

Shame closely tracks the threat of devaluation by others, even across cultures

Daniel Sznycer^{a,1}, John Tooby^b, Leda Cosmides^a, Roni Porat^{c,d}, Shaul Shalvi^{e,f}, and Eran Halperin^c

^aDepartment of Psychological and Brain Sciences, Center for Evolutionary Psychology, University of California, Santa Barbara, CA 93106-9660;

^bDepartment of Anthropology, Center for Evolutionary Psychology, University of California, Santa Barbara, CA 93106-3210; ^cIchler School of Psychology, Interdisciplinary Center Herzliya, Herzliya 46150, Israel; ^dDepartment of Psychology, Hebrew University of Jerusalem, Jerusalem 9190501, Israel; ^eCenter for Experimental Economics and political Decision Making (CREED) and Department of Psychology, University of Amsterdam, 1018 WB Amsterdam, The Netherlands; and ^fPsychology Department, Ben Gurion University of the Negev, Beer Sheva 8410501, Israel

Edited by David Buss, Department of Psychology, University of Texas at Austin, Austin, TX, and accepted by the Editorial Board January 19, 2016 (received for review July 24, 2015)

We test the theory that shame evolved as a defense against being devalued by others. By hypothesis, shame is a neurocomputational program tailored by selection to orchestrate cognition, motivation, physiology, and behavior in the service of: (i) deterring the individual from making choices where the prospective costs of devaluation exceed the benefits, (ii) preventing negative information about the self from reaching others, and (iii) minimizing the adverse effects of devaluation when it occurs. Because the unnecessary activation of a defense is costly, the shame system should estimate the magnitude of the devaluative threat and use those estimates to cost-effectively calibrate its activation: Traits or actions that elicit more negative evaluations from others should elicit more shame. As predicted, shame closely tracks the threat of devaluation in the United States ($r = .69$), India ($r = .79$), and Israel ($r = .67$). Moreover, shame in each country strongly tracks devaluation in the others, suggesting that shame and devaluation are informed by a common species-wide logic of social valuation. The shame–devaluation link is also specific: Sadness and anxiety—emotions that coactivate with shame—fail to track devaluation. To our knowledge, this constitutes the first empirical demonstration of a close, specific match between shame and devaluation within and across cultures.

shame | emotion | valuation | culture | evolutionary psychology

In all known foraging societies past and present, humans have lived embedded in dense networks of cooperative and competitive interactions, a condition that is believed to have prevailed during the evolution of our species (1–3). Individuals in such social ecologies suffered or prospered depending on the summed effects of the choices of others—such as when and how often to share food, to provide care for another’s child, to defer in conflicts, and so on. Ancestrally, the difference between an individual reproducing successfully, struggling, or dying early would have depended (in part) on the degree to which others traded off their own welfare for the welfare of that individual.

Over the last fifty years, evolutionary researchers have identified a number of selection pressures that favored the evolution of decision systems that regulate welfare trade-offs between individuals, including kin selection (4), reciprocity/exchange (5, 6), risk-pooling (2), parenting (7), mating (8), externality management (9), and the asymmetric war of attrition (10). These theories, in turn, led to the empirical discovery of various choice architectures that evolved to produce best-bet welfare trade-off decisions given the information available to the actor about a potential recipient [e.g., how to respond to cues of genetic relatedness; how to respond to cues predicting the recipient’s ability to effectively assert and defend her or his interests; how to respond to cues indicating a potential partner tends to cheat or free-ride (11–16)].

In short, favorable valuation by others was a critical resource for our ancestors. The more weight others place on the individual’s welfare relative to their own, the better off that individual will be; they will sacrifice more for that individual’s benefit, and forgo

more actions that would benefit themselves but harm that individual. In contrast, when new cues are detected that reveal the individual to be less valuable or less able to defend her interests, less weight will be placed on her welfare by the people with whom she interacts. She will have been devalued. As a result, such an individual will be helped less and harmed more. Indeed, ancestrally, social devaluation and exclusion would have entailed severe fitness costs (17, 18). This makes information that would cause others to lower their valuations of the individual a threat to fitness, and hence a selection pressure likely to have left its signature on the human neural architecture.

Indeed, an evolutionary theory of the function and architecture of the emotion of shame logically emerges from considering the functional demands placed on our ancestors by their social ecology (19–24). According to what we will call the “information threat theory of shame,” shame is an emotion program that evolved to manage the evolutionarily recurrent threat of devaluation due to adverse information reaching others (19–24). This theory incorporates and integrates elements from several evolutionary researchers (19–23, 25), and stands in contrast to the prominent view that shame is inherently maladaptive or pathological (26, 27). By “emotion” we are not referring simply to subjective feeling states. Instead, we apply the evolutionary view that emotions consist of neurally based programs whose control logic was tailored by natural selection to coordinate cognitive, motivational, behavioral, and physiological mechanisms to respond to particular evolutionarily recurrent adaptive problems (28–30): in the case of shame, to defend against devaluation (19–24).

Significance

Prominent theories of shame hold that shame is inherently maladaptive. However, direct tests of the fit between shame and its probable target domain have not previously been conducted. Here we test the alternative hypothesis that shame, although unpleasant (like pain), serves the adaptive function of defending against the social devaluation that results when negative information reaches others—by deterring actions that would lead to more devaluation than benefits, for example. If so, the intensity of shame people feel regarding a given item of negative information should track the devaluation that would happen if that item became known. Indeed, the data indicate a close match between shame intensities and audience devaluation, which suggests that shame is an adaptation.

Author contributions: D.S., J.T., and L.C. designed research; D.S. and S.S. performed research; D.S. analyzed data; and D.S., J.T., L.C., R.P., S.S., and E.H. wrote the paper.

The authors declare no conflict of interest.

This article is a PNAS Direct Submission. D.B. is a guest editor invited by the Editorial Board.

¹To whom correspondence should be addressed. Email: dsznycer2@gmail.com.

This article contains supporting information online at www.pnas.org/lookup/suppl/doi:10.1073/pnas.1514699113/-DCSupplemental.

According to the information threat theory, shame is elicited by the prospect or actuality of negative information about the individual reaching others. Its neurocognitive architecture is designed to: (i) deter the individual from taking courses of action that would cost more in terms of social devaluation than the payoffs the action would otherwise yield; (ii) limit the extent to which others learn about and spread potentially damaging information; (iii) limit the degree and the costs of any ensuing social devaluation; and, if devaluation occurs, (iv) mobilize the individual to respond adaptively to the new social landscape.

Existing findings on shame are consistent with this theory. Shame motivates one to avoid behaviors that could cause devaluation and to conceal damaging information (31). When damaging information is discovered, the shamed individual withdraws (32), accepts subordination (33, 34), shows appeasement behavior (35), increases cooperativeness (36, 37), and up-regulates cortisol (38) as well as proinflammatory cytokines to defend against infection (39). This is accompanied by a stereotyped nonverbal display (22, 40, 41). It may also be accompanied by aggression (42, 43), which would be expected if social benefits are no longer as abundantly provided because of being valued, but must instead be bargained for by threatening harm (44).

Although the hypothesis that shame evolved because it served an adaptive function might seem self-evident, a prominent theory of shame—attribitional theory—holds that this emotion is maladaptive (26, 27). Shame is, after all, associated not only with aggression but also with debilitating conditions, such as anxiety, depression, and paranoid ideation (26, 33). (We note, however, that these correlates might equally be caused by the prospect or actuality of devaluation, rather than by the emotion of shame per se.) According to one version of the attribitional theory, shame is about how the “self” views itself; that is, shame is not caused by concerns about others’ evaluations of the individual. If concerns about others’ evaluations sometimes emerge, they are thought to be a consequence of shame, not a cause of it: “people focus on others’ evaluations because they are feeling shame, not vice versa” (45, p. 349).

Here we report tests of a core prediction of the information threat theory: If shame evolved as a defense against devaluation due to negative information, then when one anticipates the release of items of negative information, those items that elicit more devaluation among members of the audience should elicit proportionately more shame. Indeed, because one of the key functions of the shame system is to evaluate alternative future courses of action, the close tracking of devaluation by shame should occur even in the complete absence of communication between the audience (whose devaluation is the problem) and the individual guiding her choices based on anticipated shame. Decisions about actions must be made in advance of observing feedback about one’s actions. Thus, asking subjects to imagine how much shame they would feel in various situations is not a convenient but ecologically invalid assay of shame—the anticipated or imagined shame is precisely the ecologically valid magnitude predicted by the theory to track degree of devaluation.

A well-engineered shame system should track devaluation incrementally and closely. The underactivation of shame would lead to maladaptive choices where (for example) the costs of the resulting devaluation exceed the benefits of the action that provoked the devaluation. Similarly, as with any defensive system, an overactivation of shame would entail diminishing or even negative returns. Given these competing demands, shame is expected to deploy in lockstep with the degree of devaluation estimated by the individual to be prevalent in the audience—the local social ecology relevant to the individual.

We tested this key design feature in the United States, India, and Israel.

Study 1

Study 1 tests the prediction that the intensity of shame reflects the degree of devaluation in the social world of the individual. To test this prediction, we created 29 scenarios in which someone’s acts, traits, or circumstances might lead them to be viewed negatively. The scenarios were designed to elicit reactions in a wide range of evolutionarily relevant domains, such as mating, parenting, social exchange, aggressive contests, status, skills, and the violation of coordinative norms.

In Study 1, participants were divided into two between-subjects conditions: an “audience” condition and a “shame” condition. Participants in the audience condition were asked to provide their reactions to 29 scenarios involving a third-party: an individual other than themselves who is the same sex and age as the participant (e.g., “He does a bad job taking care of his children,” “He is not generous with others,” “He has no idea how to load or fire a gun,” “He has poor table manners.”) Participants in the audience condition were asked to “indicate how you would view [someone of your same sex and age] if they were in those situations.” They indicated their reactions using scales ranging from 1 (I wouldn’t view them negatively at all) to 7 (I’d view them very negatively). These ratings provide a measure of the degree to which members of a given population would devalue the individual described in the scenarios.

In the shame condition, a different set of participants was asked to “indicate how much shame you would feel if you were in those situations” (i.e., in each of the 29 scenarios; e.g., “You do a bad job taking care of your children,” “You are not generous with others,” “You have no idea how to load or fire a gun,” “You have poor table manners”), with scales ranging from 1 (no shame at all) to 7 (a lot of shame). The stimuli in the audience and shame conditions were identical on a scenario-by-scenario basis, the only difference being the perspective from which the events are described.

Study 1 tests participants from three populations: the United States, India, and Israel. We first ask whether, as the information threat theory predicts, the intensity of shame tracks the degree of devaluation among members of one’s own culture. Study 1 also tests whether the intensity of shame tracks the degree of devaluation among members of a foreign culture, as well as whether devaluation in one culture predicts devaluation in another, and whether shame in one culture predicts shame in another.

From an evolutionary perspective, adaptations for valuation are expected to be distributed in a species-universal fashion (46, 47). If a species-wide architecture of social valuation exists, then this raises the expectation—in contrast to traditional anthropological expectation—that many things that are viewed as devaluing, and hence shameful, will be shared across cultures rather than unique to each culture. Whether something appears shared across cultures depends on the level of abstraction at which it is described, however. Engaging in an act that others find, for example, polluting or cowardly might elicit devaluation in every culture. However, what counts as polluting or cowardly may differ across cultures and time (e.g., mixing meat and milk for Orthodox Jews; for 18th century European aristocrats, being publicly insulted without challenging the insulter to a duel). Because we are interested in the functional design of shame, we created scenarios that should lead to devaluation across cultures: ones evoking evolutionarily relevant domains, phrased at the level of abstraction implied by the relevant adaptive problem. If some values are universally held, and shame is a defense against devaluation, then the intensity of shame these scenarios elicit in India (for example) should track the degree of devaluation they elicit in the United States and Israel. We note that, if shame is an evolved defense against devaluation, shame should track devaluation specifically in one’s local social world. Shame will track the devaluation of foreign audiences, but only

to the extent that the valuations of foreign and local audiences are in agreement with each other. If these valuations are uncorrelated, however, the relationship between shame and foreign devaluation should dissolve.

Within-Country Results. We first present the devaluation and shame results for each country. The scenarios as well as the shame and devaluation means and standard deviations for each scenario and each country are provided in *SI Appendix, Table S1*. Mean devaluation ratings ranged from 1.51 to 6.36 in the United States, 2.21–5.87 in India, and 1.47–6.59 in Israel.

1. *Social devaluation: Do participants within a given country agree on how negatively they would view the target individual in each of these scenarios?*

Yes. To measure agreement among raters on how discrediting these situations are relative to one another, we computed the intraclass correlations (ICC) for each sample. These correlations were high: ICC (2,59) = .99 in the United States, ICC (2,85) = .97 in India, and ICC (2,83) = .99 in Israel. In other words, there was widespread agreement among participants about the extent to which the individuals described in these scenarios would be viewed negatively.

2. *Shame: Do participants within a given country agree on how much shame they would feel if they found themselves in these scenarios?*

Yes. The intraclass correlations for shame were also high: ICC (2,59) = .97 in the United States, ICC (2,70) = .97 in India, and ICC (2,82) = .99 in Israel. (Mean shame ratings ranged from 2.17 to 6.49 in the United States, 2.43–6.00 in India, and 1.90–6.76 in Israel.) Thus, participants agreed about the extent to which they would feel shame in these situations.

3. *Does audience devaluation predict feelings of shame? In other words, do the negative evaluations of others predict how much shame you would feel if you found yourself in these situations?*

Yes (see Table 1, diagonal values). For each scenario we calculated the mean shame ratings provided by participants in the shame condition, and the mean devaluation ratings provided by participants in the audience condition. Shame and devaluation means were highly correlated with one another in each country, with a mean r of .72 and a range of r s of .67–.79. Scatter plots and regression lines for each country are shown in Fig. 1.

Recall that the shame and devaluation ratings originated from different participants. Consequently, these high correlations cannot be attributed to participants matching their devaluation and shame ratings (*SI Appendix, Study S1*, and Tables S4–S6 and S9). Furthermore, the calibration of shame to devaluation is finely graded—it cannot be explained by a categorical distinction between situations eliciting high versus low devaluation (Fig. 1).

Between-Country Results. Some actions, traits, and situations elicit devaluation (and shame) in some cultures but not others (48). However, if species-typical valuation mechanisms exist, then there will be situations that provoke social devaluation (and elicit

Table 1. Studies 1a–1c

Shame	Devaluation		
	United States	India	Israel
United States	.69***	.63***	.74***
India	.63***	.79***	.72***
Israel	.59**	.55**	.67***

Correlations between shame and devaluation within- and between-countries. Coefficients are Pearson's r s. ** $P < .01$, *** $P < .001$. The correlations involving Israel are based on the subset of 24 scenarios run in Israel; the other correlations are based on the full set of 29 scenarios.

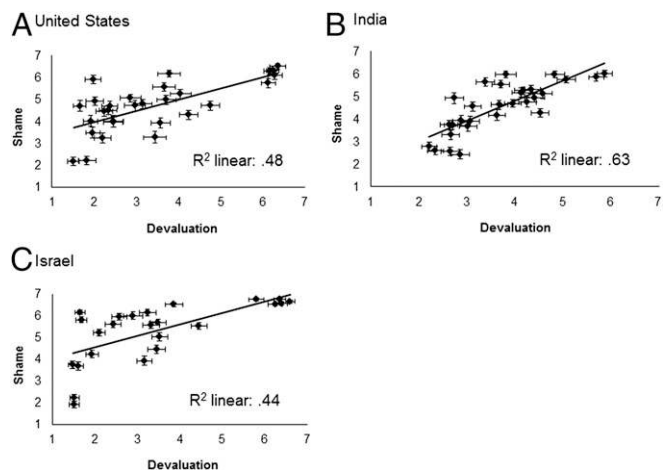


Fig. 1. Studies 1a–1c. Scatter plots and regression lines: Shame as a function of devaluation. Each point represents the mean devaluation rating and mean shame rating of one scenario. Bars represent 5SEs. Shame and devaluation ratings were given by different sets of subjects. (A) United States sample, (B) India sample, (C) Israel sample. n (A) = n (B) = 29; n (C) = 24.

shame) across cultures (49; see also refs. 50 and 51). The between-country analyses test this hypothesis.

4. *Social devaluation: Do participants across countries agree on how negatively they would view the individuals in these scenarios?*

Yes. To test for between-country agreement in devaluation, we computed the extent to which the mean devaluation ratings were correlated across countries. There was a high degree of agreement on the extent to which a given situation would provoke devaluation among: (i) Americans and Indians, $r(27) = .87$, $P = 10^{-9}$; (ii) Americans and Israelis, $r(22) = .95$, $P = 10^{-11}$; and (iii) Indians and Israelis, $r(22) = .86$, $P = 10^{-7}$.

5. *Shame: Do participants across countries agree on how much shame they would feel if they found themselves in these situations?*

Yes. To test for between-country agreement in shame, we computed the extent to which the mean shame ratings were correlated across countries. There was a high degree of agreement on the extent to which a given situation would elicit shame among: (i) Americans and Indians, $r(27) = .77$, $P = 10^{-6}$; (ii) Americans and Israelis, $r(22) = .92$, $P = 10^{-9}$; and (iii) Indians and Israelis, $r(22) = .80$, $P = 10^{-5}$.

6. *Does shame in a given country track devaluation in the other countries?*

The shame elicited in each country was strongly correlated with the devaluation from the other two countries, with a range of r s of .55–.74 (see Table 1, off-diagonal values). The average of these six between-country correlations was $r = .64$, very close to the correlations between devaluation and shame found within each country (mean $r = .72$). Indeed, in no case did shame correlate significantly more highly with within-country devaluation than with between-country devaluation (P s for the difference tests: .23–.90). In other words, the shame elicited by these scenarios tracked the devaluation of foreign audiences as strongly as it tracked the devaluation of domestic audiences.

Shame will track devaluation by foreign audiences, but only when foreign and local audiences agree in their valuations. When they disagree, the relationship between shame and foreign devaluation should weaken or dissolve. To test this prediction, we conducted a follow-up study using scenarios constructed to elicit: (i) similar levels of shame in India and the United States, (ii) more shame in India, or (iii) more shame in the United States [the latter two types of scenarios were based on anthropological (50) and historical (52) reports, as well as a website with advice to visitors to India (53) and advice from bicultural informants]. As

predicted, shame tracked the devaluation of foreign audiences when the valuations of foreign and local audiences were correlated, but it failed to track foreign audiences when the valuations of foreign and local audiences were uncorrelated (*SI Appendix, Study S2, and Tables S7, S8, and S10*).

Study 2

Study 1 showed that shame closely tracks audience devaluation. But are the effects of social devaluation specific to shame? Study 2 was designed to answer this question by also assaying two other emotions: sadness and anxiety. These emotions were selected because they often co-occur with shame (26, 33), but are unlikely to be construed as synonyms for it, unlike “embarrassment” and “guilt” (32, 54) (*SI Appendix, Study S1*). However, neither sadness nor anxiety appears to be (uniquely) designed for minimizing audience devaluation (55, 56). The prediction here is that shame tracks devaluation more closely than sadness and anxiety do. Study 2 was conducted in the United States and India.

The scenarios as well as the devaluation and emotion means and SDs for each scenario and each country are provided in *SI Appendix, Tables S2 and S3*.

1. *Do participants agree on the extent to which a situation would elicit devaluation, shame, sadness and anxiety?*

Yes. As before, participants agreed on how negatively they would evaluate the target individual across the scenarios: ICC (2,48) = .98 (United States), ICC (2,38) = .92 (India). They also agreed on how much they would feel each emotion if they found themselves in these situations. In the United States and India, respectively: ICC (2,51) = .96 and ICC (2,35) = .87 for shame, ICC (2,51) = .97 and ICC (2,39) = .92 for sadness, and ICC (2,50) = .97 and ICC (2,39) = .86 for anxiety.

2. *Does shame track audience devaluation, and does it do so better than sadness and anxiety?*

Yes, and yes. The extent to which a scenario would elicit devaluation in an audience positively predicted the intensity of shame participants would feel when imagining themselves in that scenario, $r(27) = .79$, $P = 10^{-6}$ (United States); $r(27) = .82$, $P = 10^{-7}$ (India). Devaluation and anxiety correlated somewhat in the United States, $r(27) = .37$ ($P = 0.05$) and in India, $r(27) = .57$, $P = .0014$. These correlations are descriptively lower than the correlations between devaluation and shame, and the differences are significant in the United States, $z = 2.46$, $P = .014$, and marginally significant in India, $z = 1.84$, $P = .066$. The correlation between sadness and devaluation was not significantly different from zero in the United States, $r(27) = .23$, $P = .22$, and was marginally significant in India, $r(27) = .36$, $P = .056$. These correlations are significantly lower than the correlations between devaluation and shame: $z = 3.02$, $P = .003$ (United States); $z = 2.81$, $P = .005$ (India).

Recall that the devaluation, shame, sadness, and anxiety ratings originated from different participants. Nevertheless, there were high correlations between the three emotions: for shame and anxiety, $r(27) = .77$, $P = 10^{-5}$ (United States); $r(27) = .82$, $P = 10^{-7}$ (India); for shame and sadness $r(27) = .65$, $P = .0002$ (United States); $r(27) = .64$, $P = .0002$ (India); and for sadness and anxiety, $r(27) = .87$, $P = 10^{-9}$ (United States); $r(27) = .84$, $P = 10^{-7}$ (India). The fact that audience devaluation predicted shame more strongly than it predicted the other emotions is particularly telling given that the three emotions were highly correlated with one another.

To more clearly assess the associations between the emotions and devaluation, we regressed devaluation simultaneously on shame, anxiety, and sadness. Shame continued to predict devaluation even after controlling for the other two emotions [$\beta = 1.22$, $P = 10^{-7}$ (United States); $\beta = 1.03$, $P = 10^{-4}$ (India)]. Meanwhile, neither anxiety [$\beta = -0.36$, $P = .13$ (United States); $\beta = -0.07$, $P = .79$ (India)] nor sadness [$\beta = -0.24$, $P = .24$ (United States); $\beta = -0.24$, $P = .23$ (India)] displayed unique

associations with devaluation. This implies that the significant and marginal zero-order correlations between devaluation and anxiety and between devaluation and sadness were artifacts of their association with shame.

In sum, the match between audience devaluation and shame is specific; it does not generalize to these other emotions, even when they coactivate with shame.

Discussion

These findings support the hypothesis that shame is an adaptation designed to counter the threat of being socially devalued. In particular, we showed that shame in the individual closely tracks devaluation in the individual's social ecology—what one expects of a defensive system engineered to balance the competing demands of effectiveness and economy by steering between oversensitivity to devaluation on the one hand and reckless disregard of it on the other. Moreover, the deployment of shame is specific: Emotions that coactivate with shame, such as sadness and anxiety, fail to track devaluation. These data are problematic for theories in which shame is a pathology to which others' views are irrelevant.

It is worth noting how closely shame ratings tracked devaluation ratings, despite the fact that these ratings were given by different sets of participants. For shame to track devaluation, the shame system must possess accurate information about how strongly the local audience will devalue individuals as a function of their actions or traits. Considerations of parsimony suggest that both are informed by a common underlying logic of social valuation.

The agreement across cultures, and not just within them, on shame, devaluation, and their interrelationship is also noteworthy. Nonevolutionary views conceptualize cultures as being richly and arbitrarily different from each other (57). If this were true, then what cultures devalue and what makes members of different cultures ashamed should be substantially different. Indeed, shame in particular has been argued to heavily rely on culture-specific schemas (58, 59). A stark version of this is the distinction some anthropologists make between shame cultures and guilt cultures (58). However, if (i) shame is a human-universal adaptation designed to defend against devaluation by members of one's local social ecology, and (ii) there is a species-wide architecture of social valuation, drawing on a species-typical array of evaluative adaptations for mating, reciprocity, kinship, coalitions, disease avoidance, and so on, then there ought to be robust similarities from culture to culture in shame, devaluation, and their relationship. This view gracefully explains not only the high degree of within-culture consistency or consensus (60) but also the between-culture consistency that we predicted and found. We cannot, of course, rule out the possibility that elements of shared cultural phylogeny (e.g., the use of English in the United States and India) or convergent evolution in transmitted culture led to these cross-cultural consistencies (see, e.g., ref. 61). Studies with a larger array of more distantly related cultures could address these issues. Either way, under the information threat theory, shame should track foreign audiences only to the extent that the latter's valuations correlate with the valuations of local audiences; we have found support for this hypothesis (*SI Appendix, Study S2*).

The data reported are correlations; so does devaluation cause shame (as hypothesized here) or does shame cause devaluation? The shame-causes-devaluation link seems unlikely. The experimental manipulation of criticism and publicity reliably boosts shame (23, 38, 62, 63). In contrast, displays of shame or embarrassment attenuate an audience's devaluing response when the audience and the offender share common knowledge about the discrediting act (35, 64, 65). The averted gaze and slumped posture of the shame display may lead to audience devaluation when the audience has not witnessed a discrediting act (20, 22).

However, a straightforward explanation is that the shame display leads the audience to infer discrediting behavior or reduced status on the part of the individual exhibiting shame (65). In sum, the observed association between shame and devaluation more plausibly reflects the causal link from devaluation to shame hypothesized by the information threat theory.

The theoretical proposals of various evolutionarily oriented shame researchers substantially overlap; these researchers agree, for example, that shame is a product of natural selection, that shame is sensitive to other people's evaluations of the self, that shame both deals with and anticipates threats, and that shame motivates remedial behavior (19–23). There do, however, remain differences. According to one view (21, 22), for example, shame is activated by violating a cultural norm, and “functions to enhance conformity to cultural standards for behavior that form the basis for much cooperation” (22, p. 174). The scope of the information threat theory, however, is broader than norm-governed cooperation and coordination: Shame should also be triggered by any trait, action, situation, or circumstance that would lead you to be devalued by any individual or set of individuals who can affect your welfare. Moreover, under the information threat theory, shame functions to limit information-triggered devaluation rather than to enhance conformity. The current studies are not well suited to test among different evolutionary theories of shame. Future work should test between these theories.

If the threat of devaluation is the adaptive problem the shame system evolved to solve, what other design features should shame have? First, individuals with characteristics that render them less vulnerable to devaluation by others (like strength, attractiveness, entrenched status) should, other things being equal, be less prone to shame (24). Second, the variation in the nature of the other party or parties that form an audience should lead to systematic variation in shame intensity. For example, more aggressively formidable audiences should be more shame-provoking than weaker ones, other things being equal (22). Third, shame-proneness should be a function of the ease with which new relationships can be established to compensate for degraded relationships when devaluation occurs (24).

Indeed, many of the phenomena established in the shame literature have functional interpretations in this framework. Shame is known to mobilize withdrawal (32, 34), which protects the shamed individual against acts immediately motivated by devaluation, and may weaken the formation of common knowledge of the shameful act (66). Submission (33), appeasement (35), and cooperation (37), each would function to increase the value of the shamed individual after devaluation. Aggression sometimes occurs (42, 43), which is expected when threatening or inflicting harm is a cost-effective way of preventing the spread of negative information or when it is the best way to bargain for better treatment.

More broadly, the current results help to locate shame within a functionally interlinked architecture of social emotions that also includes anger, gratitude, pride, and guilt. Although each of these emotions has different hypothesized evolved functions, they all depend on an underlying evolved welfare trade-off psychology (67, 68). Briefly, the function of anger, for example, is to orchestrate bargaining tactics when others put too low a weight on the individual's welfare; the function of gratitude is to consolidate a higher level of cooperation when the system detects that an unexpectedly high weight has been put on one's welfare; the function of pride is to motivate the individual to publicize (and achieve) traits or acts that enhance valuation by others; the function of shame is to limit reductions in the weight placed on one's welfare by an audience; the function of guilt is to prevent or remedy events where one put too low a weight on the welfare of another (often unintentionally), independent of whether the other will know it. Within this framework, one can distinguish guilt and shame while seeing why they are related. In guilt, the

outcome to be avoided is imposing harm on valued others, something that remains even if they never discover it. In shame, the outcome to be avoided is being devalued by others. One can feel both shame and guilt about the same act, but the functions, internal recalibrations, and outputs are distinct. For example, someone who felt guilt and shame about infidelity might refrain from it, whereas someone who felt shame but not guilt about infidelity might practice it but conceal it. Future work may profitably assess similarities and differences between shame and other emotions, such as guilt and embarrassment (32, 43, 62, 69).

Because shame (like pain) causes personal suffering and sometimes leads to hostile behavior, this emotion has been called “maladaptive” and “ugly” (32, 70). However, an evolutionary–psychological analysis of the existing evidence (35, 62, 71) suggests a different view: this ugly emotion may be the expression of a system that is elegantly designed to deter injurious choices and to make the best of a bad situation.

Methods

The study procedures were approved by the Institutional Review Boards at the University of California, Santa Barbara and the Ben Gurion University of the Negev. Electronic informed consents were provided at both universities. The data for all the studies are included in [Dataset S1](#).

Study 1.

Sample for Study 1a. Amazon Mechanical Turk (AMT) was used to recruit 122 participants in the United States. Four of them were removed from analyses because of failure to correctly respond to an attention check, leaving an effective sample size of 118 (62 females), with a mean age of 36 y (SD: 14). **Sample for Study 1b.** AMT was used to recruit 212 participants in India. Fifty-seven of them were removed from analyses because of failure to correctly respond to an attention check, leaving an effective sample size of 155 (59 females), with a mean age of 31 y (SD: 10).

Sample for Study 1c. One hundred sixty-five participants (133 females) were recruited in Israel from a university. Their mean age was 23 y (SD: 2).

Measures. The 29 scenarios are shown in [SI Appendix, Table S1](#). Participants were randomly assigned to either the audience condition or the shame condition. Participants indicated their sex at the outset and the scenarios were sexed appropriately. The materials included the full set of 29 scenarios in the United States and India, and 24 of the 29 scenarios in Israel. In Israel the materials were presented with other questionnaires to be reported in future work. The order in which the scenarios were presented was random across participants. The stimuli were presented in English in the United States and India, and in Hebrew in Israel (in Israel we used the unambiguous and specific shame term: “בושה” – “busha”). The Israel stimuli were first translated from English into Hebrew and then independently back-translated into English to solve inconsistencies between the original and the Hebrew translation.

Study 2.

Sample for Study 2a. AMT was used to recruit 201 participants in the United States. One of them was removed from analyses because of failure to correctly respond to an attention check, leaving an effective sample size of 200 (82 females), with a mean age of 32 y (SD: 10).

Sample for Study 2b. AMT was used to recruit 179 participants in India. Twenty-eight of them were removed from analyses because of failure to correctly respond to an attention check, leaving an effective sample size of 151 (52 females), with a mean age of 32 y (SD: 9).

Measures. Study 2 had four between-subjects conditions: one audience condition assessing devaluation, and three emotion conditions: shame, sadness, and anxiety. The scenarios were the same as in Studies 1a and 1b. The stimuli were presented in English in the United States and India.

ACKNOWLEDGMENTS. We thank Lindsay Vogt, Adrian Jaeggi, Rahul Nirmal, and two anonymous reviewers for their helpful comments; Yana Zlatkin, Danna Gal, Eliya Ziman for their help with data collection in the Israeli sample (Study 1c); and Howard Waldow. This research was supported by a National Institutes of Health Director's Pioneer Award (to L.C.), a grant from the John Templeton Foundation (JTF) (to J.T. and L.C.), and an Israeli Science Foundation Grant 914.14 (to S.S.). The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the NIH or the JTF.

1. Gurven M (2004) To give and to give not: The behavioral ecology of human food transfers. *Behav Brain Sci* 27(4):543–583.
2. Kaplan H, Hill K (1985) Food sharing among Ache foragers: Tests of explanatory hypotheses. *Curr Anthropol* 26(2):223–246.
3. Lee R, DeVore I (1968) *Man the Hunter* (Aldine, Chicago).
4. Hamilton WD (1964) The genetical evolution of social behaviour. I. *J Theor Biol* 7(1):1–16.
5. Trivers R (1971) The evolution of reciprocal altruism. *Q Rev Biol* 46(1):35–57.
6. Williams GC (1966) *Adaptation and Natural Selection: A Critique of Some Current Evolutionary Thought* (Princeton Univ Press, Princeton, NJ).
7. Clutton-Brock TH (1991) *The Evolution of Parental Care* (Princeton Univ Press, Princeton, NJ).
8. Trivers RL (1972) *Parental Investment and Sexual Selection*, ed Campbell B (Aldine-Atherton, Chicago), pp 136–179.
9. Tooby J, Cosmides L (1996) Friendship and the Banker's Paradox: Other pathways to the evolution of adaptations for altruism. *Evolution of Social Behaviour Patterns in Primates and Man. Proceedings of the British Academy*, eds Runciman WG, Maynard Smith J, Dunbar RIM (Oxford University Press, Oxford), Vol 88, pp 119–143.
10. Hammerstein P, Parker GA (1982) The asymmetric war of attrition. *J Theor Biol* 96(4):647–682.
11. Lieberman D, Tooby J, Cosmides L (2007) The architecture of human kin detection. *Nature* 445(7129):727–731.
12. Daly M, Wilson M (1980) Discriminative parental solicitude: A biological perspective. *J Marriage Fam* 42(2):277–288.
13. Cosmides L, Tooby J (2005) Neurocognitive adaptations designed for social exchange. *The Handbook of Evolutionary Psychology*, ed Buss DM (Wiley, Hoboken, NJ), pp 584–627.
14. Delton AW, Cosmides L, Guemo M, Robertson TE, Tooby J (2012) The psychosemantics of free riding: Dissecting the architecture of a moral concept. *J Pers Soc Psychol* 102(6):1252–1270.
15. Krasnow MM, Cosmides L, Pedersen EJ, Tooby J (2012) What are punishment and reputation for? *PLoS One* 7(9):e45662.
16. Fessler DM, Holbrook C, Gervais MM (2014) Men's physical strength moderates conceptualizations of prospective foes in two disparate societies. *Hum Nat* 25(3):393–409.
17. Boehm C (1985) Execution within the clan as an extreme form of ostracism. *Soc Sci Inf (Paris)* 24(2):309–321.
18. Sugiyama LS (2004) Illness, injury, and disability among Shiwi forager-horticulturalists: Implications of health-risk buffering for the evolution of human life history. *Am J Phys Anthropol* 123(4):371–389.
19. Gilbert P (1998) *What Is Shame? Some Core Issues and Controversies*, eds Gilbert P, Andrews B (Oxford Univ Press, New York), pp 3–38.
20. Gilbert P, McGuire MT (1998) Shame, status, and social roles. *Psychobiology and evolution. Shame: Interpersonal Behavior, Psychopathology, and Culture*, eds Gilbert P, Andrews B (Oxford Univ Press, New York), pp 99–125.
21. Fessler DMT (1999) *Toward an Understanding of the Universality of Second Order Emotions*, ed Hinton AL (Cambridge Univ Press, New York), pp 75–116.
22. Fessler DMT (2007) From appeasement to conformity: Evolutionary and cultural perspectives on shame, competition, and cooperation. *The Self-Conscious Emotions: Theory and Research*, eds Tracy JL, Robins RW, Tangney JP (Guilford Press, New York), pp 174–193.
23. Sznycer D (2010) Cognitive adaptations for calibrating welfare tradeoff motivations, with special reference to the emotion of shame. PhD dissertation (University of California, Santa Barbara).
24. Sznycer D, et al. (2012) Cross-cultural differences and similarities in proneness to shame: An adaptationist and ecological approach. *Evol Psychol* 10(2):352–370.
25. Baumeister RF, Tice DM (1990) Point-counterpoints: Anxiety and social exclusion. *J Soc Clin Psychol* 9(2):165–195.
26. Tangney JP, Wagner P, Gramzow R (1992) Proneness to shame, proneness to guilt, and psychopathology. *J Abnorm Psychol* 101(3):469–478.
27. Tangney JP, Dearing RL (2003) *Shame and Guilt* (The Guilford Press, New York).
28. Tooby J, Cosmides L (1990) The past explains the present: Emotional adaptations and the structure of ancestral environments. *Ethol Sociobiol* 11(4):375–424.
29. Tooby J (1985) The emergence of evolutionary psychology. *Emerging Syntheses in Science*, ed Pines D (Santa Fe Institute, Santa Fe, NM).
30. Nesse RM (1990) Evolutionary explanations of emotions. *Hum Nat* 1(3):261–289.
31. Sznycer D, Schniter E, Tooby J, Cosmides L (2015) Regulatory adaptations for delivering information: The case of confession. *Evol Hum Behav* 36(1):44–51.
32. Tangney JP, Miller RS, Flicker L, Barlow DH (1996) Are shame, guilt, and embarrassment distinct emotions? *J Pers Soc Psychol* 70(6):1256–1269.
33. Gilbert P (2000) The relationship of shame, social anxiety and depression: The role of the evaluation of social rank. *Clin Psychol Psychother* 7(3):174–189.
34. Wicker FW, Payne GC, Morgan RD (1983) Participant descriptions of guilt and shame. *Motiv Emot* 7(1):25–39.
35. Keltner D, Young RC, Buswell BN (1997) Appeasement in human emotion, social practice, and personality. *Aggress Behav* 23(5):359–374.
36. Masclat D, Noussair C, Tucker S, Villeval MC (2003) Monetary and nonmonetary punishment in the voluntary contributions mechanism. *Am Econ Rev* 93(1):366–380.
37. de Hooge IE, Breugelmans SM, Zeelenberg M (2008) Not so ugly after all: When shame acts as a commitment device. *J Pers Soc Psychol* 95(4):933–943.
38. Gruenewald TL, Kemeny ME, Aziz N, Fahey JL (2004) Acute threat to the social self: Shame, social self-esteem, and cortisol activity. *Psychosom Med* 66(6):915–924.
39. Dickerson SS, Gable SL, Irwin MR, Aziz N, Kemeny ME (2009) Social-evaluative threat and proinflammatory cytokine regulation: An experimental laboratory investigation. *Psychol Sci* 20(10):1237–1244.
40. Tracy JL, Robins RW, Schriber RA (2009) Development of a FACS-verified set of basic and self-conscious emotion expressions. *Emotion* 9(4):554–559.
41. Keltner D (1995) Signs of appeasement: Evidence for the distinct displays of embarrassment, amusement, and shame. *J Pers Soc Psychol* 68(3):441–454.
42. Fessler DMT (2001) Emotions and cost/benefit assessment: The role of shame and self-esteem in risk taking. *Bounded Rationality: The Adaptive Toolbox*, eds Selten R, Gigerenzer G (MIT Univ Press, Cambridge, MA), pp 191–214.
43. Tangney JP, Wagner P, Fletcher C, Gramzow R (1992) Shamed into anger? The relation of shame and guilt to anger and self-reported aggression. *J Pers Soc Psychol* 62(4):669–675.
44. Sell A, Tooby J, Cosmides L (2009) Formidability and the logic of human anger. *Proc Natl Acad Sci USA* 106(35):15073–15078.
45. Tangney JP, Stuewig J, Mashek DJ (2007) Moral emotions and moral behavior. *Annu Rev Psychol* 58(1):345–372.
46. Brown DE (1991) *Human Universals* (Temple Univ Press, Philadelphia).
47. Jackendoff R (2006) The peculiar logic of value. *J Cogn Cult* 6(3):375–407.
48. Crocker J, Major B, Steele C (1998) Social stigma. *Handbook of Social Psychology*, eds Fiske S, Gilbert D, Lindzey G (McGraw-Hill, Boston, MA), Vol 2, pp 504–553.
49. Kurzban R, Leary MR (2001) Evolutionary origins of stigmatization: The functions of social exclusion. *Psychol Bull* 127(2):187–208.
50. Shweder RA, Mahapatra M, Miller JG (1987) Culture and moral development. *The Emergence of Morality in Young Children*, eds Kagan J, Lamb S (Univ of Chicago Press, Chicago), pp 1–83.
51. Haidt J (2012) *The Righteous Mind: Why Good People Are Divided by Politics and Religion* (Pantheon, New York).
52. Metcalf BD, Metcalf TR (2006) *A Concise History of Modern India* (Cambridge Univ Press, New York).
53. SiliconIndia (2015) *10 Things You Should Never Do in India*. Available at travel.siliconindia.com/travel-article/10-Things-You-Should-Never-Do-In-India-aid-914.html. Accessed December 20, 2015.
54. Fessler DMT (2004) Shame in two cultures: Implications for evolutionary approaches. *J Cogn Cult* 4(2):207–262.
55. Marks IM, Nesse RM (1994) Fear and fitness: An evolutionary analysis of anxiety disorders. *Ethol Sociobiol* 15(5-6):247–261.
56. Cosmides L, Tooby J (2000) Evolutionary psychology and the emotions. *Handbook of Emotions*, eds Lewis M, Haviland-Jones JM (Guilford, NY), 2nd Ed, pp 91–115.
57. Geertz C (1973) *The Interpretation of cultures: Selected Essays* (Basic books, New York).
58. Benedict R (1946) *The Chrysanthemum and the Sword* (Houghton Mifflin, Boston).
59. Mesquita B, Karasawa M (2004) Self-conscious emotions as dynamic cultural processes. *Psychol Inq* 15(2):161–166.
60. Romney AK, Weller SC, Batchelder WH (1986) Culture as consensus: A theory of culture and informant accuracy. *Am Anthropol* 88(2):313–338.
61. Mesoudi A, Whiten A, Laland KN (2006) Towards a unified science of cultural evolution. *Behav Brain Sci* 29(4):329–347, discussion 347–383.
62. Smith RH, Webster JM, Parrott WG, Eyre HL (2002) The role of public exposure in moral and nonmoral shame and guilt. *J Pers Soc Psychol* 83(1):138–159.
63. Scarnier M, Schmader T, Lickel B (2009) Parental shame and guilt: Distinguishing emotional responses to a child's wrongdoings. *Pers Relatsh* 16(2):205–220.
64. de Jong PJ (1999) Communicative and remedial effects of social blushing. *J Nonverbal Behav* 23(3):197–217.
65. de Jong PJ, Peters ML, De Cremer D (2003) Blushing may signify guilt: Revealing effects of blushing in ambiguous social situations. *Motiv Emot* 27(3):225–249.
66. Thomas KA, DeScioli P, Haque OS, Pinker S (2014) The psychology of coordination and common knowledge. *J Pers Soc Psychol* 107(4):657–676.
67. Tooby J, Cosmides L, Sell A, Lieberman D, Sznycer D (2008) Internal regulatory variables and the design of human motivation: A computational and evolutionary approach. *Handbook of Approach and Avoidance Motivation*, ed Elliot AJ (Lawrence Erlbaum Associates, Mahwah, NJ), pp 251–271.
68. Delton AW, Robertson TE (2012) The social cognition of social foraging: Partner selection by underlying valuation. *Evol Hum Behav* 33(6):715–725.
69. Keltner D (1996) Evidence for the distinctness of embarrassment, shame, and guilt: A study of recalled antecedents and facial expressions of emotion. *Cogn Emotion* 10(2):155–172.
70. Tangney JP (1991) Moral affect: The good, the bad, and the ugly. *J Pers Soc Psychol* 61(4):598–607.
71. Dickerson SS, Mycek PJ, Zaldivar F (2008) Negative social evaluation, but not mere social presence, elicits cortisol responses to a laboratory stressor task. *Health Psychol* 27(1):116–121.