

## BRIEF REPORT

# If Looks Could Kill: Anger Attributions Are Intensified by Affordances for Doing Harm

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Emotion perception is necessarily imprecise, leading to possible overperception or underperception of a given emotion extant in a target individual. When the costs of these two types of errors are recurrently asymmetrical, categorization mechanisms can be expected to be biased to commit the less costly error. Contextual factors can influence this asymmetry, resulting in a concomitant increase in biases in the perception of a given emotion. Anger motivates aggression, hence an important contextual factor in anger perception is the capacity of the perceived individual to inflict harm. The greater the capacity to harm, the more costly it is to underestimate the extent to which the target is angry, and therefore the more that perception should be biased in favor of overestimation. Consonant with this prediction, in two studies, U.S. adults perceived greater anger when models were holding household objects having affordances as weapons (e.g., garden shears) than when they were holding objects lacking such affordances (e.g., a watering can) or were empty-handed. Consistent with the unique relationship between anger and aggression, this positive bias did not appear in judgments of other negative emotions.

*Keywords:* emotion perception, anger, fear, error management, categorization

A growing literature documents the importance of context in the categorization of others' emotions (reviewed in Barrett, Mesquita, & Gendron, 2011; see also Trope, 1986). In contrast to perspectives wherein facial expressions are thought to uniquely and unambiguously convey information about the emotional state of the individual displaying them, an emerging viewpoint underscores the complex and situated nature of the inferential processes involved in assessing another's emotions. A largely overlooked facet of these processes is the recurrent presence of asymmetries in the

costs associated with different inferential errors, an issue that existing theory usefully addresses using an evolutionary perspective.

Emotion perception is inherently imprecise, as complete intersubjectivity is impossible, and individuals are often motivated to mask their emotional state. Judgments made under uncertainty can result in over- or underestimations. When the costs of these two errors consistently differ over evolutionary time, natural selection can be expected to favor an "error management" bias toward making the less costly error (Haselton & Nettle, 2006; Johnson, Blumstein, Fowler, & Haselton, 2013; Nesse, 2005). For example, in estimating the arrival of a looming object, there are two possible errors: judging that it will arrive either sooner or later than is actually the case. The latter error will generally be more costly than the former, as evasive actions require time; consequently, speed of approach is typically overestimated (Neuhoff, 1998). Likewise, in the social domain, images of attackers, and, to a lesser extent, those displaying angry expressions, are judged to be approaching more rapidly than are neutral stimuli (Brendel, DeLucia, Hecht, Stacy, & Larsen, 2012), a pattern consonant with the greater importance of evading an assailant compared to a neutral party. Importantly, an asymmetry in the costs of over- and underestimation applies to emotion categorization as well (Maner et al., 2005).

The ability to successfully detect the presence of angry individuals would have enhanced survival and reproduction in ancestral human populations because anger is a principal factor motivating the infliction of harm. Indeed, there is an extensive literature documenting human preparedness to rapidly detect anger expres-

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sions in faces and voices, indicating that natural selection has shaped this capacity (e.g., Grandjean et al., 2005; Hansen & Hansen, 1988; Ohman & Dimberg, 1978). Crucially, the greater a target's capabilities to harm, the more costly underestimation of anger becomes, as the cost of failing to detect indications of impending aggression scales with the damage suffered as a result of this failure. We can therefore expect the mechanisms underlying anger perception to manage errors, such that the system is biased toward overestimating the degree of anger as a function of the target's potential to inflict harm. If so, then a target's possession of weapons—or tools that can serve as weapons—should increase observers' perceptions of the extent to which the target is angry. No such effect of arms should inflate perceptions of other emotions (e.g., contamination disgust, or fear) because, unlike anger, these emotions are generally not harbingers of imminent attack. To the contrary, fear typically impedes aggression and promotes retreat, suggesting that possession of weapons may decrease attributions of fear.

In Study 1, we tested the hypothesis that people's state perceptions of anger, but not other negative emotions (fear, disgust), are upwardly biased by the target individual's transient capacity to wield a dangerous object to inflict harm. We also tested the ancillary hypothesis that armed individuals would be viewed as less fearful. In addition, we conducted exploratory assessments of whether biased perceptions would extend to trait emotions. Held objects are transient features of the environment that are external to the individual and therefore not typically informative of his or her emotional state or enduring disposition, provided that these objects are not designed solely to injure others, or thought to have been actively chosen by the targets for their dangerous potential. We therefore selected an object (kitchen knife) required for a nonviolent everyday activity (cooking) to be displayed in an individual's immediate possession. Under these conditions, observed biases would arguably document a true psychological bias.

## Study 1

### Method

Adult U.S. participants ( $N = 264$ ; 79.5% White; 80 women, 183 men, and one individual who declined to specify sex; mean age 28.9,  $SD = 9.9$ ) completed an online survey, framed as an investigation of the kinds of information that observers can extract from photographs, via MechanicalTurk.com in exchange for \$0.25.

Participants viewed a single photo of a man who was described as enjoying cooking in his everyday life. In the armed condition, the model was posed holding a kitchen knife; purpose-built weapons were intentionally avoided, as more aggressive individuals may well be more likely to possess such items than are less aggressive individuals. In the unarmed condition, the same model was posed empty-handed, with the kitchen knife depicted in a separate window displayed adjacent to the photograph of the model. This presentation kept constant the visual features of the stimuli while making it clear that the target individual was not presently holding the knife. To ensure that all other aspects of the model remained identical across the two conditions, the image of the unarmed model was created by digitally manipulating the photograph of the armed model, inserting the model's now-empty hand at his side (see Figure 1). The model's arm was placed at his

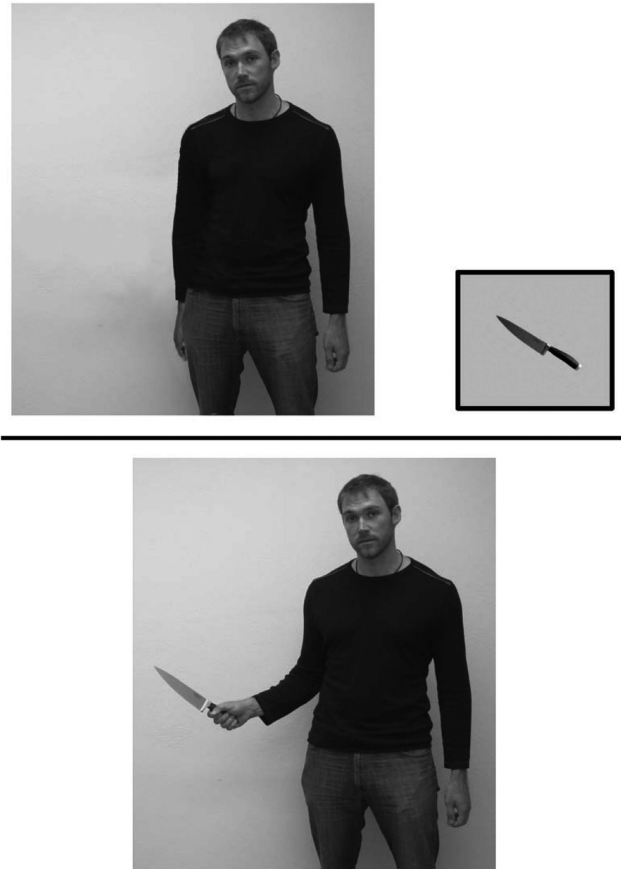


Figure 1. In Study 1, each participant viewed a man described as enjoying cooking. In the unarmed condition (top) he was depicted adjacent to a kitchen knife; in the armed condition (bottom) he was depicted holding the kitchen knife.

side because the hand appeared to be balled in a raised fist when depicted without the grasped object, potentially connoting anger or violent intent.

Participants rated the model's degree of emotional state anger, fear, and disgust (following Nabi, 2002, we used the term "grossed out" to avoid possible polysemous connotations of disgust that equate it with anger, e.g., "being disgusted with someone"). Although inferences regarding enduring traits are not central to the question of whether transient capacities for doing harm affect social assessments, inferences regarding states are nonetheless likely to generalize to judgments of traits (Gilbert & Malone, 1995; Jones & Davis, 1965; Kelley, 1972). We therefore also investigated perceptions of trait anger, fear, and disgust. The six ratings were made using separate 9-point scales, anchored by *much less than average* and *much more than average*. The state and trait questions were presented in separate blocks (counterbalanced), with the order of question items randomized within blocks. The photograph and questions about the target were visible simultaneously. Demographic questions followed.

### Results

A multivariate between-subjects ANOVA revealed a significant main effect of condition on state emotion ratings,  $F(3, 260) =$

3.83,  $p = .01$ ,  $d = .42$ . As predicted, participants rated armed models as more state angry than unarmed models and neither ratings of state disgust nor fear differed by condition (see Table 1). A multivariate between-subjects ANOVA assessing trait ratings also revealed a significant main effect of condition,  $F(3, 260) = 10.39$ ,  $p < .001$ ,  $d = .69$ . Participants rated the armed model as more anger-prone than the unarmed model. In addition, participants in the armed condition judged the model as less fear-prone and less disgust-prone (see Table 1).

**Discussion**

Emotion judgments are uncertain; therefore, the mechanisms underlying such judgments are likely to be biased toward making less costly errors. In the case of judging anger, error management theory predicts that people will err toward overestimations of anger, particularly when targets possess the means to do harm. Consonant with this hypothesis, Study 1 showed that the transient capacity to do harm entailed by possession of a tool having affordances as a weapon increased viewers’ perceptions of state anger, but not state fear or disgust. Similarly, danger cues increased ratings of trait anger. Scale ratings of the two other negative emotions—disgust and fear—showed either no effect (state) or the opposite effect (trait), providing discriminant evidence that a potential antagonist’s capacity to inflict harm yields overestimation biases for anger in particular rather than any negatively valenced emotions in general. The trait findings for fear and disgust are likewise consistent with an error management interpretation, as fearful and squeamish individuals may be less likely to engage in aggression (Pond et al., 2012). Therefore, underestimating these traits in someone possessing a weapon—as our participants did—is less costly than overestimating them. (The discrepancy between state and trait assessments of fear and disgust is examined further in the General Discussion.)

The results of Study 1 also helped to rule out a potential “semantic priming” alternative interpretation. On this account, knives are semantically associated with violence, which is closely associated with anger; hence, due to spreading activation of semantic networks (Collins & Loftus, 1975), possessing a knife could increase attributions of anger. The present results argue against this interpretation. Crucially, a knife was clearly displayed in both experimental conditions, presumably arousing putative associations with violence to an equal extent, yet unambiguous

differences in emotion ascription were observed between the conditions. Moreover, a simple priming effect would not explain the observed deflation in trait, but not state, fear and disgust ratings—to the contrary, the priming model predicts that state and trait ratings should run parallel, to the extent that state and trait emotions are closely associated. Finally, to the extent that violence is associated with fear, a priming mechanism might lead knife stimuli to inflate, rather than deflate, attributions of state fear, but this was also not found. Thus, the overall data favor an error management interpretation over semantic priming.

Although the findings are consistent with our hypothesis, Study 1 has several limitations. First, the lowered arm in the control condition photo may have caused the difference in ratings rather than the model’s physical possession of a dangerous object in the experimental condition. Second, Study 1 employed only one model, raising the possibility that the observed effects might not generalize to other target individuals. Third, Study 1 manipulated transient possession of only one sort of dangerous object, a kitchen knife. Fourth, the decrease in trait, but not state, fear, and disgust ratings was unexpected, and may have been anomalous. With these considerations in mind, and in order to replicate and extend the results of Study 1, we conducted a study that enabled us to compare possession of dangerous versus harmless objects held in identical poses. We also we employed multiple models, and we added an additional type of dangerous tool.

**Study 2a**

To further ensure that the dangerous objects used in Study 2b (kitchen knife, garden shears) do not moderate perceived emotion due to simple semantic priming of thoughts of violence, we conducted a prestudy comparing the degree to which the two objects are associated with violence.

**Method**

One-hundred and two adult U.S. participants completed an online survey, framed as an investigation of object associations, via MechanicalTurk.com, in exchange for \$0.25. Participants were asked to free-list up to five words or phrases associated with a photograph of the kitchen knife and a photograph of the garden shears to be used in Study 2b (counterbalanced). This produced 997 total words/phrases. Six hypothesis-blind judges were instructed to code whether each word or phrase was uniquely related to violence/aggression. For instance, “stab” would be coded as violence-related, whereas “cut,” which need not involve violence, would be coded as not violence-related.

**Results**

Interrater agreement was high,  $\kappa = .96$ . Where there was disagreement, the violence score was tallied according to a minimum 50% rule (i.e., three or more of the six judges categorized the phrase as referring to violence). Using this criterion, 4.6% of the words or phrases associated with the kitchen knife involved violence, compared with 2.2% of the words or phrases associated with the garden shears. This difference in the frequency of violence associations was significant,  $\chi^2(1, N = 100) = 4.36$ ,  $p < .04$ .

Table 1  
*Effects of Target Armament on Estimated State and Trait Anger, Fear, and Disgust (Study 1)*

	Unarmed		Armed		<i>F</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
State ratings							
Anger	4.36	1.77	5.03	1.87	9.09	.003	.38
Fear	4.51	1.76	4.46	1.97	0.06	.808	.03
Disgust	3.76	1.71	3.59	1.71	0.64	.426	.09
Trait ratings							
Anger	5.39	1.52	6.17	1.53	16.89	.001	.51
Fear	4.17	1.42	3.62	1.50	9.49	.002	-.38
Disgust	3.69	1.31	2.96	1.39	19.45	.001	-.54

Note. *N* = 264.

## Discussion

As intended, neither object was strongly associated with overtly violent affordances. However, the knife was associated with violence significantly more often than the garden shears. Thus, in Study 2b, if models depicted holding the knife are estimated to be angrier than models depicted holding the shears, this difference may be explicable in terms of the semantic link between the knife, violence, and anger. On the other hand, if the two dangerous objects exert an equivalent effect on anger ratings relative to harmless objects, then a simple association account would not suffice to explain the increase in anger attributions related to possessing dangerous objects.

## Study 2b

### Method

Adult U.S. participants ( $N = 292$ ; 81% White; 127 women, 159 men, six who declined to specify sex; mean age 30.4,  $SD = 10.8$ ) completed an online survey, framed as an investigation of the kinds of information that observers can extract from photographs, via MechanicalTurk.com, in exchange for \$0.25.

Participants viewed a single photo of one of three male models displaying neutral facial expressions. The photo depicted one of the three models holding one of four household tools, two of which (a kitchen knife; garden shears) could be used as weapons, and two of which (a spatula; a watering can) were harmless tools used in the same activity; purpose-built weapons were again intentionally avoided. The tools and grasping hand/wrist were digitally inserted, keeping all other aspects of the photos of a given model identical (see Figure 2).

Participants estimated the target's trait anger, fear, and disgust using 9-point scales anchored by *much less than average* and *much more than average*. In addition, we also solicited estimations of negative personality traits (unpleasantness, dishonesty, incompetence). Participants next rated the model's emotional state (degree of anger, disgust, and fear) on separate 9-point scales anchored by *not at all* and *extremely*. Finally, in a forced-choice question, participants indicated which of four emotions (anger, disgust, sadness, or happiness) the model was purportedly induced to feel before assuming a neutral expression and being photographed. The order of question items was randomized within the state and trait blocks. The photograph and questions about the target were visible simultaneously. Demographic questions followed.

### Results

**Object condition and judgments of state emotion.** A multivariate between-subjects ANOVA compared state ratings as a function of Tool Class (dangerous or harmless), Model, and Activity Type (cooking or gardening). As predicted, participants in the dangerous condition rated models as more angry relative to participants in the harmless condition,  $F(1, 274) = 9.01, p = .003, d = .36$  (see Figure 3). There were no significant interactions of condition with object type, kitchen or gardening:  $F(2, 274) = .001, p = .97$ , or target model:  $F(2, 274) = 1.92, p = .15$ , confirming that the main result in the study was not driven by any one target or object type. As in Study 1, there were no effects of condition on ratings of state disgust,  $F(1, 274) = .464, p = .50$  or state fear,  $F(1, 274) = .158, p = .69$  (see Figure 3).

In the forced-choice question, when asked to identify the model's emotion prior to being photographed, 50.6% of participants in the dangerous condition categorized the model as angry rather



Figure 2. In Study 2b, each participant viewed one of the images displayed here, of a man described as enjoying either cooking or gardening. In the unarmed condition, he was depicted holding a spatula or watering can; in the armed condition, he was depicted holding a kitchen knife or garden shears.



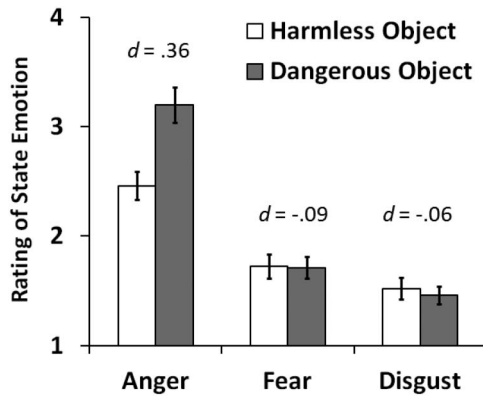


Figure 3. State emotion ratings in the dangerous versus harmless conditions (Study 2b).

than disgusted, sad, or happy, compared with only 38.6% in the harmless condition, a significant difference,  $\chi^2(1, N = 290) = 4.18, p = .041$ .

**Object condition and judgments of trait emotion and personality.** An identical multivariate ANOVA was then conducted with the trait ratings as dependent measures. As predicted, relative to the harmless condition, participants in the dangerous condition rated models as more anger-prone,  $F(1, 268) = 8.77, p = .003$ . Replicating the results of Study 1, participants in the dangerous condition also judged models as less disgust-prone,  $F(1, 268) = 5.53, p = .019$  and less fear-prone,  $F(1, 268) = 4.60, p = .033$ . With respect to the negative personality traits, participants estimated the targets in the dangerous condition to be less pleasant,  $F(1, 268) = 13.4, p < .001$  and less honest,  $F(1, 268) = 14.5, p < .001$ , but equally competent,  $F(1, 268) = .206, p = .65$  (see Figure 4).

**Normative responses and bias.** Given that the models posed with a neutral facial expression, truly normative responses in this study would have been on the low end of the 9-point state emotion scales. Likewise, with respect to the forced-choice state emotion question, exclusively normative responses would entail a 25% (chance) likelihood of choosing each of the four emotions. Responses in the control (harmless object) condition were generally close to these normative values: State emotions were rated toward the bottom of the scale (as shown in Figure 1), and anger was selected only 34% of the time in the forced-choice question (although more frequently than chance,  $\chi^2(1, N = 132) = 13.1, p < .001$ ). This pattern indicates that the dangerous objects, not the harmless ones, drove the observed biases. Systematic deviations between the normative answers and the harmless-condition answers can likely be attributed to the fact that even truly neutral male faces still appear somewhat angry due to the morphological overlap between angry and masculine facial characteristics (Becker, Kenrick, Neuberg, Blackwell, & Smith, 2007; Zebrowitz, Kikuchi, & Fellous, 2010), and, consonant with error management theory, by the potential threat posed by any unfamiliar male, armed or not.

**Discussion**

Study 2b replicated the pattern of results observed in Study 1: Models pictured as possessing objects with weapon-like affor-

dances were judged to harbor greater feelings of state anger (but not fear or disgust), to possess greater trait anger, and to possess less trait fear or disgust. Thus, the divergence in state and trait assessments of fear and disgust appears robust.

To the extent that individuals are conceptualized as harboring a single prevailing emotion state at a time, and elevated state anger is more central to the immediate danger that a person poses than diminished fear or disgust, the hypothesized error management mechanism might favor perceptions of state anger but not moderate perceived state fear or disgust. By contrast, because traits do not face the same issue of presumed exclusive activation, individuals are likely conceptualized as simultaneously possessing multiple traits, allowing the error management capacity to both up-regulate perceived trait anger and down-regulate perceived trait fear and disgust, creating an overall profile of the armed man as maximally dangerous.

Similarly consistent with an error management perspective, ratings of unpleasantness and dishonesty were elevated in the danger condition. Given norms prescribing harmonious relationships, aggressive individuals are, by definition, less pleasant; hence a bias in the attribution of aggression entails a bias in the attribution of unpleasantness. Like aggression, dishonesty entails violating norms and inflicting costs on others, thus assessments of dishonesty and aggressiveness may be interconnected. Importantly, the results for trait personality ratings are not explicable merely as an indiscriminate “reverse halo effect” (Nisbett & Wilson, 1977), as ratings of incompetence did not differ between conditions. This result is suggestive of an error management mechanism particular to potential social conflict, as, unlike unpleasantness or dishonesty, incompetence does not pertain to interpersonal antagonism. Future research is required to confirm this preliminary interpretation.

**General Discussion**

Across two studies, we found convergent evidence that individuals portrayed as in possession of tools with dangerous affordances

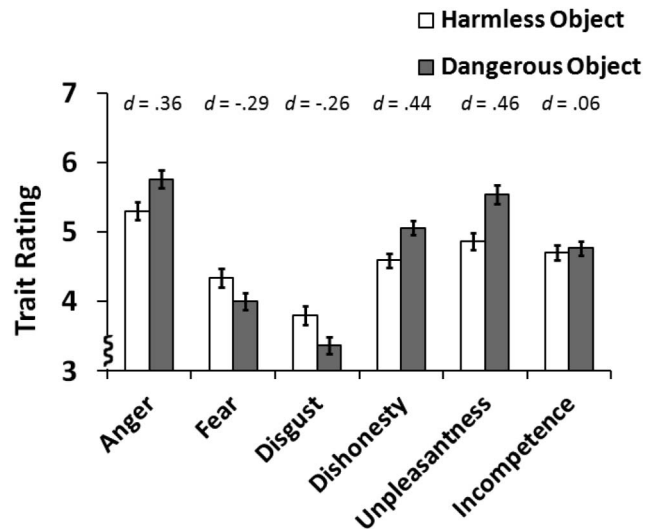


Figure 4. Trait ratings in the dangerous versus harmless conditions (Study 2b).

are judged to be more state angry and trait anger-prone—a result predicted by error management theory. Importantly, the shifts in anger attribution were not explicable by simple semantic associations between dangerous objects, violence, and anger, as a condition prominently featuring a knife on the same screen as a model produced significantly lower state and trait anger attributions than a condition in which the model was shown holding the knife (Study 1), and two dangerous objects having differing associations with violence produced indistinguishable effects on anger attribution (Study 2). Finally, we found that possessing a dangerous tool decreases attributions of trait fear and trait disgust—results that are compatible with our error management perspective, but do not follow from a simple association account.

Although the present results provide support for the hypothesis that contexts of potential threat moderate emotion attribution to reduce costly errors, there are several issues which require clarification in future research. For example, we do not know whether the biases documented here require face or body processing, both of which are critical aspects of social perception, and both of which are susceptible to biases (e.g., Johnson, Iida, & Tassinari, 2012; Kret, Pichon, Grèzes, & de Gelder, 2011). In these initial studies, we wished to manipulate possession of dangerous objects in an ecologically valid way by simply displaying individuals holding objects, holistically including faces and bodies. Similar mechanisms presumably operate for face and body perception—follow-up studies might probe whether these effects replicate with isolated faces described as corresponding to armed individuals, with faceless bodies, or even with entirely unseen targets.

Error management is a principle of decision making under uncertainty that has been productively applied to adaptive problems across many cognitive domains (Galperin & Haselton, 2012; Haselton & Buss, 2000; Johnson et al., 2013). Although we point to the classic literature on preparedness for detecting angry faces as supportive of our evolutionary account (Hansen & Hansen, 1988; Ohman & Dimberg, 1978), developmental experience is crucial for the normal expression of evolved traits (Bates et al., 1998; Frankenhuys & Panchanathan, 2011; Johnson, 2011; Tooby, Cosmides, & Barrett, 2003). Further investigation is needed to determine the relative (interactive) contributions of phylogeny and ontogeny to the system underlying these error management biases.

Questions also remain regarding the domain-specificity of threat detection mechanisms, and of the role of error management in shaping these mechanisms. Because distinct threat systems are subserved by largely overlapping neurocognitive processes (Szechtman & Woody, 2004), and the benefits of reducing the cost of errors likely applies widely, we should expect similar error management biases across different threat domains. The present research pertains to the presence of potentially hostile conspecifics and the possession of dangerous objects, but similar patterns of evaluation bias might emerge in a variety of contexts with quite different stimuli. For example, threat detection mechanisms might facilitate the avoidance of potentially hostile animals by exaggerating reactions to cues such as active drooling (which could reflect rabies, thereby increasing the potential costs of a bite). Thus, the system described here, which adaptively minimizes errors particular to armament and the social domain, may involve neurocomputational biases prevalent across various threat-assessment contexts.

## Conclusion

We document context-dependent shifts in emotion categorization wherein a target individual's temporary possession of a dangerous object increases observers' attributions of state and trait anger, decreases attributions of trait fear or disgust (i.e., squeamishness), and increases appraisals of targets as antisocial (i.e., unpleasant and dishonest). These shifts appear to reveal true biases, as our manipulations were external to, and uninformative of, the target's actual state or disposition. Analogous considerations likely apply to the categorization of a host of emotions, hence an error management perspective may shed important additional light on how context influences emotion categorization.

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