EMOTIONS AND ACTIONS ASSOCIATED WITH NORM-BREAKING EVENTS

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Norms have a strong influence on human social interactions, but the emotions and actions associated with norm-breaking events have not been systematically studied. We asked subjects to imagine themselves in a conflict situation and then to report how they would feel, how they would act, and how they would imagine the feelings and actions of their opponent. By altering the fictional scenario that they were asked to imagine (weak vs. strong norm) and the perspective of the subject (norm-breaker vs. the one whose norm has been violated), the emotions and actions associated with norm-breaking events could be examined. We tested the following hypotheses: (1) norms create emotional asymmetries that resolve conflicts in otherwise symmetrical contest situations; (2) sex differences exist in response to norm-breaking events, with males more prone to violence than females; (3) individual differences exist in response to norm-breaking events, along the lines predicted by theoretical models; and (4) emotions and actions attributed to one's opponent are distorted in ways that can be interpreted as adaptive for the believer. In addition to these basic hypotheses, we address more subtle issues concerning the particular emotions provoked by norm-breaking events, the degree to which emotional response is fine-tuned to the situation, and the degree to which emotional response correlates with anticipated behavioral response. We discuss the relevance of our study to the general study of emotions and the use of fictional scenarios as a research method in addition to the study of norms from an evolutionary perspective.

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Conflicts in human life are often resolved on the basis of social norms. For example, the norm of ownership specifies that the owner of a resource has a right to it and that others do not, no matter how much they would benefit from the resource. The rudiments of social norms can be found in nonhumans (e.g., de Waal 1995; Hauser 1992), but animal contests are decided primarily on the basis of fighting ability, the value of the resource to the contesting parties, genetic relatedness, repeated interactions, and so on (Dugatkin 1997). In human contests these factors are often overridden by norms, often so decisively that the contests do not even take place.

Norms can be enforced by third parties, but they can also be internalized (Ellickson 1991). In the latter case, norms create a psychological asymmetry between contestants in an otherwise symmetrical contest situation. Most people have experienced the anger of having their rights violated, or the shame of violating even trivial social norms, which attests to the powerful emotions elicited by norm-breaking events.

Despite the obvious importance of norms, their long history of study in social psychology (e.g., Cialdini and Trost 1998; Ellickson 1991), and the emphasis placed upon norms by evolutionary thinkers such as Alexander (1987), Axelrod (1984), Boehm (1993), Boyd and Richerson (1985, 1992), and Irons (1991), norms have been surprisingly neglected within the field of evolutionary psychology. For example, three recent textbooks on evolutionary psychology (Buss 1999; Cartwright 2000; Gaulin and McBurney 2001) devote a total of only two pages to the subject of norms. This neglect is being corrected by a number of recent conceptual treatments (Boehm 1999; Bowles and Gintis 2002; Fehr, Fischbacher, and Gachter 2002; Sober and Wilson 1998) and formal theoretical models (Gintis 2000; Gintis, Smith, and Bowles 2002; Henrich and Boyd 2001; Nowak and Sigmund 1998; Wilson and Kniffin 1999), but empirical studies of the proximate psychological mechanisms underlying norms are still in short supply (Fehr and Gachter 2002; Fehr et al. 2002).

In this paper we examine the emotions and actions associated with norm-breaking events. Subjects were asked to imagine themselves as part of a fictional scenario involving a contest between two people in the absence of third parties. Then they were asked to report how they would feel, how they would act, and how they imagined their opponent feeling and acting. By altering the fictional scenario that they were asked to imagine (weak vs. strong norm) and the perspective of the subject (norm-breaker vs. the one whose norm has been violated), the emotions and contemplated actions associated with norm-breaking events could be examined.

We used this simple methodology to test a number of basic hypotheses and more subtle questions concerning norms, emotions, and actions. The basic hypotheses are as follows:

Norms create emotional asymmetries that resolve conflicts in otherwise symmetrical contest situations and in the absence of third parties. Even though the emotional response of being "wronged" or "in the wrong" are familiar on the basis of experience, they have not been systematically studied. Our study provides a taxonomy of emotions associated with norm-breaking events and quantifies the intensity of emotional response to weak vs. strong norms.

Sex differences exist in response to norm-breaking events, with males more prone to violence than females. The fact that males are more prone to violence than females is one of the most consistent results of evolutionary psychological research (e.g., Daly and Wilson 1988) and should be reflected in the emotions and actions associated with norm-breaking events.

Individual differences exist in response to norm-breaking events, with norm-breakers in addition to norm-abiders and non-punishers in addition to punishers. Theoretical models frequently predict behavioral polymorphisms in response to norm-breaking events (reviewed by Sober and Wilson 1998). Individuals who abide by norms, punish deviants, and act contrite when they violate norms (e.g., by mistake) do not evolve to fixation. Instead, they coexist with individuals who break norms without feeling contrite and other individuals who abide by norms but do not punish deviants. These theoretical expectations are supported by the experimental economics literature, in which only some individuals cooperate in commons games and only some individuals punish norm-violators when provided the opportunity (Kagel and Roth 1995). However, these individual differences at the behavioral level have not been related to differences in emotional response at the psychological level.

Emotions and anticipated actions attributed to one's opponent are distorted in ways that can be interpreted as adaptive for the believer. In principle, it is possible for subjects to attribute the same emotions and actions to their opponents that they would feel in the same situation. However, distorted beliefs frequently motivate more adaptive behavior than accurate beliefs (Krebs and Denton 1997; Wilson 1990, 1995). We therefore expected the subjects to experience adaptively distorted beliefs about the feelings and actions of their opponents.

Some of these hypotheses may sound "obvious" in the sense that they are expected on the basis of common experience. Is it not "obvious" that people who imagine themselves in the position of a norm-violator will report different feelings than they do when in the position of one whose norm has been violated, that males will respond differently than females, and so on?

We agree that the mere existence of differences is not surprising, but the details are anything but obvious. Do emotional differences exist when the norms are weak and third parties are absent? How do sex differences in anger change in regard to weak versus strong norms? Which particular emotions differ, such as fear, anger, embarrassment, and so on? How nuanced is the emotional response: is there a difference between "upset" and "uneasy," for example? How strongly do differences in emotional response correlate with differences in anticipated action? Readers who think that the answers to these questions are obvious should make their predictions now before reading the results of our study.

In addition to addressing the specific subject of norms, our study is also relevant to the general study of emotions and the use of fictional scenarios as a research tool in evolutionary psychology. There is little doubt that emotions are adaptations for motivating action, but how sophisticated and fine-tuned are they? If they are crude adaptations, perhaps we should be thinking in terms of broad categories such as "fear," "anger," "surprise," "disgust," and so on. However, if they are sophisticated adaptations, perhaps we should be thinking in terms of hundreds or even thousands of emotional states, each tailored to highly specific situations (Cosmides and Tooby 2000). One way to test these ideas about emotions in general is to measure emotional response in relation to action for highly specific situations, as we have done in the case of norms.

Fictional scenarios are a useful tool for this kind of research because the situation can be manipulated with surgical precision, and both emotional response and contemplated action can be measured for large numbers of people at minimal cost. Of course, there are always the legitimate concerns that emotional response to a fictional scenario is not the same as it would be to a comparable real-life event, and that contemplated action is not the same as actual action. These concerns must always be kept in mind, but they must also be tempered by two considerations: First, it is possible to validate the method by comparing the response to fictional scenarios with the response to comparable real-life events. Second, even if they are not identical, imagined responses can still have a strong effect on actual responses and remain an important object of study in their own right. It is becoming increasingly apparent that narrative, or storytelling, is fundamental not only for social interactions but also for internal psychological processes. The evolved mind might be deeply narrative in its structure, continuously spinning alternative scenarios as guides to anticipated action. Not only are mainstream psychologists converging upon this concept of "narrative psychology" (e.g., Bruner 2002; Pennebaker and Seagal 1999), but also evolutionary psychologists such as Cosmides and Tooby (2000). Thus, the use of fictional scenarios might be indicative of the way the mind works, in addition to being an important research tool. We will

return to these general issues in the light of our specific study of emotions and actions in response to norm-breaking events.

METHODS

Undergraduate students from Binghamton University's human subject pool participated for course research credits. Each participant was asked to read a short fictional scenario along the following lines:

> Gold has been discovered in California and the rush is on! You are one of many prospectors during the 1800s searching the Sierra Mountains to stake a claim. You have pushed deep into unclaimed territory and have just discovered a promising stream. You fill your pan with the gravel of the stream bed, swirl it around, and to your amazement, gleaming nuggets of gold emerge! Just as you are placing the nuggets into a cloth bag, you hear the crack of a branch and look up to see another prospector rounding the bend. His equipment is still packed on his mule and he sees you at the same moment that you see him.

This scenario describes a potential conflict situation between two people in the absence of third parties. Writing the scenario in the second person ("You are a prospector . . .") was designed to encouraged the readers to imagine themselves as part of the action. Four versions of the story manipulated the perspective of the reader and the norms surrounding the situation. Perspective was altered by making the reader either the first-comer who discovered gold or the second-comer who arrived a moment later. Norms were altered by having the prospector travel through unclaimed territory (as in the above version) or through claimed territory. In the latter case, the first-comer knows that the territory is claimed but nevertheless decides to try his or her luck because no one seems to be around. The second person who arrives a moment later is described as "almost certainly the owner of the claim." The exact wording of the four scenarios is provided in an appendix. The scenarios given to male and female subjects described the second person as of their own sex. The idea of a female prospector meeting another female prospector is a bit artificial (since most real prospectors were male), but it avoids the complications associated with male-female interactions.

Ownership is a very strong norm in many societies, including our own, so there is little doubt that panning gold on another person's claim is a clear violation of a social norm. An encounter on unclaimed territory involves exactly the same situation, with the same resources at stake and fighting abilities of the two protagonists in the absence of third parties, but without the norm violation. Even on unclaimed territory, an implicit norm

might exist that gives the first-comer priority over the second-comer. If so, the implicit norm is almost certainly weaker than the explicit norm against trespassing another's claim, making the comparison between a weak and strong norm rather than between no norm and a strong norm.

In an initial stage of the experiment, 34 participants (21 females, 13 males) read one version of the story and were asked to describe (1) how they might feel in this situation, (2) how they might act in this situation, (3) how they think the other person in the story might feel, and (4) how they think the other person in the story might act. Space was provided for the participants to list feelings and actions in an open-ended format. These responses were combined and the obviously redundant items removed to produce a master list of 30 emotion-laden words and 28 action-laden words. During stage two of the experiment, 164 participants (90 females, 74 males, age range 18–25 with a mean of 19.4 yr) read a single version of the story and were asked the same four questions, but in this case they indicated their agreement to the items on the master list on a scale from 1 (strongly disagree) to 9 (strongly agree). We employed this two-stage procedure because we wanted to include all the emotional states and actions that might exist in association with the scenarios. Rather than trying to anticipate the full range ourselves, we obtained the information from the subject population during stage 1 and converted it into a quantifiable form in stage 2.

RESULTS

Tables 1 and 2 report the feelings and actions associated with meeting on unclaimed and claimed territory, respectively. The words connoting emotions are loosely grouped into the categories of fear, arousal, anger, shame, generalized distress, and possessive emotions. Words connoting actions are grouped into the categories of withdrawal, violent confrontation, and nonviolent confrontation with subcategories of dominant, subordinate, and neutral actions. Tables 3 and 4 (below) report the feelings and actions that subjects attributed to their opponents. Data are provided for all of the emotion- and action-laden words because some of the results pertain to broad patterns of differences that can be seen by scanning the columns with the asterisks and also to enable the reader to make specific comparisons in addition to the ones that we emphasize in the text. The results relevant to the four hypotheses listed in the introduction will now be described in turn.

Norms create emotional asymmetries that resolve conflicts in otherwise symmetrical contest situations and in the absence of third parties. The column labeled TRT (for "treatment") in Table 1 shows the significant differences

Table 1. Emotions and Contemplated Actions Experienced by the First-Comer (1st) and Second-Comer (2nd) to Unclaimed Territory. The first two columns give the average degree of agreement with 30 emotion words and 28 action words on a scale from 1 (highly disagree) to 9 (highly agree), followed by standard errors in the next two columns. The columns labeled F and M give average degree of agreement by males and females, followed by standard errors in the next two columns. The columns labeled TRT, SEX, and INT indicate statistically significant differences between first- and second-comers, between males and females, and interaction effects, respectively. One, two, and three asterisks indicate statistical significance at the .05, .01, and .001 levels. However, these values should be interpreted with caution, as discussed in the text.

	1st	*2nd*	*1st se*	*2nd se*	*F*	*M*	*F se*	*M se*	*TRT*	*SEX*	*INT*
EMOTIONS											
Fear											
Scared	4.00	3.89	0.58	0.58	3.86	4.05	0.55	0.62			
Nervous	4.95	5.31	0.58	0.65	5.00	5.27	0.57	0.66			
Threatened	5.85	4.78	0.60	0.63	5.45	5.22	0.61	0.63			
Worried	5.13	5.47	0.56	0.52	5.30	5.27	0.52	0.57			
Insecure	3.81	4.47	0.66	0.76	4.21	4.00	0.71	0.69			
Trapped	4.04	3.10	0.62	0.55	3.56	3.66	0.56	0.66			*
Hesitant	4.18	5.63	0.58	0.70	4.91	4.77	0.58	0.76			
Arousal											
Surprised	6.36	6.68	0.61	0.52	6.21	6.88	0.56	0.58			
Excited	4.00	4.26	0.68	0.66	5.00	3.00	0.62	0.65		*	
Shocked	4.95	5.78	0.66	0.62	4.95	5.83	0.60	0.70			
Anger											
Angry	3.95	4.68	0.55	0.59	3.39	5.44	0.44	0.64		**	
Annoyed	5.00	5.42	0.61	0.63	4.17	6.50	0.53	0.60		**	
Aggravated	5.04	6.15	0.65	0.60	4.60	6.77	0.59	0.59		**	
Shame											
Sorry	2.68	3.05	0.54	0.59	2.47	3.33	0.44	0.70			
Embarrassed	1.77	2.63	0.37	0.60	1.86	2.55	0.42	0.57			
Guilty	1.68	2.42	0.38	0.49	1.95	2.11	0.36	0.53			
Defeated	2.77	5.52	0.54	0.75	3.95	4.16	0.65	0.78	**		*
Generalized distress											
Unhappy	4.36	5.89	0.59	0.75	4.04	6.38	0.60	0.68		**	
Disappointed	4.81	6.73	0.75	0.63	5.52	5.94	0.64	0.84			
Upset	4.77	6.26	0.62	0.60	4.73	6.38	0.57	0.65			
Uneasy	5.77	5.89	0.55	0.68	5.08	6.77	0.61	0.51		*	
Uncomfortable	6.45	6.21	0.51	0.65	6.13	6.61	0.57	0.57			
Possessive emotions											
Cheated	4.18	4.21	0.69	0.58	3.52	5.05	0.54	0.73			
Protective	6.95	3.36	0.58	0.64	4.65	6.11	0.70	0.70	***		
Violated	2.45	3.57	0.41	0.74	2.69	3.33	0.51	0.69			
Jealous	2.50	6.05	0.49	0.68	3.78	4.61	0.64	0.78	***		
Selfish	6.59	4.78	0.55	0.80	4.56	7.27	0.63	0.62		**	
Competitive	6.59	5.84	0.61	0.67	5.82	6.77	0.62	0.63			
Ambitious	5.61	6.50	0.69	0.58	6.31	5.64	0.53	0.81			
Miscellaneous											
Grateful	3.18	2.26	0.69	0.44	2.65	2.88	0.57	0.65			

(*continued*)

Table 1. (*Continued*)

	1st	*2nd*	*1st se*	*2nd se*	*F*	*M*	*F se*	*M se*	*TRT*	*SEX*	*INT*
ACTIONS											
Withdraw											
Apologize	2.09	3.63	0.44	0.63	3.47	1.94	0.62	0.33		*	**
Leave	1.54	2.78	0.38	0.60	1.73	2.61	0.39	0.63			
Avoid other	3.72	3.42	0.56	0.63	4.17	2.83	0.55	0.60			
Violent confrontation											
Become violent	2.54	2.42	0.51	0.50	1.30	4.00	0.16	0.62		***	
Yell at other	2.36	1.78	0.52	0.37	1.52	2.83	0.29	0.62			
Get angry	3.22	2.94	0.56	0.57	2.34	4.05	0.42	0.67		*	
Act unfriendly	2.63	2.00	0.49	0.37	1.90	2.88	0.37	0.53			
Nonviolent confrontation											
Dominant											
Make other	5.13	2.94	0.65	0.52	3.00	5.55	0.49	0.70	**	**	
Ask for excuse	3.59	3.10	0.59	0.57	2.95	3.88	0.55	0.62			
Stand up to other	6.18	4.10	0.60	0.61	5.17	5.27	0.62	0.69	*		
Stare at other	5.63	4.78	0.61	0.64	5.26	5.22	0.58	0.69			
Act competitive	6.18	4.52	0.56	0.69	4.86	6.11	0.62	0.63			
Continue panning	6.22	6.00	0.67	0.75	7.04	4.94	0.53	0.83		*	
Subordinate											
Let other	2.22	3.78	0.41	0.66	2.91	3.00	0.56	0.55	*		
Try to hide gold	3.66	2.11	0.67	0.43	2.68	3.29	0.54	0.71			
Make up excuse	3.00	2.47	0.58	0.46	2.04	3.66	0.37	0.66		*	
Wait for other to	5.13	3.68	0.70	0.71	4.86	3.94	0.72	0.70			
Act kindly	4.95	6.36	0.56	0.61	5.91	5.22	0.52	0.71			
Explain situation	5.04	4.94	0.67	0.78	4.73	5.33	0.66	0.79			
Remain silent	4.63	5.05	0.57	0.75	5.17	4.38	0.61	0.71			
Act innocent	4.81	6.10	0.67	0.69	5.86	4.83	0.58	0.81			
Make friends	5.09	6.73	0.53	0.55	5.56	6.22	0.57	0.56	*		
Act grateful	3.09	3.42	0.65	0.62	3.13	3.38	0.57	0.72			
Act charming	3.54	5.26	0.56	0.68	4.43	4.22	0.60	0.71	*		
Neutral											
Act Calm	5.81	6.94	0.55	0.57	6.91	5.61	0.43	0.72			
Be on guard	7.77	7.00	0.48	0.60	7.13	7.77	0.48	0.61			
Start conversation	6.00	6.57	0.58	0.56	5.69	7.00	0.56	0.54			
Work for compromise	4.59	6.10	0.61	0.60	5.21	5.38	0.57	0.71			

between the first and second to arrive at the unclaimed territory (interaction effects will be discussed below, along with sex differences). The table includes multiple comparisons, which means that statistical significance values must be interpreted with caution. Purely by chance, roughly one out of twenty comparisons will be "significant" at the .05 level, one out of one hundred will be "significant" at the .01 level, and so on. Thus, differences indicated by a single asterisk should be regarded as tentative while those indicated by two and three asterisks can be accepted with greater confidence. At the level of emotion, the second-comers felt substantially more defeated, less protective, and more jealous than the first-comers. At the level of action they were less likely to make the other go away or to stand up to the other, while being more likely to make friends and act charming. Thus, an implicit norm of "first come, first served" appears to create an emotional asymmetry in an otherwise symmetrical competitive situation, even when the two individuals arrive only moments apart from each other.

The column labeled TRT in Table 2 shows the significant differences between the trespasser (first to arrive) and the owner (second to arrive) on the claimed territory. Compared with the implicit norm "first come, first served," the explicit norm of ownership creates an enormous emotional asymmetry between the two parties. Owners felt much angrier and also more protective and jealous toward the trespasser than the first-comer felt toward the second-comer in the weak norm situation. Similarly, the trespassers felt far more sorry, embarrassed, and guilty than the second-comers in the weak norm situation. Interestingly, trespassers did not feel more defeated, in contrast to the second-comers in the weak norm situation. At the level of action, the trespassers were far more likely to withdraw and the owners more likely to assert their dominance than their counterparts in the weak norm situation.

The absence of significant differences in certain emotions is also noteworthy. It might seem that the trespasser would feel more scared, nervous, threatened, worried, insecure, surprised, excited and shocked than the owner, but these differences do not reach statistical significance in our study. These emotions are indeed strongly aroused by the situation (as indicated by the high values in Table 2), but both parties are equally aroused and the emotional *differences* reside elsewhere.

Sex differences exist in response to norm-breaking events, with males more prone to violence than females. The column labeled SEX in Tables 1 and 2 gives sex differences, while the column marked INT gives interaction effects between sex and order of arrival. On unclaimed territory (Table 1), males reported feeling more angry, unhappy, and selfish than females. At the level of action they felt more prone to violence and to making the other person go away. Females were more likely than males to simply continue panning for gold. There were few significant interactions between sex and

Table 2. Emotions and Contemplated Actions Experienced by the Owner (OWN) and Trespasser (TRES) on Claimed Territory. See Table 1 for additional information.

	OWN	*TRES*	*O se*	*T se*	***F***	***M***	*F se*	*M se*	*TRT*	*SEX*	*INT*
EMOTIONS											
Fear											
Scared	4.42	5.85	0.58	0.64	5.13	5.10	0.66	0.58			
Nervous	5.52	6.85	0.62	0.61	6.18	6.15	0.62	0.65			
Threatened	5.28	6.60	0.54	0.54	5.45	6.47	0.59	0.50			
Worried	5.95	6.65	0.51	0.50	6.40	6.15	0.57	0.43			
Insecure	3.95	5.25	0.52	0.68	4.77	4.36	0.62	0.61			
Trapped	3.38	5.80	0.58	0.60	4.81	4.26	0.70	0.57	**		
Hesitant	5.09	6.50	0.49	0.36	6.27	5.21	0.44	0.45	*		
Arousal											
Surprised	7.76	7.55	0.49	0.53	7.68	7.63	0.52	0.50			
Excited	4.19	4.15	0.70	0.70	3.63	4.78	0.60	0.78			
Shocked	7.09	7.35	0.46	0.36	7.36	7.05	0.39	0.44			
Anger											
Angry	7.47	4.70	0.57	0.64	5.63	6.68	0.65	0.69	***		
Annoyed	7.76	5.30	0.45	0.53	5.86	7.36	0.58	0.47	***	*	
Aggravated	8.00	5.30	0.49	0.52	6.13	7.31	0.58	0.56	***		
Shame											
Sorry	1.42	6.65	0.21	0.52	4.54	3.31	0.75	0.62	***	*	*
Embarrassed	2.09	6.90	0.42	0.51	4.63	4.21	0.71	0.71	***		
Guilty	1.76	6.35	0.39	0.57	4.72	3.15	0.73	0.62	***	*	
Defeated	4.52	4.10	0.61	0.65	5.27	3.21	0.62	0.53		*	
Generalized distress											
Unhappy	7.71	5.65	0.44	0.53	6.31	7.15	0.54	0.51	**		
Disappointed	7.71	6.00	0.41	0.52	7.31	6.36	0.47	0.51	**		
Upset	8.00	5.85	0.44	0.54	7.00	6.89	0.54	0.55	**		
Uneasy	7.23	7.65	0.34	0.38	7.63	7.21	0.35	0.38			
Uncomfortable	6.47	7.65	0.51	0.45	6.90	7.21	0.50	0.50			
Possessive emotions											
Cheated	7.38	3.05	0.59	0.44	4.63	6.00	0.68	0.72	***		*
Protective	5.61	4.85	0.71	0.53	4.77	5.78	0.65	0.58			
Violated	5.71	2.05	0.74	0.44	3.18	4.78	0.74	0.69	***		
Jealous	7.14	4.35	0.53	0.65	5.54	6.05	0.68	0.64	**		
Selfish	6.00	5.90	0.56	0.56	6.36	5.47	0.50	0.61			
Competitive	6.71	5.75	0.61	0.55	5.63	6.94	0.61	0.52			
Ambitious	6.57	4.25	0.50	0.64	5.50	5.36	0.62	0.63	**		
Misc.											
Grateful	2.00	1.75	0.47	0.44	2.09	1.63	0.54	0.30			
ACTIONS											
Withdraw											
Apologize	1.90	6.35	0.32	0.57	4.40	3.68	0.69	0.66	***		
Leave	1.47	5.90	0.22	0.62	4.13	3.05	0.75	0.53	***		
Avoid other	3.00	5.40	0.62	0.44	4.81	3.42	0.63	0.52	**		

(*continued*)

Table 2. (*Continued*)

	OWN	*TRES*	*O se*	*T se*	***F***	***M***	*F se*	*M se*	*TRT*	*SEX*	*INT*
Violent confrontation											
Become violent	3.76	2.30	0.61	0.44	2.04	4.21	0.40	0.61	*	**	
Yell at other	4.71	2.50	0.73	0.55	2.81	4.57	0.56	0.79	**		
Get angry	5.71	2.55	0.70	0.47	3.31	5.15	0.63	0.72	***	*	
Act unfriendly	4.28	2.80	0.64	0.48	2.68	4.57	0.53	0.59	*	*	
Nonviolent confrontation											
Dominant											
Make other	5.52	3.30	0.78	0.56	3.59	5.42	0.69	0.72	*		
Ask for excuse	7.23	4.15	0.69	0.73	4.90	6.68	0.81	0.68	**		
Stand up to other	6.47	4.70	0.61	0.59	4.63	6.73	0.55	0.63	*	*	
Stare at other	6.47	4.85	0.59	0.67	5.86	5.47	0.63	0.68			
Act competitive	5.71	3.95	0.64	0.54	4.27	5.52	0.62	0.60	*		
Continue panning	6.00	2.65	0.73	0.55	4.63	4.05	0.75	0.74	***		
Subordinate											
Let other	1.95	5.20	0.33	0.59	4.13	2.84	0.61	0.53	***		
Try to hide gold	2.28	5.35	0.56	0.62	4.31	3.15	0.66	0.68	***		
Make up excuse	2.23	5.45	0.43	0.53	4.22	3.31	0.59	0.59	***		
Wait for other to	3.42	6.55	0.61	0.62	5.04	4.84	0.72	0.69	***		
Act kindly	5.09	6.75	0.62	0.50	6.72	4.94	0.46	0.67	*	*	
Explain situation	6.90	7.30	0.61	0.54	7.36	6.78	0.46	0.69			
Remain silent	3.57	4.90	0.63	0.65	5.18	3.10	0.62	0.61		*	
Act innocent	3.66	5.50	0.65	0.64	4.54	4.57	0.62	0.75			
Make friends	4.95	5.50	0.60	0.55	5.68	4.68	0.45	0.69			
Act grateful	2.38	2.55	0.50	0.47	2.77	2.10	0.50	0.46			
Act charming	4.23	5.30	0.65	0.61	5.45	3.94	0.63	0.60			
Neutral											
Act calm	5.09	6.00	0.55	0.61	5.63	5.42	0.59	0.57			
Be on guard	7.28	7.40	0.48	0.55	6.86	7.89	0.52	0.46			
Start conversation	6.76	6.40	0.56	0.46	6.27	6.94	0.51	0.50			
Work for compromise	5.42	6.00	0.63	0.65	6.63	4.63	0.53	0.68		*	

order of arrival. The strongest interaction was for the tendency to apologize. While neither sex felt inclined to apologize as the first-comer (mean score of 2 for females and 2.2 for males), females felt much more likely to apologize than males as the second-comer (mean score of 5.09 for females and 1.62 for males).

The sex differences on claimed territory (Table 2) are actually less pronounced than on unclaimed territory. For example, the sex differences for words associated with anger are highly significant in Table 1 but not in Table 2. Evidently the very large differences in anger between the owner and trespasser make the sex of the participants relatively unimportant. However, the sex differences that do exist in Table 2 confirm the prediction that males are more prone than females to a violent emotional response and associated actions in response to norm-breaking events.

Individual differences exist in response to norm-breaking events, with norm-breakers in addition to norm-abiders and nonpunishers in addition to punishers. Individual differences in response to norm-breaking events will result in variation within a single treatment. Specifically, we predict that some individuals will not feel contrite in the role of trespasser and that some individuals will not feel prone to assert their rights in the role of owner. Of course, variation always exists within treatments, so the question is the magnitude of the variation and the degree to which it correlates with variation in other emotions and anticipated actions. As an example of the kind of variation that exists within a single treatment, the average trespasser felt far more embarrassed than the average owner with no sex or interaction effect (Table 2), but the 20 subjects in the trespasser treatment still varied in their degree of embarrassment from a low score of 2 to a high score of 9. We used the "embarrassment" score for these 20 subjects as a dependent variable in a stepwise multiple regression with the other emotion words as the independent variables. The emotion words "uncomfortable (+)," "sorry (+)," "cheated (−)," and "uneasy (+)" accounted for 94.5% of the variance in response to the emotion word "embarrassed" (the + and − signs indicate positive and negative correlations). In other words, the subjects who were not embarrassed by trespassing also felt comfortable despite being confronted by the owner, were not sorry about trespassing, and felt cheated despite their status as trespasser. To see how the trespasser's degree of embarrassment relates to contemplated action, we used the embarrassment score for the same 20 subjects as the dependent variable in a stepwise multiple regression with the action words, rather than the other emotion words, as the independent variables. The action words "apologize (+)," "remain silent (+)," and "work for compromise (+)" accounted for 77% of the variance in response to the emotion word "embarrassed." Subjects who were not embarrassed as a trespasser were less likely to apologize, remain silent, or work for a compromise. These results demonstrate

that variation within a treatment is pronounced and reflects substantial individual differences in emotional response to breaking a norm, along the lines predicted by theoretical models.

To examine individual differences among subjects in the position of owner, we chose the emotion word "violated." The average owner feels far more violated than the average trespasser (with no sex or interaction effect; see Table 2), but there is still variation among the 21 subjects in the owner treatment. In fact, the distribution of scores is bimodal, with six subjects indicating the lowest score of 1 and most of the others clustered around the highest scores of 7–9. When "violated" is used as the dependent variable in a stepwise regression with the other emotion words as the independent variables, "angry (+)," "defeated (−)," and "guilty (−)" account for 78.1% of the variance. In other words, subjects who do not feel violated are not angry and actually feel defeated and guilty despite their status as owners. When action words are used as the independent variables in the stepwise regression, "get angry (+)," "start conversation (−)," and "remain silent (−)" explain 82% of the variance. Owners who do not feel violated are more likely to remain silent or to start a conversation with the trespasser than to get angry. Thus, individual differences exist in the willingness to enforce norms in addition to the willingness to break them, as predicted by theoretical models.

Emotions and actions attributed to one's opponent are distorted in ways that can be interpreted as adaptive for the believer. In addition to reporting their own feelings and contemplated actions, we also asked the subjects to report the feelings and contemplated actions that they would attribute to the other person in the scenario. As we described in the introduction, accurate assessment of feelings and actions in others is not necessarily expected from an evolutionary perspective, to the extent that distorted beliefs lead to adaptive behavior. Tables 3 and 4 are organized to facilitate comparison between what the subjects actually felt and contemplated in a given situation and what was attributed to the other person in the same situation. For example, the actual response of the trespasser is compared with the response attributed to the trespasser by the owner, and so on.

For the scenario involving meeting on unclaimed territory, Table 3 shows that first-comers anticipated the second-comer to be less aggravated, more likely to yell and to be unfriendly, more likely to act competitively, and less likely to act calm than the second-comers actually felt. Similarly, second-comers anticipated the first-comer to be more shocked, more violated, more ambitious, more prone to violence, more prone to make them go away, more likely to hide their gold, and less likely to act calm or to start conversation. In short, both first-comers and second-comers expected the other person to be more confrontational than the subjects actually felt in the position of the other person.

Table 3. Emotions and Contemplated Actions Experienced by Self and Attributed to Others on Unclaimed Territory. "Self" refers to emotions and contemplated actions experienced by the subjects, from Table 1. "Att" refers to emotions and contemplated actions attributed to the subject's opponent in the same situation. "Diff" is the difference between these two values, which measures the degree to which emotions and contemplated actions attributed to others deviates from those experienced for oneself. TRT, SEX, and INT indicate the significance of the difference, sex effects, and interaction effects respectively. 1st and 2nd refer to the feelings and actions of first-comers and second-comers, respectively.

	1st						2nd					
	Self	*Att.*	*Diff.*	*TRT*	*SEX*	*INT*	*Self*	*Att.*	*Diff.*	*TRT*	*SEX*	*INT*
EMOTIONS												
Fear												
Scared	4.00	4.94	0.94				3.89	5.00	1.11			
Nervous	4.95	5.42	0.47				5.31	6.00	0.69			
Threatened	5.85	7.15	1.30				4.78	4.13	–0.65			
Worried	5.13	6.31	1.18				5.47	5.54	0.07			
Insecure	3.81	4.05	0.24				4.47	4.27	–0.20			
Trapped	4.04	4.47	0.43				3.10	2.68	–0.42			*
Hesitant	4.18	3.68	–0.50				5.63	4.77	–0.86			
Arousal												
Surprised	6.36	7.15	0.79				6.68	7.00	0.32			
Excited	4.00	4.73	0.73				4.26	5.04	0.78			
Shocked	4.95	7.10	2.15	**			5.78	6.40	0.62			*
Anger												
Angry	3.95	5.05	1.10				4.68	4.68	0.00			
Annoyed	5.00	6.36	1.36		**		5.42	4.27	–1.15		**	
Aggravated	5.04	6.00	0.96		*		6.15	4.72	–1.43	**	*	
Shame												
Sorry	2.68	2.36	–0.32			*	3.05	3.04	–0.01			
Embarrassed	1.77	2.89	1.12				2.63	3.09	0.46			
Guilty	1.68	2.57	0.89				2.42	2.63	0.21			
Defeated	2.77	3.47	0.70				5.52	4.77	–0.75		*	
Generalized distress												
Unhappy	4.36	5.36	1.00		*		5.89	4.54	–1.35			
Disappointed	4.81	5.00	0.19				6.73	5.27	–1.46			
Upset	4.77	5.73	0.96				6.26	4.95	–1.31			
Uneasy	5.77	6.21	0.44				5.89	5.86	–0.03			*
Uncomfortable	6.45	6.63	0.18				6.21	6.22	0.01			
Possessive emotions												
Cheated	4.18	5.36	1.18				4.21	4.63	0.42			
Protective	6.95	7.05	0.10				3.36	2.95	–0.41		*	
Violated	2.45	5.26	2.81	**			3.57	2.13	–1.44			
Jealous	2.50	3.47	0.97				6.05	7.13	1.08			
Selfish	6.59	6.68	0.09				4.78	5.81	1.03		*	
Competitive	6.59	7.00	0.41				5.84	6.90	1.06			
Ambitious	5.61	7.22	1.61	*		*	6.50	5.45	–1.05			

(*continued*)

Table 3. (*Continued*)

	1st						2nd					
	Self	*Att.*	*Diff.*	*TRT*	*SEX*	*INT*	*Self*	*Att.*	*Diff.*	*TRT*	*SEX*	*INT*
Misc.												
Grateful	3.18	3.15	–0.03				2.26	4.00	1.74			
ACTIONS												
Withdraw												
Apologize	2.09	2.31	0.22				3.63	3.09	–0.54			***
Leave	1.54	1.42	–0.12				2.78	3.50	0.72		***	
Avoid other	3.72	4.31	0.59				3.42	3.50	0.08			
Violent confrontation												
Become violent	2.54	4.15	1.61	*	***		2.42	2.86	0.44		***	
Yell at other	2.36	3.89	1.53	*	**		1.78	3.27	1.49	*	*	
Get angry	3.22	5.21	1.99	*	*		2.94	4.22	1.28			
Act unfriendly	2.63	4.55	1.92	**	*		2.00	3.90	1.90	*		
Nonviolent confrontation												
Dominant												
Make other	5.13	6.63	1.50	*	***		2.94	4.09	1.15			
Ask for excuse	3.59	3.84	0.25				3.10	4.54	1.44			
Stand up to other	6.18	5.42	–0.76				4.10	5.00	0.90			
Stare at other	5.63	5.36	–0.27				4.78	6.04	1.26			
Act competitive	6.18	6.52	0.34				4.52	6.59	2.07	*		
Continue panning	6.22	7.05	0.83				6.00	3.85	–2.15			
Subordinate												
Let other	2.22	1.84	–0.38				3.78	3.13	–0.65			
Try to hide gold	3.66	6.61	2.95	***			2.11	2.45	0.34			
Make up excuse	3.00	2.73	–0.27				2.47	3.59	1.12			
Wait for other to	5.13	3.47	–1.66				3.68	4.90	1.22			
Act kindly	4.95	3.66	–1.29				6.36	5.77	–0.59			
Explain situation	5.04	3.73	–1.31				4.94	5.27	0.33			
Remain silent	4.63	4.94	0.31				5.05	4.54	–0.51			
Act innocent	4.81	5.15	0.34				6.10	5.40	–0.70			
Make friends	5.09	4.15	–0.94				6.73	5.68	–1.05			
Act grateful	3.09	1.94	–1.15				3.42	3.86	0.44			
Act charming	3.54	3.68	0.14				5.26	5.04	–0.22			*
Neutral												
Act calm	5.81	3.57	–2.24	**	**		6.94	4.77	–2.17	**		
Be on guard	7.77	8.05	0.28				7.00	6.77	–0.23			
Start conversation	6.00	4.42	–1.58	*		*	6.57	5.95	–0.62			
Work for compromise	4.59	3.94	–0.65				6.10	5.90	–0.20			

For the scenario involving meeting on claimed territory, Table 4 shows that the trespasser imagined the owner to be more threatened, less trapped, less aggravated, less defeated, less unhappy, less disappointed, less upset, more protective, less jealous, and less ambitious than the owners actually felt. The owners imagined the trespasser to be more threatened, less sorry, more protective, more violated, more ambitious, less likely to apologize, much less likely to leave, more likely to engage in violent and non-submissive nonviolent confrontation, and less likely to let the owner have his or her way than the trespasser actually felt. In short, trespassers imagined the owner to be more dominant and secure than the owners actually felt, while the owners imagined the trespasser to be less submissive than the trespassers actually felt.

The sex differences are along the same lines as reported in Tables 1 and 2. The interactions reflect numerous cases in which one sex had more distorted attributions than the other or even attributions that were distorted in opposite directions. To pick one of the strongest interaction effects, female first-comers expected the second-comer to be less apologetic (mean = 2.08) than female second-comers actually felt (mean = 5.09), while male first-comers anticipated the second-comer to be more apologetic (4.3) than male second-comers actually felt (1.62). Recall that there was already a sex difference and an interaction effect for apologizing on unclaimed territory in Table 1, with female second-comers much more likely to apologize than male second-comers. To pick another strong interaction from Table 4, female trespassers anticipated the owner to be slightly more angry (mean = 7.54) than female owners actually felt (mean = 6.36), while male trespassers anticipated the owner to be less angry (mean = 5.88) than male owners actually felt (mean = 8.9). The males in this case are similar to the more general tendency of both sexes in the position of trespasser to think that the owner is more in control than the owners actually felt.

DISCUSSION

Evolutionary psychologists have been influenced primarily by animal models in their analysis of human conflict, stressing factors such as fighting ability, the value of the resource being contested, genetic relatedness, and future interactions among the contestants. These factors are certainly important in human social interactions, but they are often powerfully overridden by norms (conversely, animal contests can be influenced by norm-like social conventions such as the "Bourgeois" strategy in game theory; Maynard Smith 1982). Thus, it is essential to understand the evolutionary basis of norms, including the proximate psychological mechanisms responsible for the establishment, maintenance, and violation of norms.

Table 4. Emotions and Contemplated Actions Experienced by Self and Attributed to Others on Claimed Territory. See Table 3 for additional information.

	OWN						*TRES*					
	Self	*Att.*	*Diff.*	*TRT*	*SEX*	*INT*	*Self*	*Att.*	*Diff*	*TRT*	*SEX*	*INT*
EMOTIONS												
Fear												
Scared	4.42	5.00	0.58				5.85	6.14	0.29			
Nervous	5.52	5.25	–0.27				6.85	7.14	0.29			
Threatened	5.28	7.20	1.92	**			6.60	7.85	1.25	*		
Worried	5.95	6.60	0.65				6.65	6.95	0.30			
Insecure	3.95	3.45	–0.50				5.25	5.42	0.17			
Trapped	3.38	1.70	–1.68	*			5.80	5.33	–0.47			
Hesitant	5.09	3.75	–1.34				6.50	6.00	–0.50			
Arousal												
Surprised	7.76	8.05	0.29				7.55	6.85	–0.70			
Excited	4.19	4.20	0.01				4.15	4.28	0.13			
Shocked	7.09	7.05	–0.04				7.35	6.33	–1.02			
Anger												
Angry	7.47	6.80	–0.67			**	4.70	5.66	0.96			
Annoyed	7.76	7.40	–0.36				5.30	5.66	0.36			*
Aggravated	8.00	6.35	–1.65	*		*	5.30	5.90	0.60			
Shame												
Sorry	1.42	1.70	0.28				6.65	4.09	–2.56	**		
Embarrassed	2.09	2.25	0.16				6.90	6.33	–0.57			
Guilty	1.76	1.80	0.04				6.35	5.20	–1.15			*
Defeated	4.52	2.35	–2.17	**			4.10	3.61	–0.49			
Generalized distress												
Unhappy	7.71	6.10	–1.61	*			5.65	6.42	0.77			
Disappointed	7.71	4.50	–3.21	***			6.00	5.23	–0.77			
Upset	8.00	6.60	–1.40	*		*	5.85	5.90	0.05			
Uneasy	7.23	6.50	–0.73			*	7.65	7.66	0.01			
Uncomfortable	6.47	6.55	0.08				7.65	7.42	–0.23			
Possessive emotions												
Cheated	7.38	7.75	0.37		*		3.05	3.71	0.66			
Protective	5.61	7.55	1.94	*			4.85	7.04	2.19	**		
Violated	5.71	7.10	1.39				2.05	3.66	1.61	*		
Jealous	7.14	3.35	–3.79	***			4.35	3.57	–0.78			
Selfish	6.00	4.60	–1.40				5.90	6.14	0.24			
Competitive	6.71	6.65	–0.06				5.75	6.76	1.01			
Ambitious	6.57	4.70	–1.87	*			4.25	6.71	2.46	**		
Misc.												
Grateful	2.00	2.50	0.50				1.75	2.90	1.15			
ACTIONS												
Withdraw												
Apologize	1.90	1.70	–0.20				6.35	4.42	–1.93	*		
Leave	1.47	1.90	0.43				5.90	2.76	–3.14	**		
Avoid other	3.00	2.05	–0.95				5.40	4.80	–0.60			

(*continued*)

Table 4. (*Continued*)

	OWN						*TRES*					
	Self	*Att.*	*Diff.*	*TRT*	*SEX*	*INT*	*Self*	*Att.*	*Diff*	*TRT*	*SEX*	*INT*
Violent confrontation												
Become violent	3.76	5.25	1.49		*		2.30	3.85	1.55	*	*	
Yell at other	4.71	5.65	0.94				2.50	3.61	1.11			
Get angry	5.71	6.30	0.59			*	2.55	4.19	1.64	*	*	
Act unfriendly	4.28	5.70	1.42			*	2.80	4.38	1.58	*		
Nonviolent confrontation												
Dominant												
Make other	5.52	7.60	2.08	*		*	3.30	4.47	1.17		***	
Ask for excuse	7.23	8.10	0.87				4.15	4.47	0.32		*	
Stand up to other	6.47	6.85	0.38			*	4.70	5.57	0.87		*	
Stare at other	6.47	6.70	0.23				4.85	6.61	1.76	*		
Act competitive	5.71	5.80	0.09				3.95	6.57	2.62	***		
Continue panning	6.00	3.10	–2.90	**			2.65	6.66	4.01	***		
Subordinate												
Let other	1.95	2.35	0.40				5.20	3.33	–1.87	*		
Try to hide gold	2.28	1.10	–1.18				5.35	6.66	1.31			**
Make up excuse	2.23	2.20	–0.03			*	5.45	5.85	0.40			
Wait for other to	3.42	4.10	0.68				6.55	5.38	–1.17			
Act kindly	5.09	4.00	–1.09		*		6.75	5.90	–0.85			
Explain situation	6.90	4.25	–2.65	**			7.30	6.76	–0.54			
Remain silent	3.57	2.80	–0.77		**		4.90	5.28	0.38			
Act innocent	3.66	3.50	–0.16				5.50	6.47	0.97			
Make friends	4.95	4.30	–0.65			*	5.50	4.52	–0.98			
Act grateful	2.38	1.60	–0.78				2.55	3.57	1.02			
Act charming	4.23	2.70	–1.53				5.30	5.28	–0.02			
Neutral												
Act Calm	5.09	3.85	–1.24				6.00	4.85	–1.15			
Be on guard	7.28	7.10	–0.18				7.40	7.23	–0.17		**	
Start conversation	6.76	6.55	–0.21				6.40	5.14	–1.26			
Work for compromise	5.42	4.15	–1.27			*	6.00	5.19	–0.81			

Conceptual and formal theoretical models of norm evolution are developing at an increasingly rapid pace (see references cited in introduction). Norms can be highly advantageous at the group level by reducing conflict, but individuals within groups often have a strong incentive to break norms, as when a trespasser discovers gold on another person's claim. Similarly, enforcing norms often provides a public good at a personal cost to the enforcers, who can be exploited by others who abide by norms but do not enforce them. Thus, the evolution of norms shares much in common with the evolution of altruism, even though norms may not appear altruistic in the intuitive sense of the word (Sober and Wilson 1998). Some models predict that norm-abiding and norm-enforcing behavior can evolve to fixation (e.g., the tit-for-tat strategy in the absence of mistakes: Axelrod and Hamilton 1981), but other models predict a more complex mix of social strategies that are maintained at a stable equilibrium, a stable limit cycle, or more chaotically (e.g., Hirshleifer and Coll 1988, 1992). This uneasy mix includes norm-breakers, norm-abiders who punish norm-breakers, and norm-abiders who fail to punish norm-breakers.

Theoretical models explain how norms can evolve and how a diversity of social strategies can coexist, but they do not address the proximate psychological mechanisms that give norms their potency and cause the individuals who employ the various strategies to act as they do. If emotions are proximate mechanisms for motivating adaptive behavior, then the emotions that impel a person to assert dominance in an otherwise symmetrical contest situation, or to refrain from obtaining valuable resources that otherwise might be had, all in the absence of third parties, must be very powerful emotions indeed. If individuals differ in their behavioral strategies, then a person who abides by norms and becomes outraged when others do not must be governed by different emotions than a person who easily breaks norms, who in turn must be governed by different emotions than a person who would never dream of breaking a norm but who also would not dream of confronting those who do.

This study was designed to complement the theoretical models by exploring the proximate psychological mechanisms elicited by norms and their violation. Through the use of fictional scenarios, we attempted to create a competitively symmetrical situation without genetic relatedness, future interactions, or third-party influence. The only differences among the treatments were the norms surrounding the situation (claimed vs. unclaimed territory) and the perspective of the subject in relation to the norm (first- vs. second-comer in the case of unclaimed territory and trespasser vs. owner in the case of claimed territory). It is possible that the fictional scenario did not eliminate the possibility of third-party influence in the minds of our subjects. In fact, it is possible that third parties were such a

constant presence during human evolution or individual development that their influence can never be eliminated from the mind of a person (e.g., "God is always watching"). However, this would merely indicate one way that norms can be internalized. In any case, in the future it will be interesting to include versions of the scenario in which third parties are present vs. absent or absent with varying degrees of certainty.

Despite the brevity of the fictional scenario, the subjects responded strongly with a suite of emotions and contemplated actions that varied among the treatments. The contest situation on unclaimed territory was constructed to be as symmetrical as possible, but even a few minutes between the arrival of the first-comer and second-comer was sufficient to establish an emotional advantage for the former. When the weak implicit norm of "first come, first served" was replaced with the strong explicit norm of legal ownership, the psychological advantage of the owner became overwhelming for most of the subjects, although some trespassers remained unrepentant and some owners appeared unwilling to defend their own rights. If the emotional reactions and contemplated actions triggered by the fictional scenario have any correspondence to reality, the norm of ownership converts a potentially dangerous conflict situation into a "no contest" situation for most but not all subjects, purely by its psychological influence and without requiring direct third-party enforcement, at least over the short term.

Sex differences in response to norm violations confirm the male propensity for violent confrontation that has been demonstrated in many other contexts (e.g., Daly and Wilson 1988). However, other sex differences and similarities could not have been predicted prior to our study; for example, a sex difference in anger for the weak norm but not the strong norm, or individual differences but not sex differences in the tendency to violate and enforce norms, as discussed for the words "embarrassed" and "violated." In general, a comparison of Tables 1 and 2 shows that sex differences outnumber treatment differences for the weak norm condition (Table 1), but that treatment differences outnumber sex differences in the strong norm condition (Table 2). In other words, strong norm violations tend to elicit the same emotional response in both men and women.

The individual differences that cut across sex are perhaps more interesting and novel than the sex differences. In addition to very large differences between treatments (e.g., between trespassers and owners on claimed territory), we observed very large differences within treatments (e.g., among trespassers and among owners on claimed territory), which strongly correlate with other emotions and contemplated actions. In one case the distribution was actually bimodal, with most owners feeling highly violated at the presence of trespasser but a minority apparently unable to muster the emotional response required to defend their own rights. A social strat-

egy that does not violate norms but that leaves the cost of enforcement to others is one of the most interesting predictions to emerge from theoretical models of norm evolution, which is supported at the level of proximate emotional mechanisms by our study.

Just as emotions are expected to be (roughly) adaptive for the person experiencing the emotions, beliefs about others should be (roughly) adaptive for the believer. However, the most adaptive beliefs are not necessarily accurate. The basic idea of adaptive distortions of reality, like the basic idea of sex differences, is already familiar to both evolutionary psychologists (e.g., Krebs and Denton 1997; Mitchell and Thompson 1986; Wilson 1990, 1995) and traditional social scientists (e.g., the literature on self-serving biases: Babcock and Loewenstein 1997; Kahneman, Knetsch, and Thaler 1991). The value of our study is not to point out something so basic but to show how it manifests itself in the specific context of norm violations. The use of fictional scenarios provides an especially interesting test because the subjects were imagining their own emotional response to the situation in addition to that of their opponent. Imagining how a trespasser feels when one is asked to take the perspective of the owner could easily have been the same as when one is asked to take the perspective of the trespasser. Instead, perspective mattered, and the emotions that subjects attributed to their opponent differed from the emotions imagined for themselves in the same situation. In general, the distortions increased the perceived likelihood of a violent confrontation, which fits nicely with the kinds of bias expected by signal detection theory (Getty 1996). Just as it is adaptive to respond to a sudden noise as signifying something dangerous, even when it probably does not, it makes sense to overestimate the danger associated with the potentially violent situation described in our scenario.

Although the primary focus of our study is on norms, we also wish to comment on the general study of emotions and on the use of fictional scenarios to study emotions and other subjects in evolutionary psychology. A major tenet of evolutionary psychology is that emotions are evolved mechanisms for motivating adaptive behavior, but a number of secondary issues still need to be resolved, including the degree to which emotions are influenced by learning, development, and culture, and the degree to which emotions can fine-tune behaviors for particular situations. Along with Ekman (1999) and Cosmides and Tooby (2000), we think that the basic architecture of emotions, including the emotional response to norm violations, is biologically innate, but that the architecture is also designed to receive environmental input in the form of learning, development, and social transmission (e.g., Luckenbill and Doyle 1989; Nisbett and Cohen 1996). Within this pluralistic framework, a wide range of possibilities remains to be determined. For example, the norm of ownership could be innate (part of the "basic architecture") or acquired by cultural transmission (part of the

"environmental input"). Individual differences in response to norm violations could reflect a genetic polymorphism, the product of learning, or a number of other possibilities (Ekman and Davidson 1994:321–343; Wilson 1994). These issues are profound but our study was not designed to address them.

The degree to which emotions can fine-tune behaviors for particular situations is another important issue that our study does address. A major trend in evolutionary psychological research has been the recognition of domain-specificity in psychological adaptations, in contrast to the assumption of domain-generality in the so-called standard social science model (Tooby and Cosmides 1992). Applying this paradigm to emotions, Cosmides and Tooby (2000) postulate hundreds or even thousands of emotional states fine-tuned to particular situations, rather than a few basic emotions such as fear, anger, and so on. Actually, even emotion researchers such as Ekman (1999), who have spent decades establishing the existence of basic emotions that exist across all cultures, appreciate that they somehow result in complex mixes of emotions tailored for particular situations.

Our study provides a useful methodology for studying the relationship between emotion and action at a fine-grained level (see also Price, Cosmides, and Tooby 2002). First a situation (in our case a norm violation) is represented in the form of a fictional scenario. Then the full range of emotional states and behavioral actions relevant to the situation is sampled from the subject population by asking them how they would feel and act in the situation, using an open-ended format (stage 1 of the study). Converting the open-ended responses into numerical scales (stage 2) allows emotional states and contemplated actions to be measured quantitatively. Finally, the relationship between emotional state and contemplated action, and the responsiveness of both to the situation, can be rigorously explored by altering elements of the fictional scenario.

Our results suggest that emotions and actions are tightly connected to each other and remarkably fine-tuned to the nuances of particular situations. For example, for subjects in the trespasser treatment, the emotional state of "embarrassed" is so tightly connected to the contemplated actions of "apologize," "remain silent," and "work for compromise" that these three variables account for 77% of the variation in embarrassment. For subjects in the owner treatment, the emotional state "violated" leads to the contemplated actions of "get angry," "don't start conversation," and "don't remain silent" so consistently that these three variables account for 82% of the variation in the feeling of being violated.

Natural language includes an enormous diversity of words that convey emotional states. Careful writers think hard about using just the right word, as if it will make an important difference in the mind of the reader. Our study suggests that the choice of closely adjacent words *does* make a

big difference to emotional response and contemplated action. When we were compiling our list of emotion-laden words from stage 1 to use in stage 2, we were uncertain about words such as unhappy, disappointed, upset, uneasy, and uncomfortable. Were they synonyms that could be represented by a single word or did they represent different emotional states? We decided to include them in our list and let the subjects tell us about their similarities and differences. As it turned out, seemingly similar words such as "upset" and "uneasy" invoked very different emotional responses and contemplated actions in the minds of our subjects. A diversity of emotion-laden words that are not mere synonyms provides another indication of the degree to which emotions fine-tune behaviors for particular situations (see Tangney et al. 1996 for an interesting analysis of the differences between the words "shame," "guilt," and "embarrassment").

Our study relied upon fictional scenarios to elicit emotions and contemplated actions rather than real-life events. Fictional scenarios are widely used in psychological research and have a number of strengths and weaknesses. On the positive side, experiments can be performed easily on large numbers of subjects and the scenarios can be altered with surgical precision to test the effects of various factors. On the negative side, it cannot be assumed that response to a fictional scenario is equivalent to response to an actual event.

Ideally, the results of experiments involving fictional scenarios should be validated by comparable experiments involving real-life events. While this would be impractical for our gold rush scenario, a recent study by Fehr and Gachter (2002) provides an excellent example. Their participants actually engaged in an activity that allowed cooperation, cheating, and (in one condition) punishment. In addition, the same participants were asked to read a closely related fictional scenario and indicate how they would feel and act. Finally, participants who did not engage in the actual activity were asked to read and respond to the fictional scenario. Response to the fictional scenario closely matched response to the actual event, even in subjects who did not participate in the actual event. This kind of validation demonstrates that imagining a given scenario can indeed be roughly comparable to actually experiencing the scenario.

Another source of evidence comes from fMRI studies that directly examine the response of the brain to fictional scenarios. Berthoz and colleagues (2002; see also Bechara 2002) had normal (e.g., free from neurological disorders) subjects read fictional scenarios on a monitor via an angled mirror positioned above the head coil of a MRI system. The scenarios included unintentional norm violations, intentional norm violations, and social interactions without norm violations in both first person ("You are invited to a Japanese dinner . . .") and third person ("Joanna is invited to a Japanese dinner . . .") versions. Stories involving norm violations triggered

regions of the brain known to play a role in representing the mental states of others and that respond to aversive emotional expressions such as anger. The response was similar for first- and third-person versions but greater for intended than unintended norm violations. Thus, the psychological response to fictional scenarios is far from superficial and involves the same regions of the brain that respond to real-life events.

These and other lines of evidence suggest that fictional scenarios are a powerful research method in part because the mind is constantly engaged in spinning fictional scenarios of its own, responding to them emotionally, and choosing alternative courses of actions on the basis of these imaginary worlds. A number of traditional psychologists have converged upon this conception of "narrative psychology" (see references cited in introduction), and Cosmides and Tooby (2000:111) even touch upon it in their review of emotions from an evolutionary psychological perspective: "Recreating cues through imagery in a decoupled mode triggers the same emotion programs (minus their behavioral manifestations), and allows the planning function to evaluate imagined situations by using the same circuits that evaluate real situations. This allows alternative courses of actions to be evaluated in a way similar to the way in which experienced situations are evaluated. In other words, image-based representations may serve to unlock, for the purposes of planning, the same evolved mechanisms that are triggered by an actual encounter with a situation displaying the imagined perceptual and situational cues."

To summarize, our study is relevant to the specific subject of norms and to the more general subjects of emotions, the use of fictional scenarios as a research method, and the importance of narrative in psychological processes. Norms certainly deserve more attention than they have so far received in evolutionary psychological research. Theoretical models are increasingly emphasizing the importance of norms in human evolution, and we hope that our study will stimulate additional research on the proximate psychological mechanisms that give norms their potency. The fine-tuned relationship between emotion and action in the context of norm violations probably also exists in other contexts that can be explored with the use of fictional scenarios, which succeeds as a research method in part because the mind itself is a teller of stories.

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APPENDIX

Instructions and exact wording of the fictional scenarios read by males, in addition to the version provided in the introduction. Versions read by females referred to the other person in the scenario as being a female.

Instructions for all versions: This study is designed to measure how people feel and act in certain social situations. First you will be asked to imagine yourself in a social situation by reading the following paragraph. Then you will be asked to indicate how both you and the other person in the story would feel and act in the situation.You are asked to imagine that the other person you encounter is of your same sex. Thanks for participating!

Second to arrive on unclaimed territory: Gold has been discovered in California and the rush is on! You are one of many prospectors during the 1800s searching the Sierra Mountains to stake a claim. You have pushed deep into unclaimed territory and have discovered a promising stream. Just as you round the bend with your mule, you encounter another prospector excitedly putting gold nuggets from his pan into a cloth bag. He sees you at the same moment that you see him.

Trespasser on claimed territory: Gold has been discovered in California and the rush is on! You are one of many prospectors during the 1800s searching the Sierra Mountains to stake a claim. You are traveling through claimed territory on your way to unclaimed land and stop by a stream. It looks promising and no one is around so you decide to try your luck. You fill your pan with the gravel of the stream bed, swirl it around, and to your amazement, gleaming nuggets of gold emerge! Just as you are placing the nuggets into a cloth bag, you hear the crack of a branch and look up to see another prospector—almost certainly the owner of the claim—rounding the bend. He sees you at the same moment that you see him.

Owner of claimed territory: Gold has been discovered in California and the rush is on! You are one of many prospectors during the 1800s who have come to the Sierra Mountains to stake a claim. You have been working your claim for several months with only moderate success. This morning you are going to try a new section of stream on your claim, but just as you

get there, you discover another prospector excitedly putting gold nuggets from his pan into a cloth bag. He sees you at the same moment that you see him.

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