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## The financial cost of status signaling: Expansive postural displays are associated with a reduction in the receipt of altruistic donations

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## ABSTRACT

Models of human altruism suggest that decisions to help are influenced by assessments of both potential recipients' need state and their competence, as high need increases the value of gifts received, and competent recipients can most effectively use and repay gifts. Need and competence are often inversely related, however, raising the question of how altruists weigh these competing sources of information. We examined the impact of a nonverbal display (expansive posture) that, by signaling high status, simultaneously cues both low need and high competence, on actual altruistic behaviors: donations of financial aid to needy individuals. Across three studies using ecologically valid data drawn from a micro-lending charity website, men who displayed expansive posture while requesting aid faced a substantial reduction in the amount of aid they received; this effect held controlling for a range of relevant covariates. These findings demonstrate that: (a) altruists bias their giving toward those in greater need rather than those who may be more competent, and (b) subtle nonverbal cues of status influence altruistic decision-making.

According to the theory of reciprocal altruism, individuals at times provide aid freely to unrelated others (i.e., non-kin) because doing so typically results in a net benefit to themselves that exceeds the cost of the gift (Kurzban, Burton-Chellew, & West, 2015; Trivers, 1971). Those who receive gifts or help without cost incur a debt to their benefactor, which is likely repaid at a later date, possibly when the original giver is in greater need (Trivers, 1971). By helping those in need, altruists therefore increase the likelihood of a future gain for themselves; for this reason, several scholars have suggested that altruism, although often experienced as costly by the benefactor (i.e., at a proximate level), is not truly altruistic at an ultimate level, in the sense of being costly for one's genes (Kurzban et al., 2015; West, Griffin, & Gardner, 2007). Instead, altruism is ultimately akin to investing in a safe but low-interest bond. Although recipients are unlikely to pay back more than they believe they received, they are likely to repay when the altruist is in greater need.

In addition to the benefits altruists are likely to eventually receive from singular direct exchanges, reciprocal altruism may additionally provide more indirect rewards. For example, altruistic exchanges foster the formation of friendships and alliances among exchange partners (Trivers, 1971). These exchanges tend to be positive interactions that are associated with experienced fitness benefits (e.g., needed assistance, gifts), so exchange partners often develop increased liking and

commitment toward one another, resulting in mutually beneficial long-term relationships. These relationships engender cycles of continued altruism; at a proximate level, individuals feel greater empathy toward friends, motivating increased altruistic efforts and ultimately resulting in greater reciprocal benefits, given that individuals in regular contact are more likely to remember debts and repay gifts. Indeed, members of the same social group tend to ignore exact costs and debts incurred by each exchange, instead trusting that repayments will happen over the course of future interactions (Sugiyama & Sugiyama, 2003; Tooby & Cosmides, 1996).

Altruists are also thought to benefit from the development of an "altruistic reputation" (Gurven, Allen-Arave, Hill, & Hurtado, 2000). In early human history, individuals typically interacted with the same small group of individuals repeatedly throughout their lives, resulting in an ability to carefully monitor group members' exchanges. By observing gift exchanges among others in one's group, individuals can evaluate their peers' altruistic reputations and select interaction partners on that basis. This kind of social monitoring increases the value of altruism because givers benefit not only from a current exchange but also from a bolstered reputation that influences future exchanges (Kurzban et al., 2015). Empirical studies supporting this account have shown that individuals deciding whom to cooperate with in experimental tasks typically choose individuals who are known to have been

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generous in a prior interaction (Barclay & Willer, 2007). Furthermore, being watched while making a charitable donation has been shown to increase ventral striatum activation, the same “reward center” of the brain that is activated by the receipt of monetary rewards (Izuma, Saito, & Sadato, 2010).

Together, these findings suggest that early humans would have benefited from the evolution of mental modules that facilitate altruistic behaviors – particularly those that increase the likelihood of effective reciprocal altruism (Delton, Krasnow, Cosmides, & Tooby, 2011; Hagen & Hammerstein, 2006). Indeed, in order to be most effective – in the sense of ensuring the greatest ultimate benefit from one's gift—altruists must not give indiscriminately. Several factors influence which recipients are most likely to produce a future benefit for the giver, and altruists must take these factors into account in their decision-making. Most notably, altruistic decisions are thought to be guided by a (presumably implicit) calculation of whether the incurred cost from giving is low relative to the benefit gained by the recipient (Trivers, 1971). Gifts that provide the greatest benefit to recipients will produce the greatest future payoff when the debt is repaid, because the experienced magnitude of the gift shapes the recipient's debt. Particularly given that in early human history gifts were often repaid through exchanges of goods that had unclear value (e.g., “if you cure my daughter when she is sick, I'll repay you with the bounty from a hunt when she is well”), early human altruists would have benefited most from helping others in ways that were perceived as generous by recipients but cost little to the altruist.

More specifically, according to Trivers (1971), in order for altruism to proliferate throughout the population, altruistic exchanges should generally follow this basic equation<sup>1</sup>:

$$\Sigma b_a - \Sigma c_a > \Sigma b_r$$

where  $b_a$  represents the benefits ultimately received by the altruist,  $c_a$  represents the costs incurred by the altruist, and  $b_r$  represents the benefits to the recipient. This formula dictates that altruism will flourish within a population if the eventual benefits to the altruist, accounting for the costs incurred by the gift, tend to outweigh the benefits to the recipient. Each altruistic exchange need not benefit the altruist more than the recipient, but over time and throughout the population altruists should stand to benefit more from these exchanges than recipients; otherwise, the relative fitness advantages accrued by recipients would lead to the eventual extinction of altruism from the population.

Importantly, then, the outcome of an altruist's cost-benefit analysis is partly determined by the potential recipient's level of need. Needy individuals derive greater benefits from a gift of fixed cost, so a recipient's need state should directly predict his or her debt to the altruist, such that greater need increases the benefit incurred from a gift and, as a result, the debt owed to a benefactor. Consistent with this expectation, beginning early in ontogeny humans seek out cues of need and help others on this basis (Berkowitz & Daniels, 1963; Burnstein, Crandall, & Kitayama, 1994; Hepach, Vaish, & Tomasello, 2013; Krebs, 1970; Roth-Hanania, Davidov, & Zahn-Waxler, 2011; Warneken & Tomasello, 2006). Cross-cultural studies also have shown that needier individuals or households tend to be granted the larger portion of unbalanced exchanges (Allen-Arave, Gurven, & Hill, 2008).

Altruists may use recipients' emotional cues to determine their neediness and guide giving decisions (Trivers, 1971). Needy recipients

should feel and express greater gratitude for the same gift compared to those who are less in need. Furthermore, these grateful feelings may serve as cues to the recipient that he or she has benefitted from another's costly behavior, and motivate the demonstration of appreciation. These feelings also determine the extent to which recipients are motivated to repay the altruist, with greater experienced gratitude precipitating greater repayment. Indeed, in a theoretical review, McCullough, Kilpatrick, Emmons, and Larson (2001) argued that gratitude can be understood as a “moral barometer,” which recipients use to determine acceptable repayment. Supporting this account, one study found that individuals high in dispositional gratitude, based on self- and peer-reports, engaged in more prosocial behaviors during a one-month period (McCullough, Emmons, & Tsang, 2002). Similarly, Tsang (2006) found that momentary feelings of gratitude motivate prosocial behaviors toward a specific benefactor.

Altruists also may use their own feelings of sympathy or empathy toward potential recipients to infer recipients' level of need and, consequently, the amount of gratitude that will be experienced in response to a gift (Trivers, 1971). By identifying those who are most needy, sympathy functions to indicate opportunities for the greatest returns on one's gifts or helping behaviors. Supporting this expectation, Eldakar, Wilson, and O'Gorman (2006) found that the amount of sympathy participants experienced when thinking about someone in need predicted their willingness to help that person.

These studies suggest that inferences about recipients' need states should drive altruistic behaviors. However, factors other than perceived need may also influence the outcome of the altruist's cost/benefit analysis. According to the *banker's paradox*, highly competent recipients make for particularly good recipients because these individuals are in a better position to reciprocate, and also to make effective use of gifts (Sugiyama & Sugiyama, 2003; Tooby & Cosmides, 1996). On this basis, altruists might be expected to seek signs of competence among potential recipients, as well as signs of need, and bias their giving in the direction of these cues. Supporting this account, several studies suggest that individuals are more likely to help those in need who also appear to be competent or high in social status. For example, Bickman (1971) found that individuals were more likely to return a lost dime to a person whose manner of dress conveyed high, rather than low, status. Similarly, Goodman and Gareis (1993) found that participants were more likely to go out of their way to help a (high-status) lawyer than a (low-status) gas station attendant. Among the *Ache*, a South American tribe of hunter-gatherers, group members who are known to be competent food producers and sharers receive greater aid when in need than their less competent peers (Gurven et al., 2000).

Furthermore, competence in a unique field may be an especially valuable trait in a potential recipient. Individuals with distinctive skill sets are fiercely sought exchange partners, because they can help others fulfill a need they cannot manage on their own. In turn, such exchanges benefit the entire group by widely disseminating distinctive knowledge, and consequently strengthening group bonds and commitment. The result is a system of social niche specialization, in which groups form, in part, by attracting individuals who can both make unique contributions and benefit from the divergent contributions of others (Sugiyama & Sugiyama, 2003). Supporting this account, humans across a wide range of cultures demonstrate cognitive abilities that appear to be ideally suited for tracking, evaluating, and comparing the skills of others (Forge, 1967; Guenther, 1999; Gusinde, 1961). This feature of humans' presumably evolved cognitive apparatus may increase the likelihood of altruists choosing to help others who appear to be competent—particularly in ways that are different from the altruist.

In sum, prior research and theory on reciprocal altruism leads to two competing expectations about altruistic decision-making. On the one hand, altruists are thought to ultimately benefit from helping those in greatest need—for whom the same gift will be perceived as most valuable, and thus lead to the greatest repayment. On the other hand, altruists are thought to ultimately benefit from helping those who are in

<sup>1</sup> Trivers (1971) uses the following formula to describe the evolutionary proliferation of altruism:  $(1/p^2)(\Sigma b_k - \Sigma c_j) > (1/q^2)(\Sigma b_m)$ , where  $p$  represents the frequency of the “altruistic gene” within the population,  $q$  represents the frequency of the “non-altruistic gene” within the population,  $b_k$  represents the benefit to the altruist of the  $k$ th altruistic act,  $c_j$  is the cost to the altruist of the  $j$ th altruistic act, and  $b_m$  is the benefit to the non-altruist of the  $m$ th altruistic act. We have adapted this formula to represent the parameters for a single adaptive altruistic exchange between one altruist and one recipient, rather than the parameters that allow altruism to evolve in a population over time.

need but also demonstrate high status, competence, or unique skills—individuals who are most likely to be capable of eventual repayment. These two expectations lead to an inherent dilemma in altruistic decision-making, because individuals who are highly competent tend not to be in great need, and needy individuals may suffer from low competence. Given this inverse relationship, cues of need and competence are often in conflict; signaling high competence or status is likely to simultaneously convey low need. This raises an important question: When faced with the decision of whether to direct one's aid toward those who appear to be in greatest need versus those who are in need but also seem competent, what do altruists do?

Although several prior studies suggest that competence or status cues sent by those in need increase helping, these studies examined predictors of the decision to help (i.e., to become an altruist), rather than the decision of *whom* to help (i.e., an existing altruist's decision about where to direct his or her limited helping efforts). To our knowledge, no prior research has addressed the question: once individuals have decided to give to the needy, which factors shape the direction of their giving? That is, when altruists have access to cues that provide information about both a recipient's likely need and his or her likely competence, which source of information guides giving?

This question is of particular importance for understanding contemporary altruism, because benefactors worldwide tend to be individuals who have already decided to engage in charitable behavior but must determine *where* to direct their efforts. Indeed, the large majority of financial aid distributed by private institutions and individuals is given by those who are seeking to help others in need; they have already made the decision to give. It is thus important to understand how these individuals decide whom to give to. Although these altruists typically do not expect direct reciprocity from recipients, their behaviors can still be understood as the result of evolved cognitive modules shaped by the adaptive benefits ancestral humans received from reciprocal altruism (Hagen & Hammerstein, 2006). For example, if humans evolved a tendency to seek out potential recipients who demonstrate competencies in distinctive areas, different from those of the altruist, wealthy donors from highly industrialized Western nations might find themselves particularly inclined to aid needy individuals from developing nations who demonstrate success in divergent domains (e.g., small-scale farming, basket weaving).

We addressed this open question in the psychology of human moral behavior by examining a behavioral cue that communicates a recipient's likely status and competence, and assessing how this cue influences needy individuals' success in earning charitable loans. Specifically, a large body of research suggests that *expansive bodily displays*, such as the cross-culturally recognized nonverbal expression of pride (Tracy & Robins, 2004, 2008) as well as more general body expansion (Hall, Coats, & LeBeau, 2005) come with a range of status and rank benefits. These displays, which appear to be universal and innate behavioral responses to success or demonstrations of competence (Tracy & Matsumoto, 2008), promote largely automatic perceptions of high rank, wisdom, and increased status and attractiveness (Cuddy, Wilmuth, Yap, & Carney, 2015; Hall et al., 2005; Martens & Tracy, 2013; Shariff & Tracy, 2009; Shariff, Tracy, & Markusoff, 2012; Vacharkulksemsuk et al., 2016). These largely uncontrollable perceptions generalize across culturally diverse and geographically separated populations, suggesting that expansive displays may be universal status signals (Tracy, Shariff, Zhao, & Henrich, 2013). Similar rank-communicating displays have been documented in non-human primates as well, pointing to an ancient phylogenetic history (DeWaal, 1989; see Tracy & Matsumoto, 2008, for a review). By sending a strong signal of high rank, these displays are likely to simultaneously communicate the displayer's competence and, as a result, his or her relatively low level of need. Testing whether altruists give more or less to potential aid recipients who display these expansive behaviors might therefore allow us to determine whether altruistic giving is biased more toward perceived competence versus need.

To test our competing hypotheses in an ecologically valid manner, we observed loan requests and financial aid received through *Kiva.org*, a micro-lending charity that aims to help individuals from developing nations generate investment capital. We did so in a series of three studies, the latter two of which were pre-registered (see <https://osf.io/gciaj/>).<sup>2</sup> In these studies, we coded nonverbal behavioral displays shown by loan requesters in their online profile pictures, and tested whether their expansive nonverbal displays predicted the amount of money they earned in charitable donations. All reported effects are therefore based on observed relations between two entirely separate sets of behaviors that share no content overlap: requesters' displays and altruists' financial decisions.

In addition to addressing an important outstanding question about altruistic decision-making, the present research also provides new data on the impact of expansive nonverbal displays. Given the large amount of research attention that has been dedicated to demonstrating the benefits accrued by those who show these displays (see, e.g., Arnette & Pettijohn II, 2012; Carney, Cuddy, & Yap, 2010; Carney, Cuddy, & Yap, 2015; Cesario & McDonald, 2013; Cuddy, Schultz, & Fosse, 2018; but see Garrison, Tang, & Schmeichel, 2016; Hall et al., 2005; Park, Streamer, Huang, & Galinsky, 2013; Ranehill et al., 2015; Shariff & Tracy, 2009; Shariff et al., 2012; Simmons & Simonsohn, 2017; Tracy et al., 2013; Vacharkulksemsuk et al., 2016), and the relatively fewer studies that have examined situations in which these displays might instead lead to negative consequences (Kalokerinos, Greenaway, Pedder, & Margetts, 2014), the present research represents an important step forward in the field's understanding of these status signals and their social impact. Findings suggesting that altruists direct aid away from those who show body expansiveness, in favor of those who may be less competent but therefore in greater need, would provide the first evidence of a real financial cost to these status signals.<sup>3</sup> In contrast, findings suggesting that altruists provide greater aid to those who communicate their high status in this manner would provide the first evidence of a real-world financial benefit to showing these displays. Furthermore, findings in support of either hypothesis would highlight the importance of subtle nonverbal cues in shaping altruistic decision-making; we are aware of no prior studies examining the impact of subtle behavioral cues of rank on altruistic behavior or generosity.

## 1. Study 1

### 1.1. Method

We assessed loan requests and financial aid received through *Kiva.org*, a micro-lending charity that seeks to help individuals from developing nations generate investment capital. Kiva works by connecting “micro-lenders”—typically altruistic individuals living in developed North American nations—with needy individuals in developing nations who are seeking start-up funds for their small, often-family-run, businesses. Donors who visit the website scroll through profiles of loan requesters and make decisions about whom to lend to. Although Kiva frames donations as “loans”, lenders cannot earn interest, making their loans more akin to small charitable donations than investments. Furthermore, the large majority of lenders view Kiva as a charity website, as do international organizations that evaluate charities; Kiva has received four stars from Charity Navigator, their highest rating.

#### 1.1.1. Data extraction

We extracted loan-requester profiles that had been posted on *Kiva*.

<sup>2</sup> In our pre-registration (see <https://osf.io/gciaj/>), we noted that we originally held competing hypotheses for the effect of expansive postural displays on aid received, as described in text, but after analyzing data obtained for Study 1, we refined our predictions for Studies 2 and 3 based on the results that emerged.

<sup>3</sup> Importantly, however, any costs of this signal are likely to be ultimately outweighed by its benefits, given the signal's cross-cultural and cross-species ubiquity.

org for approximately 24–32 h, to examine the impact of expansive nonverbal displays on immediate funding success. Given that some of these requesters had not received substantial funding within their first day online, we extracted these same profiles again approximately 24 h later, a period after which 64% had received at least some funding. Loans that are completely filled are removed from the request page, so by performing two extractions one day apart, we could identify loans that were filled between the 1st and 2nd extraction (i.e., 6 loans). All analyses were based on total funding obtained at the *second* extraction, unless the loan was filled between the two extractions, in which case analyses were based on the total amount requested.

Each profile included a photograph of the requester in his or her local environment. Research assistants blind to hypotheses coded these photos for expansive postural displays and other behaviors that have been linked to high rank perceptions, while a separate team coded for other information that was expected to predict giving (e.g., attractiveness), to be treated as covariates. Kiva profiles also provide textual information about requesters, including demographic details, size of the requested loan, and amount of money currently obtained. A research assistant blind to hypotheses extracted the following objective information from all profiles: the amount of money requested, the amount of money received thus far, the proportion of the requested loan that had been filled, nationality, age, and gender. All of these variables were either included as covariates or treated as outcome variables in analyses.

In addition, several other variables were extracted or coded from photos but not included in the final analyses, either because initial analyses indicated that they were unrelated to giving (i.e., the number and type of field lending institution's 'performance badges', classification of what the loan was requested for), or because they were unreliably coded from photos (i.e., estimated cost of assets shown in photo), or because of multicollinearity with some other variable included (i.e., national average income was excluded in lieu of nationality). See SOM4 for more information on these excluded variables.

### 1.1.2. Loan requesters

Profiles of 174 requesters were originally downloaded but 16 of these were excluded from analyses because requesters' bodies and/or faces were blurred, resulting in a final sample of 158 (69% women, age range = 19–66, median age = 40.5; world region = 21.5% Central American, 11.4% Central Asian; 12.7% East African; 3.8% Eastern Asian; 1.9% Eastern European; 20.3% South American; 12% Southeast Asian; 1.9% Southeast European; 6.3% Southern Asian; 5.7% West African; 2.5% Western Asian).

### 1.1.3. Behavioral coding of profile photos

A team of three coders (undergraduate research assistants blind to hypotheses) rated each requester's photograph on the following items, based on a reviews of expansive nonverbal behaviors known to be associated with high rank (Hall et al., 2005; Tracy & Matsumoto, 2008; Tracy & Robins, 2007): chest expansion, head tilt back/upward, one or both arms extended out from the body; arms raised, arms crossed, and arms akimbo with hands on hips. However, arms raised, crossed, and akimbo with hands on hips were not included in analyses because very few individuals engaged in these behaviors ( $n_s = 1$  for arms raised; 0 for arms crossed; and 5 for hands on hips). Ratings for each behavior were made on a scale ranging from 0 (*not at all present*) to 3 (*fully expanded/tilted back/up/fully out from body*). For the three behaviors that occurred with enough variance to be coded, interrater  $\alpha$ s = 0.73, 0.87, and 0.76; see SOM6 for means and standard deviations.

A separate team of three coders, also blind to hypotheses, coded other information from the photos, to be treated as covariates: estimated age (highly correlated with objective age:  $r = 0.82$ ), which was included in analyses for requesters who did not provide objective age; attractiveness (to a Western audience); how rural versus urban the environment in the photo appeared to be; and how run-down versus

well-maintained the environment appeared. Interrater reliability alphas ranged from 0.69 to 0.92; see Table 2 for specific inter-rater reliabilities for all three studies.

### 1.1.4. Data analyses

We tested whether each of the behavioral components associated with the pride display or previously linked to high rank predicted requesters' earnings after two days online, controlling for covariates. Financial success was operationalized in two ways: (a) the total amount of money earned, and (b) the proportion of the requested loan that was filled. The data for both these dependent variables were heavily right-skewed, such that the variance was larger than the mean ( $M_{\text{amount received}} = \$106$ , variance = \$45,513,  $SD = \$213$ ; see SOM3 for frequency distributions). All analyses were thus performed using negative binomial regression with a ln link function, which is typically used for "count" data such as these and can accommodate this distribution. Negative binomial distributions are similar to Poisson distributions but anticipate over-dispersed data, as emerged here (Gardner, Mulvey, & Shaw, 1995).

## 1.2. Results

The three coded nonverbal behaviors (chest expansion, arms outstretched, head tilted upward) were not interrelated ( $\alpha = 0.06$ ), likely due to heterogeneity in the environments where photos were taken (e.g., in an open field or a shop), positions held (i.e., some requesters were sitting, leaning, or holding objects), and the angle/height from which the photograph was taken. We thus ran separate analyses treating each of the three components as predictors.

Consistent with the hypothesis that altruists would show a bias toward giving more to those who appear to be in greater need, rather than those who convey competence, requesters' chest expansion negatively predicted the amount of money loan requesters received [ $\ln(b) = -0.71$ ,  $SE = 0.14$ ,  $p < .0001$ ] and the proportion of the requested loan that was filled [ $\ln(b) = -0.30$ ,  $SE = 0.14$ ,  $p = .03$ ]. These main effects were qualified by an interaction with gender<sup>4</sup> [ $\ln(b) = 0.65$ ,  $SE = 0.28$ ,  $p = .02$ ], indicating that the effect of chest expansion on reduced aid was substantially more pronounced for male requesters [ $\ln(b) = -1.10$ ,  $SE = 0.20$ ,  $p < .0001$ ] than female [ $\ln(b) = -0.46$ ,  $SE = 0.19$ ,  $p = .016$ ]. A similar pattern emerged for proportion of loan filled, though the interaction did not reach statistical significance,  $p = .12$  [effect among male requesters,  $\ln(b) = -0.61$ ,  $SE = 0.23$ ,  $p < .01$ , and for women,  $\ln(b) = -0.16$ ,  $SE = 0.18$ ,  $p = .38$ ].

The observed association between chest expansion and giving remained significant controlling for covariates (i.e., age, attractiveness, nationality, amount of money requested, and requesters' environment); for total money earned, effects were  $\ln(b) = -1.28$ ,  $SE = .25$ ,  $p < .0001$  (males, see Fig. 1) and  $\ln(b) = -0.40$ ,  $SE = 0.21$ ,  $p = .054$  (females), and for proportion of loan filled,  $\ln(b) = -1.38$ ,  $SE = 0.31$ ,  $p < .0001$  (males);  $\ln(b) = -0.29$ ,  $SE = 0.21$ ,  $p = .16$  (females; see Table 1 and SOM2 for full models). These results indicate that, controlling for covariates, male requesters lost 72% of what they otherwise would have earned for each degree of chest expansion they displayed (on a 4-point scale), and female requesters lost 33% of what they otherwise would have earned for each degree of chest expansion displayed (see Fig. 1).

The other rank-associated behaviors that were coded—arms outstretched and head tilted upward—did not consistently predict either dependent variable. Specifically, arms extended outward did not significantly predict the amount of money raised,  $\ln(b) = -0.08$ ,

<sup>4</sup> Although we did not predict this interaction, it is standard practice in our lab and many others to test whether target gender moderates observed effects, particularly when examining the impact of nonverbal displays on gender-relevant outcomes like earned income and social rank.

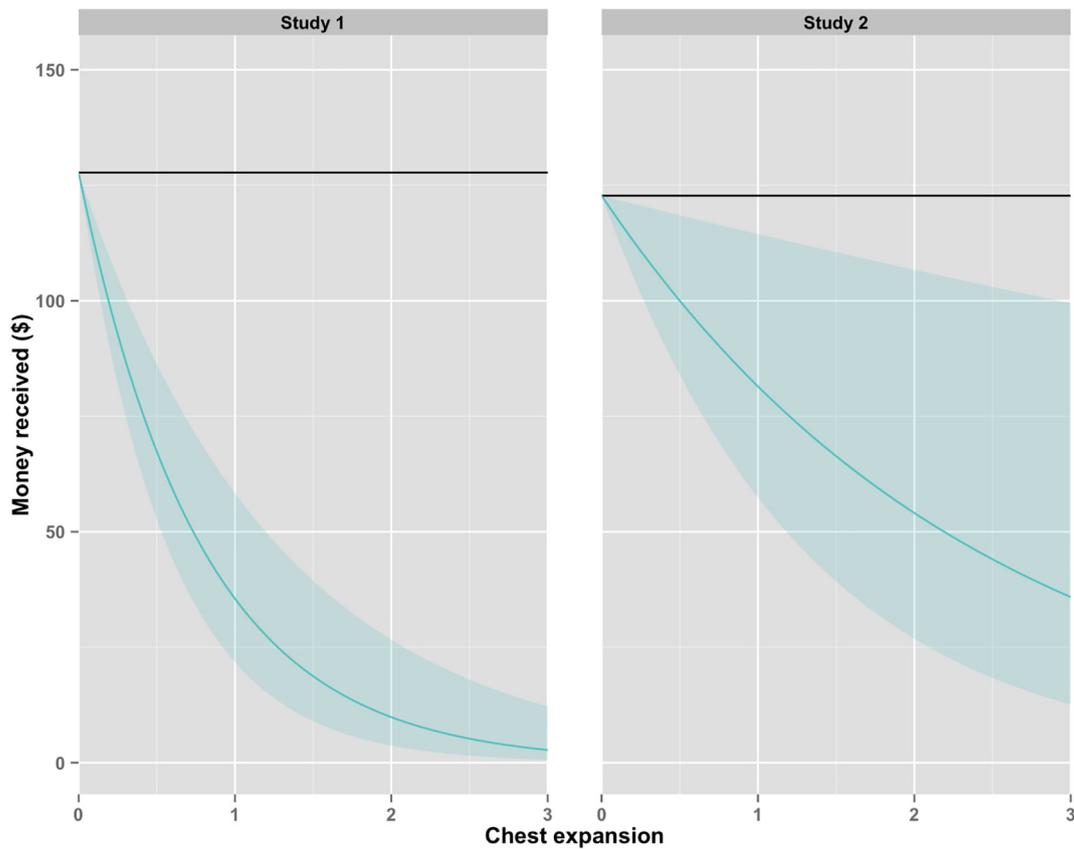


Fig. 1. Amount of money received by male loan requesters, as a function of their expansive postural displays.

Note: Model intercept and regression line for chest expansion predicting amount of money received by male loan requesters. In both Studies, expansive postural displays led to the receipt of less financial aid. Shaded area indicates the 95% confidence interval.

Table 1

Loan requesters' expansive postural displays predict reductions in financial aid received.

Predictors	Ln odds of money received (in dollars)		Ln odds of % of total loan request received	
	Study 1	Study 2	Study 1	Study 2
Chest expansion × gender (F = 1, M = 0)	0.88 (0.32)**	0.52 (0.26)*	1.09 (0.36)**	0.54 (0.26)*
Chest expansion (M)	-1.28 (0.25)***	-0.41 (0.18)*	-1.38 (0.31)***	-0.39 (0.18)*
Chest expansion (F)	-0.40 (0.21)*	0.12 (0.19)	-0.29 (0.21)	0.15 (0.19)
Gender	0.69 (0.23)**	0.17 (0.17)	0.64 (0.25)*	0.15 (0.18)
Age	0.019 (0.01)	0.01 (0.01)	0.019 (0.01)	0.003 (0.01)
Amount requested	0.018 (0.02)	0.06 (0.02)**	-0.067 (0.02)***	-0.057 (0.02)**
Attractiveness	0.077 (0.16)	0.41 (0.12)**	0.19 (0.17)	0.39 (0.12)**
Rural vs. urban	-0.50 (0.14)***	-0.32 (0.10)**	-0.45 (0.15)**	-0.26 (0.10)*
Well-maintained environment	0.65 (0.14)***	0.34 (0.11)**	0.59 (0.14)***	0.31 (0.12)*

Note. The main effect of chest expansion is presented twice, with the gender intercept set on men (M) and women (F). Intercept is set to male for all other variables, including the gender main effect. Results are unstandardized log odds ratios with standard errors in parentheses. “Amount Requested” is in units of 100 (1 = \$100). Nationality dummy variables were included in these analyses but not shown here; see SOM3 for full model.

\*  $p \leq .05$ .

\*\*  $p \leq .01$ .

\*\*\*  $p \leq .001$ .

$SE = 0.11$ ,  $p = .48$ , nor the proportion of requested loan filled,  $\ln(b) = 0.04$ ,  $SE = 0.11$ ,  $p = .75$ . Head tilted back did significantly predict both the amount of money raised and the proportion of loan filled [total raised:  $\ln(b) = -0.52$ ,  $SE = 0.16$ ,  $p = .001$ ; proportion of loan filled:  $\ln(b) = -0.60$ ,  $SE = 0.16$ ,  $p < .001$ ], and these effects held controlling for covariates [total raised:  $\ln(b) = -0.42$ ,  $SE = 0.18$ ,  $p = .02$ ; proportion of loan filled:  $\ln(b) = -0.46$ ,  $SE = 0.18$ ,  $p = .01$ ]. However, there was a significant interaction with gender for head tilt that ran counter to the interaction that emerged for chest expansion, for both money raised [ $\ln(b) = -2.47$ ,  $SE = 0.46$ ,  $p < .0001$ ] and

proportion of loan filled [ $\ln(b) = -1.01$ ,  $SE = 0.44$ ,  $p = .02$ ]; this interaction suggested that men who displayed greater head tilt back earned more money [ $\ln(b) = 1.63$ ,  $SE = 0.43$ ,  $p < .0001$ ], whereas women who displayed greater head tilt earned less [ $\ln(b) = -0.84$ ,  $SE = 0.15$ ,  $p < .0001$ ]. This interaction was substantially reduced when controlling for covariates;  $\ln(b) = -0.88$ ,  $SE = 0.49$ ,  $p = .07$  for total raised, and  $\ln(b) = -1.05$ ,  $SE = 0.52$ ,  $p = .05$  for proportion of loan filled. Given that these results were inconsistent across gender, not robust to controls, and inconsistent with the results that emerged for chest expansion, as well as the fact that head tilt tends to be more

strongly affected by camera position than is expanded posture (see Randles & Tracy, 2013), we chose to focus on chest expansion in our pre-registered hypotheses and analytic plan for Studies 2 and 3.

This decision is also consistent with the prior literature suggesting that chest expansion may be the most reliably observed and displayed component of the pride expression and other rank displays, across cultures (Tracy et al., 2013; Tracy & Matsumoto, 2008) and species (DeWaal, 1989). More specifically, the specific arm position linked to pride displays and power posing appears to vary across different instantiations of the display (e.g., Carney et al., 2010; Rule, Adams, Ambady, & Freeman, 2012; Tracy & Robins, 2007; Witkower & Tracy, 2018) and one study found that upward head tilt was not reliably displayed by congenitally blind athletes who had just won an Olympic judo match—individuals who *did* display chest expansion in response to their victory (Tracy & Matsumoto, 2008). In fact, other studies suggest that certain forms of high rank (i.e., dominance, or rank earned through threat of force and direct aggression) are conveyed through a head tilt *downward*, rather than upward (Witkower, Tracy, Cheng, & Henrich, 2018). In contrast, numerous studies examining perceptions of pride or high rank from nonverbal displays, as well as spontaneous displays of these behaviors in response to success or rank increase, have found a robust effect of chest expansion (e.g., Shariff & Tracy, 2009; Tracy & Matsumoto, 2008; Tracy et al., 2013; see also Witkower & Tracy, 2018, for a review). Chest expansion may therefore be the core component of an evolved status signal, with additional behaviors such as head tilt and arm movement varying by context, culture, and the form of status communicated.

In summary, the findings that emerged from Study 1 indicate that, when deciding where to direct their helping efforts, altruists turned *away* from those displaying expansive posture in the form of chest expansion, consistent with the suggestion that reciprocal altruism is most effective when donors give to those who seem to be in greatest need. The observed gender difference is consistent with this interpretation; women tend to be perceived as more needy than men, so their display of status signals may have been less relevant to giving decisions. That said, the gender difference observed here also might be a legacy of the early goals of micro-lending charities, which were initially founded with the aim of increasing aid to women; this legacy might have overwhelmed the effect of postural expansion in this group. However, because we did not initially expect a gender difference, or a consistent effect for chest expansion only, we next conducted a pre-registered direct replication. A successful replication of the observed negative association between men's chest expansion and altruists' behavior would suggest that chest expansion is the specific nonverbal signal that predicts real-world giving, and that donors are particularly likely to use this cue when engaging in altruistic decision making about men.

## 2. Study 2

### 2.1. Method

Study 2 was a pre-registered direct replication with an independent sample ( $N = 224$ , 63% women); see <https://osf.io/gciaj/> for hypotheses archived prior to analyses. Most notably, we predicted the same interaction with gender as emerged in Study 1, and an effect of chest expansion specifically, as was found in Study 1. The method was identical to that of Study 1; see Table 2 for inter-rater alphas for all coded variables.

#### 2.1.1. Loan requesters

Profiles of 228 requesters were originally downloaded, but 4 were excluded from analyses because requesters' bodies and/or faces were blurred, or because no photo was provided, resulting in a final sample of 224 (63% women, age = 17–69, median age = 42; world region = 14.7% Central American, 7.6% Central Asian, 12.1% East African, 0.9% European, 12.5% South American, 45.1% Southeast

**Table 2**

Interrater reliability among coders: intraclass correlation coefficients for items included in final analyses.

	Study 1	Study 2	Study 3
Chest expansion	0.73	0.68	0.74
Attractiveness	0.69	0.64	0.66
Rural vs. urban	0.80	0.81	0.83
Well-maintained environment	0.80	0.73	0.76
Age	0.92	0.91	0.91

Note. The average of coders' estimate of a requester's age was used in all cases where objective age information was missing.

Asian, 1.8% Southern Asian, 5.4% Western Asian).

### 2.2. Results

As was the case in Study 1, the data for both dependent variables were heavily right-skewed, such that the variance was larger than the mean ( $M_{\text{amount received}} = \$127.68$ , variance = \$33, 725.98,  $SD = \$183.65$ ; see SOM3 for frequency distributions), so we used the same analytic approach as in Study 1 (negative binomial regression with  $\ln$  function). Replicating Study 1 and supporting our pre-registered hypotheses, an interaction emerged between requester gender and chest expansion, predicting total amount of money received [ $\ln(b) = 0.67$ ,  $SE = 0.24$ ,  $p < .01$ ] and the proportion of loan filled [ $\ln(b) = 0.52$ ,  $SE = 0.25$ ,  $p = .04$ ], again suggesting that altruists directed their donations away from male requesters who displayed expressions that communicate high competence and low need. Specifically, chest expansion among male requesters negatively predicted the amount of money they received [ $\ln(b) = -0.59$ ,  $SE = 0.17$ ,  $p < .0001$ ], and the proportion of their requested loan that was filled [ $\ln(b) = -0.41$ ,  $SE = 0.18$ ,  $p = .02$ ]; the effect among women was not statistically significant for either money received [ $\ln(b) = 0.08$ ,  $SE = 0.18$ ,  $p = .67$ ] or proportion of loan filled [ $\ln(b) = 0.11$ ,  $SE = 0.18$ ,  $p = .56$ ]. Effects for male requesters remained significant controlling for all covariates included in Study 1, for both money earned [ $\ln(b) = -0.41$ ,  $SE = 0.18$ ,  $p = .02$ ] and proportion of loan filled [ $\ln(b) = -0.39$ ,  $SE = 0.18$ ,  $p = .034$ ; see Table 1]. These results indicate that for each degree of chest expansion displayed, male requesters lost 34% of what they otherwise would have earned (see Fig. 1).

For the sake of consistency and completeness, we again tested for similar effects of arms extended out from the body and head tilt, even though these predictors did not have consistent effects in Study 1. Controlling for covariates, arms extended did not predict either total amount of money received [ $\ln(b) = -0.04$ ,  $SE = 0.10$ ,  $p = .60$ ] or the proportion of loan filled [ $\ln(b) = -0.001$ ,  $SE = 0.10$ ,  $p = 1$ ]. Similarly, controlling for covariates, head tilt also did not predict either total amount of money received [ $\ln(b) = 0.03$ ,  $SE = 0.12$ ,  $p = .81$ ] or the proportion of loan filled [ $\ln(b) = 0.08$ ,  $SE = 0.12$ ,  $p = .51$ ].

In sum, Study 2 supported our preregistered hypothesis and directly replicated the central finding of Study 1, that expansive postural displays in the form of chest expansion shown by individuals requesting help—especially men—negatively predicted their receipt of financial aid. We next performed a conceptual replication to test our hypothesis using a different methodological approach.

## 3. Study 3

In Study 3 we examined whether the observed negative association between expansive postural displays and receipt of financial aid would hold across the entirety of the Kiva loan period. Specifically, we tested whether loan requesters who were immediately successful showed less chest expansion than those who remained unsuccessful throughout the loan-request period (i.e., one month). By using this approach, we hoped to complement the correlational analyses conducted in Studies 1 and 2

with a more quasi-experimental design. That is, whereas Studies 1 and 2 address the question of whether those who show greater chest expansion receive less, Study 3 addresses the slightly different (though conceptually similar) question of whether people who fail to secure the help they have requested are more likely to have shown expansive displays compared to those who are granted their requested aid. Although addressing this question required creating somewhat artificial groupings of successful and unsuccessful requesters, we preregistered this analytic plan to make clear that this decision was made prior to analyses or behavioral coding; see <https://osf.io/gciaj/>.<sup>5</sup>

### 3.1. Method

We combined the requester profiles downloaded for Studies 1 and 2, and extracted a group of particularly successful requesters: those who had received at least 6.5% of their requested loan within the first 48 h online ( $N = 196$ ; 73% female; age range = 17–69, median age = 42; world region = 11.2% Central American, 6.1% Central Asian, 12.2% East African, 1.5% Eastern Asian, 1% Eastern European, 12.2% South American, 43.4% Southeast Asian, 4.1% Southern Asian, 4.6% West African, 3.6% Western Asian). Although this rate may seem arbitrary, it is the minimum proportion required to complete one's goal within the month allotted by Kiva, assuming a consistent rate of donations. This number was derived from the fact that profiles are active for 30 days, so requesters need to earn at least 3.25% of their total requested loan each day in order to fill it by the end of the 30-day period. Although loans are probably not filled at a steady linear rate, linear estimation is the most stringent way to define success for the purpose of this comparison.

We compared these individuals to a newly acquired sample of requesters whose profiles were set to expire within two days (or less), meaning they had been online for at least 28 days and were unsuccessful in securing their loans during that time ( $N = 281$ ; 25% women; age range = 18–69, median age = 40; world region = 23.1% Central American, 11% Central Asian, 5.3% East African, 3.6% Eastern Asian, 9.3% Eastern European, 28.5% South American, 3.9% Southeast Asian, 3.2% West African).<sup>6</sup> Although these individuals might successfully fill their loans in the last 48 h of their profiles being live, based on a linear estimate this was not a concern because no requester in this group had received > 62% of his/her total loan request by day 28.<sup>7</sup>

To allow for an internal replication, we also conducted the same comparison a second time, defining success considerably more narrowly as requesters who filled at least 50% of their loans within the first 48 h; a much higher rate of success than would be expected for most requesters.

#### 3.1.1. Data extraction for unsuccessful requesters

To obtain a sample of unsuccessful requesters, we extracted profiles that were “expiring soon”, meaning that they had been live for at least 28 days and would be removed from the site within the next 2 days. To reach our target sample size based on predicted effect sizes (calculated from the results of Studies 1 and 2) and sufficient power needed to detect these effects, this process was repeated five times, with at least three days spaced between each extraction, to ensure that no profiles were extracted more than once. Postural displays and demographic information were obtained for this new sample in the same way as in Studies 1 and 2, by the same coders; see Table 2 for interrater alphas.

<sup>5</sup> In our archived hypotheses we made this prediction, but noted that we had failed to support it with the data collected from Study 1 only, so suggested that we were “agnostic” about whether it would emerge after more data were collected.

<sup>6</sup> We originally downloaded 287 profiles for this sample, but 2 were excluded due to blurred photos, and 4 were excluded because no photo was available.

<sup>7</sup> We included profiles that were set to expire within two days because Kiva.org has a section on their website called “Expiring Soon”, which features profiles of requesters that will expire within the next 48 h. We downloaded profiles from this section for this analysis.

### 3.2. Results

Consistent with the results of Studies 1 and 2 and our preregistered predictions, immediately successful loan requesters displayed less chest expansion than requesters who remained unsuccessful throughout the loan period [ $t(464.97) = 2.34$ ,  $M_{\text{successful}} = 0.53$  ( $SD = 0.55$ ),  $M_{\text{unsuccessful}} = 0.66$  ( $SD = 0.68$ ), Cohen's  $d = 0.21$ ,  $p = .02$ ]; no interaction with gender was observed [ $F(1, 473) = 0.083$ ,  $p = .77$ ]. This result suggests that expansive postural displays may have dissuaded charitable donations throughout the entirety of the loan period. For the comparison with very successful individuals—those who filled at least 50% of their loans within the first 48 h—the same pattern of results emerged,  $t(77.09) = 2.50$ ,  $M_{\text{successful}} = 0.47$  ( $SD = 0.41$ ),  $M_{\text{unsuccessful}} = 0.66$  ( $SD = 0.68$ ),  $d = 0.29$ ,  $p = .015$ .

However, gender was not well balanced between the more and less successful groups; 73% of successful profiles were female, compared to 25% of unsuccessful profiles,  $t(475) = 12.00$ ,  $p < .001$ . Likely as a result, the observed difference between the successful and unsuccessful groups in chest expansion did not remain significant controlling for gender [for the main comparison,  $B = -0.05$ ,  $SE = 0.07$ ,  $t = 0.76$ ,  $p = .45$ ], suggesting that this specific result should be interpreted with caution until replicated, ideally by comparing successful versus unsuccessful requesters of the same gender. Put differently, the large gender difference between successful and failing profiles limits the conclusions that can be drawn regarding the effect of chest expansion across the duration of the loan period. Nonetheless, the overall significant effect that emerged in this study suggests that unsuccessful requesters were more likely to show expansive posture than their more successful counterparts; future studies are needed to rule out the possibility that this observed difference is partially attributable to the gender difference in Kiva loan success rates.

### 4. General discussion

Across three studies, the display of expansive posture shown by individuals requesting financial aid negatively predicted the amount of aid that they received. This effect was most pronounced for male requesters, suggesting that altruists use this cue to inform and shape their giving behaviors more strongly when they are helping men. This gender difference may be explained, at a proximate level, by the fact that men who show expansive postural displays often appear more arrogant than women (Tracy & Prehn, 2012; Tracy & Robins, 2007)—and perhaps less deserving of help as a result. Alternatively, given that perceived upper body strength—presumably inferred from chest expansion—is a strong predictor of overall physical strength in men more than women (Sell et al., 2009), this cue could have had a greater impact on perceptions of high strength and corresponding low need when shown by men. Another possibility is that this status signal is simply less powerful in women, who tend to hold lower status positions than men across many human societies. The behavior might therefore carry less weight as an indicator of competence or need when shown by women, particularly in combination with the much stronger signal of need sent by their gender alone. It is noteworthy, in this vein, that much of the prior research demonstrating the communicative value of expansive nonverbal displays was conducted or demonstrated with male targets only (e.g., Shariff & Tracy, 2009; Tracy et al., 2013; but see Tiedens & Fragale, 2003; Vacharkulksemsuk et al., 2016).

Alternatively, the observed gender difference may be a legacy of the early goals of micro-lending charities, which focused on supporting female endeavors. Given the overall gender difference in loan fulfillment observed here (across the two samples included in Studies 1 and 2, 80% of loans that were filled completely belonged to women) and the finding from past research that women tend to receive greater aid than men more generally (Austin, 1979; Eagly & Crowley, 1986), the large effect of gender on giving might have overwhelmed any effect of expansive posture shown by female requesters.

Regardless of this issue—which highlights an important direction for future research—the findings from these studies provide robust evidence that, when faced with a choice about whom to give to, altruists are strongly biased toward giving to those who convey greater need, rather than those who convey competence through a signal of high rank. These findings thus address a longstanding question in the psychology of moral behavior. Consistent with predictions from reciprocal altruism, givers prioritize their moral efforts toward those they perceive to be in greatest need, despite the presence of nonverbal cues suggesting that others may be more competent. This finding thus provides strong support for a need-based explanation of altruistic behavior.

This finding also raises a challenge for the banker's paradox account of altruism, which would suggest a bias toward giving to those who convey a high likelihood of repayment. Indeed, although past studies supporting this account have found that individuals are more likely to freely help others who appear to be high rank, in all of those studies individuals were required to directly interact with recipients; decisions might thus have been guided by social factors such as a desire to appease a high status other, or to avoid contact with a low-status other. The present research provides a test of altruistic motives unadulterated by social concerns—given that Kiva lenders never meet the recipients of their aid—and therefore sheds new light on the factors that underlie reciprocal altruism. Although high-ranking recipients are more likely to effectively use the aid and repay it, low-ranking or needier recipients will experience a greater benefit from the aid, and this perceived gain is, apparently, what most strongly shapes giving decisions.

In addition, our finding that giving behaviors shifted substantially in response to subtle nonverbal cues of need and rank suggests a high degree of sensitivity in humans' capacity to calculate the likely cost/benefit ratio of one's altruistic actions. A large body of prior work has shown that these displays shape both explicit and automatic perceptions of social rank, as well as an individual's likelihood of being hired (Cuddy et al., 2015; Shariff et al., 2012; Shariff & Tracy, 2009; Tracy et al., 2013), but none of these studies examined financial or moral outcomes of these displays. The present research is thus the first to demonstrate that the expansive postural movement that is critical to expressions of pride and displays of power can have a substantial impact on both moral decision-making and actual resource distribution. Indeed, as far as we are aware, this is the first evidence of a tangible, real-world financial outcome associated with showing an expansive posture.

At a practical level, these results have important implications for needy individuals who are seeking aid and the organizations that help them do so. Kiva loan requesters who seek financial assistance to support their small business ventures may believe that demonstrating competence is a wise strategy, as donors should seek to support businesses that are particularly likely to succeed. Although this may be the case for donors who hold a stake in the venture—that is, who are giving as a direct investment for future profit—the present results suggest that donors who give with altruistic motivations do not, in fact, seek out recipients who are most likely to succeed. Instead, these altruists give to those who convey need—making the demonstration of competence a hindrance, rather than help, in the quest for financial aid.

It is also noteworthy that although these results are largely correlational, they suffer from few of the methodological limitations associated with correlations among self-report variables; all focal effects reported here are based on two separate sets of actual behaviors that share no content overlap: coded nonverbal displays and monetary allocations. In addition, although the naturalistic design of our studies did not allow us to manipulate expansive displays and thereby draw strong conclusions about causality, we were able to control for several relevant factors that might be expected to account for the observed effects, including requesters' age, attractiveness, nationality, and the amount of money they requested. Furthermore, one benefit of the present design is its high level of ecological validity, which allows us to generalize from these findings to real-world behavior. We now know what happens

when actual needy individuals—especially men—display expansive posture in the real-world context of requesting aid from potential benefactors.

Although the present findings provide robust support for a negative association between men's chest expansion and their receipt of financial aid, they cannot directly speak to the underlying psychological mechanisms operating in the minds of altruists that account for the observed effects. Understanding these mechanisms is therefore an important direction for future research. Several possibilities exist; donors may have perceived men's expansive displays as unwarranted or inappropriate, and therefore as conveying a sense of arrogance and conceit (Tracy & Prehn, 2012). Donors might also have thought consciously about recipients' need, and used expansive posture as a way of inferring that certain displayers were less in need of the requested aid. Yet another possibility is that displaying a status-enhancing expansive posture in the context of requesting help is perceived as counter-normative, resulting in perceptions of dislike or reduced trustworthiness. Consistent with this account, individuals tend to be disliked, and can even become targets of moral outrage, for showing inappropriate emotional responses (Szczyrek, Monin, & Gross, 2012).

In summary, although future studies are needed to further test the ultimate evolutionary explanation for the presently observed effect as well as the proximate psychological mechanisms, these findings provide the first robust evidence that there are real financial costs to showing expansive posture while requesting help.

#### Competing interests

We have no competing interests.

#### Author contributions

C. M. Steckler, D. Randles, and J. L. Tracy developed the study concept and study design. Data collection was performed by C. M. Steckler and D. Randles. C. M. Steckler and D. Randles performed the data analysis and interpretation under the supervision of J. L. Tracy. J. L. Tracy, C. M. Steckler, and E. Mercadante drafted the manuscript, and D. Randles provided critical revisions. All authors approved the final version of the manuscript for submission.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.evolhumbehav.2018.05.001>.

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