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Nonverbal displays of dominance and prestige: Evidence for cross-cultural and early-emerging recognition

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Author note:
Both studies were preregistered. Preregistrations, materials, and data are openly available at https://osf.io/yw5kq (Study 1), osf.io/tg3fe (Study 1 translations), and https://osf.io/5ma7k (Study 2).

Author contributions:
Zachary Witkower served as the lead author of this project by conceptualizing the research, designing the methodology, conducting formal analyses, drafting and editing the writing, visualizing the data, conducting the investigation, curating the data, and managing project administration. Alexander Hill supported this project by conducting the investigation, curating data, designing the methodology, and editing the writing. Anthea Pun supported this project by conducting the investigation, designing the methodology, and editing the writing. Andrew Baron supported this project by providing resources, supervision, and editing the writing. Jeremy Koster supported this project by providing resources, conducting the investigation, supervising, and editing the writing. Jessica Tracy supported this project by conceptualizing the research, acquiring funding, providing resources, designing the methodology, supervising, and drafting and editing the writing.

Abstract:

Two universal strategies for attaining influence – *dominance*, or the use of intimidation and force to obtain power, and *prestige*, or garnering respect by demonstrating knowledge and expertise – are communicated through distinct nonverbal displays in North America. Given evidence for the emergence and effectiveness of these strategies across cultures, including non-WEIRD small-scale, traditional societies in Africa, Asia, and South America, the nonverbal displays that are used to reliably communicate these strategies also might be universal. Here, we demonstrate that the dominance display is recognized by the Mayangna, a small-scale society in rural Nicaragua, and by Canadian children as young as 2 and 3 years old. We also find that the prestige display is reliably differentiated from dominance by both groups, and judged as a high rank signal by the Mayangna. However, members of the Mayangna confused the prestige display with happiness, and children confused the prestige display with a neutral expression. Overall, findings are consistent with a ubiquitous and early-emerging ability to recognize dominance, and with the suggestion that the prestige display is more culturally variable and ontogenetically slower to emerge.

Public Significance:

This research is the first to test whether two distinct nonverbal signals of social rank are cross-culturally recognized and early emerging. Distinct displays of dominance and prestige were reliably differentiated by individuals from two populations unlikely to have learned these displays as a result of enculturation or acculturation: the Mayangna of Nicaragua, and young children in Canada. Our findings are consistent with a universal and early-emerging ability to recognize dominance, and suggest that recognition of prestige as a high-rank display also may be universal, but is more culturally variable and ontogenetically slower to emerge.

Two distinct human status signals: Evidence for nonverbal displays of dominance and prestige in a small-scale society and young children

Across species, social rank affords access to material and social resources, influence and attention, and higher quality mates (Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Maner & Case, 2016; Maner, 2017; Von Rueden, Gurven, & Kaplan, 2008; 2010; Witkower, Tracy, Cheng, & Henrich, 2020; Brown & Maurer, 1986; Vacharkulksemsuk et al., 2016). Evidence from anthropology, evolutionary biology, and psychology suggests that humans use two distinct strategies to attain social rank and influence others: *dominance*, which involves the use of aggression and intimidation to elicit fear and forced deference, and is prevalent across the animal kingdom; and *prestige*, which involves the demonstration of knowledge and expertise to elicit respect and freely conferred deference (Cheng et al., 2013; Maner & Case, 2016; Maner, 2017; Cheng, Tracy, & Henrich, 2010; Henrich & Gil-White, 2001; Garfield, von Rueden, & Hagen, 2019). Numerous studies have found that dominance and prestige are distinct and independent strategies for effectively acquiring social rank in a wide range of social groups (e.g., Cheng et al., 2013; Anderson, Sharps, Soto, & John, 2020; Brand & Mesoudi, 2019; von Reuden, Gurven, & Kaplan, 2008), and emerge across human populations, including Western, Educated, Industrialized, Rich, and Democratic (i.e., WEIRD; Henrich, Heine, & Norenzayan, 2010) societies like the United States and Canada, as well as non-WEIRD, small-scale, traditional societies such as the Semai, Tsimane, and Chabu of Malaysia, Bolivia, and Ethiopia, respectively; Cheng et al., 2013; Von Rueden et al., 2008; Witkower et al., 2020; Henrich & Gil-White, 2001; Garfield et al., 2019; Dentan, 1968; von Rueden, Gurven, & Kaplan 2011; Garfield & Hagen, 2019).[1] Furthermore, children as young as 21-31 months are able to discriminate between high-ranking

[1] Although some recent work suggests that prestige (but not dominance) is the only a viable strategy for gaining social rank in human groups (Durkee et al., 2023), the conclusion from these authors was based on data suffering from severe multicollinearity. When reanalyzed in several ways to address this statistical limitation, both dominance and prestige

individuals who attain social rank via force versus freely accorded deference, suggesting that by even this young age children possess an understanding of the distinction between dominance and prestige (Thomas, Thomsen, Lukowski, Abramyan, & Sarnecka, 2018). These two strategies thus may represent two distinct evolved psychological and behavioral means for attaining influence.

Within North American samples, these two strategies have been associated with distinct nonverbal displays, each of which promotes increases in perceived social rank (Witkower et al., 2020). The reliably recognized dominance display includes a combination of bodily expansiveness (e.g., expanded posture, arms stretched out, hands on hips), a downward head tilt (see Witkower & Tracy, 2019),[2] and no smile and the reliably recognized prestige display includes similar bodily expansiveness but with an upward head tilt and small smile[3] (Witkower et al., 2020; Witkower & Tracy, 2019). Studies probing these displays have found that all three behaviors have independent effects on perceptions of dominance and prestige, though downwards head tilt causes the largest increase in dominance perceptions (Witkower et al., 2020; Witkower, Rule, & Tracy, under review; Witkower & Tracy, 2019). Both displays are spontaneously shown by individuals engaging in dominance or prestige strategies during times of hierarchy formation and rank conflict, and each is reliably judged as conveying one form of high rank and not the other (Witkower et al., 2020; Witkower & Tracy, 2019). Prior research has not tested whether these nonverbal displays are cross-culturally associated with

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emerged as substantial and significant predictors of rank (Cheng et al., 2023). In fact, we are aware of no studies that have found evidence suggesting that only prestige, and not dominance, is an effective means to social rank in a human group.

[2] Numerous studies have shown that a downwards head tilt is a strong signal of dominance and *not* prestige (Witkower & Tracy, 2019; Witkower & Tracy, 2021; Witkower et al., 2020), whereas an upwards head tilt, when paired with a smile, strongly communicates prestige and not dominance (Witkower et al., 2020). This effect occurs because tilting one's head downward causes the eyebrows to appear V-shaped, producing an appearance almost identical to that which occurs when individuals do not tilt their head but activate their facial corrugator muscle (i.e., Action Unit 4 in FACS, or AU4) – a movement associated with the communication of dominance and threat across cultures and ages (Witkower & Tracy, 2019; Witkower et al., 2021).

[3]Smiling may have originated in primate appeasement displays, which originally functioned to pacify aggressive behavior and facilitate peace (e.g., Van Hooff, 1967; Peterson, Dubuc, & Higham, 2018).

dominance and prestige, or, more broadly, whether there are two distinct nonverbal displays that reliably signal high social rank across cultures.

If dominance and prestige are evolved strategies for achieving social rank, their associated nonverbal displays are likely to be universally recognized signals, and therefore universally distinguishable from one another. Given the distinct social messages that individuals engaging in dominance and prestige strategies need to send in order to maintain their position— threat, intimidation, and strength on the one hand; and kindness, empathy, and knowledge or competence on the other—it is likely that these two strategies would be associated with distinct recognizable displays (Witkower et al., 2020). Furthermore, observers would likely benefit from reliably discriminating between dominant and prestigious leaders, so as to respond most adaptively to each: avoiding and appeasing the former while following and copying the latter.[4] Exhibiting an inappropriate response to either strategist could have negative fitness consequences: choosing to learn from a dominant or copying his or her aggressive behavior without the physical prowess necessary to win fights could result in injury or death (Sell, Hone, & Pound, 2012; Sell, Tooby, & Cosmides, 2009), and avoiding a prestigious leader could result in lost opportunities for social learning (Witkower et al., 2020; Tracy et al., 2020). Distinguishable nonverbal displays of dominance and prestige are therefore likely to have been adaptive for both displayers and observers.

If distinct nonverbal displays of dominance and prestige constitute evolved features of the human behavioral repertoire, rather than a result of enculturation or acculturation, they should be recognizable across human populations and from a young age. We tested these hypotheses in the present research. In Study 1, we used the "maximally divergent population" approach (Norenzayan &

[4] Notably, copying a prestigious individual is not *always* the most optimal approach, in all contexts. For example, it can be counterproductive to copy a prestigious leader's behavior if one does not possess the physical or mental capacity to effectively wield the replicated behavior (e.g., copying Shaquille O'Neal's specific basketball playstyle without his physical strength and imposing stature will likely lead to an unsuccessful basketball career).

Heine, 2005; see also Witkower & Tracy, 2022) to assess perceptions of nonverbal displays of dominance and prestige in a population geographically and culturally separated from North Americans: the Mayangna and Miskito from Arang Dak in Nicaragua (whom we refer to as the Mayangna). We use the term maximally divergent in a broad sense, to refer to individuals from largely culturally and/or geographically isolated societies, rather than to suggest that we studied two populations that are as different as could possibly exist. This approach uses the logic of population and cultural divergence to draw inferences about likely universality. Given that the Mayangna are unlikely to have learned about Western nonverbal displays through cross-cultural transmission, evidence that they reliably recognize Western-derived displays provides strong support for the suggestion that these displays are widely generalizable and may be human universals. It is difficult to explain how people from such disparate groups, with little-to-no contact, could have independently constructed or learned the same sets of facial or bodily movements to convey each form of high rank, making universal origins the most plausible explanation (Heine & Norenzayan, 2005; Witkower & Tracy, 2020).

In Study 2, we tested whether children aged 2-12 years can reliably recognize these displays. Although infants as young as 6 months associate increased body size with higher social rank (Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011), children do not associate expansive nonverbal behaviors with social rank until the age of 4 or 5 years (Terrizzi, Brey, Shutts, & Beier, 2019*,* Brey & Shutts, 2015). Furthermore, it is unclear whether this finding is attributable to an association between expansiveness and high rank or contractedness and low rank (Terrizzi et al., 2019, Brey & Shutts, 2015). However, other studies have shown that by 21 months children have the capacity to differentiate dominance and prestige from vocal cues and observed aggressive vs. admiring behavior (e.g., Margoni et al., 2018). Given the totality of these prior findings, we hypothesized that children would be able to recognize two distinct forms of status – prestige and dominance – from validated nonverbal displays by age 4.

The present research therefore extends prior work by testing whether 4- and 5-year-old children associate dominance and prestige with two distinct nonverbal displays (Terrizzi et al., 2019, Brey & Shutts, 2015). To assess the trajectory of dominance and prestige recognition across development, we also collected data from younger children (ages 2-3), older children (ages 6-12), and adults. An ability to discriminate between dominance and prestige displays early in life would suggest that recognition of these displays is largely independent of socialization and may follow a similar developmental trajectory to that of other evolved nonverbal signals, such as emotion expressions, which are explicitly recognized by the age of 3 or 4 years (Tracy, Robins, & Lagattuta, 2005; Camras & Allison, 1985; Felleman, 1983; Izard, 1971; Nelson & Russell, 2011).

In sum, the present pre-registered research (https://osf.io/yw5kq; https://osf.io/5ma7k) constitutes the first test of whether dominance and prestige are reliably identified from distinct nonverbal displays across widely varying cultural contexts and ages.

Study 1: Do individuals from a small-scale society recognize distinct displays of dominance and prestige?

Participants

The Nicaraguan community was comprised of indigenous Mayangna[5] horticulturalists living primarily in the forested region of the Bosawas Biosphere Reserve (Winking, Eastwick, Smith, & Koster, 2018; Koster, 2018; Sznycer et al., 2018; Koster, Grote, & Winterhalder, 2013). Our final sample consisted of 119 individuals in the community (65 female, 54 male), who ranged from age 18 to 75 (*M* age = 34.23; *SD* age = 14.62).

Several factors make it likely that these individuals have little familiarity with Western global culture. First, only 15% indicated that they could read and write fluently in Spanish – the national

[5] Roughly 15% of participants identify as Miskito, rather than Mayangna. Given that the large majority of the sample identify as Mayangna, we refer to the sample as Mayangna throughout this article.

language of Nicaragua. Second, participants had little formal education (M = 6.0 years, SD = 4.12 years) and minimal direct exposure to western media (71% had never seen a US movie, 84% had never seen a US television program, and 94% had never used the internet).[6] Third, nearly all participants had never left Central America (97%) or Nicaragua (95%). Roughly half (47%) reported leaving their village once per year or less, and the other half (49%) reported leaving the village roughly once per month. Finally, market integration is low; the nearest market town is approximately 15 hours away by boat.[7] That said, participants might have experienced some minimal exposure to Western culture as a result of meeting members of the current research team (or previous research teams), as well as sporadic visits from non-indigenous health officials, conservationists, or representatives. Older members of the community might have encountered American military personal during the Contra war in the 1980s.

Given our goal of recruiting individuals who possess limited to no knowledge about Western popular culture, allowing us to draw conclusions about people who have little or no knowledge of the culture where the dominance and prestige displays have thus far been documented, we first assessed participants' familiarity with Western popular culture. We did so by asking them to identify images of 13 global celebrities, who were selected based on a Google search, conducted shortly before data collection, for the 'most recognizable faces in North America': Donald Trump, Barack Obama, Hillary Clinton, Oprah Winfrey, Will Smith, Brad Pitt, Taylor Swift, Lebron James, Lionel Messi, Cristiano Ronaldo, Michael Jordan, Elvis Presley, and Abraham Lincoln. To assess participants' exposure to the culture of industrialized Nicaragua, we also showed them an image of Daniel Ortega, the current

[6] Approximately ten years ago two families in the community experimented with satellite dishes, but they were not maintained. There are currently no satellite dishes available in the community, so nobody watches television regularly. A few families have old DVD players, but it is unclear whether any of these still work. There are no television shows or movies available in their indigenous language, and although a small proportion of individuals might have exposure to Spanish movies and television, very few participants (4%) fluently speak in Spanish.

[7] Adults typically spend more than 95% of their days in the indigenous village. At least 90% of their calories come from their own subsistence strategies (e.g., horticulture, hunting, fishing, domestic animals).

President of Nicaragua who served as head of state in non-concurrent terms for 22 of the 40 years preceding data collection. We limited this task to 13 images because adding more would have required us to cut back on the experimental procedure time. For each image, participants were asked "Who is this?" and responded aloud in an open-ended fashion. On average, participants recognized fewer than one of the 13 popular cultural icons (M= 0.51 images, SD = .84, range = 0 to 3; mode = 0), and 66% recognized Ortega. We used these results to create the following participant categories, which we analyzed separately in order to provide more stringent tests of our hypotheses: (a) the full sample (N = 119), (b) participants who did not recognize President Ortega or any of the 13 cultural icons (n = 36), and (c) participants who failed to recognize any of the 14 images, had no formal education, and could not fluently read and write in Spanish (the national language of Nicaragua; n = 13).[8] These three categories constitute our *full isolated sample*, *very isolated sample*, and *most isolated sample*, respectively, in all analyses assessing recognition rates for the Mayangna.

Procedure

Participants responded to a series of 68 trials in which they were shown two nonverbal displays side-by-side and asked to select the image that best corresponded to a given prompt.[9] Each trial included one of four possible target individuals (a White or Central American male or female) posing two of four possible displays: dominance, prestige, smiling, and neutral (see Figure 1). One display in each pair corresponded to the prompt while the other served as a foil; the order of accurate expression and foil were counterbalanced across all trials. To assess recognition of dominance and prestige, we

[8] Category A is our pre-registered sample. We also pre-registered our intention to explore whether observed effects were robust across levels of western cultural exposure and literacy, but the specific criteria used for categories B and C were not specified a priori.

[9] All participants in Study 1 completed all procedures before participating in two additional studies addressing different theoretical questions. One of these examined emotion recognition (i.e., anger, fear, sadness) from body-only (i.e., face occluded) images (Witkower et al., 2021), and the other tested for the presence of the previously documented action unit imposter effect (Witkower & Tracy, 2019) in this unique sample (Witkower, Hill, Koster, & Tracy, 2022). Given that these other two studies were conducted after the completion of Study 1, participation in them could not have affected data collected in Study 1.

prompted participants to “Please select the image in which the person is” either “likely to be a leader because he/she is willing to use aggression and intimidation to get his/her way” (to assess dominance) or “accomplished and admired, and shares useful knowledge with others” (to assess prestige). This resulted in a total of 24 trials to assess recognition of dominance and prestige (i.e., two different prompts, three comparisons contrasting the accurate expression to all other foils, for four target individuals).[10] Neutral expressions were included as foils to test whether the dominance and prestige displays increased perceptions of dominance and prestige, respectively, compared to a baseline neutral display. A smiling expression was included as a foil to test whether the prestige display increased perceptions of prestige and power compared to smiling alone (Witkower et al., 2020).

Figure 1. Examples of dominance (far left), prestige (left middle), smiling (right middle), and neutral (far right) stimuli shown to Mayangna participants in Study 1 (panel A), and child participants aged 2-12 years in Study 2 (panel B).

[10] Prior to conducting the research, English versions of the prompts used to assess recognition of dominance and prestige were validated in U.S. samples (see SOM).

Additional prompts were administered in 24 trials to assess recognition of the happiness and neutral displays (see SOM), as well as the prompt 'Please select the image in which the person is powerful' in an additional 20 trials to assess whether both dominance and prestige displays were perceived as conveying high power. The 20 trials involving this last prompt required participants to view the dominance or prestige display side-by-side with each of the other three displays (including each other) for all four targets. All materials were translated from English to Spanish (and back-translated from Spanish to English) prior to the study, and then translated from Spanish to the Mayangna and Miskito languages on-site by J.K. and two research assistants fluent in Spanish, Mayangna, and Miskito (for original materials in English, Spanish translations of those materials, and Spanish-to-English back-translations, see osf.io/tg3fe).

Transparency and openness

We report all data exclusions, all manipulations, and all measures in the study, and we follow Journal Article Reporting Standards (Kazak, 2018). Preregistration and data are available at https://osf.io/yw5kq. Data were analyzed using R, version 4.0.0 (R Core Team, 2020).

Results

Figure 2 shows recognition rates (and binomial tests with 95% CIs[11]) for trials assessing dominance and prestige recognition, collapsed across selections made by all participants in response to all targets and foil comparisons. For all three participant categories (i.e., full isolated sample, very isolated sample, and most isolated sample, as outlined above), recognition rates were high and significantly greater than chance ($ps < .001$[12]). Specifically, across all foil comparisons, our full isolated sample accurately selected the dominance display 88% of the time (95% CI: [86% to 90%]),

[11] Binomial confidence intervals were obtained using a procedure described by Clopper and Pearson (1934).
[12] Generalized linear mixed effect models accounting for nesting were also conducted, and uncovered the same pattern of effects (see SOM-U).

our very isolated subsample accurately selected the dominance display 86% of the time (95% CI: [82% to 89%]), and our most isolated subsample accurately selected the dominance display 84% of the time (95% CI: [77% to 89%]). In addition, our full isolated sample accurately selected the prestige display 70% of the time (95% CI: [68% to 73%]), our very isolated subsample accurately selected the prestige display 70% of the time (95% CI: [66% to 75%]), and our most isolated subsample accurately selected the prestige display 76% of the time (95% CI: [68% to 82%]).

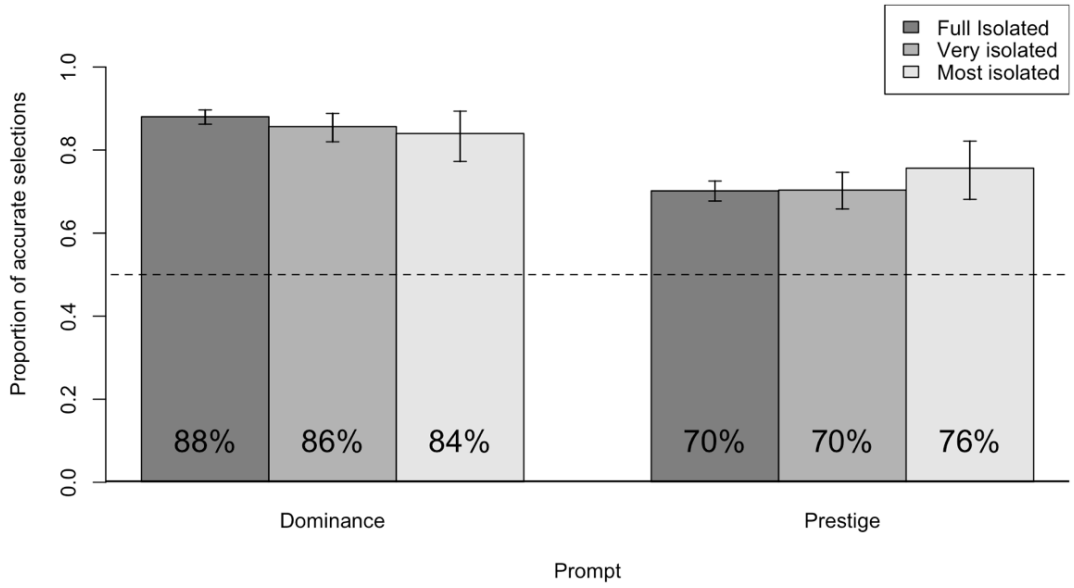

Figure 2. Accurate selection rates in response to the dominance prompt (left) and prestige prompt (right) among Mayangna participants categorized by exposure to Western global culture, Study 1. Recognition rates are collapsed across all foil comparisons. Error bars indicate 95% CIs.

Figure 3 and Table 1 show recognition rates (and 95% CIs) separately for each comparison made against each foil, for each participant category. The dominance display was recognized at rates significantly greater than chance in all comparisons and for all three subsamples. The prestige display was also recognized by all three subsamples at rates significantly greater than chance when the foil comparison was neutral or dominance, but not when the foil comparison was smiling.

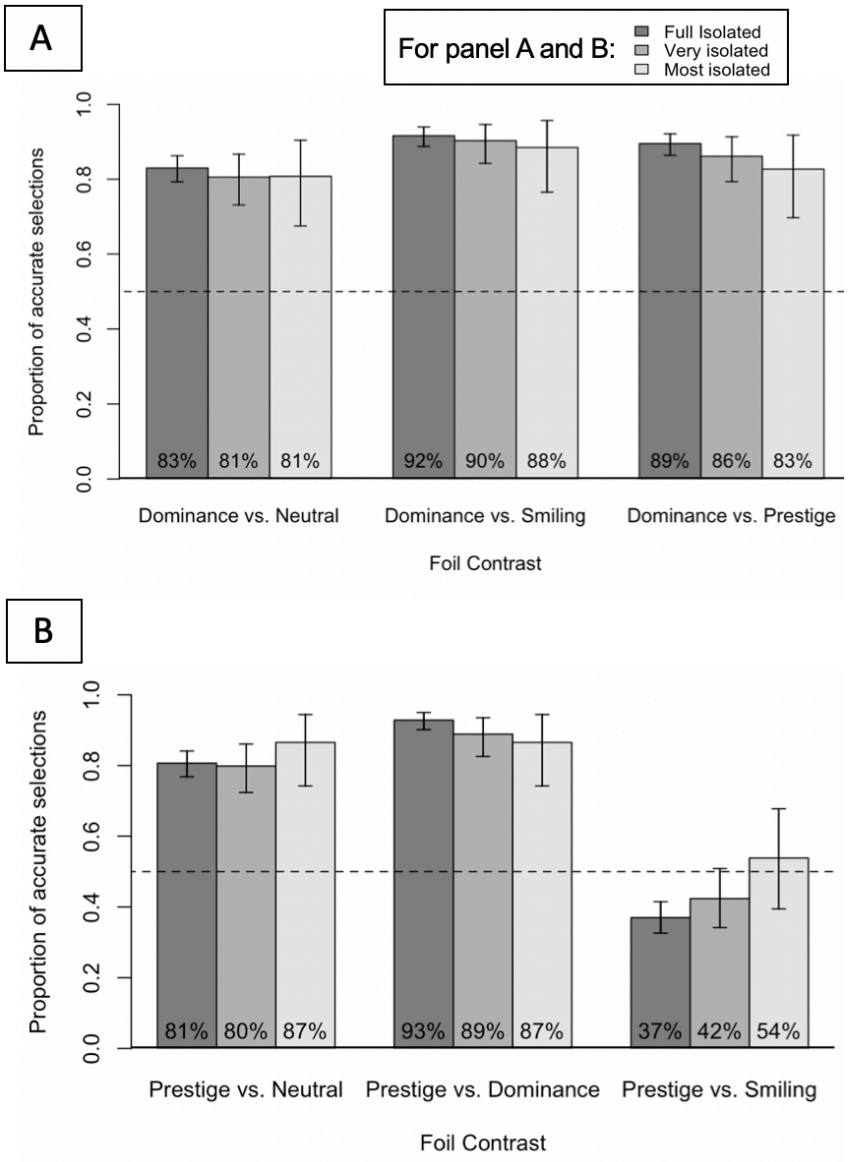

Figure 3. Mayangna participants' accurate selection rates in response to the dominance prompt (panel A) and prestige prompt (panel B), separated by foil comparison and subsample, Study 1. Error bars indicate 95% CIs.

Table 1. Mayangna participants' accurate selection rates in response to the dominance prompt and prestige prompt, separated by foil comparison and subsample, Study 1.

Comparison	*Recognition rate*	*95% CI*	*One sample binomial test (chance = 50%)*
Dominance prompt:			
Full isolated			
Dominance Vs. Neutral	83%	[79% to 86%]	$p < .001$***
Dominance Vs. Smiling	92%	[89% to 94%]	$p < .001$***
Dominance Vs. Prestige	89%	[86% to 92%]	$p < .001$***
Very isolated			
Dominance Vs. Neutral	81%	[73% to 87%]	$p < .001$***
Dominance Vs. Smiling	90%	[84% to 95%]	$p < .001$***
Dominance Vs. Prestige	86%	[79% to 91%]	$p < .001$***
Most isolated			
Dominance Vs. Neutral	81%	[67% to 90%]	$p < .001$***
Dominance Vs. Smiling	88%	[77% to 96%]	$p < .001$***
Dominance Vs. Prestige	83%	[70% to 92%]	$p < .001$***
Prestige prompt:			
Full isolated			
Prestige Vs. Neutral	81%	[77% to 84%]	$p < .001$***
Prestige Vs. Dominance	93%	[90% to 95%]	$p < .001$***
Prestige Vs. Smiling	37%	[33% to 41%]	$p < .001$***
Very isolated			
Prestige Vs. Neutral	80%	[72% to 86%]	$p < .001$***
Prestige Vs. Dominance	89%	[83% to 94%]	$p < .001$***
Prestige Vs. Smiling	42%	[34% to 51%]	$p = .08$
Most isolated			
Prestige Vs. Neutral	87%	[74% to 94%]	$p < .001$***
Prestige Vs. Dominance	87%	[74% to 94%]	$p < .001$***
Prestige Vs. Smiling	54%	[39% to 68%]	$p = .67$

Note: Data are also presented visually in Figure 3.

Figure 4 and Table 2 shows rates (and 95% CIs) at which participants identified both the dominance and prestige displays as signals of power. As hypothesized, both displays were identified as more powerful than the neutral and smiling displays, at rates significantly greater than chance in the full sample and both subsamples. Also as expected, the two high-rank displays did not differ from each other in perceptions of power.

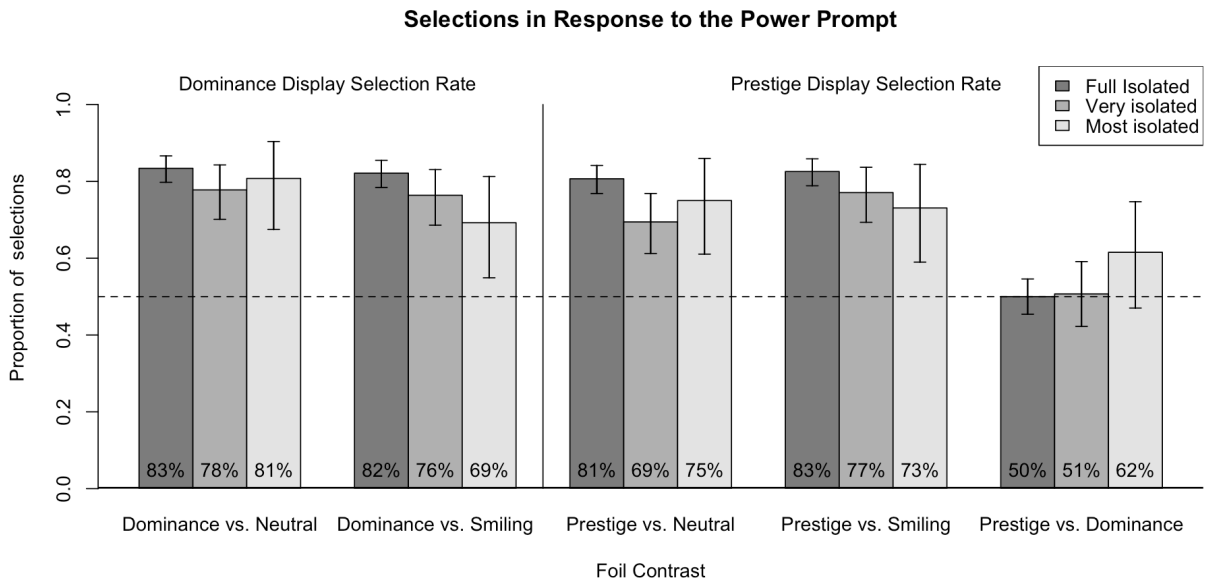

Figure 4. Mayangna participants' rates of selecting the dominance and prestige display in response to the power prompt, separated by foil comparison and subsample, Study 1.

Table 2. Mayangna participants' selection rates in response to the power prompt, separated by foil comparison and subsample, Study 1.

Comparison	*Selection rate*	*95% CI*	*One sample binomial test (chance = 50%)*
Full isolated			
Dominance Vs. Neutral	83%	[80% to 87%]	$p < .001$***
Dominance Vs. Smiling	82%	[78% to 85%]	$p < .001$***
Prestige Vs. Neutral	81%	[77% to 84%]	$p < .001$***
Prestige Vs. Smiling	83%	[79% to 86%]	$p < .001$***
Prestige Vs. Dominance	50%	[45% to 55%]	$p > .99$
Very isolated			
Dominance Vs. Neutral	78%	[70% to 84%]	$p < .001$***
Dominance Vs. Smiling	76%	[69% to 83%]	$p < .001$***
Prestige Vs. Neutral	69%	[61% to 77%]	$p < .001$***
Prestige Vs. Smiling	77%	[69% to 84%]	$p < .001$***
Prestige Vs. Dominance	51%	[42% to 59%]	$p = .93$
Most isolated			
Dominance Vs. Neutral	81%	[67% to 90%]	$p < .001$***
Dominance Vs. Smiling	69%	[55% to 81%]	$p = .007$**
Prestige Vs. Neutral	75%	[61% to 86%]	$p < .001$***
Prestige Vs. Smiling	73%	[59% to 84%]	$p = .001$***
Prestige Vs. Dominance	62%	[47% to 75%]	$p = .13$

Note: Selection rates refer to the proportion of participants who chose the display in **bold** as more powerful. Data are also presented visually in Figure 4.

It is noteworthy that although participants did not tend to identify the prestige display as more prestigious than the smiling display, they did identify the prestige display as more *powerful* than the smiling display (83%, $p < .001$). Combined with the findings that the prestige display was identified as more prestigious than both the neutral (81%, $p < .001$) and dominance (93%, $p < .001$) displays, and less dominant than the dominance display (89%, $p < .001$) by all subsamples, this result suggests that participants viewed the prestige display as a powerful expression that is clearly distinct from dominance, but is not deserving of admiration (i.e., an item used to assess prestige) compared to a smiling display.

Nonetheless, this pattern diverges from that previously observed in North American populations, where smiling targets are perceived as more prestigious than neutral and dominance displaying targets (presumably because smiling is an important component of the prestige display), but less prestigious than targets displaying prestige (Witkower et al., 2020; also see validation study reported in the SOM). The present findings are, however, consistent with results from another small-scale society. A study conducted in the Yasawan region of Fiji found that individuals there explicitly judged nonverbal displays of pride, which include the same behaviors as the prestige display examined here, as less high-status than smiling displays, while implicitly perceiving the two displays as equally strongly associated with high status (Tracy et al., 2013). That observed dissociation between explicit and implicit judgments was thought to be a result of cultural norms prohibiting the explicit appreciation of or respect for individuals who overtly display their status, despite a universal human association between pride (or prestige) displays and high status (Tracy et al., 2013, von Rueden & van Vugt, 2015; Boehm, 1999; Tracy, 2016). Similarly, in the current research Mayangna participants might have perceived the prestige display as powerful, yet felt restrained from explicitly reporting admiration for an individual who behaviorally communicated his or her high rank so overtly. In contrast, the dominance display, which is predicated on fear and aggression rather than liking and admiration, was

identified as both powerful and dominant, perhaps because while openly communicating one's status might decrease explicit perceptions of respect and admiration, it enhances explicit perceptions of intimidation and threat (i.e., the items used to assess dominance). Nonetheless, it is important to acknowledge that the pattern of results observed here also might indicate that the Mayangna do not perceive a distinction between prestige and smiling displays, though the finding that they reliably identified the prestige display as more powerful than the smiling display argues against this possibility.

Study 2: Can young children recognize distinct displays of dominance and prestige?

Participants

Two-hundred, ninety-three children between the ages of 2 and 12 years (M = 5.34, SD = 1.67) were recruited from a science center in Vancouver, B.C., and tested in a soundproof room located on-site (46% girls, 54% boys). As specified in our pre-registration plan (https://osf.io/5ma7k), our goal was to recruit at least 46 children aged 4-5 years and 46 children aged 6-8 years, to provide 80% power to detect a minimum recognition rate of 45% with a two-tailed test, the proportion threshold (i.e., chance) set at 25%, and alpha=.05. To identify the age at which recognition of dominance and prestige displays emerges, we recruited younger participants to the extent possible and tested them in a more exploratory (i.e., not preregistered) fashion. Children aged 6 through 8 were included as a more developmentally mature comparison group. Recruitment efforts were focused on younger rather than older children, and as a result, our sample size for children older than 8 years was small (n = 5) and therefore excluded from analyses (see SOM for these results). Our primary interest was in the 4- and 5-year-olds, as children begin to recognize universal emotion expressions reliably by age 4 (Garcia, Janis, & FLom, 2015; Tracy, Robins, & Lagattuta, 2005; Camras & Allison, 1985; Felleman, 1983; Izard, 1971; Nelson & Russell, 2011), and also have been found to reliably associate social rank with expansiveness at age 4 (Terrizzi, Brey, Shutts, & Beier, 2019; Brey & Shutts, 2015).

To compare children's recognition with that of adults, we recruited 281 American adults through Amazon Mechanical Turk; 44 of these individuals were excluded for failing an attention check (Witkower et al., 2020), yielding a final adult sample of 237. Adult participants were shown the same four nonverbal displays in a randomly ordered 2x2 array, and randomly assigned to identify either the dominance or prestige display using English versions of the prompts used with Mayangna participants in Study 1.

Procedure

Children were shown a dominance, prestige, neutral, and smiling display at once on an iPad, in a 2x2 array, and prompted to select either the prestigious or dominant target in a completely between-subjects design (i.e., each participant completed only one trial in which he or she responded to only one prompt), using language suitable for young children. This design prevented children from using a process of elimination. For the dominance prompt, children were asked, "Can you tell/show me who is mean, bossy, tough, or a bully?" For the prestige prompt, children were asked, "Can you tell/show me who is smart, and knows a lot of stuff they might teach you?" These prompts were intended to capture each form of high rank using language that would be understandable and appropriate for very young children. For both children and adults, the four displays shown were the same as those shown to the Mayangna participants, but here posed by a computer-generated male avatar (see Figure 1). Although different from the human targets used in Study 1, these stimuli are similar to computer-generated avatars used in previous research on children (Brey & Shutts, 2015; Terrizzi et al., 2019). Furthermore, computer-generated stimuli may lack some ecological validity but enable precise manipulations of bodily movements while ensuring that no incidental movements occur.

Transparency and openness

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study, and we follow Journal Article Reporting Standards (Kazak, 2018).

Preregistration and data are available at https://osf.io/5ma7k. Data were analyzed using R, version 4.0.0 (R Core Team, 2020).

Results

To test whether children can accurately recognize the dominance display, we assessed the proportion of children in each age group who selected the dominance display in response to the dominance prompt (see Figure 5 for selection rates and binomial tests for each pre-registered age group). For all age groups, recognition rates were significantly greater than chance. Specifically, 2- and 3-year-olds selected the dominance display 53% of the time (95% CI: [35% to 71%]), 4- and 5-year-olds selected the dominance display 72% of the time (95% CI: [58% to 83%]), 6- through 8-year-olds selected the dominance display 79% of the time (95% CI: [65% to 89%]), and adults selected the dominance display 82% of the time (95% CI: [74% to 89%]; all ps < .001). For all selections made by all age groups in response to the dominance prompt, see SOM, Table S5.

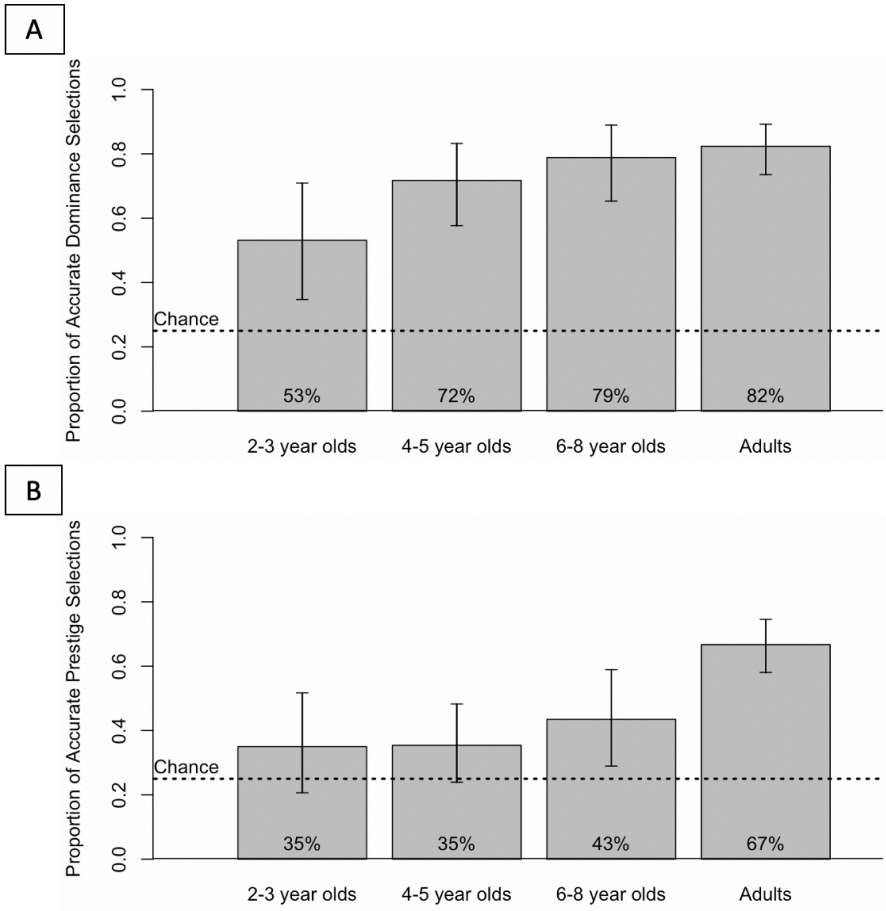

Figure 5. Children's accurate recognition rates for the dominance display (panel A) and prestige display (panel B) by age group, and including an adult comparison sample, Study 2. Error bars indicate 95% CIs.

To test whether children can accurately recognize the prestige display, we assessed the proportion of participants in each age group who selected the prestige display in response to the prestige prompt (see Figure 5). Two- and 3-year-olds accurately selected the prestige display only 35% of the time, a rate not significantly different from chance (95% CI: [21% to 52%], $p = .15$). Children aged 4-5 also selected the prestige display 35% of the time; in this case this rate was marginally above chance (95% CI: [24% to 48%], $p = .06$). For adults and children aged 6-8, recognition rates were significantly greater than chance, 67% (95%CI: [58% to 75%]) and 43% (95%CI: [29% to 59%]), respectively; ps $< .001$. These results suggest that children do not reliably demonstrate accurate recognition of the prestige display until after age 5. For all selections made by all age groups in response to the prestige prompt, see SOM, Table S5.

In a secondary analysis, we assessed recognition accuracy across development by treating age as a continuous variable. Given our focus on the early development of dominance and prestige recognition, adults were not included in this analysis; this also reduced the possibility of statistical artifacts caused by subgroup heterogeneity – samples recruited from different survey platforms and responding to different prompts –interfering with the interpretation of results. We conducted a binomial logistic regression predicting recognition accuracy (1 = accurate selection; 0 = inaccurate selection) from age (centered), prompt type (dominance versus prestige, treating dominance as the reference group), and the interaction between age and prompt type (see Figure 6). Age was a significant predictor of recognition accuracy, b = .32, 95%CI [.08 to .54], OR = 1.38, suggesting that older children were more accurate at recognizing the dominance display, and no age by prompt type interaction emerged, b = -.19, 95%CI [-.53 to .14], OR = .83, suggesting that the relationship between age and recognition accuracy did not vary depending on whether children were prompted to select the dominance or prestige display.

General Discussion

The present research is the first to test whether the dominance and prestige displays previously uncovered in North American contexts might be two universally recognized and distinguished status signals among humans. In a small-scale society culturally distant from North America, even the most isolated subgroup of individuals recognized the dominance display at rates significantly above chance. Importantly, when they made mistakes, Mayangna participants did not tend to mistake the dominance display as conveying prestige; they were no more likely to identify targets showing dominance as deserving admiration than they were targets showing neutral displays, and were substantially less likely to do so compared to smiling targets or targets showing prestige. Furthermore, children as young as 2-3 years were able to identify the dominance display at rates significantly above chance, a result

particularly noteworthy given prior findings that such young children do not reliably associate generalized expansive displays with social rank (Terrizzi et al., 2019; Brey & Shutts, 2015). We also observed improvements in children's recognition of dominance from age 2 to 8 years, suggesting that socialization and the acquisition of cultural knowledge, or maturation and development, may reinforce an early-emerging understanding or competency. Together, these findings suggest that the ability to perceive dominance from its nonverbal expression, and recognize it as a distinct form of high rank associated with power but not respect, may constitute a universal facet of human behavior.

Evidence for recognition of prestige from nonverbal cues was more equivocal. Among the Mayangna, the prestige display was rarely confused with dominance, despite being reliably seen as equally powerful. Yet it was not identified as more prestigious—that is, deserving of admiration—than was the smiling display. One possible explanation for this unexpected result is that cultural display rules and culture-specific norms around humility, such as those that characterize many small-scale, traditional societies, moderate the acceptability of displaying overt signals of status (see Tracy & Robins, 2008; Von Rueden & Van Vugt, 2015; Boehm, 1999; Tracy, 2016.) Indeed, boasting is discouraged among the Mayangna (Winking et al., 2018; Koster, 2018; Sznycer et al., 2018; Koster et al., 2013), so displaying a nonverbal expression that conveys a belief in one's own possession of knowledge and expertise might cause a displayer to appear overly confident and arrogant, and in violation of cultural norms. A display that sends such a message might therefore *reduce* the appearance of competence, as it would demonstrate incompetence in the domain of following cultural rules; displaying prestige might therefore hinder a displayer's ability to garner admiration. In contrast, norms regarding humility would be less relevant to the display of dominance; dominant leaders tend to be disliked, so breaching cultural norms would not be as consequential to their ability to attain rank. In other words, given that prestige signalers must learn and follow culturally distinct display rules and social norms to effectively garner admiration from followers, whereas dominants' influence is not

based on others' admiration, this distinction between the two forms of rank might account for the observed greater cross-cultural variability of prestige displays.

Evidence for prestige recognition among young children was also mixed. The prestige display was reliably recognized by children older than 5 years but not by younger children. This is a somewhat surprising result given that 2-4 years constitutes a critical stage of development for social learning, during which the identification and copying of prestigious models is particularly important (Birch et al., 2010; Brosseau-Liard & Poulin-Dubois, 2014). One possibility is that young children copy prestigious models but have difficulty articulating that they perceive these adults to be smart or competent; future studies are needed to test this account. Given that even very young children were able to recognize the dominance display, it would appear that they are able to articulate perceptions of threat based on nonverbal cues of dominance, highlighting a developmental difference between the two displays. This difference may also indicate that the nonverbal communication of prestige is more reliant on cultural learning compared to the nonverbal communication of dominance.

Another possible explanation for the finding that prestige was recognized at lower rates than dominance, and rates lower than chance when compared to the happiness expression, is that throughout evolutionary history and over the course of child development humans are known to rely on reputational cues (e.g., age, gender, clothing) and direct observations of behavior to infer prestige (Henrich & Gil-White, 2002; Birch, Akmal, & Frampton, 2010; Jaswal & Malone, 2007). In certain cultures, or early in the lifespan, these cues may be more important than momentary nonverbal displays in conveying prestige. Given the large body of evidence suggesting that populations around the world show evidence of granting power and social rank to both dominance and prestige strategists– and this includes non-WEIRD small-scale, traditional societies in Africa, Asia, and South America – our finding that the prestige display is not reliably recognized by the Mayangna could indicate that there are other ways humans have evolved to communicate prestige.

It is also noteworthy that the prestige prompt we used likely requires participants to make several distinct appraisals: that a target (a) possesses knowledge *and* (b) is willing and able to share that knowledge with others. Although double-barreled, this prompt allowed us to comprehensively convey a broad construct with a single item, but it is possible that respondents perceived the prestige display as relevant to only one of these features, and consequently selected a different response option (e.g., the happiness expression). This possibility is especially likely given that the willingness to share knowledge can depend on complex social structures, making the prestige display one that requires a great deal of inference. The finding that this display is reliably identified as conveying prestige by North Americans given the same prompt suggests that the double-barreled prompt is not inherently problematic, but future research is needed to test whether the Mayangna associate prestige displays with each of the separate narrower components of the prestige construct.

A broader limitation of the present research is the possibility that we omitted certain behaviors relevant to dominance or prestige displays in certain cultures. The displays used here were generated in past research based on findings from an exhaustive literature review (Witkower et al., 2022), but it remains possible that additional behaviors not examined might also signal dominance and prestige, perhaps distinctively among the Mayangna. Future studies using more exploratory designs might address this possibility by testing a wider range of behaviors, not previously associated with status.

In addition, although this research tests whether dominance and prestige displays uncovered in North America are recognized by the Mayangna and young children, it does not examine whether these individuals spontaneously demonstrate the predicted sets of nonverbal behaviors in appropriate contexts. Although prior research has found that, by the age of 3 years, children spontaneously display an upwards head tilt and expansiveness following success (Lewis et al., 1992), consistent with the prestige display, no prior work has tested whether the Mayangna, or members of any other small-scale

traditional society, demonstrate the expected sets of behavior to communicate dominance or prestige. This will be an important question for future research.

Given that we sampled participants from highly divergent cultures and ages, the current findings may generalize to adults from all around the world, and to Western children older than 4-years-old, who view similar nonverbal displays. However, given that all children sampled were Canadian, we cannot draw conclusions about the developmental trajectory of our effects across cultures. This will be an important topic for future research.

In sum, the present research provides the first evidence for a universally recognizable nonverbal indicator of dominance that is distinct from that of prestige. While prestige may, in contrast, represent a behavioral strategy in humans that is more culturally variable and ontogenetically slower to emerge (Henrich & Gil-White, 2001), the present findings are consistent with the suggestion that the dominance display is an evolved strategy for rank attainment.

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