The Art of Anger: Reward Context Turns Avoidance Responses to Anger-Related Objects Into Approach

Henk Aarts, Kirsten I. Ruys, Harm Veling, Robert A. Renes, Jasper H.B. de Groot, Anna M. van Nunen, and Sarit Geertjes
Utrecht University

Abstract

Anger has a special status among the emotions in that it can elicit avoidance as well as approach motivation. This study tested the ignored role of reward context in potentiating approach rather than avoidance responses toward objects associated with anger. In Experiment 1, angry and neutral facial expressions were parafoveally paired with common objects, and responses to the objects were assessed by subjective reports of motivation to obtain them. In Experiment 2, objects were again paired with angry or neutral faces outside of participants' awareness, and responses toward the objects were indexed by physical effort expended in attempting to win them. Results showed that approach motivation toward anger-related objects can be observed when responding is framed in terms of rewards that one can obtain, whereas avoidance motivation occurs in the absence of such a reward context. These findings point to the importance of a reward context in modulating people's responses to anger.

Whether to approach or avoid objects depends heavily on the emotional reactions they evoke. This emotional-response system seems to be hardwired and often operates outside of conscious awareness (Elliot, 2008). Although both fear and anger are often associated with avoidance, anger can also elicit approach-related affect. That is, objects that evoke anger or are perceived in the context of angry faces can activate the motivational system underlying approach behavior. In the study reported here, we aimed to further investigate this special status of anger by testing the role of reward context in evoking approach or avoidance reactions to anger-related objects.

Like fear, anger evokes avoidance reactions, possibly because both emotions serve as a basic threat signal. For example, an object that is associated with fear (e.g., a spider) suggests potential harm. Similarly, an object that is associated with anger (e.g., an object that one has fought over) suggests hostility, and it is wise to avoid such an object. Anger and fear are thus thought to reflect a common mechanism of displeasure and avoidance of undesirable events (Watson, Wiese, Vaidya, & Tellegen, 1999) that arises from the aversive motivational system (Lang, Bradley, & Cuthbert, 1998). However, anger and fear also differ. Anger (but not fear) can reinforce approach toward stimuli, and it has been suggested that anger

motivates behavior in the context of resource competition and the attainment of rewards (Potegal, 1979). Anger has also been implicated in approach motivation underlying goal pursuit, especially when goals are blocked or frustrated (Berkowitz, 1989). Finally, research has shown that cortical brain areas involved in anger overlap with the areas that are receptive to positive affect (Carver & Harmon-Jones, 2009; van Honk & Schutter, 2006), and anger is related to reward sensitivity measured with the Behavioral Activation System Scale (Carver, 2004; Harmon-Jones, 2003; Putman, Hermans, & van Honk, 2004).

Taken together, several lines of research suggest that objects associated with anger and fear potentiate avoidance responses, but that in the case of anger, approach motivation occurs when objects are perceived in terms of potential rewards or goals. Under the latter circumstances, anger-related objects may increase the motivation to obtain them. However, a direct test of this intriguing hypothesis has been lacking. We

Corresponding Author:
Henk Aarts, Utrecht University, Department of Psychology, PO Box 80140, 3508 TC, Utrecht, The Netherlands
E-mail: h.aarts@uu.nl

conducted such a test by repeatedly pairing common objects with angry faces, to experimentally create associations between objects and anger, and then observing effects on motivation. We used facial expressions because they rapidly transmit emotional information from one individual to another (Blair, 2003; Todorov, Said, Engell, & Oosterhof, 2008).

Experiment 1 was an initial test of the idea that in a reward context, linking objects to anger instigates motivation to approach these objects. We paired objects with angry or fearful faces to demonstrate the differential effects of anger and fear on motivation. Furthermore, this manipulation was between participants so that we could test the unique contribution of each emotion, and the pairing was implemented outside of participants' awareness to reduce effects of demand characteristics and strategic (socially normative) processes. Following earlier work (Custers & Aarts, 2005; Gable & Harmon-Jones, 2008), we induced a reward context by instructing all participants to consider each object as a potential goal and to indicate their motivation to obtain it. On the basis of the line of reasoning we have just outlined, we expected anger but not fear to increase motivation. In Experiment 2, we manipulated reward context, predicting that the presence of a reward context would instigate approach motivation toward objects paired with anger, but that the absence of a reward context would instigate avoidance motivation toward the same objects.

Experiment 1
Method

Participants and design. In Experiment 1, 76 undergraduates were randomly assigned to one of two conditions that differed in the type of negative facial expressions that were paired with objects. The experiment had a 2 (valence of expression: neutral vs. negative; within participants) × 2 (condition: anger vs. fear; between participants) design.

Materials and procedure. Neutral, angry, and fearful facial expressions of two male and two female actors were selected from Ekman and Friesen (1976). Ten common items (e.g., a pen, a plate) served as objects. Neutral faces and objects other than those in the experimental task were used for practice.

Across the 10 blocks of the task, five randomly selected objects were linked to four different neutral faces, and the other five objects were linked to either four different angry faces or four different fearful faces, depending on condition. In a given block, the same object was presented 16 times, each time followed by a flashed face either on the left (eight times) or on the right (eight times); each of the four faces (neutral, angry, or fearful, depending on block and condition) was flashed four times. After the 16 presentations of the object, participants indicated how much they wanted to obtain it (21-point scale ranging from *not at all* to *very much*).

Participants were told that the study concerned their visual alertness while responding to objects presented on a (100-Hz)

CRT monitor and that they would be performing a parafoveal vigilance task (Chartrand & Bargh, 1996) in which short flashes (actually, facial expressions) would appear on the screen at unpredictable places and times. Their task was to decide as quickly and accurately as possible whether each flash appeared on the left or right side of the screen and to indicate their decision by pressing one of two keys on a computer keyboard. The instructions indicated that they should fixate the object presented in the middle of the screen and respond at the end of each block. Participants were told to consider each object as a potential goal and to indicate how much they wanted to obtain it.

The flashed faces were located 7.6 cm from fixation, and thus located within the parafoveal visual field (2°–6° of visual angle from fixation) and outside the foveal visual field (see also Chartrand & Bargh, 1996). They were presented for 40 ms, followed by a mask for 120 ms (for a subliminality check, see Ruys & Stapel, 2008). The flashes were randomly presented 80, 120, 160, or 200 ms after onset of the object. The object appeared on the screen for 440 ms. Participants performed a few practice blocks before they started the actual task. Funneled debriefing (Bargh & Chartrand, 2000) showed that participants had not seen the angry or fearful expressions, and no participants felt that the flashes had influenced their motivation to obtain the objects.

Results and discussion

Within each condition, we calculated mean ratings across the five neutral blocks and across the five negative (angry or fearful) blocks (see Fig. 1). These means were subjected to a 2 (valence of expression: neutral vs. negative) × 2 (condition: anger vs. fear) analysis of variance (ANOVA). The predicted two-way interaction emerged, $F(1, 74) = 7.80$, $p_{rep} = .97$, $\eta_p^2 = .10$. Participants were less motivated to obtain objects linked
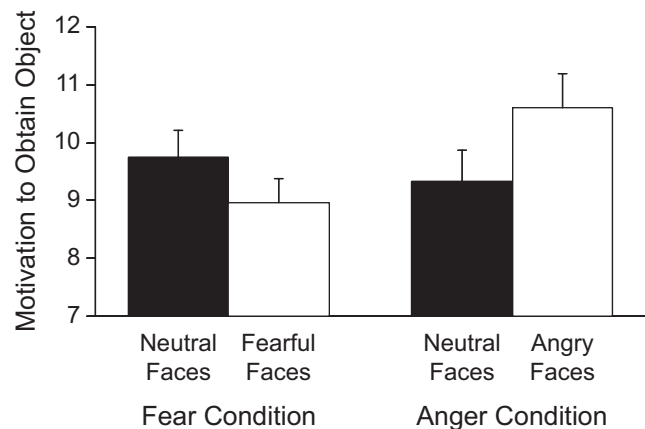

Fig. 1. Results from Experiment 1: mean motivation to obtain objects as a function of the expression linked to the object. In the fear condition, neutral and fearful faces were linked to different objects, and in the anger condition, neutral and angry faces were linked to different objects. Error bars represent standard errors.

to fearful faces than to obtain objects linked to neutral faces, $t(37) = 1.86$, $p_{rep} = .90$. However, participants were more motivated to obtain objects linked to angry faces than to obtain objects linked to neutral faces, $t(37) = 2.10$, $p_{rep} = .92$.

The results showed that participants reported increased motivation to obtain anger-related objects (relative to objects linked to neutral faces) and reduced motivation to obtain fear-related objects (again, relative to objects linked to neutral faces). Although these findings are consistent with our reward-context hypothesis, according to which anger-related objects (but not fear-related objects) elicit approach motivation when objects are represented as potential rewards or goals, reward context was not experimentally manipulated in this experiment. We included such a manipulation in Experiment 2.

Experiment 2

In Experiment 2, we tested the behavioral effects of anger-related objects by assessing the effort participants invested in squeezing a handgrip. Specifically, after an object was linked to angry or neutral faces, half of the participants simply squeezed the handgrip upon presentation of the object. This control-context condition allowed us to assess the generation of physical force in response to anger-related objects. For the other half of the participants, the object was framed as a potential reward that could be obtained. These participants learned that the harder they squeezed, the more likely it was that they would get the object. Thus, squeeze effort was instrumental in getting the goal object. Given our findings in Experiment 1, we expected that the reward context would enhance the physical effort that participants invested when responding to objects linked to angry faces. The control context was expected not to elicit motivational effort in response to objects linked to angry faces. In fact, because anger-related objects in the absence of a reward context elicit avoidance motivation, we reasoned that squeeze effort would be inhibited in the control-context condition (Gray, 1987).

Method

Participants and design. One-hundred thirty-seven undergraduates were randomly assigned to one of the two context conditions. The experiment had a 2 (valence of expression: object linked to angry vs. neutral faces) × 2 (context: control vs. reward) between-participants design. The angry and neutral faces were taken from Experiment 1. We used two different common objects (a mug and glove) and counterbalanced the order in which the objects were linked to the angry or neutral faces.

Procedure. The experiment was presented on a computer with a 100-Hz CRT monitor that was connected to a hand dynamometer of a Biopac (Goleta, CA) system measuring handgrip force (Aarts, Custers, & Marien, 2008). Participants were first familiarized with the equipment. Next, they worked on two allegedly unrelated tasks: a border detection task and a hand-grip task.

The border detection task was designed to link objects to facial expressions outside of awareness. Participants learned that this task was developed to study the detection of the shades of borders surrounding portraits. Their task was to indicate as quickly and accurately as possible whether the border of a briefly presented portrait was gray or white by pressing one of two designated keys on the keyboard. However, unbeknownst to them, each portrait was preceded by a subliminally presented (gray-scale) picture of either a mug or a glove. Within a trial, the following events occurred at the center of the screen. First, a scrambled premask (fixation) was shown for 700 ms. It was followed by presentation of an object for 30 ms and a scrambled postmask for 200 ms (for a subliminality test of this procedure, see Veling & Aarts, 2009). Then, an angry or neutral face, surrounded by a white or gray border (with a width 10% of the width of the face) was presented for 50 ms, and participants indicated the shade of the border. After a pause of 500 ms, the next trial started. This sequence was repeated 32 times per object (i.e., each face was presented eight times). Note that both angry and neutral faces were presented to each participant. Only the direct link to an object varied (i.e., one object was linked to angry faces, and the other to neutral faces).

Next, participants engaged in a study allegedly designed to examine the suitability of a new handgrip-force device. They were asked to squeeze the handgrip with their dominant hand when an object commonly used by people appeared on the screen, and to stop squeezing when the object disappeared (after 3,500 ms). Participants did not know which object would be presented until it appeared on the screen. The object that appeared was either the object previously linked to neutral faces or the object previously linked to angry faces (randomly determined). In the control-context condition, participants were merely instructed to squeeze the handgrip when the object appeared on the screen. In the reward-context condition, participants were told that they could obtain the object; the harder they squeezed, the more likely it was that they would get the object. The maximum force applied (in newtons) served as the dependent variable.

Funneled debriefing showed that participants had not seen the objects in the border detection task. Also, no participants indicated that the border detection task had influenced their squeezing in the handgrip task.

Results and discussion

The counterbalancing factors showed no main or interaction effects. Maximum force was subjected to a 2 (valence of expression) × 2 (context) ANOVA. The analysis revealed a main effect of context, $F(1, 131) = 17.86$, $p_{rep} > .99$, $\eta_p^2 = .12$, indicating that maximum force was higher when participants could obtain the object. More important, the predicted two-way interaction between valence and context was also significant, $F(1, 131) = 9.70$, $p_{rep} = .99$, $\eta_p^2 = .07$ (see Fig. 2). In the
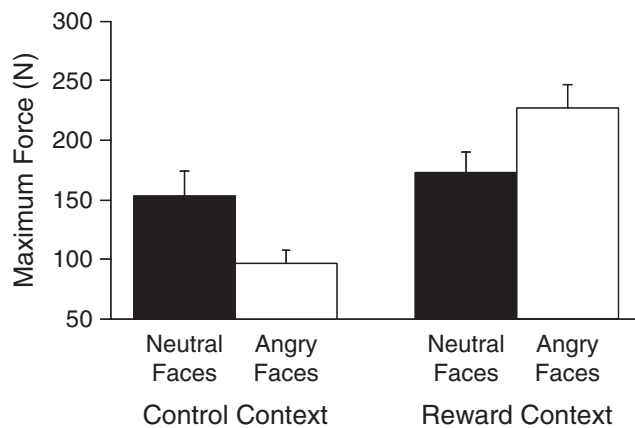
Fig. 2. Results from Experiment 2: mean maximum force as a function of context (control vs. reward) and valence of the expression linked to the object (neutral vs. angry). Error bars represent standard errors.

reward-context condition, participants demonstrated higher maximum force when the object was paired with angry rather than neutral faces, $t(65) = 2.06$, $p_{rep} = .92$. In the control condition, the inverse pattern was found: The object elicited less force when paired with angry compared with neutral faces, $t(66) = 2.36$, $p_{rep} = .95$.

These findings replicate and extend Experiment 1 by showing that a reward context potentiates approach motivation (increased physical effort) in response to objects linked to angry faces; avoidance motivation determined physical effort in the absence of a reward context.

General Discussion

Our results showed that when objects were framed in terms of potential rewards or goals that participants could obtain, anger increased approach motivation, whereas fear induced avoidance. Moreover, anger-related objects elicited approach when the objects were presented as actual rewards, but avoidance when the objects were presented without a reward context. These findings extend work revealing that the emotional experience of anger, or perception of angry faces, involves approach-related affect (Adams, Ambady, Macrae, & Kleck, 2006; Carver & Harmon-Jones, 2009), by showing that anger-related objects elicit opposite motivational behaviors depending on the context in which they are presented. Note that we used a repeated (nonconscious) pairing methodology as a critical tool to experimentally create associations between objects and anger. However, it is possible that examining responses to objects that are linked to anger in a single instance or that are already associated with anger would yield similar results.

The present findings support previous suggestions that anger is related to approach motivation (Berkowitz, 1989; Carver & Harmon-Jones, 2009), but they may also reveal some specifics as to how emotional information can elicit different motivational reactions. For instance, several researchers (e.g., Horstmann, 2003; Ruys & Stapel, 2008) have posited

that facial expressions can be processed in terms of social meaning (e.g., "someone is angry at me") or emotional meaning (e.g., "anger"). When processed as social signals, other people's faces convey behavioral intentions or environmental threats and determine the observer's behavior from a social (other) perspective. However, when facial expressions are processed in terms of emotional meaning, the source and details of the emotion remain ambiguous and vague, and the observer's behavior may be determined from a personal (self) perspective (Lambie & Marcel, 2002; Lindquist & Barrett, 2008).

This view on the processing of emotional information connects well with our findings if we assume that the anger-related (and fear-related) objects were processed differently in the reward context than in the control context. That is, the reward context caused participants to attend to the anger-related object they could obtain from a personal perspective, and biased them toward processing the emotional meaning of anger. Thus, the anger-related object motivated approach behavior because anger is generally accompanied by feelings of dominance and a preparedness to attack (in contrast, fear induced avoidance because of the general aversive function it serves; Harmon-Jones, 2004; Lerner & Keltner, 2001). Without the reward context, the anger-related object may have been processed as a social signal and therefore motivated avoidance behavior, because the anger of other people is threatening and elicits preparation for submission or escape of punishment. Accordingly, objects paired with angry faces potentiated approach behavior in a reward context and avoidance behavior in a neutral context. Future research could examine this proposed effect of context on differential processing of emotional information to test whether it indeed plays a role in eliciting approach and avoidance motivation in the case of anger as well as other emotions.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

References

Aarts, H., Custers, R., & Marien, H. (2008). Preparing and motivating behavior outside of awareness. *Science*, *319*, 1639.

Adams, R.B., Ambady, N., Macrae, C.N., & Kleck, R.E. (2006). Emotional expressions forecast approach-avoidance behavior. *Motivation and Emotion*, *30*, 179–188.

Bargh, J.A., & Chartrand, T.L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H.T. Reis & C.M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 253–285). New York, NY: Cambridge University Press.

Berkowitz, L. (1989). Frustration-aggression hypothesis: Examination and reformulation. *Psychological Bulletin*, *106*, 59–73.

Blair, R.J.R. (2003). Facial expressions, their communicatory functions and neuro-cognitive substrates. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *358*, 561–572.

Carver, C.S. (2004). Negative affects deriving from the behavioral approach system. *Emotion*, *4*, 3–22.

Carver, C.S., & Harmon-Jones, E. (2009). Anger is approach-related affect: Evidence and implications. *Psychological Bulletin*, *135*, 183–204.

Chartrand, T.L., & Bargh, J.A. (1996). Automatic activation of impression formation and memorization goals: Nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology*, *71*, 464–478.

Custers, R., & Aarts, H. (2005). Positive affect as implicit motivator: On the nonconscious operation of behavioral goals. *Journal of Personality and Social Psychology*, *89*, 129–142.

Ekman, P., & Friesen, W.V. (1976). *Pictures of Facial Affect*. Palo Alto, CA: Consulting Psychologists Press.

Elliot, A.J. (2008). *Handbook of approach and avoidance motivation*. Mahwah, NJ: Erlbaum.

Gable, P.A., & Harmon-Jones, E. (2008). Approach-motivated positive affect reduces breadth of attention. *Psychological Science*, *19*, 476–482.

Gray, J.A. (1987). *The psychology of fear and stress* (2nd ed.). New York, NY: Cambridge University Press.

Harmon-Jones, E. (2003). Anger and the behavioral approach system. *Personality and Individual Differences*, *35*, 995–1005.

Harmon-Jones, E. (2004). Contributions from research on anger and cognitive dissonance to understanding the motivational functions of asymmetrical frontal brain activity. *Biological Psychology*, *67*, 51–76.

Horstmann, G. (2003). What do facial expressions convey: Feeling states, behavioral intentions, or action requests? *Emotion*, *3*, 150–166.

Lambie, J.A., & Marcel, A.J. (2002). Consciousness and the varieties of emotion experience: A theoretical framework. *Psychological Review*, *109*, 219–259.

Lang, P.J., Bradley, M.M., & Cuthbert, B.N. (1998). Emotion, motivation, and anxiety: Brain mechanisms and psychophysiology. *Biological Psychiatry*, *44*, 1248–1263.

Lerner, J.S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology*, *81*, 146–159.

Lindquist, K.A., & Barrett, L.F. (2008). Constructing emotion: The experience of fear as a conceptual act. *Psychological Science*, *19*, 898–903.

Potegal, M. (1979). The reinforcing value of several types of aggressive behavior: A review. *Aggressive Behavior*, *5*, 353–373.

Putman, P., Hermans, E., & van Honk, J. (2004). Emotional Stroop performance for masked angry faces: It's BAS, not BIS. *Emotion*, *4*, 305–311.

Ruys, K.I., & Stapel, D.A. (2008). Emotion elicitor or emotion messenger? Subliminal priming reveals two faces of facial expressions. *Psychological Science*, *19*, 593–600.

Todorov, A., Said, C.P., Engell, A.D., & Oosterhof, N.N. (2008). Understanding evaluation of faces on social dimensions. *Trends in Cognitive Sciences*, *12*, 455–460.

van Honk, J., & Schutter, D.J.L.G. (2006). From affective valence to motivational direction: The frontal asymmetry of emotion revisited. *Psychological Science*, *17*, 963–965.

Veling, H., & Aarts, H. (2009). Putting behavior on hold decreases reward value of need-instrumental objects outside of awareness. *Journal of Experimental Social Psychology*, *45*, 1020–1023.

Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, *76*, 820–838.