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Emotional Expressions Forecast Approach-Avoidance Behavior

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Abstract The contention that basic behavioral intentions are forecasted by emotional expressions has received surprisingly little empirical support. We introduce a behavioral task that gauges the speed with which movement of angry and fearful faces (toward or away from an expressor's gaze) are accurately detected. In two studies we found that perceivers were faster to correctly detect approaching anger faces (i.e., faces that moved in the direction of their own gaze). The opposite, however, was not true for fear expressions. These findings offer evidence that, at least for anger displays, the basic behavioral intent to approach is strongly transmitted and at very low-levels of processing, even priming congruent behavioral responses in observers. The null results for fear faces may indicate that these signal a "freezing" response or behavioral inhibition rather than flight per se. The results of this work are discussed in relation to contemporary theories of emotion.

Keywords Emotion · Approach-avoidance · Facial expression · Anger · Fear · Behavioral intention · Action tendency

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The ability to detect another's intention to approach or avoid us is arguably a principal mediating factor governing social interaction. To date empirical work undertaken on approach-avoidance behavioral motivations has largely concentrated on the experience or response of an observer to a stimulus event (e.g., Cacioppo, Priester, & Bernston, 1993; Davidson & Hugdahl, 1995; Harmon-Jones, 2003). In the current work, we are interested instead in how such motivational tendencies are attributed to (and thereby communicated by) a stimulus face. Our treatment of behavioral intent, therefore, is strictly in terms of what is conveyed by a target face, not what is felt by the observer in response to such a stimulus. This is an important distinction given that approach-avoidance tendencies attributed to expressive faces are not always equivalent to the approach-avoidance reactions generally elicited by them.

In the case of joy, the expression conveys both a heightened likelihood of approach by an expressor as well as a congruent reaction in the observer (Davidson, 1992). For anger, on the other hand, the expression conveys a heightened likelihood of approach (i.e., aggression) by an expressor (Horstmann, 2003), yet tends to elicit avoidance in an observer (Marsh, Ambady, & Kleck, 2005). In the former example, the behavioral motivation conveyed by the stimulus is equivalent to the behavioral response it tends to elicit from others. Perhaps due to this, previous work has often conflated the valence and motivational tendencies associated with emotion, leading to what is commonly referred to as the valence/motivation confound. Yet, in the latter example, the behavioral tendency associated with felt anger is opposite from that which it tends to elicit in an observer. Work done to disentangle the valence/motivation confound, therefore, has examined approach behavior elicited by the experience of anger (Harmon-Jones, 2003), a negative yet approach-oriented emotion. The current research extends these insights by examining whether the

tendency to approach is likewise communicated by anger displays; this is discussed in more detail below.

There are a number of reasons we chose to focus our attention on the specific emotional displays of anger and fear. Of all the basic emotions thought to be universally decodable (Ekman et al., 1987), these two share several underlying characteristics. For example, they share a negative valence, are associated with high arousal, and signal threat (Russell, 1980; Watson & Tellegmen, 1985). Anger and fear are also commonly associated with very physical forms of approach-avoidance (i.e., fight/flight). In addition, that these displays are associated with potential threat arguably indicates an adaptive imperative for the timely and efficient processing of such underlying behavioral motivations. Given these shared factors, it is not surprising that in contemporary theories of emotion attribution based upon factor analytic models (Russell, 1980; Watson & Tellegmen, 1985), anger and fear are virtually indistinguishable. Notably these models do not consider the behavioral intentions associated with emotions, either in terms of those conveyed by the expressor or those experienced by the observer. Yet, in this regard anger and fear are arguably diametrically opposed.

Even the configural properties associated with anger (lowered brows/narrowed eyes) versus fear (raised brows/widened eyes) appear antithetical, consistent with one of the underlying principles of expression production proposed in the seminal work of Darwin (1872/1997). Darwin suggested that physical antithesis serves to distinguish behaviors that convey opposing meaning (e.g., dominance/submission). Consistent with this is evidence that while anger elicits avoidance behavior in an observer, fear elicits approach (Marsh, Ambady, & Kleck, 2005). Conversely, in terms of the person experiencing the emotion, anger is associated with approach and fear with avoidance (Harmon-Jones & Allen, 1998; Harmon-Jones & Seligman, 2001). What has yet to be examined, and is the focus of the current paper, is whether such behavioral motivations are inherent in the meaning communicated by emotional expression.

Approach and avoidance motivation and emotion

One common way to operationalize approach and avoidance stems from traditional behavioral learning paradigms where behavioral motivation and emotion have been linked to one another based on responses to reward versus punishment contingencies (Miller, 1937); approach motivation is defined by appetitive behavior, and avoidance motivation by aversive behavior. Evidence for the specific association between emotion and approach-avoidance motivation has largely involved the examination of differential hemispheric asymmetries. Greater right-frontal activation has been associated with avoidance motivation as well as with flattened positive affect and increased negative affect, whereas greater left-frontal activation has been associated with approach motivation and positive affect (see Davidson, 1993, 1998 for reviews).

Additional evidence supporting the emotion /behavior orientation link stems from that accumulated in studies using measures based on Gray's (1987, 1994) proposed emotion systems. The most widely studied are the Behavioral Activation System (BAS) and the Behavioral Inhibition System (BIS). The BAS is argued to be highly related to appetitive or approach-oriented behavior in response to reward, whereas the BIS is argued to be related to inhibited behavioral responding. Carver and White (1994) developed a BIS/BAS self-report rating measure that is thought to tap into these fundamental behavioral dispositions. Indeed they found that extreme scores on BIS/BAS scales are linked to behavioral sensitivity toward punishment versus reward contingencies, respectively. Several researchers have further shown that the dominance of one of these dimensions over the other (e.g., BIS over BAS, or BAS over BIS) can predict hemispheric lateralization in resting EEG arousal consistent with that found for emotion (Harmon-Jones, 2004; Sutton & Davidson, 1997). Finally, the BIS/BAS measures have been shown to be related to emotional predisposition, with positive emotionality being related to the dominance of BAS over BIS (Arnett & Newman, 2000; Matthys, van Goozen, de Vries, Cohen-Kettenis, & van Engeland, 1998; Watson, Wiese, Vaidya, & Tellegen, 1999), and depressiveness and fearful anxiety being related to the dominance of BIS over BAS (Davidson & Hugdahl, 1995; Schmidt, 1999; Watson et al., 1999).

Importantly, negative emotions have been generally thought to be avoidance oriented and positive emotions to be approach oriented, creating the valence/motivation confound, an observation which led Harmon-Jones and colleagues to test for hemispheric asymmetries associated with anger, a negative emotion with an approach orientation (aggression) (Harmon-Jones & Allen, 1998; Harmon-Jones & Segilman, 2001). They argued that left- hemispheric lateralization associated with anger would indicate that the hemispheric asymmetries previously found were in fact due to behavioral motivation, whereas right- hemispheric asymmetries would indicate that they were due to valence. In these studies they found that both dispositional anger (Harmon-Jones & Allen, 1998) and felt anger (Harmon-Jones & Segilman, 2001) are associated with left lateralized EEG arousal, consistent with the first interpretation and with that previously reported only for positive emotion. Similarly, they found that the dominance of BAS over BIS is associated with anger (Harmon-Jones, 2003). This work therefore confirms that emotions can be distinguished from one another based on motivational orientations associated with them, and reveals anger to be a particularly telling example of this effect.

Although a negative emotion, the argument that anger is associated with approach is not a new contention. Behaviors associated with anger have been historically associated with approach motivation. For example, aggression, like pleasure, has been demonstrated in animal studies to be positively reinforcing, yielding appetitive behavior (Baenninger, 1974; Potegal, 1979). Fear on the other hand has been traditionally regarded as an avoidance emotion. Thus, although anger and fear share a 'negative' valence, high arousal, and threat value, they also appear to be opposed in terms of underlying behavioral motivation. In the current work, we were primarily interested in examining differences in signal values of approach-avoidance. Thus, these two emotional displays seemed ideal for such inquiry.

Taken together, the literature supports the notion that there are separate emotion systems in the brain that directly relate to the behavioral tendencies to approach and avoid. Emotion appears to be fundamentally related to these behavioral systems, and thus it stands to reason that approach and avoidance tendencies would also be communicated via the visual signals given off by the face during emotion expression.

Expressions as signals of behavioral motivation

The contention that facial expressions have evolved primarily to signal behavioral intent was put forth in Fridlund's behavioral ecology perspective (1994). According to this view, drawing from Darwin's (1872/1997) seminal writings, facial expressions evolved specifically to forecast the behavioral intentions (and consequences) of the expressor's emotion to others. Thus, anger arguably conveys to an observer a readiness to attack another (i.e., "Back off or I'll attack"), while fear conveys a readiness to submit or back down (i.e., "Don't hurt me! I give up") (examples from Yik & Russell, 1999). From this view, facial displays necessarily convey a socio-communicative signal value and need not convey emotion at all, a contention that is in direct contrast to an alternative evolutionary theory put forth by Ekman (1972). In this theory (also drawing heavily upon Darwin's writings) physiological, neural, and cross-cultural evidence has been used to support the notion that facial expressions are directly associated with felt emotion, and as such primarily convey emotion. Importantly, this theory does not exclude behavioral intention as an important component of expressed emotion. In fact, it even suggests that behavioral intention may have influenced the forms expressions take (Ekman, 1972, 1997).

Other views on emotion purport that feeling states, behavioral intentions, and action requests are all distinct and important aspects of emotion (see Yik & Russell, 1999). Some researchers even suggest that feelings are the conscious perceptions of behavioral intentions (i.e., action tendencies), or put differently that emotional feeling is simply a form one's own awareness of having an intention (Fridja, 1995; Fridja & Tcherkassof, 1997). In sum, despite wide disagreements about the very nature of emotion and emotional expression, most emotion researchers seem at least able to agree that facial expressions of emotion likely convey fundamental information regarding the basic behavioral tendencies of the expressor (e.g., Ekman, 1973; Fridlund, 1994; Frijda & Tcherkassof, 1997; Izard, 1971; Russell, 1997).

Work done to date directly examining this issue supports the above contention. For instance, one study demonstrated that action tendencies and emotion labels are attributed to faces at comparable levels of agreement (Frijda & Tcherkassof, 1997). Similarly, employing a forced- choice paradigm, Yik and Russell (1999) found cross-cultural evidence that participants assign behavioral intention descriptors (based on Fridlund's theory) with about equal consistency as they do emotion descriptors (based on Ekman's theory) (see Yik & Russell, 1999). Finally, in an attempt to examine the most salient message conveyed by facial displays (emotions or behavioral intents), one study forced participants to choose between emotional or motivation descriptors (Horstmann, 2003). This work found that although participants generally chose emotion descriptors, a significant portion of respondents did choose motivations. Particularly relevant to the current work is the case of anger where motivations were predominantly chosen over emotion labels, suggesting that behavioral motivation is perhaps predominantly communicated by anger expressions.

Given the lively debate among emotion researchers described above concerning the nature and meaning of emotional expression, it is surprising how little research has been conducted to directly test the notion that emotional expressions convey intent. Thus, whether perceivers actually extract basic behavioral intentions (i.e., approach/avoidance) from emotional information conveyed by the face, and/or whether such information is processed relatively automatically, has not been adequately addressed. This is even more striking given that there is a great deal of work examining the strong association of behavioral intentions and emotional experience. A fairly extensive literature exists, for instance, demonstrating the role of embodiment in emotional experience (for review see Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). This work reveals that experiencing certain emotions elicits approach-avoidance behavioral tendencies (Harmon-Jones, 2003; Marsh, Ambady, & Kleck, 2005), and likewise engaging in approach-avoidance behaviors influences subsequent attitudes and emotion processing (Cacioppo, Priester, & Berntson, 1993; Neumann & Strack, 2000).

An obvious prediction, and the one driving the current work, is that the behavioral motivations associated with felt emotion will be readily communicated by corresponding facial displays, and will be processed effortlessly. In order to examine this, we investigated whether emotional expression

primes expectations for certain behavioral consequences. We did this by measuring the speed with which participants correctly detect whether the stimulus person displaying anger or fear appeared to approach or withdraw from the direction of his/her own gaze.

Perhaps most closely related to the current work is research conducted by Neumann and Strack (2000) in a study in which participants were made to feel as though they were approaching or withdrawing from words presented on a computer screen. This was done by displaying a background of concentric circles that appeared to expand or contract, creating the illusion of movement. When the circles made the participants feel that they were approaching the computer, they were faster at categorizing the positive words, whereas when made to feel as if they were withdrawing, they were faster at categorizing the negative words. The authors concluded that the circles served as exteroceptive cues that gave the participants a sense of approaching or withdrawing from the words themselves, and that it was their own sense, or embodiment, of movement that therefore primed their responses. The current work differs from this work in two important ways. First, the studies reported in the current paper are not focused on the influence of one's own experience of approach-avoidance behavior on emotion processing, but rather on the influence of *expressed* emotion on the detection of approach-avoidance behavior in another person. In addition, by examining two negatively valenced emotions, the current work contributes in a unique way to an emerging literature disentangling the valence/motivation confound in emotion processing.

The current work

We predicted that approach behaviors on the part of a stimulus person would be processed more quickly when associated with anger than with fear displays, whereas avoidance behaviors would be more efficiently processed when associated with fear than with anger. To address this hypothesis, we ran two studies using a reaction-time paradigm to examine responses to the apparent motion of emotionally expressive faces presented on a computer screen. In both studies, we examined the speed with which participants were able to indicate whether a face appeared to approach or withdraw from the target of its own gaze. In Study 1 we used direct gaze faces (i.e., the observer was the target of the gaze). After a brief initial presentation, these faces appeared to either approach the observer (i.e., they enlarged, appearing to pop-out of the screen), or withdrew (i.e., they shrunk, appearing to fall into the screen). Participants were explicitly asked to label, via mouse click as quickly and accurately as possible, whether each face approached or withdrew from them. In Study 2, we had faces with laterally averted gaze appear to move toward or away from their own gaze (i.e., to the left or right of initial presentation). In this study, participants were asked simply to make a right or left mouse click in the direction the face appeared to move. In both studies, we recorded the speed with which participants were able to process actual approach-avoidance behaviors as a function of emotion displayed, thereby helping reduce the chance that attributions could be due to a cognitive decision-making process (i.e., one where cognitive schemas about emotion are used to infer motivation).

Study 1

Method

Participants

Fifteen female and seven male undergraduate students were recruited for this study. One participant was dropped for accuracy lower than 3 standard deviations below the mean. Some participants were run in a small group in a computer laboratory. The remaining participants were run individually. All participants received partial course credit for their participation.

Materials and design

Facial photographs of anger and fear were presented via computer, each displayed by eight male and eight female models. Faces were selected from the Montreal Set of Facial Displays of Emotion (Beaupre & Hess, 2005), wherein each exemplar displayed both expressions, and from a set developed in Ambady's laboratory (Chiao & Ambady, 2001), wherein each displayed only one. All faces were of European descent. Faces were cropped to include only the neck, head and hair of each exemplar, and were presented against a black background. All faces were forward-looking, thereby appearing to make eye contact with the observer. Initial presentation size of faces was approximately 3×4 inches. These were presented in the middle of the screen for 1000 ms. The perception of movement was accomplished by immediately replacing the initial face presentation with an identical one of either reduced size (i.e., 2×3 inches) simulating the perception of the face falling back into the computer away from the participant, or one of increased size (i.e., 4×5) simulating the perception of the face popping out of the computer toward the participant (see Fig. 1). Exemplar faces were randomly presented in a 2 (anger/fear) $\times$ 2 (approach/avoidance) factorial design, and were repeated twice across all treatment conditions, resulting in a total of 128 stimulus trials.

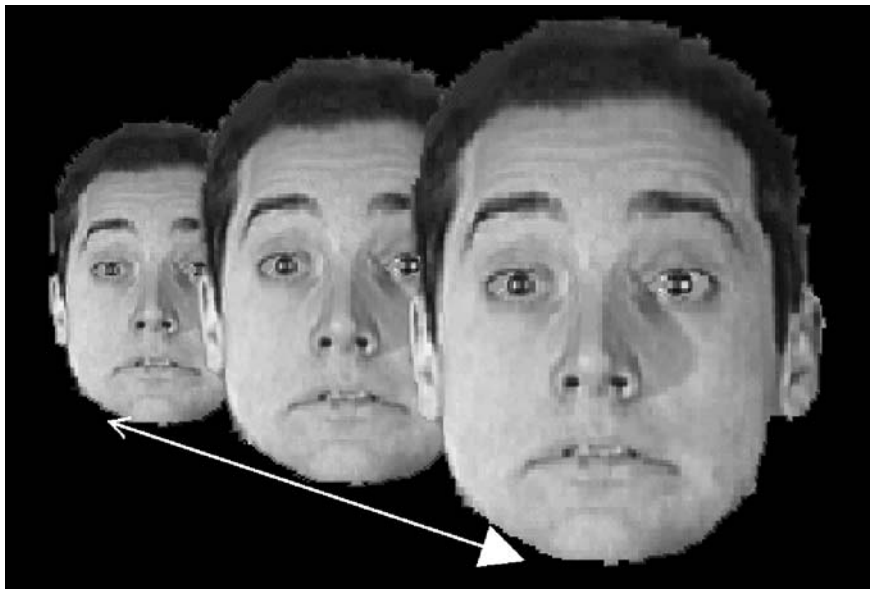

Fig. 1 Example stimuli showing a fear face shrinking to simulate withdraw or enlarging to simulate approach. From Montreal Set of Facial Displays of Emotion [CD], by U. Hess, 2005, University of Quebec at Montreal, Montreal, Quebec, Canada. Adapted with permission of the author

Procedure

Each participant was seated approximately 24 in. in front of a 15-in. monitor. Stimulus trials were presented using Superlab Pro^{TM} (see Haxby, Parasuraman, Lalonde, & Abboud, 1993). Participants were instructed to label, via a right or left mouse click, whether each face appeared to approach or withdraw from them. Each face was presented in the center of the computer screen and was preceded by a 500-ms fixation point. After an initial 1000-ms presentation, faces either shrunk or enlarged to simulate approach-avoidance movement. Once apparent motion was achieved, the face remained on the screen until a response was made. Participants were asked to respond as quickly and as accurately as possible.

Results and discussion

Prior to analyses, incorrect responses were dropped. Overall accuracy was 98.4%. The reaction time data were then log-transformed. For ease of interpretation, we converted data back into milliseconds for reporting means and standard errors.

The central hypothesis was tested by computing a 2 (anger/fear expression) × 2 (approach/avoidance movement) repeated measures analysis of variance. A main effect emerged indicating faster responses to forward moving faces, $F(1,20) = 9.04$, $p < .01$, partial $\eta^2 = .31$. This main effect was qualified by the predicted interaction between emotion and approach-avoidance movement, $F(1,20) = 4.66$, $p < .05$, partial $\eta^2 = .19$. Inspection of the means (see Fig. 2) suggests this effect was driven primarily by differential responses to approaching anger displays. Direct comparisons support this conclusion by revealing that approaching anger expressions were responded to more quickly than all other treatment conditions including angry withdrawing, $t(21) = p < .005$, $r = .60$, fear approaching, $t(21) = p < .02$, $r = .52$, and fear withdrawing, $t(21) = p < .005$, $r = .62$, faces.

These findings offer preliminary support for the central hypothesis that anger conveys fundamental information regarding the likelihood of the expressor to approach. Anger expressions were responded to more quickly than all other conditions. Contrary to the current hypotheses, no differences emerged for fear withdrawing faces. A main effect of direction of movement indicating faster responses to approaching faces was evident. This effect may be akin to the joint attention effects previously found for laterally-averted gaze (see Driver et al., 1999). Joint attention will be addressed in more detail in Study 2. In addition, although this study employed a speeded reaction time task to reduce the likelihood that the results are dependent upon high-level cognitive appraisal, this possibility can not be ruled out, particularly given that participants were explicitly asked to label the faces as approaching or withdrawing. In addition, stimuli remained on the screen until responses were made, and thus faster responses to approaching anger may simply have been motivated by an avoidance response in the observer, in order to make the aversive stimulus disappear more quickly. This alternative explanation may suggest an effect driven more by an avoidance response in the observer than an attribution of approach to the stimulus face.

Thus, to replicate these findings using a more stringent test of the hypothesis, Study 2 was conducted. This study examined responses to faces with laterally-averted gaze direction (left/right), which appeared to move to the left or right of their initial presentation location, thereby simulating

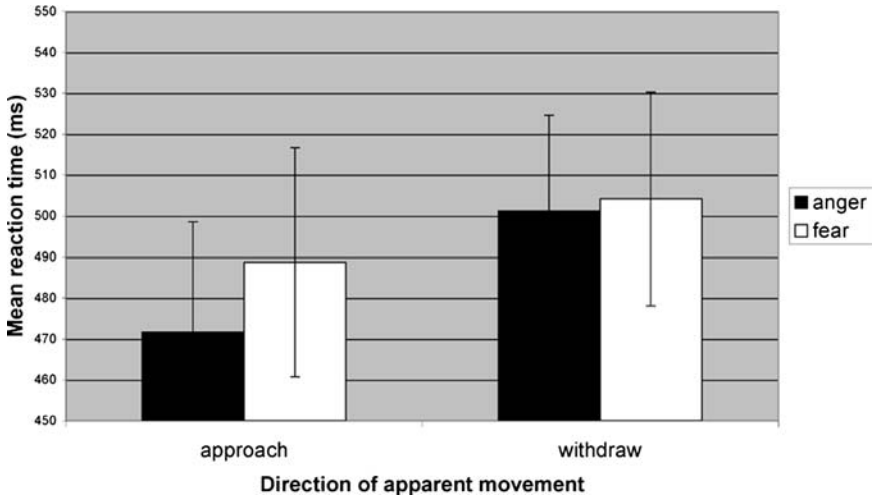

Fig. 2 Speed to correctly detect approaching or withdrawing faces as a function of facial expression (Study 1)

approach toward or withdrawal from the stimulus person's own gaze. In this study, we asked participants simply to make a left or right mouse click in the same direction that each face appeared to move, eliminating any explicit task demands to label the faces as approaching or avoiding, and thereby eliminating the need for cognitive labeling associated with the task.

Study 2

Methods

Participants

Twenty-four female, 24 male, and one gender-unidentified undergraduate students were recruited for this study from the Boston area. One participant was dropped for accuracy more than 5 standard deviations below the mean. Participants were run individually and received partial course credit for their participation.

Materials and design

Facial stimuli were the same as described in Study 1, again displayed against a black background. All faces were manipulated to display laterally-averted gaze using Adobe Photoshop™. The size of faces was approximately 3×4 inches. These were initially presented in the middle of the screen for 1000 ms. The perception of movement was accomplished by immediately replacing the initial facial display with an identical display approximately 2 inches to the right or left of initial presentation. The vertical displacement of the stimulus remained unaltered. All 16 exemplar faces were randomly presented in a 2 (anger/fear expression) $\times$ 2 (left/right gaze) $\times$ 2 (left/right movement) factorial design. Facial stimuli were repeated twice across all conditions resulting in a total of 256 stimulus trials.

Procedure

Each participant was seated approximately 24 in. in front of a 15-in. monitor with a serial mouse. As in Study 1 stimulus trials were presented using Superlab Pro™. Each face was presented in the center of the computer screen and was preceded by a 500-ms fixation point. After 1000-ms, faces either shifted to the right or left. Participants were instructed to make a right or left mouse click in the same direction the face appeared to move. Thus, no cognitive labeling of the faces was required at all, only a consistent behavioral response. Once the face shifted to the left or right, it remained on the screen until a response was made. Participants were asked to respond as quickly and as accurately as possible.

Results and discussion

Prior to analyses, incorrect responses were dropped. Overall accuracy was 98.9%. The data were then log-transformed before analysis. For ease of interpretation, we converted data back into milliseconds when reporting means and standard errors.

The central hypothesis was again tested by computing a 2 (anger/fear expression) $\times$ 2 (approach/avoidance) repeated measures analysis of variance. In this case all trials in which a face moved in the direction of its own gaze were coded as approaching, and those that moved away from the direction of its own gaze were coded as withdrawing. A main effect emerged revealing faster response times to approaching faces than withdrawing faces, $F(1,47) = 10.71$, $p < .005$, partial $\eta^2 = .19$. This main effect was qualified by the predicted interaction between the apparent motion (approach-avoid) of the face and emotion (anger/fear) expressed, $F(1,47) = 4.58$,

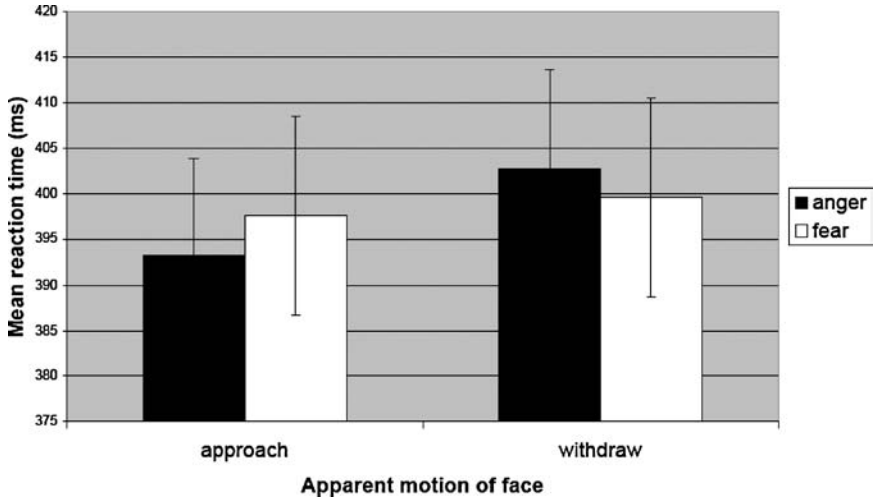

Fig. 3 Speed to correctly detect approaching or withdrawing faces as a function of facial expression (Study 2)

$p < .05$. partial $\eta^2 = .09$. As in Study 1, inspection of the means revealed that these effects were predominantly driven by responses to approaching anger faces (see Fig. 3). Direct comparisons further support this conclusion showing that approaching anger expressions were responded to more quickly than anger withdrawing, $t(47) = (-3.66)$ $p < .001$, $r = .47$, fear approaching, $t(47) = -2.05$, $p < .05$, $r = .29$, and fear withdrawing, $t(47) = -2.59$, $p < .02$, $r = .35$, faces. In addition, anger withdrawing faces were responded to more slowly than fear approaching faces, $t(47) = 2.46$, $p < .02$, $r = .34$, suggesting that the interaction effect may have at least partially been driven by slower responses to anger withdrawing faces as well. To examine this possibility more closely we ran two planned contrasts. The first contrast compared approaching anger faces against both approaching and withdrawing fear faces (contrast weights: –2, 1, 1), $F(1,47) = 7.49$, $p < .01$, partial $\eta^2 = .14$. The second contrast compared withdrawing anger faces also against both approaching and withdrawing fear (contrast weights: 2, −1, −1), $F(1,47) = 4.66$, $p < .05$, partial $\eta^2 = .09$. These contrasts support the conclusion that anger expressions both facilitated perceptions of approach, as well as inhibited perceptions of withdrawal. As in Study 1, no differences were found in a direct comparison of approaching versus withdrawing fear.

The results of this study offer additional support for the notion that approach behavioral tendencies are communicated by anger expressions. Because this study required only a consistent behavioral response from participants (a left or right mouse click in the direction of perceived movement), one possible conclusion is that expressions effectively primed a consistent behavioral response in the observer. Thus, these findings help rule out the possibility from Study 1 that it is the participants' own avoidance response that leads to faster responses to approaching anger faces. In this study none of the faces appeared to approach the observer, and the participants were quicker to make concordant behavioral responses when anger faces move in the direction of their own gaze. In addition, a main effect that emerged for faster response times to approaching faces was not surprising given the literature on joint attention effects (see Driver et al., 1999). Such work has demonstrated attentional shifts in the direction of another's gaze that appear to occur reflexively, which may have facilitated responding in the current context. Notably, this effect was eliminated for fear faces, suggesting perhaps that fear signals a "freezing" response.

General discussion

The two studies reported here offer support for the contention that an approach behavioral intent is conveyed by facial expressions of anger. The current studies focused on perhaps the most fundamental forms of behavioral intent (approach-avoidance) and therefore may reflect emotion processing at its most basic level of biological relevance. Baron-Cohen (1995) describes behavioral intent as "primitive mental states in that they are basic ones that are needed in order to be able to make sense of the universal movements of all animals: approach and avoidance" (pages 33–34).

In both studies, apparent approach movement of a face toward an implied object of its own gaze was detected more quickly when displaying anger. These findings are in line with current conceptualizations linking approach-avoidance motivation and emotional experience. Similar differences did not emerge, however, for fear expressions. It is possible that this can be explained by considering that fear conveys a heightened likelihood for behavioral inhibition (i.e., as in Gray's BIS) more so than a flight response per se. This conclusion is certainly consistent with animal studies on fear responses, which demonstrate early freezing responses during fear, ones that appear to be modulated by an amygdala response to threat (LeDoux, 1996). Although freezing

responses are clearly not always the most adaptive response to danger, particularly for humans, from an evolutionary point of view, it makes sense given that predators in the wild are often highly sensitive to biological movement. Thus, freezing likely afforded our species a survival advantage in response to predation. Although we had predicted withdrawal to be associated with fear, the results more strongly support the notion that fear conveys behavioral inhibition, though this conclusion must be taken with great caution as it is based on a null effect. Taken together, these findings for anger and fear support the notion that the behavioral motivations people subjectively experience during emotion also appear to be objectively conveyed by corresponding expressive behavior. In this way emotional expression appears to convey the basic behavioral consequences of emotion, as indicated by enhanced processing efficiency of these consequences.

The interactions found in the studies reported herein, although significant, are admittedly small. Thus, although approach motivation appears to be automatically processed as part of the anger display, it is not clear that it is the only, or even the most powerful, signal communicated by this expression. As many researchers currently contend, emotions appear to be "syndromes of correlated components" (see Yik & Russell, 1999 p. 151), all of which likely contribute to a complete meaning of emotion, and therefore add to the overall variance associated with emotional communication. At the same time, it is important to note that the current paradigms constitute extremely stringent tests of the hypothesis. The apparent motion of the faces was unambiguous as evident in the high levels of accuracy exhibited by participants. Thus even subtle variation in processing efficiency as a function of emotional expression is quite notable. In addition, the effect sizes for detecting approaching anger versus all the other treatment conditions (i.e., anger withdrawing, fear approaching, and fear withdrawing) were all well within a respectable range (r's = .29 – .62), with reaction time differences ranging from approximately 10–30 ms. Further, our findings that anger appears more likely than fear to convey basic behavioral motivations corroborates recent findings using self-report measures (see Horstmann, 2003). The small effects for the predicted interactions, therefore, are largely explained by the lack of differences found between approaching and withdrawing fear faces. The lack of significant effects for fear faces are difficult to interpret, because the null effect may instead indicate that "freezing" or behavioral inhibition is communicated by this expression, or it may simply indicate that fear expressions fail to communicate behavioral tendency at all. Future studies examining a broader range of emotional displays will help clarify these effects.

Such future studies will likely benefit from modifying the current paradigm in ways to increase power, by including, for instance, contexts where movement is more subtle or even ambiguous, or where response competition is introduced. It should be noted that research examining similar types of purportedly reflexive and low-level processing have also been marked by small effects. Reflexive orienting or joint attention, for example, is revealed via very small reaction time differences, yet these effects are considered reflective of processes crucial to the development of mental state attribution or Theory of Mind (see Baron-Cohen, 1995). Given the known importance of approach-avoidance motivation in emotional experience, the current results, although small, may similarly reflect basic processes crucial to the development of emotional state attribution.

In sum, the current work offers support for Fridlund's (1994) and Frijda's (1995) theories that basic behavioral tendencies (or action tendencies) are a fundamental aspect of what is conveyed by emotional expressions. The studies reported here circumvented the limitations of previous work based on self-report data, which has left open the possibility that behavioral tendencies are cognitively extracted from expressions. Put differently, behavioral intentions applied to emotional expressions have previously faced problems ruling out a conscious decision-making explanation, one where cognitive schemas related to emotion might be used to infer a related motivation. Given the amount of debate on these issues, the dearth of relevant empirical work is striking, and has likely been due to the lack of an adequate behavioral measure. Thus, one clear implication of the current work is that it offers a viable technique to examine behavioral intentions by gauging responses to their corresponding behavioral consequences. A speeded reaction time task reduces the chances that the results are dependent upon participants engaging in higher-level cognitive processing. Further, in both of the current studies, participants were asked to attend to the apparent movement of the face, not to the facial display itself, making differential responses more an implicit consequence of emotional expression than an explicit one. Study 2 is perhaps the most stringent test in that participants were not required to attribute *any* cognitive labels to the faces, but rather were asked only to respond with a consistent behavioral movement in the form a left or right mouse click.

The current work also helps to further disentangle the motivation/valence confound reported in previous emotion research (see Harmon-Jones, 2003). As noted earlier, much of the previous work linking emotion to approach-avoidance motivations has confounded behavioral intentions with the valence of emotion. Recent work has convincingly documented that anger, although negatively valenced, is associated with heightened approach motivation (Harmon-Jones & Allen, 1998; Harmon-Jones & Seligman, 2001), work that has focused exclusively on the emotional traits and states of participants. The current findings suggest that the behavioral intentions subjectively experienced by a person when

experiencing emotion (as demonstrated in these previous studies) also appear to be at least in part objectively attributed to their corresponding emotional displays (as demonstrated in the current work). This is particularly telling because such a link between felt and conveyed behavioral motivation in emotion would arguably have to be highly evolved.

Anger and fear have been found to differentially signal dominance and submission, respectively (Hess, Sylvie, & Kleck, 2000; Knutson, 1996). This is particularly relevant to the current work given that dominance displays in animals and nonhuman primates are often regarded as analogous, if not homologous, to displays of anger and fear displays in humans (Andrew, 1965; Argyle & Cook, 1976; Darwin, 1872/1997; Van hoof, 1976). Darwin (1872/1997) observed that expressive behaviors in animals often approximate more stable characteristics that help signal dominance/submission. In this way, expressions and appearance cues appear to share signal values that are fundamentally and functionally related (see also Hess, Adams & Kleck, in press; Marsh, Adams, & Kleck, 2005), which highlights clear areas for future examination. The possibility of functional correspondence between various social cues along such a basic continuum as approach-avoidance offers exciting possibilities for future research examining interactions among distinct sources of social information conveyed by the face, and may help elucidate an already emerging literature on "compound social cue processing" (e.g., Adams & Kleck, 2003, 2005; Adams, Hess, Kleck, & Wallbott, 2004; Hess, Adams, & Kleck, 2004; Marsh, Ambady, & Kleck, 2005; Marsh, Adams, & Kleck, 2005). Such work has begun to underscore a functional correspondence between cues such as gaze direction, emotion, gender, and facial maturity but as of yet has not examined their mutual relation in signaling basic behavioral intents, which will likely offer key insights and directions for future efforts of this kind. Davidson and Hugdahl (1995) stated that "approach and withdrawal are fundamental motivational dimensions that are present at any level of phylogeny where behavior itself is present" (page 362). As such, these behavioral motivations are likely inherent in all forms of social communication as well.

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