily expansion, symmetrical closed mouth smiling, level head angle). In all cases actors were instructed to direct their eye gaze forward into the camera. Consistent with past research, expansiveness was operationalized as standing up straight, holding one's arms out from the body, hands on the hips, and expanded chest (Hall et al., 2005; Tracy & Robins 2004; 2007a).

Measures. Participants indicated their judgments of prestige (α s across targets $\geq .84$) and dominance (α s across targets $\geq .88$) using the same items and rating scale as was used in Studies 1 and 2, and indicated perceptions of agency (α s across targets $\geq .84$) and communion (α s across targets $\geq .90$) using the same items and rating scale as was used in Study 2.

Procedure

Participants viewed four nonverbal displays posed by a target individual matched to their own gender, and for each display provided ratings of prestige, dominance, agency, and communion. Participants viewed and judged same-gender target only, to minimize possible effects of physical attraction which could bias perceptions.⁷ Participants then completed the same attention check item used in Studies 1 and 2, before being debriefed.

Results

Perceptions of Prestige

We first conducted a 2 (gender) x 4 (nonverbal display) mixed-model analysis of variance (ANOVA) on perceptions of prestige. (Because participants viewed a target of their own gender only, all gender effects are potentially due to both target and perceiver, which were completely confounded). Supporting our hypotheses, a main effect emerged for display type, $F(3,654) = 98.94, p < .001, \eta_p^2 = .31$, indicating that prestige perceptions were highest for the prestige display when compared to all other displays (see Figure 8; $ps \leq .028, ds \geq .18$). No clear main effect of gender emerged, $F(1,218) = 2.70, p = .10, \eta_p^2 = .01$, nor was there a gender by display interaction, $F(3,654) = .14, p = .90, \eta_p^2 = .001$; see Figure 8.

Perceptions of Dominance

We next conducted a 2 (gender) x 4 (nonverbal display) mixed-model analysis of variance (ANOVA) on perceptions of dominance. Supporting our hypotheses, a main effect emerged for nonverbal display, $F(3,654) = 100.48, p < .001, \eta_p^2 = .32$, indicating that dominance perceptions were highest for the dominance display compared to all other displays ($ps < .001; ds \geq .92$; see Figure 9). A main effect also emerged for gender, $F(1, 218) = 33.08, p < .001, \eta_p^2 = .13$, indicating that the male target was perceived as more dominant than the female target. There was also a 2-way interaction between gender and display, $F(3,654) = 11.21, p < .001, \eta_p^2 = .05$. For the male target, the prestige and neutral displays did not differ significantly in dominance ($p = .31, d = .19$), but for the female target the prestige display was judged significantly more dominant than the neutral display ($p < .001, d = .51$). Additionally, for the male target the prestige display was not judged as significantly more dominant than the smiling display ($p = .77, d = .14$), but for the female target the prestige display was judged significantly more dominant than the smiling display ($p < .001, d = .83$). (Interestingly, this pattern did not emerge for participant or target

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gender in the subsequent gender-balanced Studies 4a or 4b). Importantly, though, the dominance display was perceived as significantly more dominant than all other nonverbal displays regardless of gender (all $ps < .001$).

Perceptions of Agency

We next conducted a 2 (gender) x 4 (nonverbal display) mixed-model analysis of variance (ANOVA) on perceptions of agency. Main effects emerged for display, $F(3,654) = 99.49$, $p < .001$, $\eta_p^2 = .31$, and target gender, $F(1,218) = 5.41$, $p = .02$, $\eta_p^2 = .02$; but these effects were qualified by a 2-way interaction between gender and display, $F(3,654) = 8.19$, $p < .001$, $\eta_p^2 = .04$. This interaction indicates that while the prestige display was perceived as significantly more agentic than both the smiling and neutral display for both the male and female targets ($ps \leq .001$, $ds \geq .38$), the dominance display was perceived as significantly more agentic than the smiling display for the female target only ($p = .002$, $d = .43$); when posed by the male target, the dominance display was judged to be no more agentic than the smiling display, $p > .99$, $d = -.16$. The male dominance display was, however, judged more agentic than neutral (for both targets, $ps < .001$, $ds \geq .66$), suggesting that the dominance display increased perceptions of agency compared to a neutral target, but the smiling display also increased perceptions of agency for the male target.

Perceptions of Communion

Finally, a 2 (gender) x 4 (nonverbal display) mixed-model analysis of variance (ANOVA) was conducted on perceptions of communion. Main effects emerged for display, $F(3,654) = 209.98$, $p < .001$, $\eta_p^2 = .49$, and gender, $F(1,218) = 26.65$, $p < .001$, $\eta_p^2 = .11$, but these effects were also qualified by a gender by display interaction, $F(3,654) = 6.83$, $p < .001$, $\eta_p^2 = .03$. Deconstructing this interaction indicated that for both targets, the dominance display was

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perceived as significantly lower in communion compared to all other displays ($ps < .001$, $ds \geq .51$), and the prestige display as significantly higher in communion compared to the dominance and neutral displays ($ps < .001$, $ds \geq .45$), but for the female target, the prestige display was perceived as lower in communion than the smiling display ($p < .001$, $d = .58$), whereas when posed by a man, these two displays did not differ in communion ($p = .84$, $d = .10$). This gender difference could indicate a bias to perceive women (but not men) as colder and therefore lower on communion when they engage in agentic nonverbal behaviors.

Are Dominance and Prestige Impressions Based on Perceptions of Agency and Communion?

To test whether perceptions of agency and communion mediated the effect of the prestige display on judgments of prestige, we ran a multiple mediator model with the nonverbal display as the focal predictor (neutral display = 0, prestige display = 1), perceptions of agency and communion as mediators, and judgments of prestige as the criterion (using the MEMORE; Montoya & Hayes, 2017; see Figure 5). As was the case for similar analyses in Study 2, it is important to note our assumption that all of these perceptions in fact occur at the same time in a fairly holistic manner, so these analyses should not be taken to indicate true causality. Instead, they may give a better sense of the interrelations among these perceptions.

Results showed that the prestige display predicted increased judgments of prestige, $b = 1.12$, $t = 12.97$, $p < .001$, 95% CI:[.95, 1.29], and increased perceptions of agency, $b = 1.46$, $t = 14.76$, $p < .001$, 95% CI:[1.27, 1.66] and communion, $b = .92$, $t = 9.92$, $p < .001$, 95% CI:[.74, 1.11]. Agency perceptions, $b = .62$, $t = 17.26$, $p < .001$, 95% CI:[.55, .69] and communion perceptions, $b = .33$, $t = 8.82$, $p < .001$, 95% CI:[.26, .40], in turn, both predicted increased judgments of prestige. Finally, as hypothesized, the indirect effect of the prestige display on

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prestige judgments was significant via agency perceptions, $b = .91$, 95% CI:[.72, 1.09], and communion perceptions, $b = .31$, 95% CI:[.21, .42]. In fact, perceptions of agency and communion fully mediated the effect of the prestige display on judgments of prestige; including perceptions of agency and prestige as mediators eliminated the direct effect of the prestige display on judgments of prestige, $b = -.09$, $t = -1.21$, $p = .23$, 95% CI:[-.25, .06].

Next, to test whether perceptions of agency and communion mediated the effect of the dominance display on judgments of dominance, we ran a multiple mediator model with the nonverbal display as the focal predictor (neutral display = 0, dominance display = 1), perceptions of agency and communion as mediators, and perceptions of dominance as the criterion (using the MEMORE; Montoya & Hayes, 2017; see Figure 6). The dominance display predicted increased judgments of dominance, $b = 1.40$, $t = 11.88$, $p < .001$, 95% CI:[1.17, 1.63] and increased perceptions of agency, $b = .96$, $t = 9.78$, $p < .001$, 95% CI:[.77, 1.16], and decreased perceptions of communion, $b = -.88$, $t = -9.79$, $p < .001$, 95% CI:[-1.05, -.70]. Increased agency perceptions, in turn, predicted increased judgments of dominance, $b = .74$, $t = 15.19$, $p < .001$, 95% CI:[.65, .84], whereas decreased communion perceptions predicted increased judgments of dominance, $b = -.51$, $t = -9.52$, $p < .001$, 95% CI:[-.61, -.40]. Finally, as hypothesized, the indirect effect of the dominance display on dominance judgments was significant via agency perceptions, $b = .71$, 95% CI:[.54, .89], and communion perceptions, $b = .44$, 95% CI:[.30, .60]. Including these mediators in the model partially attenuated the effect of the dominance display on judgments of dominance, $b = .24$, $t = 2.66$, $p = .009$, 95% CI:[.06, .42] (see Figure 6).

Discussion

Study 3 demonstrated that the distinct nonverbal displays of prestige and dominance uncovered in Studies 1 and 2 are perceived distinctively as conveying prestige and dominance

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when shown by human targets of both genders. More specifically, the prestige display (i.e., expansiveness, smile, head tilted up) was judged to be significantly more prestigious than the dominance display (i.e., expansiveness, no smile, head tilted down), the neutral display, and the smiling display, and these effects did not vary by gender. Similarly, the dominance display was judged to be significantly more dominant than the prestige display, the neutral display, and the smiling display, and this effect also emerged among displays of both genders. Finally, perceptions of prestige and dominance formed from the prestige and dominance displays (respectively) were comprised of similar perceptions of increased agency but divergent perceptions of communion.

Two unexpected results did emerge, however. First, the prestige display was perceived as more agentic than the dominance display – a result inconsistent with Study 2. This difference might be due to an unwillingness among participants in Study 2 to attribute the possession of knowledge and expertise to a non-human avatar, or to something specific in the morphological features of our human targets in Study 3, or to a tendency among this particular sample of participants to view prestige as a more effective route to social rank than dominance. Although future research is needed to address this issue, it is important to note that in both Studies 2 and 3, both displays were perceived as highly agentic.

Second, when posed by a male target, the dominance display was perceived as no more agentic than the smiling display. This result is inconsistent with our hypotheses and with the results of Studies 1 and 2, which also used a male target. One possible explanation is that participants interpreted the smiling human man as possessing license (i.e., rank) to smile freely (Hecht & LaFrance, 1998), but (correctly) chose not to make similar attributions of license to a computer-generated man in our prior studies. Another possibility is that observers who were men

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felt competitive with the dominance-displaying human man (but not the avatar) and judged him as low in agency as a way of “taking him down a notch”. Regardless of this issue—which warrants future research investigation—the present results indicate that the dominance display does elicit greater perceptions of dominance than all comparison displays.

Studies 4a and 4b

Studies 1-3 support our hypothesis that the prestige and dominance rank attainment strategies are associated with distinct nonverbal displays, comprised of behaviors consistent with our specific predictions. However, in all of these studies participants viewed and judged a limited number of target individuals showing these displays. In Studies 4a and 4b we therefore tested whether results would generalize across a larger number of human targets. Study 4a used the same method as in Study 2, but participants viewed one of eight human targets rather than a single avatar. In Study 4b participants also viewed one of these eight targets, but we assessed judgments using a forced-choice response method, to determine which displays were perceived as most prestigious and most dominant when participants were required to choose only one from four possible displays (prestige, dominance, neutral, and smiling).

Participants

Study 4a. One-thousand, one hundred fifty-nine U.S. workers were recruited from MTurk. We elected to recruit a large sample to ensure the stability of mean ratings for each target (Hehman, Xie, Ofosu, & Nespoli, 2018). After 158 participants were excluded for failing the attention-check item used in all previous studies, the final sample consisted of 1,001 participants (55% men). This sample is nearly two times larger than what would be required for 80% power to detect the smallest effect size uncovered in Study 3 ($f = .09$), assuming no correction for sphericity and the correlation among repeated measures set to .50. Participants

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were roughly the same age as in previous studies ($M = 36.15$ years; $SD = 12.99$ years), and also primarily White (76%).

Study 4b. One-thousand, eighty-two U.S. workers (who did not participate in Study 4a) were recruited from MTurk. After 85 participants were excluded for failing the same attention-check item used in the prior studies, the final sample consisted of 997 participants (43% men). This sample is two times larger than what would be required for 80% power to detect a recognition rate of 35% with chance recognition at 25%, using a 2-tailed test for both the dominance and the prestige condition. Participants were roughly the same age as in previous studies ($M = 36.95$ years; $SD = 12.14$ years), and also primarily White (77%).

Materials

Stimuli. Eight actors (4 men, 4 women; 5 White, 3 Central American) posed the displays of prestige, dominance, neutral, and smiling.⁸ The posing procedure was identical to that used in Study 3, except that photographs were taken in a different room and with a high definition camera for enhanced quality. Although the same two actors from Study 3 again served as targets, we took new photos of these two individuals to ensure consistency with the rest of the new stimuli (e.g., background color). In addition, in the stimuli used in Study 3 the woman actor seems to be raising her shoulders slightly in the smiling display, and this accidental behavior could have caused her to appear submissive or embarrassed. In developing the current stimuli (for Studies 4a and 4b), we ensured that all targets' shoulders were relaxed in all smiling images. The same stimuli were used for both Studies 4a and 4b; all images can be found in the SOM (see Figure S8).

Procedure

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Study 4a. Participants were randomly assigned to view one of the eight targets displaying all four nonverbal displays. Participants were shown each display in a random order, and indicated how prestigious and dominant each appeared to be, using the abbreviated measures of dominance and prestige used in previous studies. Participants then completed the same attention check item used previously, before being debriefed.

Study 4b. Participants were randomly assigned to view one of eight targets displaying all four nonverbal displays. All four displays were presented simultaneously in a 2x2 grid (with the location of each display randomized for each participant; see Figure 10 for an example). Participants completed a single trial in which they were randomly assigned to select either the most prestigious target or the most dominant target. This method was used to prevent participants from reaching decisions through a process of elimination (DiGirolamo & Russel, 2017; Nelson et al., 2018). More specifically, participants assigned to the prestige condition were asked: “Please select the image of the person who is likely to be a leader because he/she is accomplished, admired, and possesses useful knowledge and expertise.” Participants assigned to the dominance condition were asked: “Please select the person who is likely to be a leader because he/she is willing to use aggression and intimidation to get his/her way.” These items were generated on the basis of theoretical definitions of prestige and dominance (see Henrich & Gil-White, 2001; Cheng, Tracy, & Henrich, 2010), and were found to yield high recognition rates in a pilot study that asked 237 participants not included in the present research to identify the stimuli used in Study 2 with these two items (67% for prestige, 82% for dominance; Witkower, Tracy, Hill, Pun, Baron, & Koster, 2018).

Results

Study 4a

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Perceptions of prestige. First, we conducted a repeated-measures analysis of variance (ANOVA) to determine the effect of nonverbal display on perceptions of prestige. Supporting our hypotheses, an effect of display type emerged, $F(3, 3000) = 376.34, p < .001, \eta_p^2 = .27$, indicating that the prestige display increased perceptions of prestige compared to the neutral display ($p < .001; d = .64$) and the dominance display ($p < .001; d = .74$). However, the prestige display was not judged as significantly more prestigious than the smiling display ($p > .99; d = .02$). The smiling display was also judged to be significantly higher in prestige compared to the neutral ($p < .001; d = .70$) and dominance ($p < .001; d = .72$) displays (mean ratings of prestige for each target can be found in Figure 11).

Although a 4 (nonverbal display) x 2 (target gender) mixed-model ANOVA uncovered a small but significant interaction, $F(3, 2997) = 4.59, p < .001, \eta_p^2 = .005$, for both men and women targets the prestige display was rated as more prestigious than the neutral ($ps < .001, ds \geq .71$) and dominance ($ps < .001, ds \geq .69$) displays; and prestige and smiling displays did not differ significantly for either gender ($p > .99, ds \leq .03$; see SOM for detailed results). Similarly, a 4 (nonverbal display) x 2 (participant gender) mixed-model ANOVA uncovered a small but significant interaction, $F(3, 2994) = 4.59, p = .01, \eta_p^2 = .004$, but for both men and women perceivers the prestige display was rated as more prestigious than the neutral display ($ps < .001, ds \geq .64$) and dominance display ($ps < .001, ds \geq .71$), and the prestige and smiling displays did not differ significantly ($p > .99, ds \leq .04$; see SOM for full details). There was no significant 3-way interaction between nonverbal display, participant gender, and target gender, $F(3, 2988) = 1.14, p = .33, \eta_p^2 = .001$. For details on the significant target and perceiver gender interactions that emerged, see SOM.

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Overall, these results suggest that the prestige display increased perceptions of prestige when compared to the neutral display and the dominance display, but was not perceived as significantly more prestigious when compared to the smiling display. This same pattern emerged for both men and women targets, and both men and women perceivers.

Perceptions of Dominance. We next conducted a repeated-measures analysis of variance (ANOVA) to determine the effect of nonverbal display on perceptions of dominance. Supporting our hypotheses, an effect of display type emerged, $F(3,3000) = 453.33, p < .001, \eta_p^2 = .31$, indicating that the dominance display led to greater perceptions of dominance compared to neutral ($p < .001, d = .83$), smiling, ($p < .001, d = .96$), and prestige ($p < .001, d = .63$) See Figure 11). A 4 (nonverbal display) x 2 (target gender) mixed-model analysis of variance (ANOVA) found no clear interaction, $F(3,2997) = 2.36, p = .08, \eta_p^2 = .002$, indicating that these results held across target gender. In contrast, a 4 (nonverbal display) x 2 (participant gender) mixed-model analysis of variance (ANOVA) uncovered a small but significant interaction, $F(3,2994) = 5.48, p = .002, \eta_p^2 = .005$. Nonetheless, the dominance display was judged to be more dominant than the neutral ($ps < .001, ds \geq .78$), smiling ($ps < .001, ds \geq .88$), and prestige ($ps < .001, ds \geq .63$) displays for both men and women perceivers (see SOM for full details including pairwise comparisons). No significant 3-way interaction emerged between nonverbal display, participant gender, and target gender, $F(3,2988) = 1.10, p = .53, \eta_p^2 = .001$.

These results suggest that the dominance display increased perceptions of dominance when compared to all other displays, and this pattern emerged for both men and women targets, and both men and women perceivers.

Study 4b

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Perceptions of Prestige. A Chi-squared goodness of fit test for participants selecting the prestigious target was significant, $\chi^2 = 296.99$, $p < .001$, indicating that participants did not select all displays with a similar frequency. Instead, the prestige display was selected 53% ($SD = .02$, 95% CI:[49%, 57%]) of the time, a rate significantly greater than chance (which was 25%), and significantly greater than the rates of selection for all three other displays. The smiling display was selected 32% ($SD = .02$, 95% CI:[28%, 36%]) of the time, also greater than chance but significantly less than that for the prestige display. The neutral and dominance displays were both selected at rates below chance (see Figure 12).

Although a Chi-squared test of independence suggested that target gender was slightly related to the display selected, $\chi^2 = 36.52$, $p < .001$, *Cramer's V* = .25, the prestige display was selected at rates significantly greater than chance, and significantly greater than all other displays, for both men (55%, $SD = .50$, 95% CI:[49%, 61%]) and women (51%, $SD = .50$, 95% CI:[44%, 57%]) targets (see SOM for full details). Participant gender was not significantly related to the display selected, $\chi^2 = 3.07$, $p = .38$, *Cramer's V* = .08.

Overall, these results suggest that of the four displays shown, the prestige display was most frequently judged to be the most prestigious, and this effect held for both men and women targets, and men and women displayers.

Perceptions of Dominance. A Chi-squared goodness of fit test for participants selecting the most dominant target was significant, $\chi^2 = 518.99$, $p < .001$, indicating that participants did not select all displays with a similar frequency. Instead, the dominance display was selected 69% ($SD = .02$, 95% CI:[65%, 73%]) of the time, a rate significantly greater than chance (25%), and significantly greater than the rates of selection for all three other displays. All other nonverbal displays were selected at rates below chance (see Figure 12).

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Two separate Chi-squared tests of independence suggested that target gender, $\chi^2 = 6.61$, $p = .09$, *Cramer's V* = .12, and participant gender, $\chi^2 = 3.06$, $p = .38$, *Cramer's V* = .08, were not significantly related to the display selected. These results suggest that of the four displays shown, the dominance display was most frequently judged to be the most dominant, and this effect held for both men and women targets, and men and women displayers.

Discussion

Studies 4a and 4b provide additional confirmatory support for the distinctiveness of the dominance and prestige displays uncovered in Studies 1-3, and demonstrate that this perceptual distinction holds across a variety of targets, and across participant and target gender. More specifically, when participants judged the prestige and dominance of all four displays (Study 4a), they perceived the prestige display (i.e., expansiveness, smile, head tilted up) as significantly more prestigious than a neutral and dominance display, and the dominance display as significantly more dominant than all three other displays. Similarly, when participants were asked to select the most prestigious or dominant display of the four (Study 4b), they chose the intended display significantly more often than chance and significantly more often than all three other displays. All of these effects emerged for both men and women targets and perceivers. It is particularly noteworthy that, when asked to select the most prestigious target in the stimulus set, only 11% of participants selected the dominance display, and when asked to select the most dominant target, only 16% of participants selected the prestige display; in other words, few participants confused the two high-rank displays. Together, these results provide strong evidence that the prestige and dominance displays are reliably perceived and recognized signals of prestige and dominance (respectively), which are distinct from one another.

However, one unexpected result did emerge: in Study 4a, participants judged targets

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showing a smiling display to be as prestigious as targets showing prestige. This result differs from the results of Study 4b, which used the same images but adopted a different response method (continuous scale ratings in Study 4a vs. forced-choice in Study 4b), and also from the results of Studies 2 and 3, which used a similar method but different images. One possible explanation for the latter difference is that the smile shown by the avatar used in Study 2 might not perfectly resemble a human smile, and this oddness might have led to lower ratings of prestige in that study.

Overall, the finding of similar prestige ratings of these two displays in Study 4a, which was more highly powered and included more targets than Studies 2 and 3, suggests that, at least at times, individuals perceive smiling targets as prestigious even when other components of the prestige display are absent. This result also confirms a key finding of the prior studies: smiling increases perceptions of prestige while decreasing perceptions of dominance. Importantly, the forced-choice method used in Study 4b revealed a different pattern of results from Study 4a: when individuals were forced to choose which target conveyed the greatest prestige, they chose the prestige display and not the smiling one, suggesting that, ultimately, when individuals directly compare the displays, the prestige display is deemed to convey prestige to a greater extent than merely smiling—consistent with the results of Studies 2 and 3. Together, the results of these two studies indicate that both the smiling and prestige display communicate prestige, but perceivers can reliably differentiate between the two, and when forced to do so judge the prestige display as conveying greater prestige.

One limitation of Study 4 is that target sex was not balanced across target ethnicity. As a result, analyses examining the effects of target gender and ethnicity may be somewhat confounded. Future studies are needed to test whether the effects uncovered here are robust

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across a wider variety of targets that vary in ethnicity, and future designs should ensure that target gender is balanced across target ethnicity.

Study 5

Studies 1-4 provide the first evidence that prestige and dominance are associated with distinct nonverbal displays, which are reliably discriminated from one another. In Study 5 we sought to determine whether these displays are spontaneously shown during ecologically valid rank contests by individuals who emerge as prestigious and dominant in their social groups. We further examined whether these displays play a role in shaping peers' impressions of displayers' prestige and dominance, and, as a result, promote emergent social influence. To do so, we coded the nonverbal displays shown by individuals engaging in a group task, in which hierarchies naturally emerged (see Cheng et al., 2013). We predicted that individuals who emerged as prestigious would spontaneously display expansiveness, smiling, and an upwards head tilt, whereas individuals who emerged as dominant would spontaneously display expansiveness, no smile, and a downwards head tilt. We further predicted that both sets of behaviors would indirectly predict displayers' emergent social influence, as judged by his or her peers in the group, and by outside observers who did not participate in the task but later watched videos of the interactions. We finally predicted that any observed effects of prestige and dominance displays on social rank outcomes would be mediated by perceptions of prestige and dominance.

Method

Participants

One hundred, ninety-one students at the University of British Columbia (53% men) were randomly assigned to one of 36 same-gender groups (19 all-men groups, 17 all-women groups). Group sizes ranged from four to seven people ($M = 5.34$, $SD = .83$), and all participants were

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previously unacquainted with each other. All participants were paid for their participation. These data were drawn from a larger project, partially reported in Cheng and colleagues (2013) and Cheng and colleagues (2016); these papers report results of separate analyses and address different questions).

Procedure

Participants first completed a decision-making task, known as “Lost on the Moon,” independently, and then worked collectively as a group for 20 minutes on the same task. They were instructed to use their answers from the independent task to guide group interactions. Specifically, participants were asked to rank-order fifteen items (e.g., oxygen tanks, heating unit) in order of their utility for surviving a crash landing on the moon (Bottger, 1984). All group interactions were recorded with video cameras mounted on two tripods on either side of the table. Participants were incentivized such that every member of high-performing groups would receive a \$5 bonus in addition to their \$10 compensation for participating in the study. However, at the end of the study all participants were told that their group had performed well and were provided with a bonus. Before the conclusion of the study, participants privately rated each group member on several measures in a round-robin design. Finally, participants were debriefed and thanked for their time.

Measures

Nonverbal behavior. Eight different time-points were selected from the video-recorded group interactions and subsequently coded for nonverbal behaviors. A research assistant blind to hypotheses selected six segments from each group interaction (all segments were 20 seconds in length), during which a key decision was made by the group. Additionally, a 20-second clip from the first moments of the interaction and a 20-second clip from the final moments of the

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interaction (when participants received positive feedback about their group performance) were selected for all participants. Two research assistants watched these eight 20-second video-recordings and rated each participant on the intensity of several nonverbal behaviors. Sound was muted to focus on information in the visual stream during the coding process.

Coders rated nonverbal behaviors related to the dominance and prestige displays documented in Studies 1, 2, and 3: head tilt upward, head tilt downward, degree of smiling, and expansiveness (assessed via the items: chest expanded, arms extended out from body, wide or expansive display, body occupying much space, torso pushed out, and arms raised; interitem $\alpha \equiv .85$). Importantly, the validity of using head-tilt downward as a predictor of dominance was somewhat limited by our inability to measure eye gaze; because only two video cameras were used to record up to six participants at a time, it was not possible to accurately and reliably code eye gaze direction. Given that head-tilt downward conveys shame or low-status instead of dominance when eye gaze is directed downwards (Tracy, Robins, & Schriber, 2009; Witkower & Tracy, 2018; Keltner, 1995; Zivin, 1977), this limitation reduced our likelihood of observing a reliable head-tilt downward effect for dominance strategists.

For bodily expansiveness, we opted to aggregate across several expansiveness items, to obtain a more comprehensive index of this behavior. In addition to testing our primary hypotheses using this aggregated measure of expansiveness, we also conducted exploratory analyses to test whether dominance and prestige strategies might be associated with distinct forms of expansion. Coders rated the intensity of each nonverbal behavior on a scale ranging from 0 (*Not at all present*) to 1 (*Visible but very mild intensity*) to 5 (*Extreme intensity*), based on Tracy and Matsumoto (2008). Participants' final scores for each behavior were computed by

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summing, within each coder, ratings for that item across all 20-second clips of that participant, then averaging across both coders (interrater $\alpha \geq .71$ for all coded behaviors).

Round-robin peer ratings. Upon completion of the group task, participants rated each other group member on a number of measures (i.e., prestige, dominance, social influence, and liking), on a scale ranging from 1 (not at all) to 7 (very much). All ratings were analyzed using SOREMO (Kenny 1998) to implement the social relations model (Kenny & La Voie, 1984). We focused on target effects, which capture each target's average rating (i.e., on average, how was a specific target perceived by all other group members) after statistically removing idiosyncratic perceiver and dyadic relationship biases.

Prestige and Dominance. Participants rated the perceived prestige and dominance of each group member using the full 17-item Prestige ($\alpha = .89$) and Dominance ($\alpha = .93$) Peer Rating Scales (Cheng et al., 2010). However, one item ("members of your group do not want to be like him/her") was excluded because it is less suited for briefly acquainted group members.

Agency and Communion. Agency was assessed with three items from the Revised Interpersonal Adjective Scales: "assertive", "self-confident", and "timid" (reverse scored; Wiggins et al., 1988; ($\alpha = .92$). Communion was assessed with two items: "unsympathetic" (reverse scored) and "softhearted".

Liking. Liking was assessed with two items: "I like this person" and "I like working with this person".

Social influence. Unlike in Studies 2 and 3, we examined and analyzed perceived social influence and perceived agency separately, because participants in Study 5 engaged in a lengthy social interaction with one another, allowing for the formation of separate impressions of each person's trait agency and his or her influence over the rest of the group in determining task

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outcomes. We expected that in Study 5 participants would judge each peer's social influence not merely on the basis of how agentic he or she seemed to look, but also based on how much actual influence he or she had over the group's decisions.

Social influence was measured in two ways. First, participants engaging in the interaction rated each other group member on three items: "This person led the task", "this person had high status", and "this person was paid attention", on a scale ranging from 1 (*not at all*) to 7 (*very much*; $\alpha = .89$). Second, two research assistants blind to hypotheses and unacquainted with participants independently watched all video-recorded group interactions after the study was conducted (i.e., videos of full 20-minute interactions, not the 20-second video clips). After viewing each session, they judged each participant on his or her social influence by rating the extent to which each group member was "influential" (inter-rater $\alpha = .87$), using a rating scale ranging from 1 (*Not at all*) to 5 (*Extremely*). By obtaining influence ratings from outside observers as well as interactants, we were able to assess perceived influence without potential biases resulting from having worked and become acquainted with targets.

Results

Bivariate correlations were conducted to assess relationships between nonverbal behaviors and rank strategies.⁹ In support of our hypotheses, individuals who emerged as more prestigious (i.e., greater prestige target effects) engaged in more expansiveness, $r = .18$; $p = .01$, 95% CI:[.04, .31], smiling, $r = .26$, $p < .001$, 95% CI:[.12, .39], and upwards head tilting, $r = .19$, $p = .009$, 95% CI:[.05, .32]. Downwards head tilt was not clearly correlated with prestige target effects, $r = -.11$, $p = .14$, 95% CI:[-.25, .03]. Also consistent with our predictions, individuals who emerged as more dominant (i.e., greater dominance target effects) engaged in more expansiveness, $r = .18$, $p = .012$, 95% CI:[.04 to .31]. However, smiling, $r = -.07$, $p = .38$, 95%

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CI:[-.21, .07], downwards head tilting, $r = -.12$, $p = .11$, 95% CI:[-.25, .02], and upwards head tilting, $r = .03$, $p = .68$, 95% CI:[-.11, .17], were not significantly correlated with dominance target effects (see also Table 3).

Based on our predictions for the prestige display, the results of Studies 1-4, and the correlations observed here among the predicted prestige display behaviors (see Table 2), we created a composite *prestige display* variable, by standardizing and averaging the behaviors of upwards head tilt, smiling, and expansiveness ($\alpha = .80$). However, correlations among predicted dominance display behaviors were low or not statistically significant, so it would not have been psychometrically appropriate to aggregate dominance display components into a single dominance display composite; such a composite would have low predictive utility in any case (see Table 2). In support of our hypotheses, individuals who were more likely to engage in the composite prestige display were judged as higher in agency, $r = .22$, $p = .003$, 95% CI:[.08, .35], more likeable, $r = .24$, $p = .001$, 95% CI:[.10, .37], and marginally higher in communion, $r = .13$, $p = .08$, 95% CI:[-.01, .27].

Individuals who demonstrated the prestige display were also judged by their peers as more influential (i.e., social influence target effects), $r = .19$, $p = .01$, 95% CI:[.05, .32], and were judged to be more influential by outside observers, $r = .23$, $p = .001$, 95% CI:[.09, .36]. We next tested whether prestige displays predicted social influence target effects via perceptions of prestige, and not dominance, using the Preacher and Hayes (2008) indirect effect test, with the prestige display as the focal predictor, target effects of prestige and dominance as mediators, and target effects of social influence as the criterion (see Figure 13). Supporting our expectations, the prestige display predicted prestige target effects, $\beta = .34$, $t = 3.68$, $p < .001$, but not dominance target effects, $\beta = .06$, $t = .62$, $p = .54$, and prestige target effects in turn predicted social

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influence target effects, $\beta = .55$, $t = 15.09$, $p < .001$. Finally, as hypothesized, the indirect effect of the prestige display on social influence was significant via prestige target effects, $\beta = .19$, 95% CI:[.08, .29], but not via dominance target effects, $\beta = .04$, 95% CI:[-.09, .18]. Including dominance and prestige target effects as mediators eliminated the direct effect of the prestige display on social influence, $\beta = .02$, $t = .32$, $p = .75$. Including gender as a covariate did not alter any of these effects.

When outside-observer ratings of social influence were used as the outcome variable instead of peer ratings, the indirect effect of the prestige display on social influence was again significant via prestige target effects, $\beta = .11$, 95% CI:[.04, .20], but not via dominance target effects, $\beta = .03$, 95% CI:[-.08, .15]. As noted above, the prestige display predicted prestige target effects, $\beta = .34$, $t = 3.68$, $p < .001$, but not dominance target effects, $\beta = .06$, $t = .62$, $p = .54$, and prestige target effects predicted outside-observer rated social influence, $\beta = .34$, $t = 6.06$, $p < .001$. Including gender as a covariate did not alter any of these effects. When outside observer ratings of influence were the criterion, the direct effect of the prestige display on influence after controlling for both mediators was $\beta = .16$, $p = .03$.

Exploratory analyses

We next sought to explore whether dominance and prestige strategists might convey their agency using different kinds of expansive behaviors. Bivariate correlations conducted between each separate expansive nonverbal behavior and each rank strategy indicated that prestigious individuals tended to display *chest expanded* and *torso pushed out*, $r = .19$, $p = .008$, 95% CI:[.05, .32], and $r = .19$, $p = .01$, 95% CI:[.05, .32], respectively, whereas dominant individuals showed no tendency toward displaying these forms of bodily expansion, $r = .03$, $p = .67$, 95% CI:[-.11, .17], and $r = .01$, $p = .95$, 95% CI:[-.13, .15], respectively (see Figure 14). Conversely,

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dominant individuals tended to display *arms out*, $r = .28$, $p < .001$, 95% CI:[.14, .41], whereas prestigious individuals showed no such tendency, $r = .06$, $p = .44$, 95% CI:[-.08, .20]. The item *body occupies much room* was also positively related to dominance target effects, $r = .25$, $p < .001$, 95% CI:[.11, .38], and only marginally to prestige target effects, $r = .13$, $p = .055$, 95% CI:[-.01, .27]; the same pattern emerged for *wide stance*, $r = .18$, $p = .01$, 95% CI:[.04, .31] for dominance, and $r = .14$, $p = .056$, 95% CI:[-.002, .28] for prestige. Finally, the item *arms raised* showed small, non-significant positive relations with both prestige, $r = .07$, $p = .32$, 95% CI:[-.07, .21], and dominance, $r = .12$, $p = .11$, 95% CI:[-.02, .26].

Together, these results provide preliminary evidence to suggest that the ways in which individuals expand their bodies—that is, the specific behaviors used—may vary by dominance and prestige strategies. More specifically, subtle expansive behaviors closely linked to the nonverbal expression of pride, such as chest expanded and torso pushed out, appear to be more indicative of prestige than dominance. In contrast, more overt expansive behaviors such as spreading one's arms out from the body, holding a wide stance, and occupying more space, appear to be more closely associated with dominance than prestige. We more directly tested these specific expansive behavioral distinctions in Study 6.

Discussion

Study 5 demonstrated that individuals whose peers judged them as prestigious tended to spontaneously display the nonverbal expression of prestige (i.e., expansive bodily displays, smile, upwards head tilt) in an ecologically valid rank contest. Furthermore, showing these displays predicted emergent rank outcomes; individuals who displayed greater prestige were judged to have greater influence over their group, both by their fellow group members and by unacquainted outside observers. Finally, these associations were mediated by perceptions of

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prestige and not dominance, suggesting that individuals who engage in prestige behaviors are perceived as prestigious at least in part as a result of these behaviors, and these perceptions drive consequent social influence. These results provide strong support for the suggestion that the nonverbal expression of prestige uncovered in Studies 1, 2, and 3, 4a, and 4b is naturally displayed in ecologically valid group settings, and functions to influence impressions that lead to social influence.

In contrast, the results for dominance displays were less consistent. Although dominant individuals tended to display expansiveness, no significant relation emerged between dominance perceptions and smiling or head tilt, suggesting that in this particular social interaction, peers were not reliably using these nonverbal behaviors to infer dominance, or dominant individuals were not systematically engaging in these two components of the display. Importantly, though, dominant individuals did not show any evidence of displaying behaviors distinct to prestige, yet they still influenced group behavior.

Study 5 also provides the first evidence that different forms of bodily expansive behaviors are displayed by dominant and prestigious individuals. Prestigious individuals tended to show subtle forms of expansiveness (i.e., chest expansion, torso pushed out), whereas dominants tended to display more overt and extreme space-taking behaviors (e.g., arms out, arms up). This distinction is consistent with prior research suggesting that subtle shifts in posture are related to perceptions of competence, intelligence, and popularity (Back, Schmukle, & Egloff, 2010; Weisfeld & Beresford, 1982), whereas larger expansive behaviors are related to perceptions of anger, threat, and social rank (Witkower & Tracy, 2018; Cashdan, 1998; Hall et al., 2005; Marsh et al., 2009); these latter behaviors may increase perceived physical prowess and also appear invasive of others' personal space (Marsh et al., 2009; Vieira & Marsh, 2014).

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One possible explanation for the absence of an observed significant relationship between (reduced) smiling and dominance is that, with the coding process we used, reduced smiling was challenging to measure, as neutral facial displays are also absent of a smile (Coan & Gottman, 2007). In other words, the absence of a positive correlation between dominance target effects and smiling may indicate that dominants tended to display a non-smiling neutral expression, or at least that they were as likely to do so as they were to smile, in contrast to prestige strategists who were more inclined to smile. Analyzing the full 20-minute interactions, rather than sampling only key time-points, could help improve the accuracy of our assessment of smiling.

The absence of a significant relation between downward head tilt and dominance may be a result of the known positive association between downward head tilt and submissiveness, a trait that is associated with low levels of both dominance and prestige. Submissiveness and shame are conveyed from a head tilt downward with eye gaze directed downward rather than straight ahead (Tracy et al., 2009). In contrast, based on Studies 1-4 as well as other research (Hehman et al., 2013; Mignault & Chaudhuri, 2003; Rule et al., 2012; Witkower & Tracy, 2018b), when downward head tilt is paired with eye gaze directed toward the viewer, it clearly communicates dominance. In the present Study 5, because only two video cameras were used to record up to six participants at a time, it was not possible to accurately and reliably code eye gaze direction, making it difficult to interpret the null relation between downward head tilt and dominance. We sought to address this limitation in Study 6.

Another possible explanation for the absence of an observed association between dominance and smiling or downward head tilt, as well as any coherence among these dominance display features, is that undergraduate students working together on a task might be particularly unlikely to use a dominance strategy. In the context of research participation at a university,

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wielding a highly aggressive and intimidating strategy like this might be considered inappropriate; in fact, mean target effects for prestige ($M = 4.93$, $SD = .62$) were substantially higher than those for dominance ($M = 2.43$, $SD = .83$), $F(1,190) = 1212.42$, $p < .001$, $\eta_p^2 = .87$ (both were scored on a 5-point scale). In other words, although dominance was as effective a strategy as prestige, in terms of promoting social influence (Cheng et al., 2013), based on peer ratings it may have been used less often or with less intensity. It is possible that different results would emerge in other populations of individuals competing for high rank outside of the university setting (e.g., prison populations, certain corporate contexts), and in such situations dominance nonverbal behaviors might cohere more strongly and be displayed with greater frequency.

One additional limitation of the current study is that it does not fall neatly into categories of either perceived high rank or actual high rank (e.g., Hall et al., 2005). This is due to the fact that our criterion measures of actual high rank were assessed with peer ratings (i.e., “target effects” in SRM), which were obtained at the end of the task after peers finished interacting with targets, as well as with outside observer ratings (after they viewed the entire interaction among interactants). As a result, both sets of ratings were likely influenced in part by targets’ spontaneous nonverbal behaviors during the interaction (and peers’ responses to one another’s displays). However, it is almost certainly the case that peer and outside-observer ratings were also influenced by other indicators of rank, beyond nonverbal behaviors, such as verbal behaviors, content of speech, tone of voice, height, size, clothing, attractiveness, age, and so on. We therefore view these ratings as valid criterion measures of actual emergent social rank, consistent with studies suggesting that consensus ratings from peers are the most appropriate way to assess social rank (Anderson & Kilduff, 2009). Nonetheless, it is important note that

these criterion measures may be inherently confounded, to some degree, with our outcome measure of nonverbal behavioral displays.

Study 6

Study 5 provided the first evidence that prestige and dominance behaviors are spontaneously displayed by individuals who emerge as prestigious and dominant during an ecologically valid group setting. In Study 6 we sought to determine whether these same displays are shown by prestigious and dominant individuals as they attempt to influence observers in a real-world context, outside the laboratory. More specifically, we analyzed the nonverbal behaviors shown by then-candidate Hillary Clinton and then-candidate Donald Trump during the three televised 2016 U.S. presidential debates.

Although both Clinton and Trump are high ranking individuals who successfully influenced a large proportion of voter behavior in the 2016 election (Clinton won the popular vote and Trump won the electoral college), there is good reason to suspect that they exemplify prestige and dominance strategists, respectively. First, in a recent study Kakkar and Sivanthan (2017) asked participants to judge the dominance and prestige of Trump and Clinton, using a shortened version of the Dominance and Prestige scales similar to those used in the present Studies 1-4. Their participants rated Trump as more dominant than Clinton, Cohen's $d = .48$, whereas they rated Clinton as more prestigious than Trump, Cohen's $d = .64$

Consistent with these results, Musser and Orke (1992) would characterize Trump as an “independent maximizer”; an individual who goes about “seeking their own interests in a way that is insensitive to the needs of others” (see Eaton & Giacomino, 2000; p. 219). This characterization maps perfectly onto one of the items used to measure dominance in Studies 1-4 (i.e., “This person often tries to get their own way regardless of what others may want”), and is

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prototypical of dominant strategists (Cheng et al., 2013; Maner & Mead, 2010). Furthermore, a quantitative discourse analysis by Calhoun (2016) found that Trump showed a greater difference in the use of self-centered compared to group-centered pronouns than other presidential candidates during the primary debates (see also Ahmadian, Azarshahi, & Paulhus, 2017), and was more likely to engage in metaphors centered around aggression, fighting (i.e., boxing), and conflict. These tendencies are also consistent with the use of a dominance strategy (Maner & Case, 2016; Maner & Mead, 2010; Henrich & Gil-White, 2001). Trump also demonstrates high levels of grandiosity (Ahmadian et al., 2017), which has been linked to hubristic pride and dominance (Cheng et al., 2010; Tracy et al., 2010). Finally, several scholars have noted that during both the primary and regular election campaign Trump regularly attempted to intimidate his critics and opponents with threats oriented toward attaining power, thus demonstrating behaviors that are definitional of dominance (McAdams, 2016; Tracy, 2016a; 2016b).

Conversely, Hillary Clinton is so strongly associated with concepts of success and expertise – central to prestige – that her image has been used by experimental psychologists to effectively prime successful female leadership (Latu, Schmid-Mast, Lammers, & Bombari, 2013). Furthermore, both men and women judge Clinton to be as competent as some of the most competent world leaders, such as Bill Clinton and Angela Merkel (Latu et al., 2013). Clinton also has been identified as a desirable person to have as a teammate during a difficult situation and as someone who would reduce one's worries about poor performance on a difficult task, suggesting that individuals tend to believe they would enjoy working with her and hold an approach orientation toward her, as is essential for prestigious leaders to retain their power (Taylor, Lord, McIntyre, & Paulson, 2011). Finally, as a former Secretary of State and U.S. Senator, Clinton has held several of the highest-ranking political positions in the U.S.

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government, which have provided her with actual knowledge and experience in dealing with some of the most important world political affairs (although Trump now holds such a position, prior to the 2016 Debates he had not).

In sum, although it is likely that both Trump and Clinton have at times used both dominance and prestige to get ahead (as effective leaders often do), the preponderance of evidence suggests that during the 2016 Debates, Trump was a more typical dominance strategist and Clinton a more typical prestige strategist. Nonetheless, we directly tested this assumption in Study 6 by coding speech segments from each candidate across the three televised presidential debates and assessing the extent to which these segments conveyed attacks or other demonstrations of aggression (indicative of dominance) and demonstrations of expertise (indicative of prestige). We expected to observe greater demonstrations of expertise or knowledge and fewer attacks from Clinton, and the reverse behavioral pattern from Trump.

Turning to our main hypotheses for Study 6, we predicted that across the three presidential debates, Clinton, as a prestige strategist, would show greater evidence of nonverbal displays of prestige, including upward head tilting and smiling, compared to Trump. Conversely, we predicted that Trump, as a dominance strategist, would show greater evidence of nonverbal displays of dominance, including downward head tilting with eye gaze directed toward Clinton and less smiling, compared to Clinton. Although we expected both candidates, as highly agentic and influential individuals, to demonstrate expansive behaviors, based on the preliminary results of Study 5 pointing to potentially distinct forms of expansiveness, we further expected Clinton to engage in more subtle forms of expansiveness (i.e., chest expansion), and Trump to engage in more overt and space-taking forms of expansiveness (e.g., arms out, body occupying much room). Finally, expansive behaviors not distinctively related to prestige or dominance in Study 5

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(i.e., arms up) were not expected to be displayed to a significantly greater extent by either candidate.

Importantly, several of these behaviors—most notably body expansion and smiling—are strongly linked to gender (Hall, Carter, & Horgan, 2000; LaFrance, Hecht, & Paluck, 2003; Mayo & Henley, 1981; Gallaher, 1992), so observed differences between the candidates in the display of these behaviors could be due to the gender difference between them as well as to rank strategy. It is also noteworthy that gender differences in dominance and prestige are consistent with ethological differences between men and women, and humans' evolutionary history of intrasexual selection for combat competition (as evidenced by dimorphism in body size, muscularity, and behavior); studies have found that men are more likely than women to utilize direct forms of aggressive behavior (Archer 2004; but see Bettencourt & Miller, 1996; Barlett & Coyne; 2014). Given that gender and rank strategy were perfectly confounded in this study, we could not tease apart these explanations. This limitation, and results that partially ameliorate it, are detailed in the Discussion section.

Materials and Procedure

To test the validity of our assumption that Clinton and Trump are prestige and dominance strategists respectively, two research assistants blind to our hypotheses independently listened to all three presidential debates (audio only) and identified specific time-points in which one candidate or the other engaged in either an attack (defined as a behavior intended to harm the other candidate; Anderson & Bushman, 2002), or demonstrated his or her knowledge and expertise (i.e., by identifying experiences, capabilities, or a fundamental understanding of a topic). Both coders were undergraduate students at a Canadian University, currently living in Canada, and not eligible to vote in the U.S. election. Final time-points were selected for

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subsequent analyses based on total consensus among coders; this resulted in the inclusion of 108 non-overlapping 5-second time-points across the three debates.

Next, to code the nonverbal behaviors displayed by each candidate, a new team of three research assistants independently watched 5-seconds of video starting at each identified time-point.¹⁰ These individuals (also students or recent graduates of a Canadian University, currently living in Canada, and not eligible to vote in the U.S. election) were blind to hypotheses and why those particular time points had been chosen, or what was happening at that moment in the debates. They viewed the video clips without sound. Research assistants were instructed to code the intensity of each of the behaviors found in Study 5 to be associated with prestige or dominance using a rating scale ranging from 0 (behavior not at all present) to 3 (most intense version of the behavior present), based on past research (Tracy & Matsumoto, 2008): *head tilt up* (interrater $\alpha = .72$), *smiling* ($\alpha = .87$), *chest expanded* ($\alpha = .59$), *arms up* ($\alpha = .91$), *arms out* ($\alpha = .83$), and *body occupies much room* ($\alpha = .61$). Coders were not provided with any information about the meaning of these behaviors. Although two additional behaviors—*wide stance* and *torso pushed out*—were examined in Study 5, these behaviors were not analyzed in the current study because they were not regularly observable (i.e., they were often out of the vantage of the camera).

To address a limitation of Study 5, coders were additionally asked to determine whether each candidate engaged in the combination of a downwards head tilt with eye gaze directed towards the other candidate, or not ($\alpha = .62$). Stated differently, coders analyzed each 5-second clip and identified whether the candidate engaged in a downwards head tilt with eye gaze directed, or did not engage in this combination of behaviors.

Results

Did Clinton and Trump Differ in their use of Prestige versus Dominance Strategies?

A Chi squared test of independence on the number of attacks and demonstrations of expertise displayed by each candidate revealed a significant difference between the two candidates in the use of each strategy, $X^2 = 13.46$, $p < .001$ (see Figure 15). Specifically, of the total instances of attacks observed, Trump engaged in a relatively greater proportion than Clinton, 53 vs. 26, $p = .003$, 95% CI:[.57, .77], and Clinton engaged in more demonstrations of knowledge and expertise than Trump, 21 vs. 8, $p = .02$, 95% CI:[.53, .77]. These results support our expectation that Clinton and Trump are prestige and dominance strategists, respectively, and engaged in behaviors correspondent to each rank-attainment tendency during the three presidential debates.

Nonverbal Displays of Prestige and Dominance

We conducted separate univariate ANOVAs to test whether each coded behavior was displayed to a different extent by each candidate. In support of our hypotheses, significant effects emerged for head tilted upward, $F(1,106) = 45.27$, $p < .001$, $d = 1.28$; smiling, $F(1,106) = 34.42$, $p < .001$, $d = 1.06$; and, marginally, head tilted downward with gaze directed, $F(1,106) = 3.20$, $p = .077$, $d = .35$; indicating that Clinton engaged in greater upwards head tilting and smiling than Trump, whereas Trump engaged in marginally more downwards head tilting with gaze directed than Clinton (see Figure 16).

Bodily Expansiveness

We next sought to test the hypothesis emerging from Study 5, that dominance and prestige strategists use different forms of bodily expansion. We conducted separate univariate ANOVAs predicting each of the four expansiveness behaviors coded. Replicating the results of Study 5, Clinton engaged in greater chest expansion than Trump, $F(1,106) = 11.85$, $p \leq .001$, $d =$

.67, but Trump occupied more space and extended his arms out from his body more than Clinton, $F(1,106) = 11.36, p \leq .001, d = .66$, and $F(1,105) = 11.15, p \leq .001, d = .66$ (see Figure 16). Also consistent with Study 5, the two candidates did not differ in the extent to which they raised their arms upward, $F(1,106) = 1.84, p = .18, d = .27$, though there was a trend toward greater arm raising by Trump, as was observed in Study 5 for dominant participants.

Discussion

In Study 6 we found that then-candidate Clinton and then-candidate Trump—a prestigious and a dominant leader, respectively—demonstrated the nonverbal behavioral displays associated with their corresponding rank-attainment strategies during the three U.S. presidential debates. These results provide the first evidence that the nonverbal expressions of prestige and dominance first uncovered in Studies 1, 2, 3, 4, and 5 are displayed by prestige and dominance strategists in real-world rank contests.

Several of the more specific results from this study are particularly noteworthy. First, consistent with our predictions, a downwards head tilt combined with gaze directed toward the other candidate was marginally more likely to be displayed by the dominant candidate. In contrast to the video clips coded in Study 5, in Study 6 we were able to obtain high-definition, close-up recordings of the candidates from a range of angles, allowing our coders to identify specific instances in which each candidate displayed a downwards head tilt with or without gaze directed towards the other candidate. Second, replicating the exploratory findings of Study 5, subtle forms of expansive bodily movements (i.e., chest expanded) were displayed to a greater extent by the prestige strategist, while more overt and space-taking forms (i.e. body occupying much space, arms extended outward) were displayed to a greater extent by the dominant strategist. Arms raised above the head— an expansive behavior that was not significantly related

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to dominance or prestige in Study 5 – was here shown to a similar extent by both candidates, as well. Together, Studies 5 and 6 thus provide the first evidence that although dominance and prestige are both signaled by expansive bodily movements (as was found in Studies 1-4), the two signals differ in the specific forms this expansiveness takes.

One important limitation of Study 6 is that the presumed differences between the candidates in dominance and prestige are confounded with gender. It is therefore possible that some of the behavioral differences observed between the two targets were a result not of their particular rank strategy but rather of gender differences in nonverbal behavior. However, men and women both tilt their heads to communicate intimidation (if anything, men tend to tilt their heads upward – not down – more than women, for this purpose; Hehman et al., 2013), and women engage in more nodding (Hall, Carter, & Horgan, 2000; Mayo & Henley, 1981), making it unlikely that all observed differences were due to gender. In addition, men tend to engage in more expansive behavior than women (Mayo & Henley, 1981; Gallaher, 1992), but Clinton nonetheless engaged in greater displays of chest expansion, and the candidates did not differ meaningfully in the extent to which they raised their arms – a behavior not clearly related to either dominance or prestige in Study 5 but one that should presumably be part of the general expansiveness typically shown by men.

In our view, these specific results, as well as the overall convergence in findings across the seven studies reported here, ameliorate the concern that the results of Study 6 might stem solely from gender differences. Nonetheless, until future studies are available to address the extent to which these distinct displays are used to communicate dominance and prestige by both men and women in real-world contexts, we would urge readers to draw their strongest conclusions about Study 6 from those results that are unlikely to be due to gender: the head tilt

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difference between the candidates, and the difference in subtle forms of expansiveness (i.e., chest expansion).

Another possible explanation for the observed difference between the candidates in head tilt direction is the difference in height of the two individuals; Trump might have tilted his head downward to look at Clinton. However, there is good reason to question this explanation. Trump and Clinton were separated by a distance of (roughly) 15 feet. Assuming Trump was looking down at Clinton due to his taller stature, the angle of his head would not meaningfully (or observably) shift. Using geometry, we can determine that if Trump (191 centimeters tall) was looking down at Clinton (165 centimeters tall – but likely taller if she was wearing heels, which would further minimize this difference), and they were separated by 15 feet (~458 centimeters), his head would shift only 3.25 degrees to make eye contact with her. A head movement of this magnitude is unlikely to be observable or reliably coded, making it unlikely that the height difference between the two was responsible for the observed head tilt difference.

General Discussion

The present research is the first to examine whether there are distinct sets of nonverbal behaviors that are displayed by prestigious and dominant individuals, and whether these same behaviors are used by observers to form perceptions of prestige and dominance, and to confer social rank upon displayers on this basis. Based on prior research, we hypothesized that expansiveness, smiling, and an upwards head tilt would be associated with prestige, whereas expansiveness, no smile, and a downwards head tilt would be associated with dominance. Using a multi-method approach that included tightly controlled experimental manipulations, a correlational study examining actual group interactions and the impact of nonverbal displays on emergent rank outcomes, and an observational study based on real-world data from validated

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prestige and dominance strategists during the U.S. presidential debates, we found strong support for both of these hypotheses, as well as for a more exploratory hypothesis regarding the distinctive forms of expansive bodily displays shown by dominance and prestige strategists.

More specifically, in Studies 1, 2, 3, 4a, and 4b, we found that perceivers made impressions of targets' dominance and prestige on the basis of the predicted sets of behaviors, and only rarely confused the two displays. In other words, judges perceived dominance rather than prestige from the permutation of expansiveness, no smile, and head tilted down with eye gaze directed forward, and prestige rather than dominance from the permutation of expansiveness, smiling, and head tilted up. Furthermore, the prestige display was positively, and the dominance display negatively, associated with liking and communion, but both displays were positively associated with perceptions of agency and social influence. These results held across men and women judges and targets, suggesting these two displays carry the same signal value across gender.

In Study 5 we found that individuals working together on a group task tended to spontaneously display the behaviors found to be associated with prestige and dominance, and prestige strategists, in particular, tended to display the behaviors associated with the prestige display, whereas dominance strategists were more likely to display (some of) the behaviors associated with the dominance display. Furthermore, prestige nonverbal behaviors predicted the amount of influence individuals attained over their groups, based on ratings made by both fellow group members and unacquainted outside observers. This effect was mediated by these individuals' peers' perceptions of their prestige, suggesting that because nonverbal displays of prestige led to perceptions of prestige, these displays consequently increased these individuals' attainment of social influence.

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In Study 5 we also uncovered evidence to suggest that there are subtle differences in the kinds of expansive behaviors displayed by prestigious and dominant individuals, with the former showing subtle postural movements typically associated with the nonverbal expression of pride (i.e., chest expansion) and the latter showing larger and more obvious space-consuming movements (e.g., wide stance, arm extension). Finally, in Study 6, by examining then-candidate Hillary Clinton and then-candidate Donald Trump's nonverbal behaviors during the 2016 presidential debates, we found that the predicted set of prestige and dominance behaviors were each displayed in a real-world status competition, by a prestige and dominance strategist. Study 6 also replicated the finding from Study 5 that the two strategies are associated with distinctive forms of expansiveness. Together, these seven studies thus provide strong converging evidence that dominance and prestige are associated with distinct nonverbal signals which naturally emerge in ecologically valid group settings and real-world rank contests, and result in rank conferral from others.

Theoretical Implications

Although a large body of research has demonstrated that certain nonverbal behaviors are associated with generalized high rank, the present studies are the first to find distinct nonverbal behavioral suites associated with two distinct forms of high rank, prestige and dominance. These findings are consistent with the notion that humans have evolved two distinctive forms of social rank, which are characterized by distinct vocal signals, psychological frameworks, and evolutionary functions, yet which both lead to influence over others (Cheng et al., 2013; Cheng et al., 2010; Cheng et al., 2016; Henrich & Gil-White, 2001; Maner, 2017; Maner & Case, 2016; Tracy et al., 2010). Furthermore, our finding that both men and women received conferrals of status as a result of displaying nonverbal expressions of prestige and dominance is consistent

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with research suggesting that prestige and dominance are viable avenues for rank attainment among both genders (Cheng et al., 2013; Maner & Case, 2016).

One contribution of the present results is that they help explain several inconsistencies that have emerged in past research. First, previous studies examining the impact of head tilt on rank perceptions have produced a variety of findings, at times showing that downwards head tilt increases perceptions of high rank, and at other times that an upwards head tilt head tilt increases perceptions of high rank (Bente et al., 2010; Hehman et al., 2013; Mignault & Chaudhuri, 2003; Rule et al., 2012; for review see Witkower & Tracy, 2018a). Similarly, smiling has been associated with perceptions of both high rank and low rank (Hall et al., 2005; Hess, Blairy, & Kleck, 2000; Shariff et al., 2012; Shariff & Tracy, 2009; Tracy et al., 2013), and a meta-analysis has shown a large amount of heterogeneity among these effects (Hall et al., 2005). The present results suggest that these mixed findings are likely to be due to the ways in which social rank has been measured in the relevant past studies; typically, these studies did not distinguish between dominance and prestige, yet measured rank using words likely to connote one form of rank or the other (see Cheng et al., 2013).

Another noteworthy finding emerging from the present research is the large overlap between the prototypical pride expression and the observed prestige display (i.e., chest expanded, smiling, head tilted upward). The present results therefore provide support for a functionalist account of why the pride expression is accurately recognized and automatically associated with high rank across cultures (Shariff et al., 2012; Shariff & Tracy, 2009; Tracy & Robins, 2008; Tracy et al., 2013; Tracy & Matsumoto, 2008; Fessler, 1999); in displaying pride, individuals are also signaling their prestige. However, this conclusion raises questions for prior accounts that distinguished between two forms of pride: authentic and hubristic (Tracy & Robins, 2007b; but

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see Holbrook, Piazza, & Fessler, 2014). Although authentic pride is strongly related to prestige, and may be the emotion that most drives prestige attainment (Cheng et al., 2010; Tracy, 2016b), hubristic pride is just as strongly related to dominance, and has been found to be either negatively or not related to prestige (Cheng et al., 2010). The pride expression communicates both forms of pride (Tracy & Robins, 2007b; Tracy & Prehn, 2012), but the present findings indicate that hubristic pride might in fact be better identified from an expression that includes elements of the dominance display –such as head tilt downward (rather than upward), wider stance, and perhaps even reduced smiling. Exploring these questions is an important direction for future research.

The present results also have implications for our understanding of prestige and dominance as two distinct forms of high rank. The finding that these strategies are associated with different signals bolsters accounts suggesting that prestigious and dominant individuals are likely to behave in different ways as leaders and seek disparate forms of followership, and that followers are likely to behave differently when interacting with prestigious and dominant leaders (Cheng et al., 2013; Cheng et al., 2016; Henrich & Gil-White, 2001; Maner, 2017). Although past research has identified vocal characteristics that can be used to identify dominance, the current studies provide the first evidence that visually observed nonverbal behaviors also play a role in the distinctive signaling process (Cheng et al., 2016). Future studies might further probe the social functions of separately signaling dominance and prestige by examining the divergent ways in which observers respond to these nonverbal displays.

The current findings also have implications for other research on nonverbal displays of high rank. Prior studies have shown that expansiveness functions to increase the apparent size of a displayer (Marsh et al., 2009), and although this is likely to be the case for the space-

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consuming form of expansiveness found here to be associated with dominance (e.g., arms out, body occupying much room), the more subtle chest expansiveness observed among prestigious individuals might serve a different function. The present findings also have implications for the literature suggesting that holding expansive postural and bodily poses increases feelings of power (e.g., Carney, Cuddy, & Yap, 2010; Carney, Cuddy, & Yap, 2015; Ranehill et al., 2015; see Gronau et al., 2017 for a bayesian meta-analysis of pre-registered replications). These studies have typically manipulated expansiveness without clearly delineating how, or which behaviors are most critical. Given the present evidence that different forms of expansiveness send different messages about power, the previously documented ‘power pose’ may be associated with two largely opposing messages. If this is the case, it could help account for inconsistencies in the behavioral outcomes of power posing (e.g., Carney et al., 2015; Ranehill et al., 2015; but see Simmons & Simonsohn, 2017). Regardless of what the future holds for power posing, researchers who seek to test this account should more rigorously consider the specific makeup of the behaviors involved in the pose.

Limitations and Future Directions

It is important to note several limitations of the present research. First, we used a top-down, theoretically driven approach, in which we measured or manipulated specific behaviors that we expected to be linked to each rank strategy, largely based on prior research on agency and communion. It is therefore possible that additional behaviors, not examined here, are also distinctively associated with dominance and prestige. An important future direction is therefore to use a more bottom-up approach to further address these issues.

Second, although our findings provide largely convergent evidence across seven studies, several inconsistencies did emerge. For example, in Study 5 downwards head tilt was not related

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to dominance—likely due to our inability to code eye gaze direction in that study, as well as our use of only one camera recording up to three people, which prevented us from adjusting camera angles for individual participants or centering participants within the frame. Some of these limitations were addressed in Study 6, but future studies should verify these results in additional naturalistic group interactions using cameras tailored to each individual. In addition, given the likely importance of eye gaze direction when considering head tilt, future studies should consider using automated coding software to more accurately assess eye and head movements as they emerge in naturalistic settings (Cohn, Reed, Ambadar, Xiao, Moriyama, 2004; Velloso, Bulling, & Gellersen, 2013; Xiao, Moriyama, Kanade, & Cohn, 2003).

Third, future research is needed to examine whether these behaviors are likely to be spontaneous displays, potentially evocative of some internal subjective experience in the way that emotion expressions are typically thought to be (e.g., individuals who feel knowledgeable may spontaneously display prestige in response to these feelings), or deliberative actions intended to communicate a particular message (e.g., individuals who want others to view them as smart might intentionally display certain prestige-related behaviors). Our expectation is that both displays include both spontaneous and deliberative elements. For example, prior studies have found that individuals spontaneously display behaviors associated with prestige after succeeding in a valued domain (Tracy & Matsumoto, 2008), but also when asked to pose expressions consistent with how they would behave if they were successful, or attained a personal achievement (Banziger & Scherer, 2010; see Witkower & Tracy, 2018a, for a review). Similarly, studies have found that individuals asked to show behaviors that would intimidate others—that is, pose a display intended to send an aggressive message—tilt their heads downward, a key component of the dominance display (Hehman et al., 2013), but we are unaware of any prior

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research examining whether individuals who feel aggressive or dominant spontaneously engage in behaviors associated with the dominance display.

Fourth, although we found that symmetrical smiles communicate prestige but not dominance, smiles come in a variety of forms, and it is not clear whether all forms of smiling would be more strongly associated with prestige. For example, asymmetrical smiles (when paired with facial behaviors prototypically associated with disgust; e.g., AU 9 and 10; Chapman, Kim, Susskind, & Anderson; Ekman & Friesen, 2002) may be perceived as “dominant,” defined as a sense of superiority (Rychlowska et al., 2017). Although these findings may be taken to suggest that asymmetrical smiles are associated with both dominance and prestige, given that both are linked to superiority, it also may be the case that these smiles communicate prestige only, consistent with the present finding that symmetrical smiling is associated with prestige only. Another possibility is that *asymmetrical* smiles actually communicate dominance and not prestige; although we found a negative association between symmetrical smiling and dominance, it is plausible that different results would emerge for asymmetrical smiles.

Another important future research direction is to examine possible interaction effects of dominance and prestige on nonverbal displays. Given that the two dimensions are conceptually distinct and empirically orthogonal in many (though not all) social groups (see Cheng et al., 2013; Cheng et al., 2010; Redhead, Cheng, Driver, Foulsham, & O’Gorman, under review; Garfield & Hagen, under review), a person can be high in both forms of social rank at the same time, or high in one and low in the other, or low in both. For example, a professor high in both prestige and dominance might be respected and admired by her students for her impressive publications and knowledge base, but simultaneously harshly punish students who challenge her in class—leading students to also fear her. It is an open question whether such a person would

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show both prestige and dominance nonverbal displays interchangeably, or different displays at different times depending on particular situations; future research is needed to explore this issue, and also test whether interactions between dominance and prestige might predict other nonverbal behaviors. That said, in the present Study 5 we found no significant interactions between prestige and dominance target effects predicting any of the assessed behaviors: downwards head tilt, $\beta = .06$, $t = .87$, $p = .39$; upwards head tilt, $\beta = .02$, $t = .28$, $p = .78$; prestige display, $\beta = .03$, $t = .56$, $p = .58$; expansiveness, $\beta = .05$, $t = 1.01$, $p = .31$; or smiling, $\beta = .01$, $t = .23$, $p = .82$.

Additionally, in studies 1, 2, 3, 4a, and 4b, each participant made judgments about a single individual showing different nonverbal behaviors. This design allowed us to minimize possible target effects (e.g., morphological differences between targets that might influence judgments if participants viewed multiple targets), but it also may have reduced ecological validity and increased participants' tendency to attend closely to subtle behavioral differences between displays that they otherwise might have missed.

Finally, like much psychological research, all of the present studies were based on samples drawn from North American (i.e., largely WEIRD) populations (Henrich, Heine, & Norenzayan, 2010). If the displays observed here are part of the evolved suites of behavior associated with dominance and prestige, then they should reliably signal each rank strategy across diverse populations. An important direction for future research is therefore to test the extent to which these displays generalize across diverse populations. Although an upwards head tilt and expansive posture have been associated with perceptions of high rank across populations (e.g., Bente et al., 2010; Tracy et al., 2013), studies have yet to examine whether distinct expressions of dominance and prestige are recognized as distinct forms of high rank across varied cultural groups.

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In conclusion, the current research provides the first evidence that prestige and dominance are associated with distinctive nonverbal signals, which facilitate rank attainment. Prestige is associated with subtle forms of expansiveness (chest expanded, torso pushed out), a smile, and an upwards head tilt, whereas dominance is associated with larger space-consuming forms of expansiveness (e.g., arms out from body, wide stance), reduced smiling, and a downwards head tilt. Our findings are thus consistent with the suggestion that humans may have evolved to use distinct sets of nonverbal behaviors to communicate their prestige and dominance, and observers rely on these distinct behaviors, alongside vocal, emotional, and personality characteristics, to identify and confer status to prestigious and dominant individuals.

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Table 1.

Perceptions of Nonverbal Displays included in Study 1.

Display #	Smile	Expansive	Head Tilt	Dominance (α)	Prestige (α)	Liking	Influence(α)
1	No	No	Down	4.94 ^{ab} (.94)	4.00 ^f (.90)	3.50 ^f	4.47 ^{bc} (.81)
2	No	No	Level	4.08 ^e (.94)	4.43 ^{cd} (.92)	4.26 ^{cd}	4.26 ^d (.79)
3	No	No	Up	4.08 ^e (.93)	4.19 ^{ef} (.91)	4.02 ^e	4.14 ^{de} (.83)
4	No	Yes	Down	5.15^a (.92)	4.30^{de} (.89)	3.50^f	4.72^a (.82)
5	No	Yes	Level	4.88 ^b (.93)	4.64 ^b (.89)	4.03 ^{de}	4.76 ^a (.82)
6	No	Yes	Up	4.61 ^{cd} (.93)	4.93 ^a (.90)	4.39 ^{bc}	4.77 ^a (.80)
7	Yes	No	Down	4.56 ^d (.94)	3.95 ^f (.94)	3.49 ^f	4.26 ^d (.84)
8	Yes	No	Level	3.49 ^f (.94)	4.55 ^{bc} (.92)	4.67 ^a	4.02 ^e (.86)
9	Yes	No	Up	3.35 ^f (.93)	4.56 ^{bc} (.92)	4.84 ^a	3.95 ^e (.86)
10	Yes	Yes	Down	4.86 ^{bc} (.95)	4.40 ^{cd} (.92)	3.79 ^e	4.63 ^{ab} (.83)
11	Yes	Yes	Level	3.97 ^e (.93)	4.93 ^a (.92)	4.63 ^{ab}	4.45 ^c (.86)
12	Yes	Yes	Up	3.91^e (.94)	5.00^a (.88)	4.78^a	4.45^c (.87)

Note. Dominance and prestige displays used in subsequent studies are in bold. Cronbach's alpha is presented in parentheses. Superscripts are based on 95% CI, with shared superscripts indicating no significant difference, $p < .05$.

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Table 2.

Correlations Among Nonverbal Behaviors, Study 4

	1.	2.	3.	4.
1. Expansiveness	--			
2. Head Tilt Up	.83**	--		
3. Smiling	.43**	.43**	--	
4. Head Tilt Down	.20**	.18*	-.003	--

Note. ** $p < .01$, * $p < .05$

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Table 3.

Correlations between Nonverbal Behaviors and Emergent Peer Perceptions, Study 4.

	Prestige	Dominance	Agency	Communion	Liking	Influence (peer rated)	Influence (outside observer rated)
Expansiveness	0.18**	0.15*	0.24**	-0.12	0.15*	.22**	.31**
Head Tilt Up	0.19**	0.03	0.13†	0.07	0.15*	.11	.16*
Smiling	0.26**	-0.07	0.16*	.26**	0.29**	.14†	.14†
Head Tilt Down	-0.11	-0.12	-0.24	-.01	-0.15*	-.19**	-.18*
Prestige Display	0.26**	0.05	0.21**	.12†	0.23**	.18*	.23**

Note. ** $p < .01$, * $p < .05$, † $p < .10$

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Figure 1. Examples of stimuli used in Studies 1 and 2. In Study 2, these stimuli were used as the “smiling” (top left), “prestige” (top right), “neutral” (bottom left), and “dominance” (bottom right) conditions.

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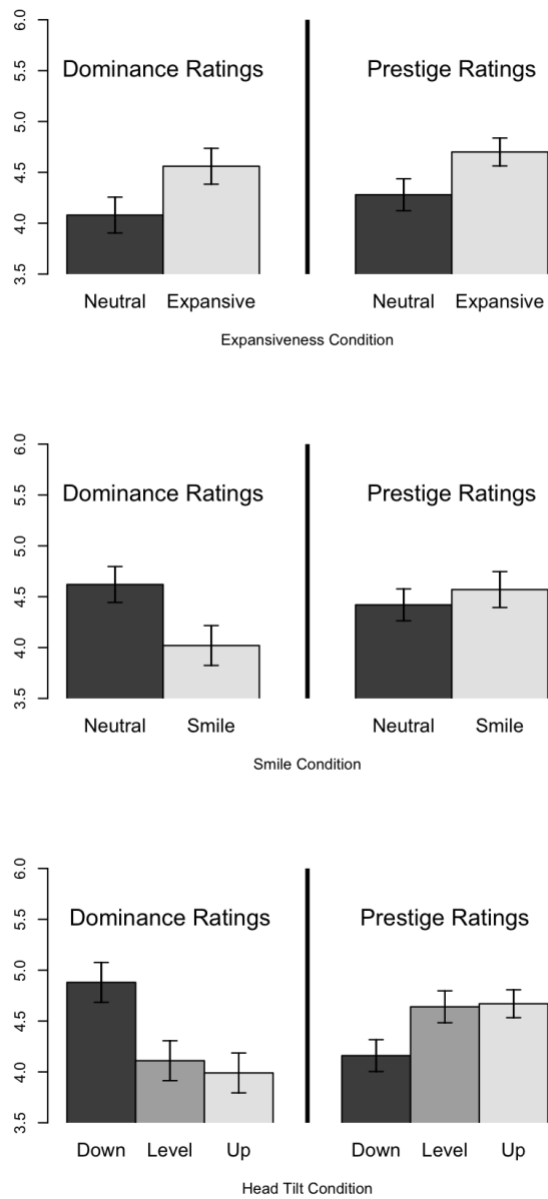


Figure 2. Mean Judgments of Dominance and Prestige by Condition, Study 1. Error bars indicate 95% CIs.

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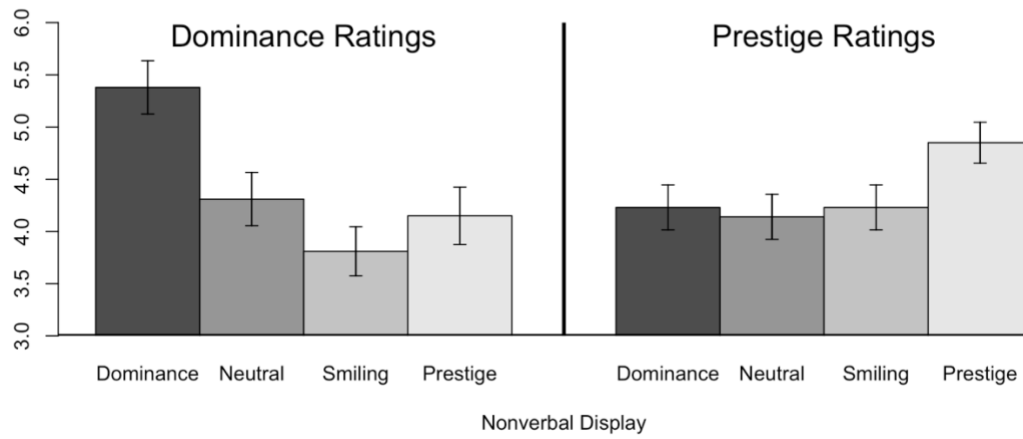


Figure 3. Judgments of Dominance and Prestige by Nonverbal Display, Study 2. Error bars indicate 95% CI.

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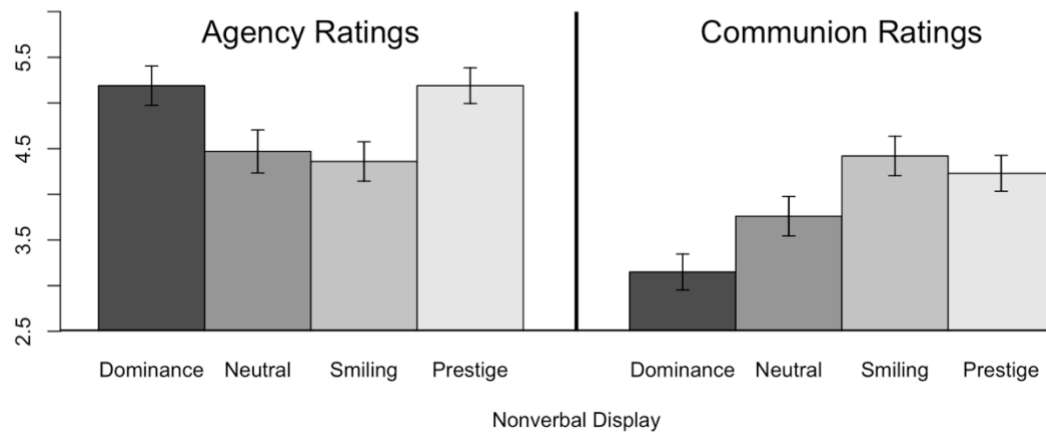


Figure 4. Perceptions of Agency and Communion by Nonverbal Display, Study 2. Error bars indicate 95% CI.

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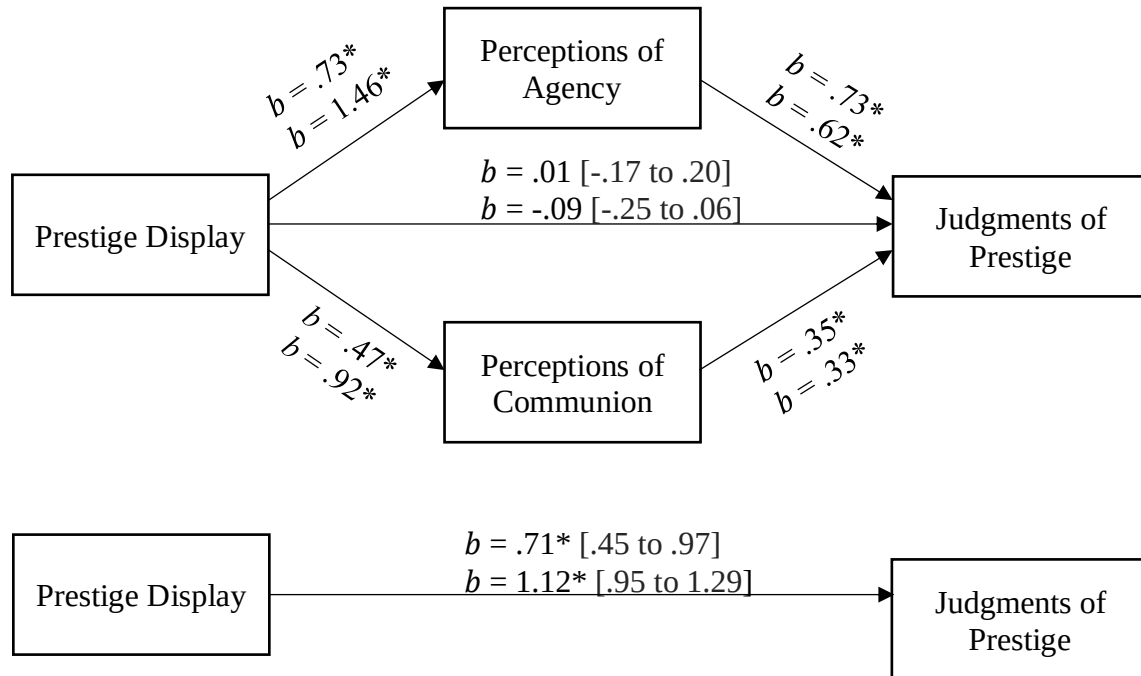


Figure 5. Effect of Prestige Display on Judgments of Prestige, Mediated by Perceptions of Agency and Perceptions of Communion, Studies 2 and 3.

Note. Coefficients from Study 2 are presented on top, and coefficients from Study 3 are presented on the bottom.

*95% CI does not cross zero, 95% CI presented in brackets for c' pathway.

Prestige display variable constitutes the comparison between the prestige display and the neutral display.

Unstandardized coefficients were derived using MEMORE (Montoya & Hayes, 2017).

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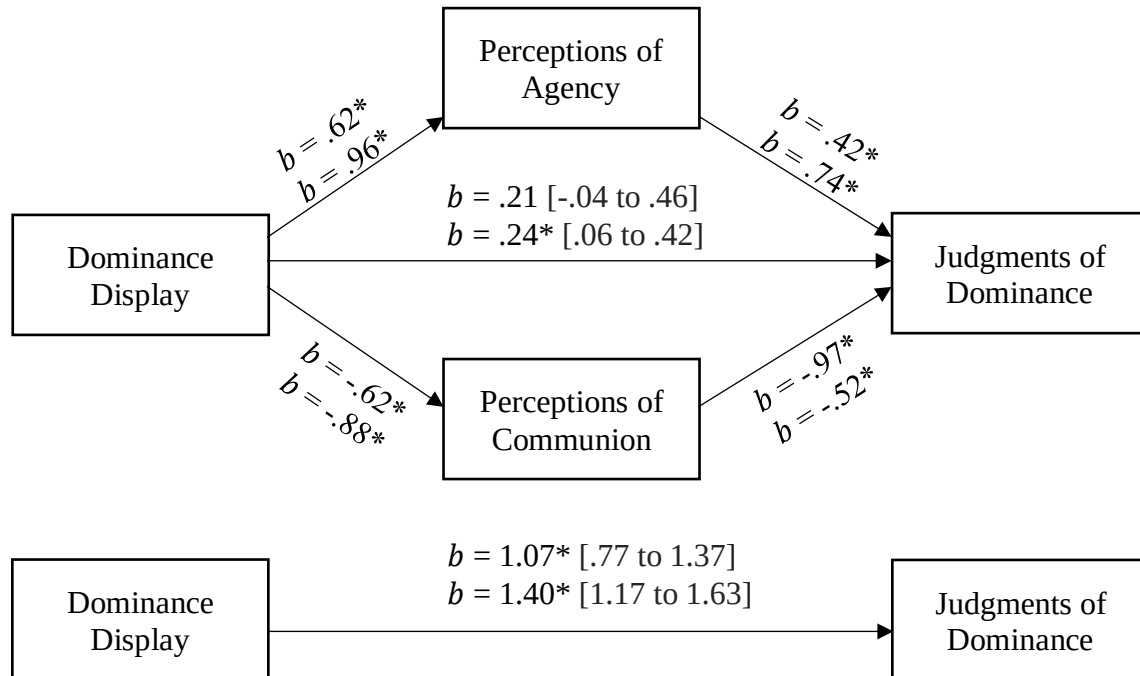


Figure 6. Effect of Dominance Display on Judgments of Dominance, Mediated by Perceptions of Agency and Perceptions of Communion, Studies 2 and 3.

Note. Coefficients from Study 2 are presented on top, and coefficients from Study 3 are presented on the bottom.

*95% CI does not cross zero. 95% CI presented in brackets for c' pathway.

Dominance Display variable constitutes the comparison between the dominance display and the neutral display.

Unstandardized coefficients derived using MEMORE (Montoya & Hayes, 2017).

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Figure 7. Prestige, Smiling, Dominance, and Neutral (from left to right) Display Stimuli used in Study 3

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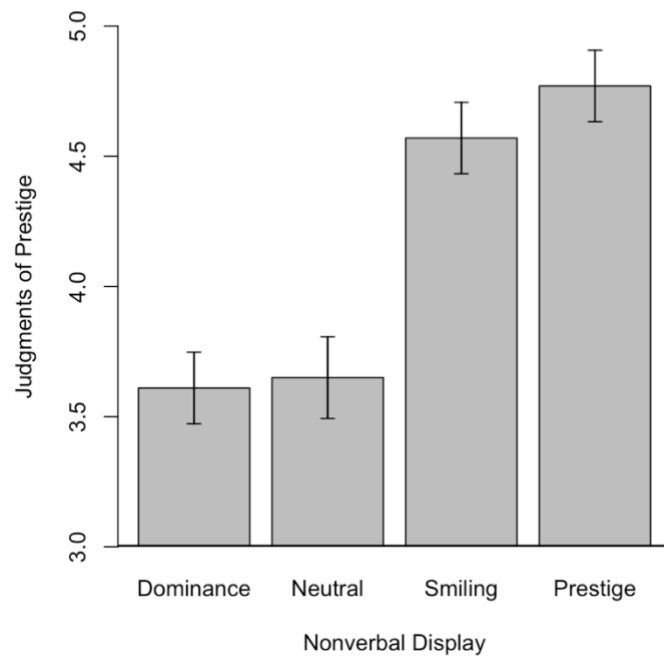


Figure 8. Judgments of Prestige by Nonverbal Display, Study 3.
Note. Error bars indicate 95% CI.

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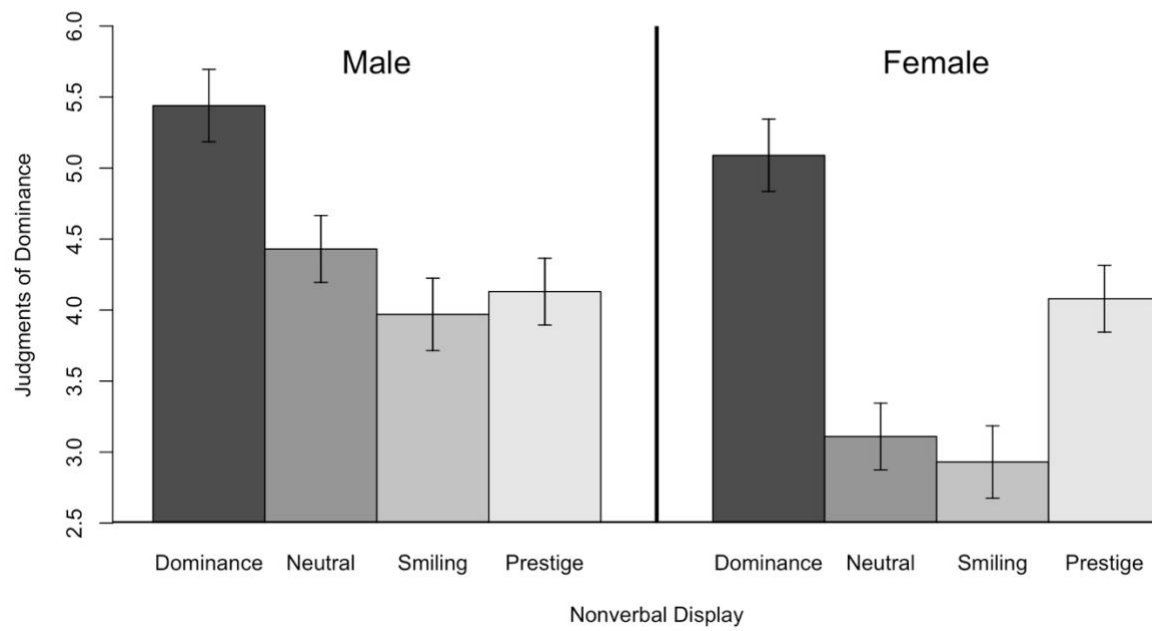


Figure 9. Gender by Display Interaction Predicting Dominance, Study 3.
Note. Error bars indicate 95% CI.



Figure 10. Example of Prestige (top left), Smiling (bottom left), Dominance (bottom right), and Neutral (top right) Stimuli used in Studies 4a and 4b.

Note. The above 2x2 grid format is an example of the format that participants viewed in Study 4b. To minimize any potential order effects, the configuration of displays in the four grids was randomized across participants.

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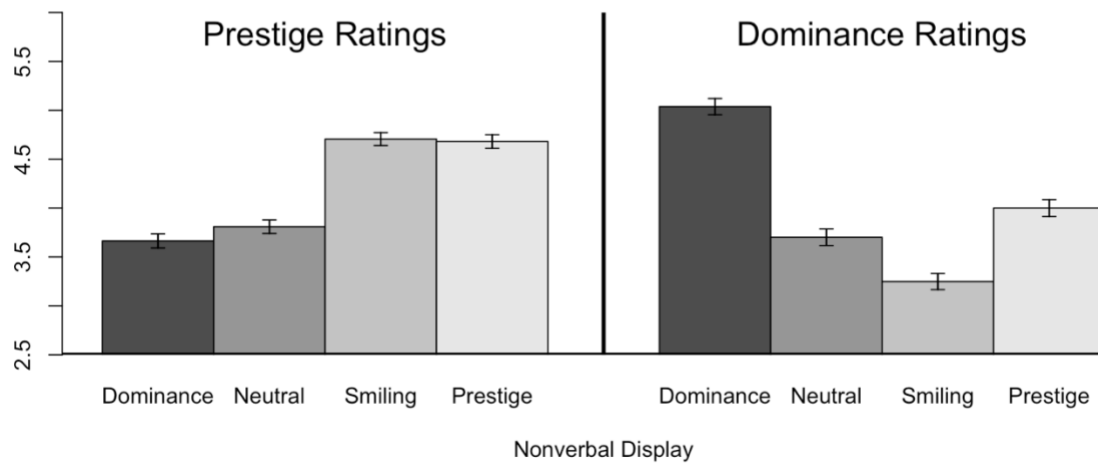


Figure 11. Judgments of Prestige (left) and Dominance (right) for Each Nonverbal Display, Study 4a.

Note. Error bars indicate 95% CI.

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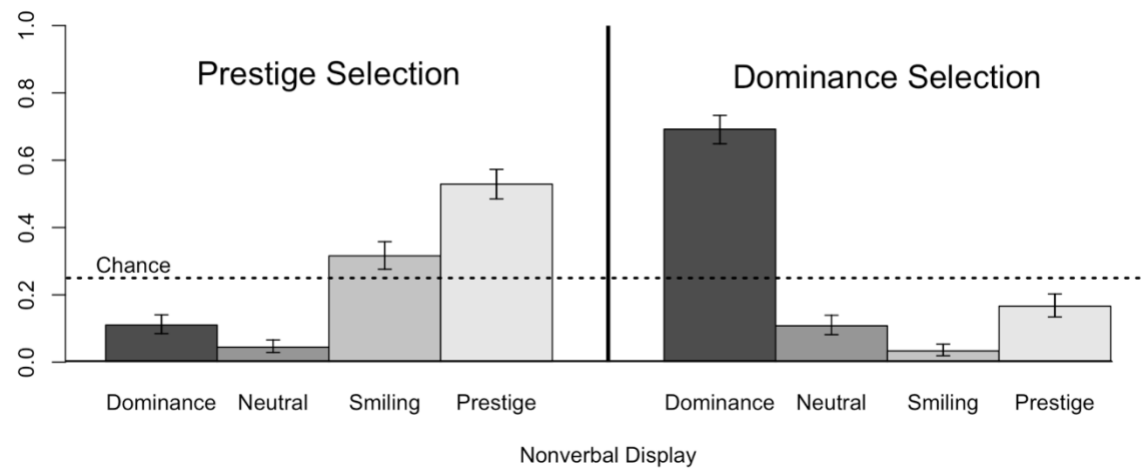


Figure 12. Proportion of Selections for Each Nonverbal Display in the Prestige (left) and Dominance (right) Condition, Study 4b.
Note. Error bars indicate 95% CI.

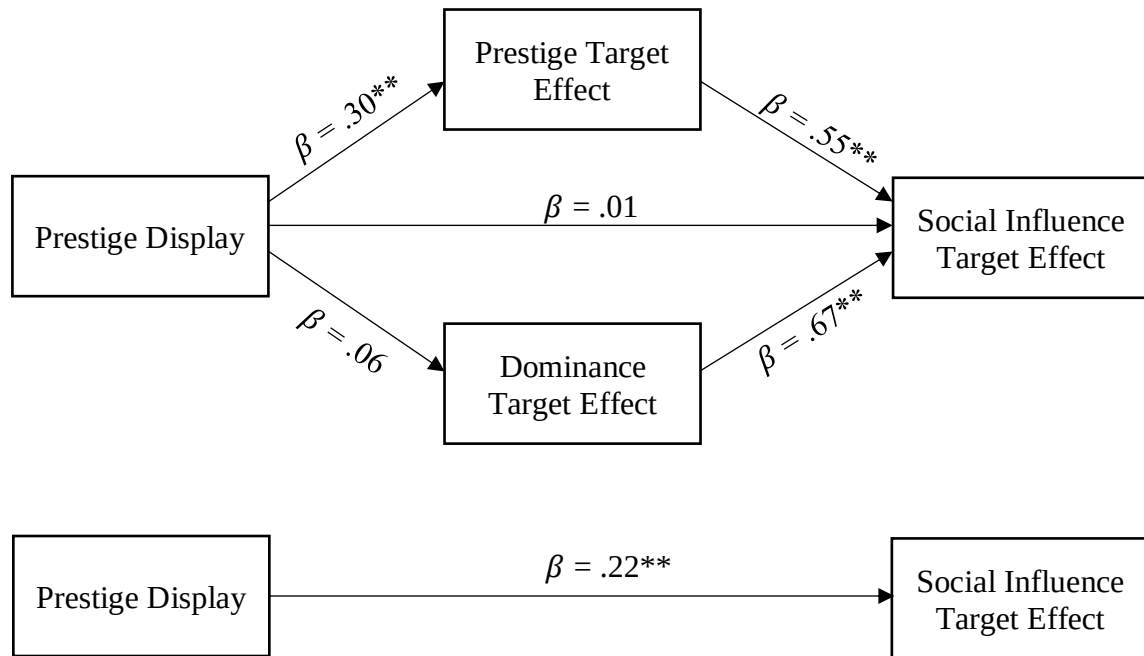


Figure 13. Effect of Prestige Display on Social Influence, Mediated by Perceptions of Prestige, Study 5.

Note. $^{**}p < .01$. Target effects were derived using Social Relations Model (Kenny & La Voie, 1984).

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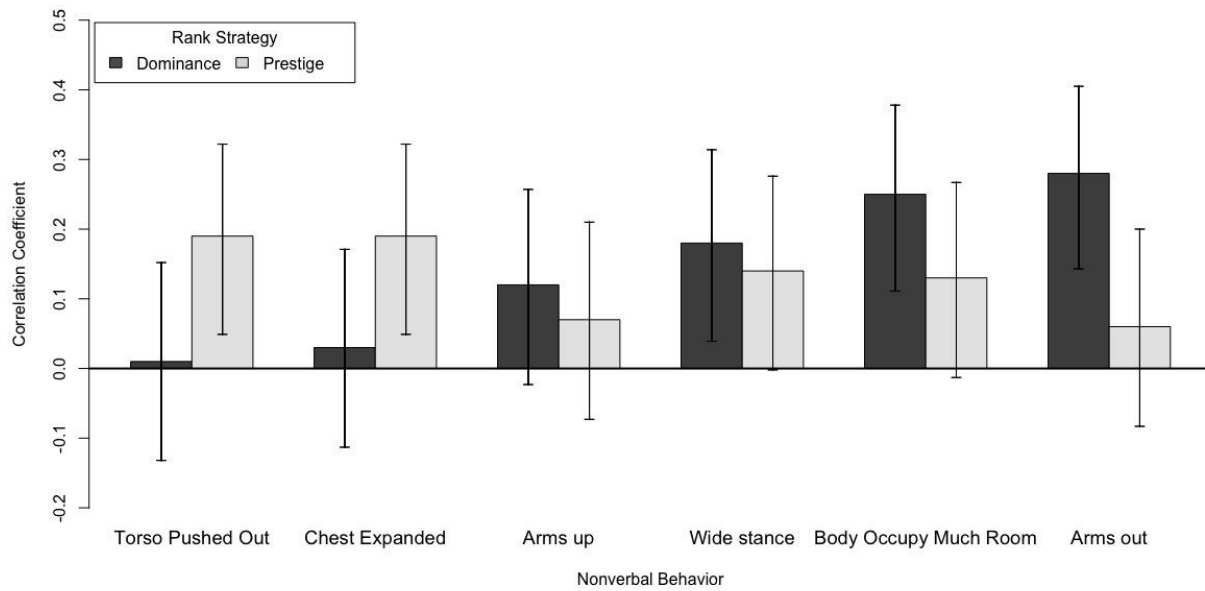
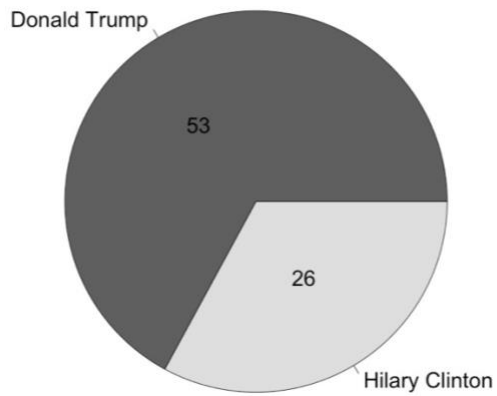


Figure 14. Correlations Between Each Expansive Behavior and Rank Strategy, Study 5. Note. Error bars indicate 95% CI around each correlation.

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Proportion of Attacks by Each Candidate



Demonstrations of Expertise by Each Candidate

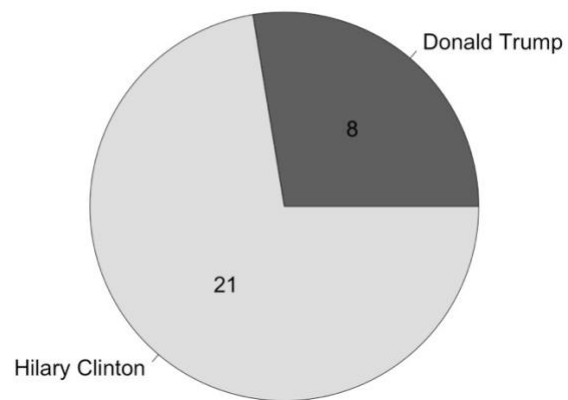


Figure 15. Proportion of Attacks (indicating Dominance) and Demonstrations of Expertise (indicating Prestige) by Each Candidate, across the Three Presidential Debates, Study 6

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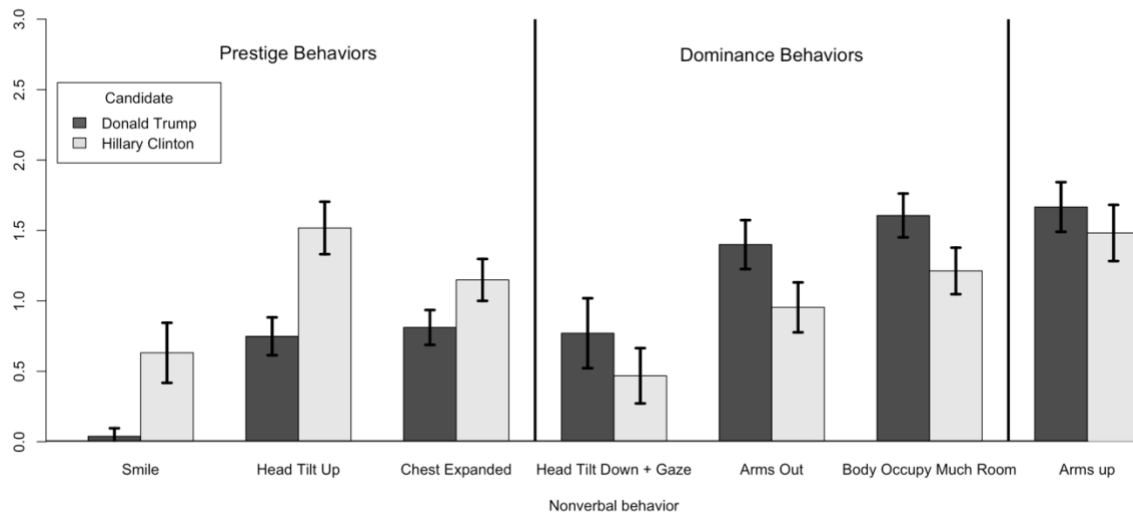


Figure 16. Nonverbal Behaviors Displayed by Each Candidate Across the Three Presidential Debates, Study 6.

Note. Error bars indicate 95% CI.

Endnotes

¹ Although we focus here on visually observable nonverbal behaviors, a large body of work indicates that humans (and other species) also rely extensively on vocal signals for communicating social rank; numerous studies suggest that deeper vocal pitch is associated with higher rank (e.g., Cheng, Tracy, Ho, & Henrich, 2016; Puts, Gaulin, & Verdolini, 2006; Leongómez, Mileva, Little, & Roberts, 2017), though one set of studies found the opposite, a positive association between high pitch and rank (Ko, Sadler, Galinsky, 2014). Distinguishing between dominance and prestige might help resolve this apparent inconsistency. In fact, a recent set of studies found that the vocal pitch of dominant, but not prestigious, individuals dynamically deepens across a set of utterances (Cheng et al., 2016). Future studies are needed to explore whether this distinction also influences static pitch levels.

² One interesting exception is that when facing threat or uncertainty, individuals may preferentially select dominant leaders, whose force and coercive capacities become deemed as locally valued attributes (Kakkar & Sivanathan, 2017; Lausten & Petersen, 2017; van Vugt & Grabo, 2015).

³ Failing to differentiate between distinct forms of high rank can obfuscate important diverging effects that emerge when these distinctions are made. For example, by distinguishing between an “empathic/responsible” and a more “egoistic/aggressive” version of high rank, Hall, Schmid-Mast, and Latu (2005) observed diverging relationships with social perception accuracy – a construct related to emotion intelligence— such that individuals high in the more empathic/responsible form of high rank tended to show strong social perception accuracy, whereas those high in the more egoistic/aggressive form demonstrated marginally worse perception accuracy.

⁴ Smiling was based on movement created from symmetrical activation of the Zygomatic major muscle, outlined by elongated and angled lip corners raised infraorbital triangle, and deepening of the nasolabial furrow (AU 12 of FACS; Ekman & Friesen, 2002). However, the artificial appearance of the avatar and his closed lips might have also led to the appearance of lips pressed together (AU 24).

⁵ Perceptions of liking and influence were also measured, using researcher-generated items. Details on methods and results based on these scales are presented in the SOM.

⁶ Analyses using multilevel modeling, including models with covariates, are reported in the SOM for Studies 1, 2, and 3.

⁷ Although this logic assumes heterosexuality, this is a reasonable assumption for the large majority of the sample; estimates suggest that 95% of M-Turk workers report being largely or entirely heterosexual (Beall, 2016)

⁸ To maintain consistency with the closed-mouth smile portrayed in the prestige display, we asked targets portraying smiling faces to show a closed mouth smile (AUs 6+12). However, incidental variation in muscle activation appeared across images in this condition; for example, in several photos orbicularis oculi activation (AU 6) was challenging to observe due to shadowing or image quality, and one smile included parted lips (AU 25; likely due to intense activation of AU 12). All stimuli can be found in the SOM.

⁹ Confidence intervals were constructed around correlation coefficients with 100 bootstrapped samples based on Biesanz (*under review*).

¹⁰ Although three coders were used to code all nonverbal behaviors, the coding performed by one of these individuals was excluded for the items *chest expanded* and *body occupies much room* to improve inter-rater reliability.