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The emotion–valuation constellation: Multiple emotions are governed by a common grammar of social valuation

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ABSTRACT

Social emotions are hypothesized to be adaptations designed by selection to solve adaptive problems pertaining to *social valuation*—the disposition to attend to, associate with, and aid a target individual based on her probable contributions to the fitness of the valuer. To steer between effectiveness and economy, social emotions need to activate in precise proportion to the local evaluations of the various acts and characteristics that dictate the social value of self and others. Supporting this hypothesis, experiments conducted in the United States and India indicate that five different social emotions all track a common set of valuations. The extent to which people value each of 25 positive characteristics in others predicts the intensities of: pride (if you had those characteristics), anger (if someone failed to acknowledge that you have those characteristics), gratitude (if someone convinced others that you have those characteristics), guilt (if you harmed someone who has those characteristics), and sadness (if someone died who had those characteristics). The five emotions track local valuations (mean $r = +.72$) and even foreign valuations (mean $r = +.70$). In addition, cultural differences in emotion are patterned: They follow cultural differences in valuation. These findings suggest that multiple social emotions are governed (in part) by a common architecture of social valuation, that the valuation architecture operates with a substantial degree of universality in its content, and that a unified theoretical framework may explain cross-cultural invariances and cultural differences in emotion.

1. Introduction

Over the last half-century, evolutionarily-oriented theorists have developed theories of how a number of different adaptive problems favored the evolution of psychological mechanisms that place weight on the welfare of others and that, within limits, sacrifice self for others. These theories include: kin selection (Hamilton, 1964), reciprocation (Trivers, 1971), partner choice (Noë & Hammerstein, 1994), reputation (Nowak & Sigmund, 1998), risk-pooling (Kaplan & Hill, 1985), externality management (Tooby & Cosmides, 1996), and (substituting deference for valuation) aggressive contests (Hammerstein & Parker, 1982). These theories led to the empirical discovery of an array of neurocognitive architectures for computing the *social value* of a target individual to a valuer, which takes into account: (i) the target's probable contribution of fitness benefits to the valuer as, e.g., kin, mate, trading partner, and fellow coalition member, and (ii) the target's probable imposition of fitness costs on the valuer, if not propitiated (Gilbert, 1997; Barclay & Willer, 2007; Cacioppo, Gardner, & Berntson, 1999; Cuddy, Fiske, & Glick, 2008; Lieberman, Tooby, & Cosmides, 2007;

Sznycer, De Smet, Billingsley, & Lieberman, 2016; Lukaszewski, Simmons, Anderson, & Roney, 2015; Sell, Tooby, & Cosmides, 2009; Sznycer, Delton, Robertson, Cosmides, & Tooby, 2019; see Levy & Glimcher, 2012; Klein, Deaner, & Platt, 2008; Hare, Camerer, Knoepfle, O'Doherty, & Rangel, 2010). Based on a target's social value to a valuer, the valuer will (or will not) be disposed to trade her welfare in favor of the target's welfare by, e.g., aiding the target or refraining from benefiting at the target's expense (Tooby, Cosmides, Sell, Lieberman, & Sznycer, 2008).

Novel challenges and opportunities arose for ancestral humans with the appearance of conspecifics who were intrinsically valuable to the individual and who could conditionally value or devalue the individual based on the individual's actions and characteristics. For example, indications that another individual now places more weight on your welfare than she used to are auspicious, because the other will thence take more actions that benefit you but cost her, and fewer actions that benefit her but cost you. The other has a stake in your well-being, and so you have a stake in the other's well-being (Aktipis et al., 2018; Roberts, 2005; Tooby & Cosmides, 1996). Thus, indications of being

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valued more highly than previously have the effect of raising the other's social value to you, with corresponding increases in your valuation of the other and your disposition to aid the other (Smith, Pedersen, Forster, McCullough, & Lieberman, 2017; for exceptions to this, see Ackerman & Kenrick, 2008).

Ancestral humans faced many other adaptive problems of social valuation besides the increase in the social value of others to the self. These include: (i) the decrease in the social value of others to the self; (ii) changes, positive and negative, in the value of the self to others; (iii) mismatches between the valuations presently assigned by self or others and the equilibrium valuations that are most efficient (or prudent) to assign based on self and others' relative ability and willingness to deliver benefits or inflict costs; and (iv) the loss of valuable others. These adaptive problems would have crafted programs that carry out the requisite computations to govern behavior in a manner that promoted survival and reproduction in ancestral environments.

It has been hypothesized that emotions are neurocognitive adaptations designed by natural selection to orchestrate cognition and behavior in the service of solving complex adaptive problems, and that social emotions are a subset of emotions designed to solve adaptive problems of sociality (Darwin, 1872; Ekman, 1992; Keltner & Haidt, 1999; Nesse, 1990; Tooby, 1985; Tooby & Cosmides, 1990). Recalibration appears to be a central aspect of social emotions: These emotions recalibrate internal variables of the cognitive architecture, including, notably, variables that index the social valuations assigned by self and others (Al-Shawaf, Conroy-Beam, Asao, & Buss, 2016; Al-Shawaf & Lewis, 2017; Delton & Robertson, 2016; Sell et al., 2009; Sznycer et al., 2017; Sznycer, Cosmides, & Tooby, 2017; Tooby & Cosmides, 2008). From this theoretical perspective, different social emotions are different adaptations that evolved to solve different adaptive problems of social valuation and that have different elicitors and outputs.¹ For example:

- The gratitude system appears designed to consolidate a higher level of cooperation with a social partner (Algoe, Haidt, & Gable, 2008; Lim, 2012; Smith et al., 2017). Gratitude is triggered by indications that another places an unexpectedly high weight on the individual's welfare (Algoe et al., 2008; Lim, 2012; Smith et al., 2017; Tesser, Gatewood, & Driver, 1968; Tsang, 2006a, 2006b). Once activated, gratitude increases the weight the individual attaches to the other's welfare (Gordon, Impett, Kogan, Oveis, & Keltner, 2012; Lim, 2012; Smith et al., 2017), which can lead to a cycle of escalating, mutual valuation (Algoe et al., 2008; Algoe, Fredrickson, & Gable, 2013; Tooby & Cosmides, 1996).
- The pride system is designed to motivate the achievement and advertisement of socially valued acts or traits so that others place more weight on the individual's welfare (Fessler, 1999; Sznycer et al., 2017; Tracy, Shariff, & Cheng, 2010; Weisfeld, 1999). Pride is triggered in response to achievements—events indicating the individual has an enhanced capacity to deliver benefits or impose costs on others (Lewis, Alessandri, & Sullivan, 1992; Tracy & Matsumoto, 2008). When triggered, the pride system advertises one's achievements, motivates continued investment in the courses of action that bring about achievement, and demands enhanced valuation from others (Riskind & Gotay, 1982; Tracy & Robins, 2008; Weisfeld, 1999; Williams & DeSteno, 2008; see Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013).
- Anger functions to bargain for better treatment (Sell et al., 2017). Anger triggers in response to indications that another places insufficient weight on the welfare of the individual—less weight than the individual feels entitled to (Sell et al., 2009, 2017). Once triggered, the anger system deploys various tactics to incentivize the other to increase her valuation of the individual: communication of

the anger state (Galati, Sini, Schmidt, & Tinti, 2003; Sell, Cosmides, & Tooby, 2014), arguments (Averill, 1982; Sell et al., 2017), and threats of (or actual) withdrawal of assistance or imposition of costs (Daly & Wilson, 1988; Felson, 1982; Sell, 2011).

- Guilt appears designed to remedy situations where one put insufficient weight on the welfare of a valuable other (often unintentionally), independent of whether the other knows this (Baumeister, Stillwell, & Heatherton, 1994; Leith & Baumeister, 1998; McGraw, 1987; Smith, Webster, & Eyre, 2002; Sznycer, 2010, 2019; Tooby & Cosmides, 2008). Once triggered, the guilt system increases the weight the individual attaches to the other's welfare: It interrupts the imposition of costs (Cohen, Panter, & Turan, 2013; Cohen, Panter, Turan, Morse, & Kim, 2014) and motivates actions to benefit the victim and repair the relationship, including: restitutions, amends, apologies, confessions, and acceptance of responsibility (Baumeister, Stillwell, & Heatherton, 1995; de Hooge, Zeelenberg, & Breugelmans, 2007; Ketelaar & Au, 2003; Leith & Baumeister, 1998; Ohtsubo & Yagi, 2015; Sznycer, Schniter, Tooby, & Cosmides, 2015; Tangney, 1991).
- Sadness is activated by the separation, incapacitation, or death of associates who may otherwise value the individual's welfare and make positive fitness contributions to her (Tooby & Cosmides, 1990; Keller & Nesse, 2006; see also Hagen, 1999; Hagen & Barrett, 2007). When activated, sadness reduces the motivation to move and to act (Michalak et al., 2009), a response that can prevent behaviors causing further loss (Keller & Nesse, 2006; Welling, 2003). Also, sadness prompts cognitive activity geared to solve problems related to the loss or to adapt to the loss (Andrews & Thomson Jr, 2009).
- Shame functions to minimize the spread of negative information about the self and the cost of any ensuing devaluation (Gilbert, 1997; Fessler, 1999; Weisfeld & Dillon, 2012; Sznycer, Tooby, et al., 2016). Shame is triggered by indications of probable or actual devaluation (Dickerson, Mycek, & Zaldivar, 2008; Robertson, Sznycer, Delton, Tooby, & Cosmides, 2018; Smith et al., 2002). Shame motivates the individual to inhibit actions that may cause others to devalue her (de Hooge, Breugelmans, & Zeelenberg, 2008; Fehr & Gächter, 2000), to conceal incriminating information (Leach & Cidam, 2015; Sznycer et al., 2015), and to withdraw from the situation (Wicker, Payne, & Morgan, 1983). When ashamed, the individual appeases (Keltner, Young, & Buswell, 1997) and produces a stereotyped nonverbal display that deters attacks by signaling subordination (Fessler, 1999; Gilbert, 2000; Keltner et al., 1997; Tracy & Matsumoto, 2008; Weisfeld & Dillon, 2012).

Gratitude, pride, anger, guilt, sadness, and shame appear to be different emotion programs, each selected for by different adaptive problems, and each with different functions, input conditions, information-processing procedures, core-affective properties (Nelson & Russell, 2014; Russell, 1980), physiological signatures (Blascovich & Mendes, 2010; Siegel et al., 2018), and behavioral repertoires. Nevertheless, if those emotions are to mobilize in a cost-effective fashion, they all need accurate estimates of the degree to which the underlying acts, traits, and circumstances that trigger them are valued or disvalued in one's local ecology. It has been hypothesized that the human mind–brain features a generative grammar with universal principles and open parameters that computes the social value of an individual based on her actions (e.g., shares food), traits (e.g., physically formidable), and characteristics (e.g., sibling of chief), and that social emotions consult relevant social values to modulate their operation (Jackendoff, 2006; Tooby & Cosmides, 2008; Sznycer, Al-Shawaf, et al., 2017; Sznycer, 2019; see also references above).

A prediction follows from this hypothesis: If an individual in a given social ecology is positively (or negatively) evaluated when she performs act *x* (or displays trait *x*), then *x* may participate in the elicitation of multiple, different social emotions. For example, if people value *trustworthiness* in others (i.e., if the grammar of valuation attaches a positive

¹ For alternative views of emotion, see, e.g., Barrett and Russell (2014).

weight to the welfare of those who display trustworthiness), then pride may be triggered when, e.g., one is trustworthy; anger may be triggered when, e.g., one is trustworthy and others fail to acknowledge it, behaving as if one were not so; gratitude may be triggered when, e.g., a friend convinces third parties that one is trustworthy—because those situations meet the input conditions of those emotions (see above; see also Gervais & Fessler, 2017).

A given act or trait displayed by self or others may elicit different emotions depending on which role that act or trait plays in conceptual structure. For example, *trustworthiness* may be part of TRIGGER OF ANGER (as in, e.g., [fails to acknowledge that [I am trustworthy]]) or TRIGGER OF GRATITUDE (as in, e.g., [convinces others that [I am trustworthy]]). Further, a given act or trait displayed by self or others may participate in different emotion-specific computations and generate different emotion-specific outputs. However, the local value attached to the underlying act or trait will be, as a first approximation, *the same*, regardless of which social emotion is currently accessing that value. Therefore, it is further predicted that there will be a correspondence between (i) the difference in value the grammar of valuation attaches to two (or *n*) different acts or traits, and (ii) the difference in the intensity of emotion that those acts or traits elicit as constituents of triggers of emotions. Moreover, and critically, the valuation–emotion correspondence will obtain for each of multiple, different emotions. For example, if trustworthiness is more highly valued than marksmanship in a given social ecology, then, everything else being equal, the intensity of anger will be higher when, e.g., someone fails to acknowledge one's trustworthiness than when someone fails to acknowledge one's good marksmanship; the intensity of gratitude will be higher when, e.g., someone convinces others that one is trustworthy than when someone convinces others that one has good marksmanship; and so forth.

If social emotions are well-engineered adaptations, they should estimate and track the valuations held by members of one's local social ecology. This would prevent two types of errors in the operation of these emotions. One possible error occurs when social emotions under-activate relative to local valuations. This would result in ineffectiveness. For example, the under-activation of pride would lead to the insufficient pursuit and advertisement of socially valued acts, and thus to only a fraction of the increase in others' valuations of the self that is achievable cost-effectively. The under-activation of anger would insufficiently incentivize the target of the anger to upwardly recalibrate her valuation of the self, and thus also would yield a fraction of the benefits that are achievable cost-effectively. The under-activation of gratitude would cut down opportunities to cement a cooperative relationship with a well-disposed social partner.

If emotion under-activation is a costly error, so is emotion over-activation. This would lead to diminishing or even negative returns. For example, the over-activation of pride would lead to the over-pursuit and over-advertisement of socially valued courses of action—something which audiences might resist and devalue (Anderson, Ames, & Gosling, 2008; Greenaway & Kalokerinos, 2017; Schlenker & Leary, 1982). The over-activation of gratitude could lead to excessive investments in a social partner; it also may have the paradoxical effect of eliciting devaluation from others, because it may imply that one's social worth is lower than it actually is (see Tiedens, Ellsworth, & Mesquita, 2000).

To steer between effectiveness and economy, social emotions need to consult the grammar of valuation to estimate the value the relevant act or trait affords to local audiences, and modulate their activation in proportion to that value.² Moreover, because one of the key functions of emotions is to evaluate alternative future courses of action (Bechara, Damasio, & Damasio, 2000; Schwarz, 2000; Sznycer, Tooby, et al., 2016), the close tracking of act/trait valuations by emotions should occur even in the absence of any communication between the audience,

which collectively dictates the values of acts and traits, and the individual guiding her choices based on anticipated emotion. Decisions about actions must often be made in advance of observing feedback about one's actions, and so the social emotions would be handicapped if they needed to compute local values by first observing others' reactions to one's acts and traits instead of estimating those magnitudes in advance. That is, social emotions are expected to mobilize not only reactively, in response to actual events, but also anticipatorily and prospectively (Van Der Schalk, Bruder, & Manstead, 2012). Thus, it is a theoretically-derived prediction that the anticipated or imagined intensity of social emotions will accurately and precisely track the values afforded to audiences by the relevant acts and traits.

The preceding argument has various entailments. If the grammar of valuation and allied emotion systems are evolved, human-universal adaptations, then the predicted associations between social valuation and the intensities of multiple emotions should be observable across populations. What's more, audience valuations in a given population may predict emotions in another population. The social emotions evolved for making decisions among, recalibrating with respect to, and tracking the values of those who can impact one's welfare—one's local group. Indeed, some actions, traits, and situations elicit evaluative responses and emotions in some populations but not others (Haidt, 2012; Sznycer et al., 2016; von Fürer-Haimendorf, 1967)—expected when open parameters of the valuation grammar are filled in with different local information. However, if the valuation grammar features universal principles besides open parameters, then actions, traits, and situations that tap these principles may elicit agreement across populations about social valuation and emotions, and, moreover, multiple emotions in a given population may all track the valuations that people hold in other, foreign populations.

Existing data support some of these predictions. For example, the intensity of anticipated pride regarding a given socially valued act or trait precisely tracks the degree to which audiences value those individuals who perform that act or display that trait (Sznycer, Al-Shawaf, et al., 2017; see also Leary, Tambor, Terdal, & Downs, 1995). This result replicated in 16 industrial countries in four continents. Further, consistent with the hypothesis that the valuation grammar is equipped with invariant, species-typical principles, pride in each of the 16 countries tracked the valuations expressed by foreign audiences in each of the other 15 countries (Sznycer, Al-Shawaf, et al., 2017). More recently, close associations between pride and the valuations expressed by audiences were observed in 10 traditional small-scale societies around the world (Sznycer, Xygalatas, Alami, et al., 2018), suggesting that the match between pride and the evaluative psychology of audiences stems from pan-human adaptations designed by selection. Importantly, the valuations expressed by audiences are tracked specifically by pride. Other positively-valenced emotions do not uniquely track audience valuations, even when those other emotions co-activate with pride (Sznycer, Al-Shawaf, et al., 2017).

In other sets of studies, shame tracked the devaluation that audiences expressed with respect to various disgraceful acts and traits (Sznycer, Tooby, et al., 2016; Sznycer, Xygalatas, Agey, et al., 2018; Cohen, Chun, & Sznycer, forthcoming). Meanwhile, other negatively-valenced emotions failed to uniquely track audience devaluation (Sznycer, Tooby, et al., 2016).

Although the pride and shame studies are suggestive, these studies used different acts and traits as stimuli. Thus, while there is evidence of a pride–valuation link and a shame–devaluation link, it is not yet known whether the valuations afforded by one and the same set of acts and traits predict the intensities of each of multiple emotions, as the theory predicts (but see Durkee, Lukaszewski, & Buss, forthcoming, for evidence that pride and shame track a common set of acts and traits). Further, pride and shame are reputation-management emotions—a particular subset of social emotions. Thus, it is an open question whether the valuation–emotion links generalize to other social emotions not specifically designed to manage one's reputation.

² We note that deviations from proportionality can occur due to such factors as error and opportunism (e.g., Johnson & Fowler, 2011).

1.1. The present experiment

The present experiment focuses on five social emotions: pride, anger, gratitude, sadness, and guilt. This selection allows tests of the match-to-valuation hypothesis across many, functionally distinct social emotions: Some of those emotions are positively-valenced while others are negatively-valenced; some of those emotions are arousing while others are not (Mauro, Sato, & Tucker, 1992; Russell & Barrett, 1999); some of those emotions function to manage the individual's reputation while others do not. These emotions vary along other dimensions as well (Fontaine, Scherer, Roesch, & Ellsworth, 2007; Scherer & Wallbott, 1994; Smith & Ellsworth, 1985). Furthermore, and critically, a single set of acts and traits is used as stimuli to elicit each emotion.

The present experimental design can answer the following questions: Is there a lawful association between local audiences' social valuations of specific acts and traits and the activation of multiple social emotions? And, if so, is the valuation–emotion constellation observed in multiple cultures? And, does the magnitude of audience valuation in one culture predict the intensity of multiple emotions in another culture?

Additionally, the present experimental design can answer the question: Are cultural differences in emotion arbitrary, or are they patterned? If emotion is a function of valuation, then cultural differences in emotions may be a function of cultural differences in valuation. More specifically, the more an act or trait is valued in culture *A* compared to culture *B*, the more we expect that act or trait to participate in the elicitation of multiple emotions in culture *A* compared to culture *B*.

2. Method

2.1. Participants and procedure

We collected data with Amazon Mechanical Turk from 242 participants (133 females) in the United States (age: $M = 36$, $SD = 12$) and 188 participants (61 females) in India (age: $M = 32$, $SD = 9$). Fifteen Indian participants were excluded from analyses due to failure to pass an attention check, leaving an effective sample of 173 participants (55 females) (age: $M = 32$, $SD = 9$). Inclusion of the inattentive Indian participants does not change the pattern of results.

The stimuli consist of 25 brief hypothetical scenarios, developed by Sznycer, Al-Shawaf, et al. (2017), in which someone's acts, traits, or circumstances might lead them to be viewed positively. The scenarios were designed to elicit reactions in a wide variety of evolutionarily relevant domains, such as social exchange, skills, aggressive contests, mating, parenting, and leadership, and were phrased at a relatively high level of abstraction (e.g., “You have many unique skills”, rather than, e.g., “You know how to play the piano and how to pilot airplanes”).

Participants were randomly assigned to one of six between-subjects conditions: one valuation condition, and five emotion conditions: *guilt*, *sadness*, *pride*, *anger*, and *gratitude*. (Shame was not assessed in this experiment). In all six conditions participants rated the same basic set of 25 scenarios. The main difference across conditions—the experimental manipulation—was a prompt, displayed immediately before the scenarios, instructing participants to interpret the scenarios in a way that would elicit either valuation of a target individual or one of the five emotions.

In the valuation condition, the prompt asked participants to imagine that the acts and traits described in the 25 scenarios (e.g., “She is trustworthy,” “She has many unique skills,” “She is physically attractive”) are true of a target individual: an individual other than the participant who is of the same sex and age as the participant. Then, participants were asked to “indicate [for each scenario] how you would view this person,” with scales ranging from 1 to 7 (I wouldn't view them positively at all – I'd view them very positively). These ratings provide situation-specific measures of the degree to which members of a given

population would value the individual described in the scenarios.

In the guilt condition, the prompt asked participants to imagine that they backed into someone's car and dented it, and further, that there wasn't any evidence that they dented the other's car: No one saw them, and their own car remained intact. They left the scene without leaving their insurance information, which would have helped the target pay for the repair but at the cost of an increased premium for themselves. Subsequently, participants learn that the car they dented belongs to a neighbor. Participants were then asked to indicate, for each of the 25 scenarios, “how much guilt you would feel if you then learn that several positive things are true of your neighbor”, with scales ranging from 1 to 7 (no guilt at all [– a lot of guilt] if this is true of the woman [man] whose car I dented).

In the sadness condition, the prompt asked participants to imagine that a neighbor—a person they knew little about—had died recently. They indicated “how much sadness you would feel if you find out that several positive things were true of that woman [man]” (e.g., “She was trustworthy,” “She had many unique skills,” “She was physically attractive”), with scales ranging from 1 to 7 (no sadness at all [– a lot of sadness] if this was true of the deceased woman [man]).

In the pride condition, the prompt asked participants to imagine that the acts and traits described in the 25 scenarios are true of themselves (e.g., “You are trustworthy,” “You have many unique skills,” “You are physically attractive”), and to “indicate how much pride you would feel if you were in those situations”, with scales ranging from 1 to 7 (no pride at all – a lot of pride).

In the anger condition, the prompt asked participants to imagine that positive things are true of themselves but their friend fails to properly acknowledge those things. Participants were asked to “indicate how much anger you would feel if your friend fails to properly acknowledge those [things],” with scales ranging from 1 to 7 (no anger at all [– a lot of anger] if my friend fails to properly acknowledge that this is true of me).

In the gratitude condition, the prompt asked participants to imagine that by spreading information favorable to the participant a good friend convinces third parties that positive things are true of the participant, even though that information is not exactly accurate. Participants indicated “how much gratitude you would feel toward your friend for convincing others [about that],” with scales ranging from 1 to 7 (no gratitude at all [– a lot of gratitude] if my friend convinces others that this is true of me).

In sum, participants rated, for each of 25 scenarios describing positive acts and traits, their: (i) valuation of another individual, if those things were true of that individual; (ii) guilt, if those things were true of another individual on whom the participant has imposed costs—in the absence of any incriminating evidence that might point the other individual or third parties to the participant; (iii) sadness, if those things were true of a recently deceased neighbor; (iv) pride, if those things were true of themselves; (v) anger, if a friend failed to acknowledge those things about them; or (vi) gratitude, if a friend convinced others that those things are true of the participant. Each participant rated only one of the six sets of 25 items.

The scenarios were presented in randomized order within conditions. The stimuli were presented in English in the United States and India. Full text of the condition prompts and scenarios used in the United States and India are provided in the Appendix, Tables S1, S2 & S3.

3. Results

3.1. Within-country results

First, we report the results for each country. Descriptive statistics are provided in Tables S2 & S3.

Valuation: Do participants within countries agree on how positively they would view the target individual in each of these scenarios? Yes. To measure

agreement among raters on how socially valuable the 25 acts and traits are relative to one another, we computed intra-class correlations (ICC) in each country. There was widespread agreement about how socially valuable these acts and traits are relative to one another: United States: ICC (2,39) = .97; India: ICC (2,30) = .87.

Emotions: Do participants within countries agree on the degree to which they would feel an emotion if they found themselves in one of the five emotion-eliciting situations? Yes. There was widespread agreement about the relative intensity of emotion the 25 situations would elicit. United States: pride: ICC (2,40) = .93; anger: ICC (2,41) = .90; gratitude: ICC (2,40) = .96; sadness: ICC (2,43) = .97; guilt: ICC (2,39) = .91. India: pride: ICC (2,25) = .82; anger: ICC (2,29) = .60; gratitude: ICC (2,29) = .75; sadness: ICC (2,32) = .83; guilt: ICC (2,28) = .54.

Does valuation predict the intensities of the five emotions within countries? Yes. The magnitude of social valuation afforded by the 25 positive characteristics correlates positively with the intensities of: pride (if those characteristics were true of you), anger (if a friend failed to acknowledge those characteristics in you), gratitude (if a friend convinced third parties that those characteristics are true of you), sadness (if those characteristics were true of a deceased neighbor), and guilt (if those characteristics were true of someone on whom you have imposed costs). For each of the 25 scenarios, we calculated the mean ratings of each of the five emotions provided by participants in the emotion conditions, and the mean valuation ratings provided by participants in the valuation condition. In the United States, for a given scenario, ratings of valuation predicted the intensities of the five emotions: pride, anger, gratitude, sadness, and guilt ($r_s = .62-.81, p_s = 10^{-6}-.0009$). In India, too, for a given scenario, ratings of valuation predicted the intensities of the five emotions ($r_s = .37-.87, p_s = 10^{-7}-.069$) (see Figs. 1, 2 [panels A, B], and Table 1). Moreover, the emotion–valuation associations all held in mixed models predicting ratings of each emotion from ratings of valuation across the 25 scenarios. In these mixed models, the intercept and slope of emotion ratings were modeled as fixed effects while the participant-level emotion intercept was modeled as a random effect (see Table 2 for model statistics). As such, it is unlikely that the observed associations between emotions and valuation are driven by participant-level error (Judd, Westfall, & Kenny, 2012).

Further, the intensities of the five emotions were intercorrelated, both in the United States ($r_s = .62-.90, p_s = 10^{-9}-.0009$) and in India ($r_s = .34-.84, p_s = 10^{-6}-.09$) (see Table 1). Recall that the ratings of valuation, pride, anger, gratitude, sadness, and guilt originated from different participants. Consequently, these correlations cannot be attributed to participants matching their valuation and emotion ratings.

3.2. Between-country results

To test for between-country agreement in valuation, in emotions, and in the valuation–emotion links, we computed the extent to which the mean valuation ratings and the mean emotion ratings are correlated across countries.

Valuation: Do American and Indian participants agree on how positively they would view the target individual in each of these scenarios? Yes. There was between-country agreement on the degree to which a given act or trait would elicit valuation: $r = .95, p = 10^{-12}$. The more American participants valued a target individual for taking a given act or displaying a given trait, the more Indian participants valued a target individual for taking that act or displaying that trait. The ordinal cross-country agreement in social valuation was extraordinarily high.

Emotions: Do American and Indian participants agree on the intensity with which they would feel an emotion if they found themselves in one of the five emotion-eliciting situations? Yes. American and Indian participants agreed about the relative extent to which a given characteristic would elicit pride (if that characteristic is true of them; $r = .84, p = 10^{-6}$), anger (if a friend failed to acknowledge that characteristic in them; $r = .64, p = .0006$), gratitude (if a friend convinced third parties that that characteristic is true of the participant; $r = .88, p = 10^{-8}$), sadness

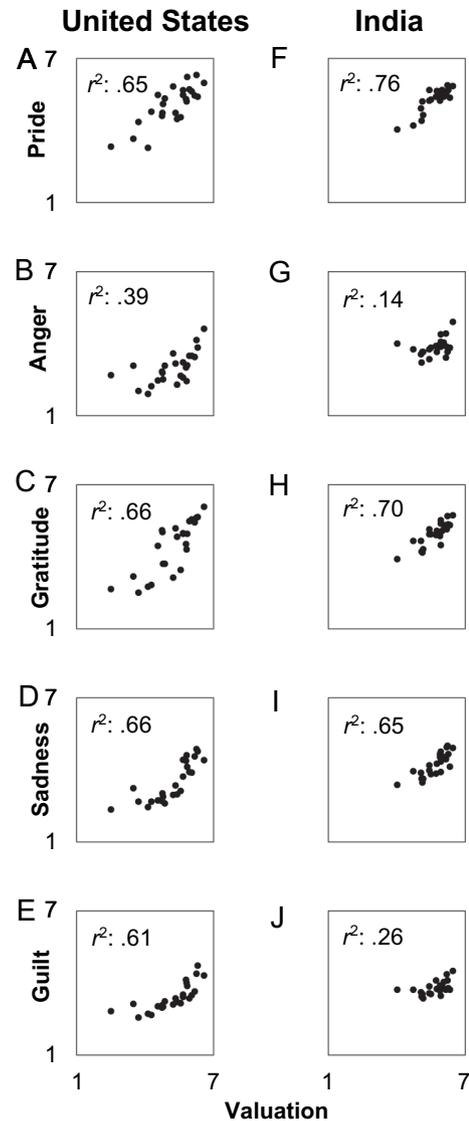


Fig. 1. Scatter plots: Intensities of emotion as a function of valuation, by country.

Note: Each point represents the mean valuation rating and mean emotion rating of one scenario. Ratings of valuation, pride, anger, gratitude, sadness, and guilt were given by different participants. N on which the correlations are based = number of scenarios = 25. Effect size: r^2 linear. United States data: panels A–E; India data: panels F–J.

(if that characteristic was true of a deceased neighbor; $r = .91, p = 10^{-9}$), and guilt (if that characteristic is true of someone on whom they have imposed costs; $r = .84, p = 10^{-6}$).

Does magnitude of valuation in one country predict intensities of emotions in the other country? Yes. Valuation in each country predicted each of the five emotions in the other country. American participants' ratings of valuation were correlated with Indian participants' ratings of pride, anger, gratitude, sadness, and guilt ($r_s = .42-.90, p_s = 10^{-9}-.04$). Likewise, Indian participants' ratings of valuation were correlated with American participants' ratings of pride, anger, gratitude, sadness, and guilt ($r_s = .53-.76, p_s = 10^{-4}-.007$) (see Fig. 2 [panels C, D], and Table 1). Further, each of the five emotions in each country was correlated with each of the other four emotions in the other country ($r_s = .35-.90, p_s = 10^{-8}-.09$; Table 1). As was the case for the within-country results, these between-country associations held whether computed as zero-order correlations (Table 1) or in mixed models (Table 2). To put some of this more vividly: One can accurately predict

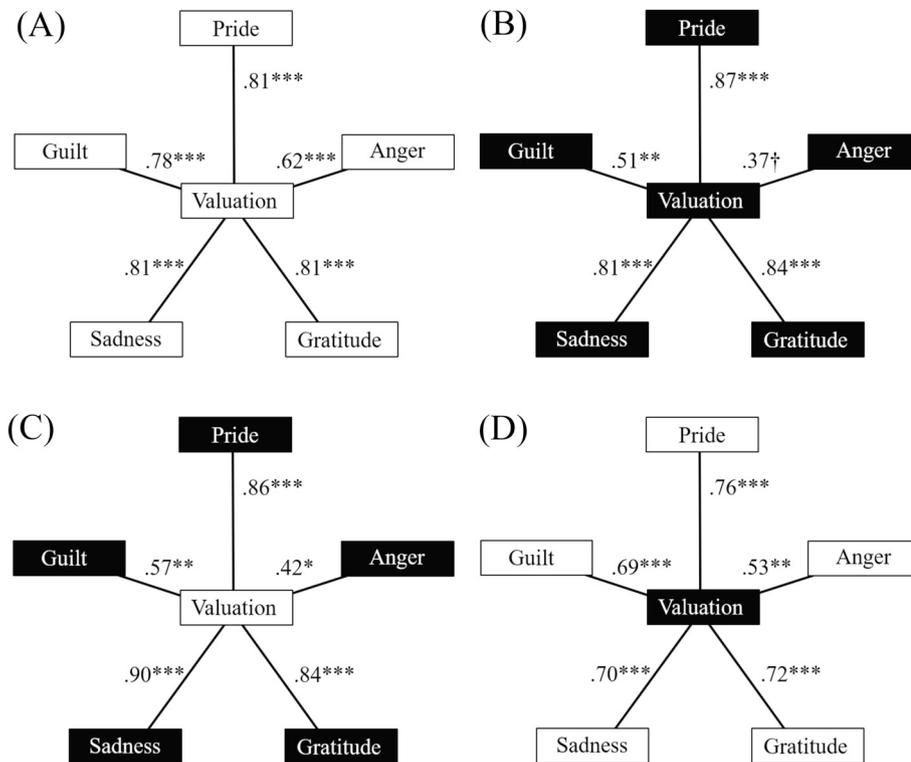


Fig. 2. Correlations between valuation and intensities of emotion, within- and between-countries. Note: (A) United States correlations (white boxes). (B) India correlations (black boxes). (C) Correlations between United States valuation and India emotions. (D) Correlations between India valuation and United States emotions. N on which the correlations are based = number of scenarios = 25. Ratings of valuation, pride, anger, gratitude, sadness, and guilt were given by different participants. *** $p < .001$; ** $p < .01$; * $p < .05$; † $.05 < p < .10$.

the intensities of Indians' sadness from Americans' social valuations, and the intensities of Americans' anger from the intensities of Indians' pride.

Do the results actually reflect five different social emotions tracking social valuations? The present experiment was not designed to assess the degree of specificity with which the five emotions track the valuation of audiences. However, we note that emotion ratings in almost all cases correlated more highly with same-emotion ratings across countries than with different-emotion ratings either within or across countries (see Table 1). Evidence of specificity becomes even more pronounced when holding constant valuation—which, as predicted, is moderately-to-strongly correlated with all emotions. Table S4 presents the results of partial correlations among country-specific emotion ratings across the 25 scenario items, while controlling for valuation ratings. When controlling for valuation ratings from both the US and India, the same-emotion partial correlations across countries were descriptively much larger than nearly all of the different-emotion partial correlations. This was true for anger–anger (*partial* $r = .52$, $p < .01$), gratitude–gratitude (*partial* $r = .72$, $p < .001$), guilt–guilt (*partial* $r = .77$, $p < .001$), pride–pride (*partial* $r = .53$, $p < .01$), and sadness–sadness (*partial* $r = .68$, $p < .001$). Low statistical power at the scenario level prevents us from testing inferentially whether the same-emotion correlations are larger than the relevant different-emotion correlations. However, we note that the average same-emotion partial correlation effect size was $+ .64$, whereas the average different-emotion partial correlation effect size was $+ .18$. Patterns were very similar when controlling for either US valuation ratings or India valuation ratings (see Table S4).

Are there cultural differences in emotions? And if so, are cultural differences in emotions patterned? Yes, and yes. Ratings of valuation and emotions tended to be higher in India than in the United States (Table S5). Importantly, cultural differences in emotions were systematically correlated with cultural differences in audience valuation. For each scenario, and for each of the six measures (valuation, pride, anger, gratitude, sadness, and guilt), we subtracted the mean ratings provided by American participants from the mean ratings provided by Indian participants. This resulted in 25 difference scores—one for each of the 25 scenarios—for each of the six measures. As predicted if cultural

differences in emotion stem from cultural differences in valuation, difference scores of valuation were positively correlated with difference scores of pride ($r = .53$, $p = .006$), difference scores of anger ($r = .54$, $p = .005$), difference scores of gratitude ($r = .74$, $p = .00002$), difference scores of sadness ($r = .59$, $p = .002$), and difference scores of guilt ($r = .79$, $p = .000003$). The more an act or trait was socially valued by Indian participants relative to American participants, the more that act or trait participated in the elicitation of pride, anger, gratitude, sadness, and guilt among Indian participants relative to American participants.

4. Discussion

The present research adds to a growing number of findings supporting the claim that social evaluations underlie the operation of multiple, different social emotions (Sznycer, Tooby, et al., 2016; Sznycer, Al-Shawaf, et al., 2017; Sznycer, Xygalatas, Agey, et al., 2018; Sznycer, Xygalatas, Alami, et al., 2018; Durkee et al., forthcoming; Cohen et al., forthcoming; Lieberman et al., 2007; Lim, 2012; Smith et al., 2017). The present research also indicates cross-cultural regularities in the structure and content of human social-evaluative psychology, as found in past research (Buss, 1989; Buss et al., 1990; Shackelford, Schmitt, & Buss, 2005; Fiske, Cuddy, & Glick, 2007; Evans & Scott, 1984; Brown, 1991; Rozin, Lowery, & Haidt, 1999; Henrich et al., 2006; Herrmann, Thöni, & Gächter, 2008; Sznycer, Tooby, et al., 2016; Sznycer, Al-Shawaf, et al., 2017; Sznycer, Xygalatas, Agey, et al., 2018; Sznycer, Xygalatas, Alami, et al., 2018; Curry, Mullins, & Whitehouse, 2019; Durkee et al., forthcoming). Against this background, this work is to our knowledge the first to document a quantitatively close correspondence between social evaluations and the intensities with which multiple social emotions are activated.

The degree to which local audiences positively value a target individual if various acts, traits, or circumstances are true of that individual predicts the degree to which people feel each of five different social emotions. This result replicates in the United States and India, two countries with seemingly disparate cultures. Moreover, audience valuations in each country predict the intensities of each of the five emotions in the other country. This suggests that multiple social

Table 1
Correlations between conditions, within- and between-countries.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Valuation_US												
(2) Pride_US	.81						.76					
(3) Anger_US	.62	.64					.53	.58				
(4) Gratitude_US	.81	.66	.67				.72	.74	<u>.35</u>			
(5) Sadness_US	.81	.66	.62	.72			.70	.61	<u>.38</u>	.73		
(6) Guilt_US	.78	.63	.72	.72	.90		.69	.60	.41	.72	.90	
(7) Valuation_IN	.95											
(8) Pride_IN	.86	.84					.87					
(9) Anger_IN	.42	<u>.36</u>	.64				<u>.37</u>	<u>.34</u>				
(10) Gratitude_IN	.84	.66	.63	.88			.84	.77	<u>.37</u>			
(11) Sadness_IN	.90	.67	.69	.82	.91		.81	.70	.41	.84		
(12) Guilt_IN	.57	.44	.73	.64	.65	.84	.51	.50	.53	.65	.69	

Note: Coefficients are Pearson's r s. N on which the correlations are based = number of scenarios = 25. Shaded cells: within-country correlations; non-grey cells: between-country correlations. US: United States; IN: India. Ratings of valuation, pride, anger, gratitude, sadness, and guilt were given by different participants. All p s < .05 (at least), except the underlined ones, where $.05 < p < .10$.

Table 2
Fixed effects of nation-specific valuation on emotion ratings, from mixed models.

Predictor		US emotion		India emotion	
		Fixed effect [95% CI]	<i>t</i> -test	Fixed effect [95% CI]	<i>t</i> -test
US valuation	Anger	.41 [.31; .50]	$t(983) = 9.26, p < .0001$	.15 [.06; .24]	$t(695) = 3.20, p = .001$
	Gratitude	.89 [.80; .99]	$t(959) = 18.72, p < .0001$	.41 [.31; .50]	$t(695) = 8.33, p < .0001$
	Guilt	.44 [.37; .51]	$t(935) = 12.55, p < .0001$	.16 [.08; .23]	$t(671) = 4.11, p < .0001$
	Pride	.68 [.59; .77]	$t(983) = 15.19, p < .0001$	.42 [.35; .51]	$t(599) = 9.81, p < .0001$
	Sadness	.65 [.59; .72]	$t(1007) = 19.66, p < .0001$	.43 [.35; .51]	$t(767) = 1.81, p < .0001$
India valuation	Anger	.60 [.45; .75]	$t(983) = 7.76, p < .0001$	.23 [.07; .38]	$t(695) = 2.80, p = .005$
	Gratitude	1.37 [1.20; 1.54]	$t(959) = 16.07, p < .0001$	.69 [.83; .95]	$t(695) = 8.24, p < .0001$
	Guilt	.67 [.55; .79]	$t(935) = 1.82, p < .0001$	.24 [.11; .37]	$t(671) = 3.69, p < .0001$
	Pride	1.09 [.94; 1.25]	$t(983) = 13.96, p < .0001$	.74 [.59; .88]	$t(599) = 9.94, p < .0001$
	Sadness	.97 [.86; 1.09]	$t(1007) = 16.32, p < .0001$	.66 [.52; .79]	$t(767) = 9.53, p < .0001$

Note: In each mixed model, the intercept and slope of emotion ratings on nation-specific valuation ratings were modeled as fixed effects (using type III sum of squares), while the participant-level emotion intercept was modeled as a random effect.

emotions are governed, in part, by a common, human-universal grammar of social valuation. Importantly, the emotion–valuation link is not confined to the reputation-management emotions of pride and shame, as was observed in past research (Sznycer, Tooby, et al., 2016; Sznycer, Al-Shawaf, et al., 2017; Sznycer, Xygalatas, Agey, et al., 2018; Sznycer, Xygalatas, Alami, et al., 2018; Durkee et al., forthcoming; Cohen et al., forthcoming). Instead, this link generalizes across a broad suite of social emotions. Indeed, similar emotion–valuation links are observed across emotions that appear to have highly different functions, computational properties, and phenomenologies. To see the breadth of this effect, consider pride and sadness. These emotions are approximately opposite each other in the two-dimensional bipolar core-affective space defined by valence and arousal (Nelson & Russell, 2014; Russell, 1980). And yet, despite these and other important differences between those two emotions, one and the same set of act/trait valuations accounts for 65–76% of the variance in same-country ratings, and 50–82% of the variance in cross-country ratings, of both pride and sadness. This degree of coherence across different situations, different emotions, and different cultures is striking. Yet, this coherence is expected if (i) multiple social emotions modulate their activation in proportion to the social value of self and others, in order to steer optimally between efficiency and economy, and (ii) universal, species-typical principles underlie the computation of social values.

The present theoretical framework can explain not only within- and between-culture regularities in emotion; this framework can also begin to explain cultural differences in emotion (Sznycer et al., 2012; Sznycer,

Tooby, et al., 2016, Study S2; Sznycer, Al-Shawaf, et al., 2017, Study S1; see also Mesquita & Frijda, 1992; Scherer & Wallbott, 1994; Elenbein & Ambady, 2002). Cultural differences in social emotions are expected to follow cultural differences in social valuation: The more an act or trait is socially valued in culture A compared to culture B, the more that act or trait is expected to participate in the elicitation of a social emotion in culture A compared to culture B. Indeed, this was the case for all five of the emotions studied herein. Of course, a comprehensive mapping of cultural differences in emotion must also explain how and why social valuation varies across populations, and this will necessitate further inquiry.

Previous theories have assumed wholesale differences in emotion patterning or emotion activation across cultures (Benedict, 1946; Boiger, Mesquita, Uchida, & Feldman Barrett, 2013; Heine, Lehman, Markus, & Kitayama, 1999; Hofstede, 2001; Kuppens, Realo, & Diener, 2008; Markus & Kitayama, 1991; Mesquita, 2001; Mosquera, Manstead, & Fischer, 2000; Suh, Diener, Oishi, & Triandis, 1998; Uchida & Kitayama, 2009). Those theories have also assumed that sweeping cultural differences in emotion are caused by a single variable. Single-sources of cultural differences in emotion have been variously attributed to: individualism vs. collectivism (Kuppens et al., 2008; Mesquita, 2001; Suh et al., 1998), independent self vs. interdependent self (Heine et al., 1999; Markus & Kitayama, 1991), self-expression values vs. survival values (Kuppens et al., 2008), guilt cultures vs. shame cultures (Benedict, 1946), individualistic cultures vs. honor cultures (Mosquera et al., 2000), Euro-American cultures vs. East Asian cultures (Boiger

et al., 2013; Uchida & Kitayama, 2009), and uncertainty avoidance (Hofstede, 2001). By contrast, under the present framework one expects finer fractionation of emotions across cultures (see also Sznycer et al., 2012). Which of two cultures will experience an emotion more intensely is a question that may not have a single answer, as that may sensitively depend on how those cultures value the particular acts or situations that trigger that emotion. This is not to say that wide-ranging differences in emotion cannot occur between different populations; they can, if the elicitors of emotion have broad effects in parameterizing the grammar of valuation. Previous accounts of cultural differences in emotion can account for many observations. However, an adaptationist approach appears to have the potential to produce a more nuanced picture of cultural differences, to explain cross-cultural regularities and cross-cultural variation in emotion with a common explanatory framework, and to integrate psychological theories of emotion with the rest of science.

Past work has shown specificity in pride and shame's tracking of audience evaluations, insofar as pride uniquely tracks audiences' positive evaluations over and above other pleasant emotions (Sznycer, Al-Shawaf, et al., 2017), whereas shame uniquely tracks audiences' negative evaluations over and above other unpleasant emotions (Sznycer, Tooby, et al., 2016). The present findings also speak to the distinctness of multiple emotions, albeit only suggestively. Although the intensities of multiple emotions were moderately-to-strongly intercorrelated within and between countries, cross-national correlations of the same emotion (e.g., US pride with India pride) tended to be much larger than correlations of different emotions within or across countries. Thus, multiple emotions reliably organize their activation around a common suite of social valuations, and yet each emotion also appears to track a distinct set of situation features that are unique to its input-output logic.

This work has various limitations. The experimental design is not optimal for assessing specificity of emotion, and further research should therefore clarify the extent to which the emotions studied herein are functionally specialized and distinct (for steps in this direction, see: Sznycer, Tooby, et al., 2016; Sznycer, Al-Shawaf, et al., 2017; Robertson, Delton, Klein, Cosmides, & Tooby, 2014; Durkee et al., forthcoming). Further research is also necessary to determine whether the valuation–emotion links observed here generalize to other actions, traits, and eliciting situations, to the reactive (vs. prospective) operation of emotions, to the various mechanisms that emotions orchestrate, to other social and non-social emotions, and to other, non-English-speaking populations and cultures. Regarding the last point, we note that the within-country valuation–emotion correlations tended to be somewhat lower in India than in the United States (Tables 1 & 2). This may be the result of noise, since a large proportion of Amazon Mechanical Turk Indian participants does not speak English as first language (Pavlick, Post, Irvine, Kachaev, & Callison-Burch, 2014; Sznycer, Tooby, et al., 2016, studies S1b & S2b). This is speculation, however, as we restricted data collection to participants from the United States vs. India but did not collect data on participants' language or culture.

4.1. Concluding remarks

These findings provide further evidence for the existence of a universal grammar of social valuation and support the novel hypothesis that this grammar of valuation governs the activation of multiple social emotions. The present study contributes to a growing body of research indicating that adaptationism is a productive framework for mapping the information-processing structure and content of motivation and emotion.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.evolhumbehav.2019.05.002>.

References

- Ackerman, J. M., & Kenrick, D. T. (2008). The costs of benefits: Help-refusals highlight key trade-offs of social life. *Personality and Social Psychology Review*, 12, 118–140.
- Aktipis, A., Cronk, L., Alcock, J., Ayers, J. D., Baciu, C., Balliet, D., ... Muñoz, A. (2018). Understanding cooperation through fitness interdependence. *Nature Human Behaviour*, 2(7), 429.
- Algoe, S. B., Fredrickson, B. L., & Gable, S. L. (2013). The social functions of the emotion of gratitude via expression. *Emotion*, 13(4), 605.
- Algoe, S. B., Haidt, J., & Gable, S. L. (2008). Beyond reciprocity: Gratitude and relationships in everyday life. *Emotion*, 8, 425–429.
- Al-Shawaf, L., Conroy-Beam, D., Asao, K., & Buss, D. M. (2016). Human emotions: An evolutionary psychological perspective. *Emotion Review*, 8(2), 173–186.
- Al-Shawaf, L., & Lewis, D. M. (2017). Evolutionary psychology and the emotions. *Encyclopedia of Personality and Individual Differences*, 1–10.
- Anderson, C., Ames, D. R., & Gosling, S. D. (2008). Punishing hubris: The perils of overestimating one's status in a group. *Personality and Social Psychology Bulletin*, 34, 90–101.
- Andrews, P. W., & Thomson, J. A., Jr. (2009). The bright side of being blue: Depression as an adaptation for analyzing complex problems. *Psychological Review*, 116(3), 620–654.
- Averill, J. R. (1982). *Anger and aggression: An essay on emotion*. New York, NY: Springer.
- Barclay, P., & Willer, R. (2007). Partner choice creates competitive altruism in humans. *Proceedings of the Royal Society of London B: Biological Sciences*, 274(1610), 749–753.
- Barrett, L. F., & Russell, J. A. (2014). *The psychological construction of emotion*. Guilford Publications.
- Baumeister, R. F., Stillwell, A. M., & Heatherton, T. F. (1994). Guilt: An interpersonal approach. *Psychological Bulletin*, 115, 243–267.
- Baumeister, R. F., Stillwell, A. M., & Heatherton, T. F. (1995). Personal narratives about guilt: Role in action control and interpersonal relationships. *Basic and Applied Social Psychology*, 17, 173–198.
- Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex*, 10(3), 295–307.
- Benedict, R. (1946). *The chrysanthemum and the sword*. Boston: Houghton Mifflin.
- Blascovich, J., & Mendes, W. B. (2010). Social psychophysiology and embodiment. *The Handbook of Social Psychology*, Vol. 5, 194–227.
- Boiger, M., Mesquita, B., Uchida, Y., & Feldman Barrett, L. (2013). Condoned or condemned: The situational affordance of anger and shame in the United States and Japan. *Personality and Social Psychology Bulletin*, 39(4), 540–553.
- Brown, D. E. (1991). *Human universals*. Philadelphia: Temple University Press.
- Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, 12(1), 1–14.
- Buss, D. M., Abbott, M., Angleitner, A., Asherian, A., Biaggio, A., Blanco-Villasenor, A., ... Yang, K.-S. (1990). International preferences in selecting mates: A study of 37 cultures. *Journal of Cross-Cultural Psychology*, 21, 5–47.
- Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1999). The affect system has parallel and integrative processing components: Form follows function. *Journal of Personality and Social Psychology*, 76(5), 839.
- Cheng, J. T., Tracy, J. L., Foulsham, T., Kingstone, A., & Henrich, J. (2013). Two ways to the top: Evidence that dominance and prestige are distinct yet viable avenues to social rank and influence. *Journal of Personality and Social Psychology*, 104(1), 103–125.
- Cohen, A. S., Chun, R., & Sznycer, D. (forthcoming). Pride and shame track the evaluative psychology of audiences: Preregistered replications of Sznycer et al. (2016, 2017).
- Cohen, T. R., Panter, A. T., & Turan, N. (2013). Predicting counterproductive work behavior from guilt proneness. *Journal of Business Ethics*, 114(1), 45–53.
- Cohen, T. R., Panter, A. T., Turan, N., Morse, L., & Kim, Y. (2014). Moral character in the workplace. *Journal of Personality and Social Psychology*, 107(5), 943.
- Cuddy, A. J. C., Fiske, S. T., & Glick, P. (2008). Warmth and competence as universal dimensions of social perception: The stereotype content model and the BIAS map. *Advances in Experimental Social Psychology*, 40, 61–149.
- Curry, O. S., Mullins, D. A., & Whitehouse, H. (2019). Is it good to cooperate? Testing the theory of morality-as-cooperation in 60 societies. *Current Anthropology*, 60(1), 47–69.
- Daly, M., & Wilson, M. (1988). *Homicide*. New York: Aldine de Gruyter.
- Darwin, C. (1872). *The expression of the emotions in man and animals*. London: John Murray.
- Delton, A. W., & Robertson, T. E. (2016). How the mind makes welfare tradeoffs: Evolution, computation, and emotion. *Current Opinion in Psychology*, 7, 12–16.
- Dickerson, S. S., Mycek, P. J., & Zaldivar, F. (2008). Negative social evaluation, but not mere social presence, elicits cortisol responses to a laboratory stressor task. *Health Psychology*, 27, 116–121.
- Durkee, P., Lukaszewski, A. W., & Buss, D. M. (forthcoming). Pride and shame: Key components of a cross-culturally universal status management system.
- Ekman, P. (1992). An argument for basic emotions. *Cognition and Emotion*, 6, 169–200.
- Elfenbein, H. A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin*, 128(2), 203–235.

- Evans, S. S., & Scott, J. E. (1984). The seriousness of crime cross-culturally: The impact of religiosity. *Criminology*, 22(1), 39–59.
- Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review*, 90(4), 980–994.
- Felson, R. B. (1982). Impression management and the escalation of aggression and violence. *Social Psychology Quarterly*, 245–254.
- Fessler, D. M. T. (1999). In A. L. Hinton (Ed.), *Toward an understanding of the universality of second order emotions*. New York: Cambridge University Press.
- Fiske, S. T., Cuddy, A. J. C., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in Cognitive Sciences*, 11, 77–83.
- Fontaine, J. R., Scherer, K. R., Roesch, E. B., & Ellsworth, P. C. (2007). The world of emotions is not two-dimensional. *Psychological Science*, 18(12), 1050–1057.
- von Fürer-Haimendorf, C. (1967). *Morals and merit: A study of values and social controls in south Asian societies*. (London).
- Galati, D., Sini, B., Schmidt, S., & Tinti, C. (2003). Spontaneous facial expressions in congenitally blind and sighted children aged 8–11. *Journal of Visual Impairment and Blindness*, 97(7), 418–428.
- Gervais, M. M., & Fessler, D. M. (2017). On the deep structure of social affect: Attitudes, emotions, sentiments, and the case of “contempt”. *Behavioral and Brain Sciences*, 40(e225), 1–18.
- Gilbert, P. (1997). The evolution of social attractiveness and its role in shame, humiliation, guilt and therapy. *British Journal of Medical Psychology*, 70, 113–147.
- Gilbert, P. (2000). The relationship of shame, social anxiety and depression: The role of the evaluation of social rank. *Clinical Psychology & Psychotherapy*, 7, 174–189.
- Gordon, A. M., Impett, E. A., Kogan, A., Oveis, C., & Keltner, D. (2012). To have and to hold: Gratitude promotes relationship maintenance in intimate bonds. *Journal of Personality and Social Psychology*, 103(2), 257.
- Greenaway, K. H., & Kalokerinos, E. K. (2017). Suppress for success? Exploring the contexts in which expressing positive emotion can have social costs. *European Review of Social Psychology*, 28(1), 134–174.
- Hagen, E. H. (1999). The functions of postpartum depression. *Evolution and Human Behavior*, 20(5), 325–359.
- Hagen, E. H., & Barrett, H. C. (2007). Perinatal sadness among Shuar women: Support for an evolutionary theory of psychic pain. *Medical Anthropology Quarterly*, 21(1), 22–40.
- Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. New York, NY: Paragon.
- Hamilton, W. D. (1964). The genetical evolution of social behaviour. *Journal of Theoretical Biology*, 7, 1–52.
- Hammerstein, P., & Parker, G. A. (1982). The asymmetric war of attrition. *Journal of Theoretical Biology*, 96, 647–682.
- Hare, T. A., Camerer, C. F., Knopfle, D. T., O'Doherty, J. P., & Rangel, A. (2010). Value computations in ventral medial prefrontal cortex during charitable decision making incorporate input from regions involved in social cognition. *Journal of Neuroscience*, 30(2), 583–590.
- Heine, S. J., Lehman, D. R., Markus, H. R., & Kitayama, S. (1999). Is there a universal need for positive self-regard? *Psychological Review*, 106(4), 766–794.
- Henrich, J., McElreath, R., Barr, A., Ensminger, J., Barrett, C., Bolyanatz, A., ... Henrich, N. (2006). Costly punishment across human societies. *Science*, 312(5781), 1767–1770.
- Herrmann, B., Thöni, C., & Gächter, S. (2008). Antisocial punishment across societies. *Science*, 319(5868), 1362–1367.
- Hofstede, G. H. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations* (2nd ed.). Thousand Oaks, CA: Sage.
- de Hooge, I. E., Breugelmans, S. M., & Zeelenberg, M. (2008). Not so ugly after all: When shame acts as a commitment device. *Journal of Personality and Social Psychology*, 95, 933–943.
- de Hooge, I. E., Zeelenberg, M., & Breugelmans, S. M. (2007). Moral sentiments and cooperation: Differential influences of shame and guilt. *Cognition & Emotion*, 21, 1025–1042.
- Jackendoff, R. (2006). The peculiar logic of value. *Journal of Cognition and Culture*, 6, 375–407.
- Johnson, D. D., & Fowler, J. H. (2011). The evolution of overconfidence. *Nature*, 477(7364), 317–320.
- Judd, C. M., Westfall, J., & Kenny, D. A. (2012). Treating stimuli as a random factor in social psychology: A new and comprehensive solution to a pervasive but largely ignored problem. *Journal of Personality and Social Psychology*, 103(1), 54.
- Kaplan, H., & Hill, K. (1985). Food sharing among ache foragers: Tests of explanatory hypotheses. *Current Anthropology*, 26, 223–239.
- Keller, M. C., & Nesse, R. M. (2006). The evolutionary significance of depressive symptoms: Different adverse situations lead to different depressive symptom patterns. *Journal of Personality and Social Psychology*, 91, 316–330.
- Keltner, D., & Haidt, J. (1999). Social functions of emotions at four levels of analysis. *Cognition & Emotion*, 13(5), 505–521.
- Keltner, D., Young, R. C., & Buswell, B. N. (1997). Appeasement in human emotion, social practice, and personality. *Aggressive Behavior*, 23, 359–374.
- Ketelaar, T., & Au, W. T. (2003). The effects of feelings of guilt on the behaviour of uncooperative individuals in repeated social bargaining games: An affect-as-information interpretation of the role of emotion in social interaction. *Cognition and Emotion*, 17, 429–453.
- Klein, J. T., Deaner, R. O., & Platt, M. L. (2008). Neural correlates of social target value in macaque parietal cortex. *Current Biology*, 18(6), 419–424.
- Kuppens, P., Realo, A., & Diener, E. (2008). The role of positive and negative emotions in life satisfaction judgment across nations. *Journal of Personality and Social Psychology*, 95(1), 66–75.
- Leach, C. W., & Cidam, A. (2015). When is shame linked to constructive approach orientation? A meta-analysis. *Journal of Personality and Social Psychology*, 109(6), 983–1002.
- Leary, M. R., Tambor, E. S., Terdal, S. K., & Downs, D. L. (1995). Self-esteem as an interpersonal monitor: The sociometer hypothesis. *Journal of Personality and Social Psychology*, 68, 518–530.
- Leith, K. P., & Baumeister, R. F. (1998). Empathy, shame, guilt, and narratives of interpersonal conflicts: Guilt-prone people are better at perspective taking. *Journal of Personality*, 66(1), 1–37.
- Levy, D. J., & Glimcher, P. W. (2012). The root of all value: A neural common currency for choice. *Current Opinion in Neurobiology*, 22(6), 1027–1038.
- Lewis, M., Alessandri, S. M., & Sullivan, M. W. (1992). Differences in shame and pride as a function of children's gender and task difficulty. *Child Development*, 63, 630–638.
- Lieberman, D., Tooby, J., & Cosmides, L. (2007). The architecture of human kin detection. *Nature*, 445, 727–731.
- Lim, J. (2012). *Welfare Tradeoff ratios and emotions: psychological foundations of human reciprocity*. Doctoral dissertation. Santa Barbara: University of California.
- Lukaszewski, A. W., Simmons, Z. L., Anderson, C., & Roney, J. R. (2015). The role of physical formidability in human social status allocation. *Journal of Personality and Social Psychology*, 110, 385–406.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98(2), 224–253.
- Mauro, R., Sato, K., & Tucker, J. (1992). The role of appraisal in human emotions: A cross-cultural study. *Journal of Personality and Social Psychology*, 62(2), 301–317.
- McGraw, K. M. (1987). Guilt following transgression: An attribution of responsibility approach. *Journal of Personality and Social Psychology*, 53, 247–256.
- Mesquita, B. (2001). Emotions in collectivist and individualist contexts. *Journal of Personality and Social Psychology*, 80(1), 68–74.
- Mesquita, B., & Frijda, N. H. (1992). Cultural variations in emotions: A review. *Psychological Bulletin*, 112(2), 179–204.
- Michalak, J., Troje, N. F., Fischer, J., Vollmar, P., Heidenreich, T., & Schulte, D. (2009). Embodiment of sadness and depression—Gait patterns associated with dysphoric mood. *Psychosomatic Medicine*, 71(5), 580–587.
- Mosquera, P. M. R., Manstead, A. S., & Fischer, A. H. (2000). The role of honor-related values in the elicitation, experience, and communication of pride, shame, and anger: Spain and the Netherlands compared. *Personality and Social Psychology Bulletin*, 26(7), 833–844.
- Nelson, N. L., & Russell, J. A. (2014). Dynamic facial expressions allow differentiation of displays intended to convey positive and hubristic pride. *Emotion*, 14(5), 857.
- Nesse, R. M. (1990). Evolutionary explanations of emotions. *Human Nature*, 1, 261–289.
- Noë, R., & Hammerstein, P. (1994). Biological markets: Supply and demand determine the effect of partner choice in cooperation, mutualism and mating. *Behavioral Ecology and Sociobiology*, 35(1), 1–11.
- Nowak, M. A., & Sigmund, K. (1998). Evolution of indirect reciprocity by image scoring. *Nature*, 393(6685), 573–577.
- Ohtsubo, Y., & Yagi, A. (2015). Relationship value promotes costly apology-making: Testing the valuable relationships hypothesis from the perpetrator's perspective. *Evolution and Human Behavior*, 36(3), 232–239.
- Pavlick, E., Post, M., Irvine, A., Kachaev, D., & Callison-Burch, C. (2014). The language demographics of Amazon mechanical turk. *Transactions of the Association for Computational Linguistics*, 2, 79–92.
- Riskind, J. H., & Gotay, C. C. (1982). Physical posture: Could it have regulatory or feedback effects on motivation and emotion? *Motivation and Emotion*, 6(3), 273–298.
- Roberts, G. (2005). Cooperation through interdependence. *Animal Behaviour*, 70(4), 901–908.
- Robertson, T. E., Delton, A. W., Klein, S. B., Cosmides, L., & Tooby, J. (2014). Keeping the benefits of group cooperation: Domain-specific responses to distinct causes of social exclusion. *Evolution and Human Behavior*, 35, 472–480.
- Robertson, T. E., Sznycer, D., Delton, A. W., Tooby, J., & Cosmides, L. (2018). The true trigger of shame: Social devaluation is sufficient, wrongdoing is unnecessary. *Evolution and Human Behavior*, 39, 566–573.
- Rozin, P., Lowery, L., & Haidt, J. (1999). The CAD triad hypothesis: A mapping between three moral emotions (contempt, anger, disgust) and three moral codes (community, autonomy, divinity). *Journal of Personality and Social Psychology*, 76, 574–586.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6), 1161.
- Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, 76(5), 805–819.
- Scherer, K. R., & Wallbott, H. G. (1994). Evidence for universality and cultural variation of differential emotion response patterning. *Journal of Personality and Social Psychology*, 66, 310–328.
- Schlenker, B. R., & Leary, M. R. (1982). Audiences' reactions to self-enhancing, self-degrading, and accurate self-presentations. *Journal of Experimental Social Psychology*, 18(1), 89–104.
- Schwarz, N. (2000). Emotion, cognition, and decision making. *Cognition & Emotion*, 14(4), 433–440.
- Sell, A., Cosmides, L., & Tooby, J. (2014). The human anger face evolved to enhance cues of strength. *Evolution and Human Behavior*, 35(5), 425–429.
- Sell, A., Sznycer, D., Al-Shawaf, L., Lim, J., Krauss, A., Feldman, A., ... Tooby, J. (2017). The grammar of anger: Mapping the computational architecture of a recalibrational emotion. *Cognition*, 168, 110–128.
- Sell, A., Tooby, J., & Cosmides, L. (2009). Formidability and the logic of human anger. *Proceedings of the National Academy of Sciences of the United States of America*, 106, 15073–15078.
- Sell, A. N. (2011). The recalibrational theory and violent anger. *Aggression and Violent Behavior*, 16, 381–389.
- Shackelford, T. K., Schmitt, D. P., & Buss, D. M. (2005). Universal dimensions of human

- mate preferences. *Personality and Individual Differences*, 39, 447–458.
- Siegel, E. H., Sands, M. K., Van den Noortgate, W., Condon, P., Chang, Y., Dy, J., ... Barrett, L. F. (2018). Emotion fingerprints or emotion populations? A meta-analytic investigation of autonomic features of emotion categories. *Psychological Bulletin*, 144(4), 343–393.
- Smith, A., Pedersen, E. J., Forster, D. E., McCullough, M. E., & Lieberman, D. (2017). Cooperation: The roles of interpersonal value and gratitude. *Evolution and Human Behavior*, 38(6), 695–703.
- Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, 48(4), 813–838.
- Smith, R. H., Webster, J. M., & Eyre, H. L. (2002). The role of public exposure in moral and nonmoral shame and guilt. *Journal of Personality and Social Psychology*, 83, 138–159.
- Suh, E., Diener, E., Oishi, S., & Triandis, H. C. (1998). The shifting basis of life satisfaction judgments across cultures: Emotions versus norms. *Journal of Personality and Social Psychology*, 74(2), 482.
- Sznycer, D. (2010). *Cognitive adaptations for calibrating welfare tradeoff motivations, with special reference to the emotion of shame (Doctoral dissertation)*. Santa Barbara: University of California.
- Sznycer, D. (2019). Forms and functions of the self-conscious emotions. *Trends in Cognitive Sciences*, 23(2), 143–157.
- Sznycer, D., Al-Shawaf, L., Bereby-Meyer, Y., Curry, O. S., De Smet, D., Ermer, E., ... Seal, M. F. L. (2017). Cross-cultural regularities in the cognitive architecture of pride. *Proceedings of the National Academy of Sciences*, 114(8), 1874–1879.
- Sznycer, D., Cosmides, L., & Tooby, J. (2017). Adaptationism carves emotions at their functional joints. *Psychological Inquiry*, 28(1), 56–62.
- Sznycer, D., De Smet, D., Billingsley, J., & Lieberman, D. (2016). Coresidence duration and cues of maternal investment regulate sibling altruism across cultures. *Journal of Personality and Social Psychology*, 111(2), 159–177.
- Sznycer, D., Delton, A. W., Robertson, T. E., Cosmides, L., & Tooby, J. (2019). The ecological rationality of helping others: Potential helpers integrate cues of recipients' need and willingness to sacrifice. *Evolution and Human Behavior*, 40(1), 34–45.
- Sznycer, D., Lopez Seal, M. F., Sell, A., Lim, J., Porat, R., Shalvi, S., ... Tooby, J. (2017). Support for redistribution is shaped by compassion, envy, and self-interest, but not taste for fairness. *Proceedings of the National Academy of Sciences*, 114(31), 8420–8425.
- Sznycer, D., Schniter, E., Tooby, J., & Cosmides, L. (2015). Regulatory adaptations for delivering information: The case of confession. *Evolution and Human Behavior*, 36, 44–51.
- Sznycer, D., Takemura, K., Delton, A. W., Sato, K., Robertson, T., Cosmides, L., & Tooby, J. (2012). Cross-cultural differences and similarities in proneness to shame: An adaptationist and ecological approach. *Evolutionary Psychology*, 10, 352–370.
- Sznycer, D., Tooby, J., Cosmides, L., Porat, R., Shalvi, S., & Halperin, E. (2016). Shame closely tracks the threat of devaluation by others, even across cultures. *Proceedings of the National Academy of Sciences*, 113(10), 2625–2630.
- Sznycer, D., Xygalatas, D., Agey, E., Alami, S., An, X.-F., Ananyeva, K. I., ... Tooby, J. (2018). Cross-cultural invariances in the architecture of shame. *Proceedings of the National Academy of Sciences*, 115(39), 9702–9707.
- Sznycer, D., Xygalatas, D., Alami, S., An, X.-F., Ananyeva, K. I., Fukushima, K. I., & Tooby, J. (2018). Invariances in the architecture of pride across small-scale societies. *Proceedings of the National Academy of Sciences*, 115(33), 8322–8327.
- Tangney, J. P. (1991). Moral affect: The good, the bad, and the ugly. *Journal of Personality and Social Psychology*, 61, 598–607.
- Tesser, A., Gatewood, R., & Driver, M. (1968). Some determinants of gratitude. *Journal of Personality and Social Psychology*, 9(3), 233.
- Tiedens, L. Z., Ellsworth, P. C., & Mesquita, B. (2000). Sentimental stereotypes: Emotional expectations for high-and low-status group members. *Personality and Social Psychology Bulletin*, 26(5), 560–575.
- Tooby, J. (1985). The emergence of evolutionary psychology. In D. Pines (Ed.), *Emerging syntheses in science* (pp. 67–76). Santa Fe: Santa Fe Institute.
- Tooby, J., & Cosmides, L. (1990). The past explains the present: Emotional adaptations and the structure of ancestral environments. *Ethology and Sociobiology*, 11, 375–424.
- Tooby, J., & Cosmides, L. (1996). Friendship and the Banker's paradox: Other pathways to the evolution of adaptations for altruism. In W. G. Runciman, J. Maynard Smith, & R. I. M. Dunbar (Vol. Eds.), *Evolution of social behaviour patterns in primates and man*. Vol. 88. *Evolution of social behaviour patterns in primates and man* (pp. 119–143). Proceedings of the British Academy.
- Tooby, J., & Cosmides, L. (2008). In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *The evolutionary psychology of the emotions and their relationship to internal regulatory variables*. NY: Guilford.
- 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*. Vol. 15. *Handbook of approach and avoidance motivation* (pp. 251–). .
- Tracy, J. L., & Matsumoto, D. (2008). The spontaneous display of pride and shame: Evidence for biologically innate nonverbal displays. *Proceedings of the National Academy of Sciences*, 105, 11655–11660.
- Tracy, J. L., & Robins, R. W. (2008). The nonverbal expression of pride: Evidence for cross-cultural recognition. *Journal of Personality and Social Psychology*, 94, 516–530.
- Tracy, J. L., Shariff, A. F., & Cheng, J. T. (2010). A naturalist's view of pride. *Emotion Review*, 2(2), 163–177.
- Trivers, R. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology*, 46, 35–57.
- Tsang, J.-A. (2006a). Gratitude and prosocial behaviour: An experimental test of gratitude. *Cognition & Emotion*, 20(1), 138–148.
- Tsang, J.-A. (2006b). The effects of helper intention on gratitude and indebtedness. *Motivation and Emotion*, 30(3), 198–204.
- Uchida, Y., & Kitayama, S. (2009). Happiness and unhappiness in east and west: Themes and variations. *Emotion*, 9(4), 441–456.
- Van Der Schalk, J., Bruder, M., & Manstead, A. (2012). Regulating emotion in the context of interpersonal decisions: The role of anticipated pride and regret. *Frontiers in Psychology*, 3, 1–9.
- Weisfeld, G. (1999). In J. M. G. van Der Dennen, D. Smillie, & D. R. Wilson (Eds.), *Darwinian analysis of the emotion of pride/shame*. Westport: CT: Praeger Publishers.
- Weisfeld, G. E., & Dillon, L. M. (2012). Applying the dominance hierarchy model to pride and shame, and related behaviors. *Journal of Evolutionary Psychology*, 10(1), 15–41.
- Welling, H. (2003). An evolutionary function of the depressive reaction: The cognitive map hypothesis. *New Ideas in Psychology*, 21(2), 147–156.
- Wicker, F. W., Payne, G. C., & Morgan, R. D. (1983). Participant descriptions of guilt and shame. *Motivation and Emotion*, 7, 25–39.
- Williams, L. A., & DeSteno, D. (2008). Pride and perseverance: The motivational role of pride. *Journal of Personality and Social Psychology*, 94(6), 1007–1017.