Research Article

A Dynamic Model of Guilt

Implications for Motivation and Self-Regulation in the Context of Prejudice

David M. Amodio,[1] Patricia G. Devine,[2] and Eddie Harmon-Jones[3]

[1]New York University, [2]University of Wisconsin–Madison, and [3]Texas A&M University

ABSTRACT—*Guilt is widely recognized as an important self-regulatory emotion, yet alternative theoretical accounts view guilt primarily as either a punishment cue or a prosocial motivator. Integrating these views, we propose that guilt functions dynamically to first provide a negative reinforcement cue associated with reduced approach motivation, which transforms into approach-motivated behavior when an opportunity for reparation presents itself. We tested this hypothesis in the context of racial prejudice. White subjects viewed a multiracial series of faces while cortical activity was recorded using electroencephalography. Following bogus feedback indicating anti-Black responses, subjects reported elevated guilt, which was associated with changes in frontal cortical asymmetry indicating reduced approach motivation. When subjects were presented with an opportunity to engage in prejudice-reducing behavior, guilt predicted greater interest in prejudice reduction, which in turn was associated with an approach-related shift in frontal asymmetry. The results support a dynamic model in which guilt is associated with adaptive changes in motivation and behavior.*

Guilt has long been regarded as playing a critical role in self-regulation. Freud (1930/1961) conceptualized guilt as conflict between the ego and superego, functioning to keep one's behavior in line with moral standards while punishing id-inspired transgressions. The function of guilt in the intergroup domain was first articulated by Allport (1954), who described guilt as a "moral uneasiness" and "inner check" that drives egalitarians to correct behavior deviating from their nonprejudiced standards (see also Myrdal, 1944). Classic and contemporary theorizing has likewise noted the importance of guilt in the regulation of social behavior, defining guilt as a negative affective experience that is evoked when one's behavior falls short of personal or societal standards and that motivates reparatory behavior (Baumeister, Stillwell, & Heatherton, 1994; Frijda, 1994; Lewis, 1971; Mosher, 1965; Tangney, Miller, Flicker, & Barlow, 1996; Tomkins, 1963). However, the extant literature suggests inconsistent functional accounts of guilt, with some theorists emphasizing a self-punishment function and others emphasizing a prosocial, reparatory function. Still others have suggested that reparatory behaviors following a prejudiced act serve merely as "token" gestures to assuage doubts of one's egalitarianism (e.g., Dutton & Lennox, 1974). The present research was designed to reconcile alternative functional views of guilt by examining neural activations associated with approach-withdrawal motivation in the context of intergroup bias.

Address correspondence to David M. Amodio, Department of Psychology, New York University, New York, NY 10003, e-mail: david.amodio@nyu.edu.

THEORETICAL ACCOUNTS OF GUILT

Theorists agree that guilt is elicited by an interpersonal transgression and experienced as self-disappointment (by contrast, shame is typically experienced as self-loathing; Tangney & Dearing, 2002). However, accounts of guilt's self-regulatory function differ, particularly with respect to its underlying approach-withdrawal motivational orientation. One view posits that guilt functions primarily as a punishment cue that promotes reinforcement learning and inhibition of the transgressive behavior (Monteith, 1993). Across several studies, Monteith and her colleagues have examined the role of guilt in the self-regulation of intergroup behavior (Devine, Monteith, Zuwerink, & Elliot, 1991; Monteith, 1993; Monteith, Ashburn-Nardo, Voils, & Czopp, 2002). This program of research has shown that low-prejudice subjects report increased guilt after learning they have responded with prejudice, and their feelings of guilt are associated with inhibition of ongoing behavior and engagement in self-reflection. According to Monteith, such experiences train an individual to be more vigilant of environmental cues indicating the potential for bias, which in turn cause more careful

responding in future situations. These findings suggest that guilt is associated with a reduction of approach motivation.

An alternative theoretical account suggests that guilt functions primarily to facilitate prosocial behavior (Baumeister et al., 1994; Baumeister, Stilwell, & Heatherton, 1995; Maitner, Mackie, & Smith, 2006; Tangney, 1991). This prosocial perspective views guilt within a societal context, in which guilt, like other "social emotions" such as shame and embarrassment, serves as an ever-present specter of punishment that keeps people's behavior in line with the moral standards of their community (Frijda, 1994). Research examining individuals' retrospective accounts of guilt-inducing situations has associated guilt with efforts to improve social relationships (Baumeister et al., 1995; Tangney & Dearing, 2002). In contrast to the findings of Monteith and her colleagues, research supporting the prosocial account has linked guilt with approach motivation.

The two functions ascribed to guilt—as an inhibitor of transgressive behavior versus a promoter of prosocial behavior—highlight different motivational processes and behavioral outcomes. Yet these accounts may be complementary. Monteith and her colleagues' focus on guilt as a behavioral inhibitor emphasizes the initial experience of guilt, which functions to halt the interpersonal damage being caused by the transgressive behavior. Her research was designed to assess guilt-related processes occurring in the moment of an actual transgression. By contrast, researchers emphasizing a prosocial account (e.g., Baumeister et al., 1994, 1995; Tangney, 1991) have focused on the more distal implications of guilt for subsequent behaviors in interpersonal relationships. We propose that, when considered together, these alternative theoretical foci suggest a dynamic function of guilt, whereby the experience of guilt is initially associated with the interruption of ongoing behavior and a reduction in approach tendencies in order to halt a transgression, survey the damage, and learn from mistakes. The function of guilt then transforms to promote approach responses toward reparatory behaviors, aimed at making up for past transgressions and behaving more appropriately in future situations. Hence, the critical difference between proximal and distal functions of guilt concerns shifting motivational orientations and corresponding changes in behavior.

STUDY OVERVIEW

The present research tested the hypothesis that guilt performs a two-stage function that involves (a) an initial reduction in approach motivation when one becomes aware of having committed a social transgression, followed by (b) an increase in approach motivation when one is presented with an opportunity to engage in behavior to repair the transgression. To measure online changes in approach (vs. withdrawal) motivation, we monitored asymmetries in subjects' frontal cortical activity during their experiences and responses associated with guilt. A large body of literature has shown that frontal cortical asymmetry, as measured using electroencephalography (EEG), reliably corresponds to state approach-withdrawal orientation (Davidson, 1992; Harmon-Jones, 2003), such that relative left-sided asymmetry is associated with approach and right-sided asymmetry is associated with withdrawal. Evidence for this relationship comes from a wide range of studies examining EEG responses to emotional film clips, manipulated emotion, imagery, biofeedback, and spontaneous and directed facial expressions of emotion, as well as associations with psychopathology (see Coan & Allen, 2003, for a review).

The reliability of state and trait frontal EEG as an index of motivational orientation has been established in validation studies (Hagemann, Naumann, Thayer, & Bartussek, 2002), and source-localization analyses have determined that approach/withdrawal-related frontal EEG asymmetry arises from dorsolateral prefrontal cortical activity (Pizzagalli, Sherwood, Henriques, & Davidson, 2005). This asymmetry is believed to reflect asymmetric dopaminergic projections from the striatum that are involved in coordinating action with learned punishment-reward contingencies (Berridge, España, & Stalnaker, 2003). Hence, an EEG measure of frontal cortical asymmetry is uniquely suited for measuring changes in approach-withdrawal orientation associated with guilt.

We tested our hypothesis in the context of racial prejudice. Previous research has shown that White Americans often respond with unintentional racial bias despite their egalitarian beliefs (Amodio, Harmon-Jones, & Devine, 2003; Amodio et al., 2004). Indeed, many self-avowed egalitarians report feelings of guilt following from such transgressions (Devine et al., 1991). Therefore, this context provides a reliable method for inducing guilt. In addition, by manipulating prejudice-related guilt in a controlled laboratory context, we could carefully examine subjects' subsequent motivational and behavioral responses to stimuli that are associated with reparation (e.g., prejudice reduction) or irrelevant to reparation.

METHOD

Subjects

Forty-seven White American introductory psychology students participated for course credit. A female-only sample was used to reduce possible sex-related variability in physiological responses, and right-handed subjects were selected to avoid physiological differences due to brain laterality (Davidson, Ekman, Saron, Senulis, & Friesen, 1990). Although some work suggests that female gender roles relate to guilt proneness (Benetti-McQuoid & Bursik, 2005), guilt has been shown to function in the same way for women and men (Monteith, 1993; Monteith et al., 2002), and thus any observed effects for our all-female sample are likely to generalize to men.

Because our manipulation of guilt assumed that subjects held egalitarian self-standards (Monteith, 1993), subjects were eligible only if they scored above the midpoint of the 7-point

Attitudes Toward Blacks (ATB) scale (Brigham, 1993), administered prior to participation in a mass testing session. Subjects' average ATB score ($M = 6.12$, $SD = 0.63$) was significantly above the midpoint (4), $t(36) = 20.52$, $p_{rep} = .99$, $r = .96$. Data from 10 subjects were excluded because of extensive EEG artifact ($n = 5$), failure to follow instructions ($n = 1$), or suspicion ($n = 1$), or because their scores on one of the EEG measures were considered outliers ($z > 3.0$; $n = 3$).

Procedure and Materials

After providing consent, subjects were fitted with an electrode cap for EEG recording. Eight minutes of baseline resting EEG were recorded (alternating eyes open and closed), and then subjects completed a baseline measure of state affect. Next, subjects were told they would view a series of faces while their brain waves were recorded. Subjects were seated approximately 4 ft from a 19-in. computer monitor. A set of 36 color pictures (7 in. × 9 in.) of White (12), Black (12), and Asian (12) male faces with neutral expressions was presented in the center of the monitor in random sequence, each for 6 s, followed by a variable-time interval (14–22 s). Next, 36 pictures from the International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, 1999)—12 neutral, 12 positive, and 12 negative nonface pictures—were presented in the same manner as the face pictures. Subjects were instructed to make no response, but to remain still and to focus on each picture for the duration of its presentation.

Guilt Manipulation

After viewing both sets of pictures, the subject relaxed while the experimenter purportedly prepared some final measures. Via intercom, the experimenter offered to let the subject see the results of his or her brain-wave responses to each set of pictures. These results were presented on the computer monitor "automatically" by a computer program and were viewed in privacy.

Two bogus bar graphs were presented, each for 30 s. The first graph indicated that the subject responded very positively toward positive IAPS pictures, very negatively to the negative IAPS pictures, and neutrally to the neutral IAPS pictures. These results confirmed subjects' obvious expectations, serving to bolster the veracity of the bogus feedback. Next, a graph of the subject's responses to the faces was presented. The graph depicted very positive responses to White faces, relatively positive responses to Asian faces, and moderately negative responses to Black faces.

Immediately following the presentation of the bogus EEG responses, the monitor was turned off, and the experimenter instructed the subject to remain still while baseline EEG was recorded for an additional 2 min. The subject then completed a second state-affect measure, which contained the same items as the first, but differed in some superficial aspects to disguise the fact that it was a repeated measure. Finally, the subject was informed that the experiment had concluded approximately 20 min early.

Measure of Reparatory Behavior

Subjects were asked if, in the remaining 20 min, they would help evaluate stimuli for use in a future, unrelated study. All agreed. The experimenter explained that in the future study, subjects would read a variety of magazine articles on different topics, and that we wanted to get a sense for how interesting subjects would find the articles. Subjects were shown 19 individual article titles, formatted to resemble newsprint headlines. Each title was presented for 6 s on the computer screen, followed by a 10-s interval. Interspersed among filler titles (e.g., "Five steps to a healthier lifestyle," "TV's potential to teach infants") were 3 titles pertaining to prejudice reduction ("Improving your interracial interactions," "10 ways to reduce prejudice in everyday life," "Ways to eliminate your own racism in the next millennium"). After viewing each title, subjects rated their personal interest in reading the article. EEG was recorded continuously throughout the task. After completing this task, subjects were carefully probed for suspicion using a "funneled" approach, debriefed, awarded credit, and dismissed (Harmon-Jones, Amodio, & Zinner, 2007).

Measures of State Affect

As noted, state affect was measured at baseline and postfeedback. Subjects rated their experience of each of a list of feelings "at this moment," using a scale from 1 (*not at all*) to 9 (*extremely*). The two measures contained the same items. Our primary interest was in subjects' single-item ratings of guilt (*guilty*). In addition, we created indices of anxiety (*bothered*, *tense*, *distressed*, *uncomfortable*, *uneasy*), sadness (*sad*; single item), other-directed negative affect (*irritated at others*, *frustrated with others*, *angry at others*), and positive affect (*happy*, *optimistic*, *content*, *good about myself*). Shame (*ashamed*) was also included as a single-item measure. For each pre- and postmanipulation index, ratings were averaged ($\alpha s > .86$).

EEG Recording and Processing

EEG was recorded using 16 tin electrodes embedded in a stretch Lycra cap (ElectroCap, Eaton, OH), positioned using known anatomical landmarks according to the 10-20 international system. Data were collected from frontal (Fp1, Fp2, F3, F4, F7, F8), central (C3, C4), temporal (T3, T4, T5, T6), and parietal (P3, P4) scalp regions; along the midline (Cz, Pz); and from right earlobe, all referenced to left earlobe, and with a forehead ground. Vertical and horizontal eye movements were recorded to facilitate artifact scoring. Scalp electrode impedances were below 5 kΩ (within 1 kΩ of homologous sites). Signals were amplified using Neuroscan Synamps (Sterling, VA) through a 0.1- to 100-Hz band-pass filter, and digitized at 500 Hz. Off-line, EEG was rereferenced to average earlobes and visually

scored for muscle and ocular artifact, and signal exceeding ±100 μV (including eye blinks) was rejected by computer algorithm.

Artifact-free 2.048-s epochs were extracted through a Hamming window (75% overlap) and submitted to fast Fourier transform. Spectral power at each site was averaged within eyes-open and eyes-closed blocks of baseline EEG, across the 2 min of postfeedback recording, and within title type during title viewing. Because alpha power (8–13 Hz) is inversely related to cortical activity (Lindsley & Wicke, 1974), total alpha power was obtained for analysis. Power values were natural-log transformed, and asymmetry scores were calculated by subtracting left- from right-sided alpha at homologous sites.

RESULTS

After receiving feedback indicating they had responded negatively toward Black faces, subjects reported significantly increased guilt, anxiety, sadness, and other-directed negative affect, and reduced positive affect, relative to baseline, ts(36) > 2.01, p_{rep}s > .88, rs > .32 (see Fig. 1; effects of shame are described separately later in this section). The increase in guilt, $t(36) = 6.17$, $p_{rep} = .99$, $r = .72$, was larger than the change in any other emotion, ts(36) > 3.42, p_{rep}s > .97, $r = .50$. Subjects also exhibited a significant reduction in left-sided frontal asymmetry following feedback ($M = .004$, $SD = .08$), relative to baseline ($M = .06$, $SD = .10$), $t(36) = -2.89$, $p_{rep} = .96$, $r = -.43$, indicating a reduction in approach motivation. Frontal asymmetry following feedback did not differ from zero, $t(36) = 0.25$, $p_{rep} = .28$, $r = .04$.

To assess our hypothesis that guilt should be associated with an initial reduction in approach motivation, we tested correlations between changes in affect and frontal cortical asymmetry. In these analyses, we examined residualized change scores in which baseline affect and EEG measures were covaried from their respective postfeedback measures (Cohen, Cohen, West, & Aiken, 2003). The results were consistent with our hypothesis: A reduction in left-sided frontal asymmetry was significantly correlated with greater guilt, but not correlated with anxiety, sadness, other-directed negative affect, or positive affect (see Table 1). Change in guilt was not associated with change in asymmetry at any other scalp location, and no other emotion was associated with a shift in EEG asymmetry at any scalp site. The association between greater guilt and reduced frontal asymmetry remained significant when other reported emotions or EEG asymmetry from other scalp regions was partialed out, rs(34) > −.36, p_{rep}s > .91. These results demonstrated a unique association between increased guilt and reduced left-frontal cortical asymmetry.

Reparatory Effects of Guilt

Next, we examined subjects' responses during the presentation of the article titles. Subjects' desire to read prejudice-reduction and filler articles did not differ, $t(36) = 0.44$, $p_{rep} = .39$, $r = .07$. However, the experience of guilt was associated with a stronger desire to read articles about prejudice reduction, but not with a stronger desire to read filler articles (see Table 2). No other emotion variable predicted the desire to read prejudice-reduction (rs < .10, p_{rep}s < .46) or filler (rs < .28, p_{rep}s < .82) articles. Examination of frontal EEG revealed a large left-sided shift in frontal cortical activity during viewing of prejudice-reduction titles, $t(36) = 8.75$, $p_{rep} > .99$, $r = .82$, relative to postfeedback EEG. However, left-sided asymmetry also increased while subjects viewed filler titles, $t(36) = 12.10$, $p_{rep} > .99$, $r = .90$, and, indeed, EEG asymmetry scores for filler and prejudice-reduction articles were highly correlated, $r(35) = .63$, $p_{rep} > .99$, suggesting a general increase in approach motivation when subjects were presented with the opportunity to engage in a new task.

To examine the unique relations between frontal cortical asymmetry and the desire to read prejudice-reduction versus filler articles, we computed residualized frontal asymmetry

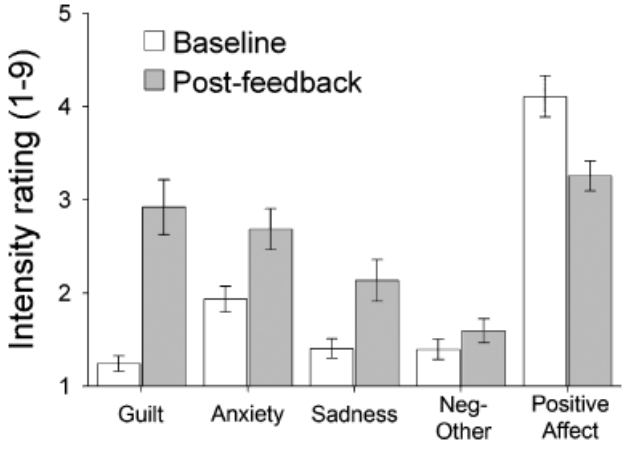

Fig. 1. Subjects' state affect, reported at baseline (before feedback) and after feedback indicating subjects' prejudiced response. Neg-other = other-directed negative affect.

TABLE 1

Correlations Between Postfeedback Emotions and Cortical Asymmetry at Frontal, Temporal, Central, and Parietal Scalp Regions

	Scalp region			
State emotion	Frontal (F4-F3)	Temporal (T4-T3)	Central (C4-C3)	Parietal (P4-P3)
Guilt	−.45**	−.32	−.24	−.08
Anxiety	−.25	−.21	−.16	.05
Sadness	−.05	−.22	−.05	.02
Other-directed negative affect	−.10	−.24	−.30	−.05
Positive affect	.08	.02	−.03	.20

Note. Baseline levels of state affect and electroencephalogram asymmetry were covaried from each score.
**p_{rep} = .96.

TABLE 2

Correlations Among Key Variables Testing the Dynamic Model of Guilt

Measure	1	2	3	4
1. Guilt	—			
2. Postfeedback EEG	−.45*	—		
3. Prejudice-reduction title rating	.42*	.06	—	
4. Filler title rating	.03	.05	.23	—
5. Prejudice-reduction title EEG	.00	−.11	.32*	.12

Note. Baseline levels were covaried from postfeedback measures of guilt and electroencephalogram (EEG) asymmetry. Title-viewing EEG scores represent partial correlations: EEG from filler trials was covaried for trials with prejudice-reduction titles, and vice versa.
*$p_{rep} > .88$.

scores in which EEG from either prejudice-reduction or filler articles was covaried from the EEG variable of interest. As expected, increased left-frontal asymmetry during viewing of prejudice-reduction titles predicted greater desire to read prejudice-reduction articles, but not filler articles (see Table 2). By contrast, increased asymmetry during viewing of filler titles was not associated with a desire to read prejudice-reduction articles, $r(36) = .00$, $p_{rep} = .09$, or filler articles, $r(35) = -.07$, $p_{rep} = .36$. No other emotion variable predicted a change in asymmetry during viewing of prejudice-reduction titles ($rs < .15$, $p_{rep}s < .60$). Considered together, these analyses indicate that the activation of guilt engaged a specific pattern of approach motivation aimed at rectifying the transgression that originally produced the guilt.

Guilt Versus Shame

Given the important theoretical distinction between guilt and shame (Lewis, 1971; Tangney & Dearing, 2002), we examined change in self-reported shame and its relation to frontal cortical asymmetry. A critical distinction between guilt and shame is that feelings of guilt focus narrowly on one's transgression and thus may be alleviated through reparation, whereas shame implicates one's entire self-concept and is not easily alleviated through behavioral reparations. Thus, shame would not be expected to lead to the shift toward approach motivation and reparatory behavior associated with guilt. Although the present research was not designed to examine distinctions between guilt and shame, we present ancillary comparisons of guilt versus shame effects here.

Subjects reported a significant increase in shame following feedback ($M = 2.92$, $SD = 1.87$), relative to baseline ($M = 1.22$, $SD = 0.58$), $t(36) = 5.29$, $p_{rep} > .99$, $r = .66$, and the degree of change did not differ from change in reported guilt, $t(36) = 0.31$, $p_{rep} = .30$, $r = .01$. Indeed, changes in guilt and shame were correlated, $r(35) = .58$, $p_{rep} > .99$. However, residualized postfeedback shame scores (with baseline shame covaried) were not associated with frontal asymmetry following feedback or with a desire to read prejudice-reduction articles ($p_{rep}s < .32$), and partial correlations showed that change in guilt continued to predict frontal asymmetry following feedback, $r(34) = -.48$, $p_{rep} = .97$; reported desire to read prejudice-reduction articles, $r(34) = .44$, $p_{rep} = .96$; and (marginally) frontal asymmetry during viewing of prejudice-reduction titles, $r(34) = -.24$, $p_{rep} = .77$, when change in shame was covaried. Hence, guilt was uniquely associated with self-regulatory motivational and behavioral processes, a result consistent with previous theorizing (Tangney et al., 1996).

DISCUSSION

Philosophers and early psychologists have regarded guilt as a critical motivator of moral behavior (e.g., Freud, 1930/1961; Plato, 1993), yet the psychological processes through which guilt promotes such behavior are complex and not very well understood. Modern psychologists have offered alternative perspectives on the function of guilt, with some focusing on guilt's role in behavioral inhibition and reinforcement learning (e.g., Monteith, 1993), and others highlighting guilt as an approach-related impetus for prosocial behavior (Baumeister et al., 1994). We have proposed a dynamic model of guilt that integrates previous theoretical analyses, and tested this model in the context of racial prejudice using a multimethod approach incorporating self-report, behavioral, and neural measures. Our proposal was supported by the finding that guilt arising from a personal transgression (responding with prejudice) was initially associated with a reduction in approach motivation, as indicated by on-line measures of frontal cortical asymmetry, as well as by the finding that when subjects were given the opportunity for reparation, their feelings of guilt predicted their interest in prejudice-reducing behavior, which in turn was accompanied by a strong approach-oriented shift in patterns of frontal cortical activity. This pattern of results is illustrated in Figure 2. Considered altogether, the observed results suggest that guilt may be best conceptualized as an emotion that orchestrates a

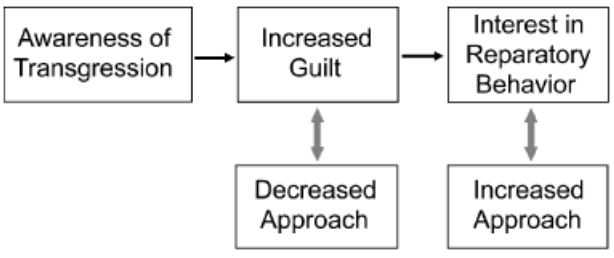

Fig. 2. A dynamic model of guilt. Awareness of having committed a moral transgression elicits feelings of guilt, which correspond to a decrease in approach motivation. When an opportunity for reparation presents itself, feelings of guilt predict interest in reparatory behavior, which in turn corresponds to an increase in approach motivation.

multifaceted self-regulatory process that involves a complex sequence of behaviors in response to a moral transgression.

A Dynamic Model of Social Emotions

Our findings suggest a novel conceptualization of emotions as serving a dynamic motivational function for regulating behavior. Previously, emotions have often been viewed as relatively unchanging feeling states or as associated with a single behavioral tendency or motivational orientation. For example, many "basic" emotions (Ekman, 1992), such as fear or disgust, may be appropriately viewed as serving a single motivational and behavioral function (e.g., to escape or recoil). In contrast, social emotions, such as guilt, shame, love, and resentment, serve more complex interpersonal functions that pertain to highly elaborated social contingencies and have implications extending beyond the initial emotion-eliciting event (Keltner & Haidt, 1999; Tomkins, 1963; cf. Dutton & Lennox, 1974). Social emotions pertain to more highly evolved social networks and the enhanced social-cognitive abilities that uniquely enable humans to navigate these networks (Keltner & Haidt, 1999). Whereas basic emotional responses, such as conditioned fear, may be observed across a broad phylogenetic range of animals, social emotions are most clearly evident in those with a *theory of mind*, that is, an awareness that the self and others possess unique mental states (Premack & Woodruff, 1978). Theory of mind is associated with evolutionarily advanced neural structures, such as the prefrontal cortex, that are involved in coordinating complex relationships between the self and others (Amodio & Frith, 2006), in monitoring changing outcomes (Knutson, Taylor, Kaufman, Peterson, & Glover, 2005), and in forming goals (Braver & Bongiolatti, 2002). Hence, we suggest that social emotions, by virtue of their functional complexity and association with frontal cortical regions implicated in social-cognitive processes, are best conceptualized in terms of a dynamic mechanism.

We found support for our proposed dynamic model of guilt. Might this model apply to other social emotions? Consider shame, for example, which is typically elicited alongside guilt following interpersonal transgressions (Tangney, 1991). Like guilt, initial feelings of shame are accompanied by behavioral inhibition and attention to transgression-related cues. However, guilt implies a desire to repair one's transgression, whereas shame is associated with a fearful response and the desire to escape social scrutiny (Lewis, 1971; Tangney et al., 1996). This distinction suggests different motivational dynamics for guilt and shame. Whereas guilt transforms into approach motivation aimed at reparation, shame may be more likely to transform into withdrawal motivation aimed at avoiding social scrutiny (although our study was not designed to test shame-related processes). By contrast, it is unlikely that basic negative emotions or mood would follow the dynamic pattern observed for guilt. Although generalized negative affect may be associated with decreased approach motivation, it would not be expected to shift to an approach motivation. Indeed, the feedback manipulation caused changes in a range of emotions, including general forms of negative affect, but only guilt was associated with dynamic motivational processes.

Neural Correlates of Emotion

Here we have provided the first functional neurocognitive analysis of guilt. Although recent research has attempted to map emotions, including guilt, onto specific brain structures (see review by Moll, Zahn, de Oliveira-Souza, Krueger, & Grafman, 2005), the present research acknowledges that guilt is an emotion embedded in social exchange and can be best understood in terms of its self-regulatory functions. The social neuroscience approach taken in this research placed guilt and its self-regulatory functions in a broader framework of neuroscience and approach-withdrawal motivation, rather than attempting to isolate guilt in a specific neural structure.

Conclusion

Emotions are complex psychophysiological processes that function to guide behavior. To date, emotions have been viewed primarily as unimodal responses, each of which is associated with a single motivational impetus (e.g., to approach or avoid). Our findings suggest that some emotions—particularly social emotions—may be better understood as dynamic responses that can include multiple stages, each with different motivations triggered by different internal or external cues. Within the intergroup context, this model of emotion explains how guilt may function as a reinforcement learning cue as well as an impetus for prosocial egalitarian responses. More broadly, this model provides an account of how emotions function to orchestrate complex forms of social behavior.

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