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Effects of Direct and Averted Gaze on the Perception of Facially Communicated Emotion

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Research has largely neglected the effects of gaze direction cues on the perception of facial expressions of emotion. It was hypothesized that when gaze direction matches the underlying behavioral intent (approach-avoidance) communicated by an emotional expression, the perception of that emotion would be enhanced (i.e., shared signal hypothesis). Specifically, the authors expected that (a) direct gaze would enhance the perception of approach-oriented emotions (anger and joy) and (b) averted eye gaze would enhance the perception of avoidance-oriented emotions (fear and sadness). Three studies supported this hypothesis. Study 1 examined emotional trait attributions made to neutral faces. Study 2 examined ratings of ambiguous facial blends of anger and fear. Study 3 examined the influence of gaze on the perception of highly prototypical expressions.

When expressing emotion in the presence of another person, you may find yourself either "staring that person down" or embracing him or her with an adoring gaze. However, you may dart your eyes away or simply cast them down. Chances are the specific type of gaze behavior you display will vary as a function of the type of emotion you are expressing. Evidence from both human and nonhuman primate research supports such a link between gaze and emotion behavior. Research in humans has shown, for example, that approach-oriented emotions, such as joy, love, and anger, tend to be expressed more with direct gaze, whereas avoidance-oriented emotions, such as embarrassment, sorrow, and disgust, tend to be expressed more with averted gaze (see Argyle & Cook, 1976; Fehr & Exline, 1987; Grumet, 1999; Kleinke, 1986; Rutter, 1984). Likewise, primatologists have repeatedly commented that direct gaze generally accompanies dominance/aggression displays in nonhuman primates, whereas averted gaze accompanies submissive/fear displays (e.g., Hinde & Rowell, 1962; Redican, 1982). It stands to reason that if specific gaze behaviors tend to co-occur with particular facial displays of emotion, then these gaze behaviors might also influence how such facial displays are perceived by others. Surprisingly, the role of gaze direction in the perception of facially communicated emotion has remained a virtually neglected topic in psychological research. By drawing on previous research demonstrating a link between approach and avoidance behavioral motivations in gaze and emotion behaviors, the present research hypothesized that the congruence of these cues in facial displays would likely enhance emotion perception.

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Sociocommunicative Value of Gaze and Emotion Expression

Approach-Avoidance Motivation and Gaze Direction

As a social signal, direction of gaze has been implicated in signaling an expressor's approach-avoidance behavioral tendencies. Stern (1977) offered evidence that gaze behavior provides a way for infants to approach and withdraw from others in an effort to regulate their own emotional experience. In addition, according to Mehrabian's (1967) immediacy model of social intimacy, increased eye contact is an essential cue used to enhance psychological closeness in adults. Argyle's (Argyle & Dean, 1965; see also Argyle & Cook, 1976; Rutter, 1984) conceptually related affilliative equilibrium model specifically implicates approach-avoidance forces as mediating such immediacy behavior.

More recently, research demonstrates that both infants and adults reflexively respond to the gaze direction displayed by others (Baron-Cohen, 1997; Driver et al., 1999; Macrae, Hood, Milne, Rowe, & Mason, 2002). Infants as young as 2 days old can distinguish direct from averted gaze, suggesting that the ability to detect gaze direction is innately prepared (Farroni, Csibra, Simion, & Johnson, 2002). According to Baron-Cohen (1995), this innate capacity to process gaze information plays a critical role in the development of a "theory of mind" (i.e., the ability to infer behavioral intentions from the nonverbal behavior of others). He defines behavioral intentions as "primitive mental states in that they are the basic ones that are needed in order to be able to make sense of the universal movements of all animals: approach and avoidance" (pp. 33–34).

Approach-Avoidance Motivation and Emotion

The behavioral tendencies to approach and avoid are also associated with emotional states. Two lines of evidence support this

claim. The first is research done using electroencephalography (EEG), which measures cortical brain activity. The second stems from Gray's (1987, 1994) proposed emotion systems, including the behavioral activation system (BAS), which is conceptually related to approach motivation, and the behavioral inhibition system (BIS), which is conceptually related to avoidance motivation.

In EEG studies, anger and joy have been found to be associated with more left-hemispheric brain activity, whereas fear and sadness have been associated with more right-hemispheric brain activity (Davidson & Hugdahl, 1995; Harmon-Jones & Allen, 1998; Harmon-Jones & Sigelman, 2001). Such lateralized brain activity is thought to be related to the approach and avoidance tendencies associated with each emotion. Davidson and Hugdahl (1995) concluded that it is not surprising that emotions are fundamentally related to approach and avoidance tendencies, given that these behaviors are present at all levels of phylogeny during which biological movement arises.

In addition, ratings on a self-report BIS/BAS measure (see Carver & White, 1994) have been linked to emotional predispositions, with positive emotionality and aggressive impulse being linked to the dominance of the BAS (Arnett & Newman, 2000; Matthys, van Goozen, de Vries, Cohen-Kettenis, & van Engeland, 1998; Watson, Wiese, Vaidya, & Tellegen, 1999) and depressiveness and fearful anxiety being linked to the dominance of the BIS (Davidson & Hugdahl, 1995; Schmidt, 1999; Watson et al., 1999). This pattern of data closely corresponds to that of the EEG studies reported above. In summary, given that emotion is fundamentally related to approach and avoidance motivation, it is reasonable to assume that emotional expression functions to convey these basic intents to others.

Emotion Expression and Eye Gaze Taken Together

Despite wide disagreement over whether emotional displays are universal or culturally determined, cognitive or biological in origin, most recent researchers nonetheless seem able to agree that facial expressions can functionally act to forecast an organism's behavioral tendencies (Ekman, 1973; Fridlund, 1994; Frijda & Tcherkassof, 1997; Izard, 1971; Perrett & Emery, 1994; Plutchik, 1980; Russell, 1997). The ability to detect another's intention to approach or avoid us is arguably a principal mediating factor governing social interaction. As previously noted, at a fundamental level, both gaze and emotion are associated with the underlying behavioral tendencies to either approach or avoid, and therefore together likely share the function of signaling these intents.

It is important to note that most of the work done on approach-avoidance behavioral motivations to date concentrates on the *experience*, or response of an observer to some stimulus event (e.g., Cacioppo, Priester, & Berntson, 1993). In the present work, we are instead interested in how such motivational tendencies are *perceived* by an observer. Put differently, we are interested in the behavioral motivation communicated by others. For instance, although observers will likely withdraw from the angry face of another, they will also likely perceive a high likelihood of the expressor to approach them. 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 display.

In summary, gaze behavior and emotion have both been linked to approach and avoidance motivational orientations. Direct gaze, anger and joy, share an approach orientation, whereas averted gaze, fear and sadness, share an avoidance orientation. Thus, it is predicted that when gaze direction matches the underlying behavioral intent communicated by a specific emotion expression, it will enhance the perception of that emotion (referred to here as the *shared signal hypothesis).*

Present Research

The three studies reported below examined the shared signal hypothesis, which specifically stipulates that the congruence in signal value (i.e., the common approach-avoidance behavioral tendency communicated) between gaze direction and facial expression will increase the perception of the underlying emotion communicated by the face. Thus, we predicted that direct gaze would increase the perception of approach-oriented emotions (anger and joy) and that averted gaze would increase the perception of avoidance-oriented emotions (fear and sadness).

Study 1 investigated this hypothesis in the person perception domain by examining the effects of gaze direction on the perception of emotional trait dispositions attributed to neutral facial displays. Study 2 tested the effects of gaze direction on the perception of ambiguous facial expressions (i.e., blended anger and fear expressions) in order to examine the perceptual shift of one emotion over another as a function of gaze direction. Finally, Study 3 was conducted to test differences in perceived emotional intensity in clearly recognizable facial expressions (i.e., anger, fear, sadness, and joy) in order to examine the influence of gaze direction when emotion perception is unambiguous.

Study 1

This study was conducted to explore the effects of gaze direction on person perception with neutral facial displays. Static facial appearance cues and gaze direction have both been shown to impact person perception. A substantial literature exists, for instance, linking both types of cues to the perception of dominance and affiliation (e.g., Argyle & Cook, 1976; Eagly, Ashmore, Makhijani, & Longo, 1991; Fehr & Exline, 1987). Likewise, facial expression cues have been found to drive personality trait inferences (Hess, Sylvie, & Kleck, 2000; Knutson, 1996). Even more relevant to the present work, differences in facial appearance cues alone have been found to influence perceived emotional dispositions (Adams & Kleck, 2002; Laser & Mathie, 1982). Static facial appearance cues found to influence social perception (e.g., pronounced brow, smaller eyes, thinner lips, and a more protrusive chin; see Zebrowitz, 1997) arguably resemble facial expressive cues that are associated with the communication of emotion (e.g., furrowed brow, narrowed eyes, thinned lips, and jutted chin; see Ekman & Friesen, 1978; Marsh, Adams, & Kleck, 2005). For these reasons, it was predicted that attributions of anger, joy, fear, and sadness would be made in response to neutral facial displays as a function of gaze direction even in the absence of overt expressive cues.

Method

Participants. Thirty-five female and 25 male undergraduate students participated in this study for partial course credit. Participants were run in groups of not more than 6 people.

Materials and design. Photographs of 15 women and 15 men were used. All faces were neutral displays (i.e., were devoid of expressive information). Photographs were selected from the Pictures of Facial Affect (Ekman & Friesen, 1976), the JACneuF (Matsumoto & Ekman, 1988), a set developed by Kirouac and Doré (1984), and a set developed by Adams and Kleck (2001). All stimulus persons were of European descent. The photographs were digitized, cropped in order to display only the head and neck of each individual, and printed in black and white on 8.5 × 11 in. (21.6 × 28 cm) white paper at a size of approximately 3 × 4 in. (8 × 10 cm). Two different sets of facial stimuli were constructed, each consisting of 30 photographs. In each stimulus set, half the faces were manipulated to display direct gaze and half averted gaze. Gaze direction was manipulated using Adobe Photoshop. If an exemplar face was presented with direct gaze in one stimulus set, it was presented with averted gaze in the other set. An equal number of participants rated each set. Direction of lateral gaze shift (right or left) was randomly assigned for each averted gaze face.

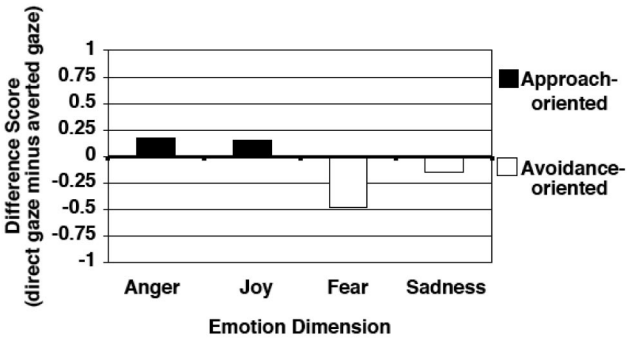

Figure 1. Effects of gaze direction on perceived emotional dispositions. For ease of conceptual interpretation, the dependent variable is reported as a difference score. This was done by subtracting ratings made of averted gaze faces from those made of direct gaze faces. A negative rating indicates a greater perceived attribution of a particular emotion disposition for averted gaze, whereas a positive rating indicates a greater attribution of emotion disposition for direct gaze.

Procedure

Each participant was seated at a separate table and was supplied with one of the two randomized sets of photographs and with a rating booklet and pencil. Participants were asked to rate each of the 30 faces on four emotion scales (Anger, Fear, Sadness, Joy). This resulted in an emotion profile for each face. Ratings were made on 7-point continuous scales ranging from 1 (*not at all frequently*) to 7 (*very frequently*), indicating "how likely the person depicted in the photograph is to *experience* each emotion."

Results and Discussion

It was expected that ratings of approach-oriented dispositions (i.e., anger and joy) would be higher for direct relative to averted gaze stimuli, whereas ratings of avoidance-oriented dispositions (i.e., fear and sadness) would be higher for averted relative to direct gaze faces. In order to test the predicted interaction between gaze direction and perceived emotional disposition, a 4 (anger/joy/fear/sad emotion dimension) × 2 (direct/averted gaze direction) repeated measures analysis of variance (ANOVA) was computed. A main effect for emotion was found, $F(3, 177) = 9.29$, $p < .001$. Inspection of the means indicated that this effect was due to faces being rated lower on fear disposition than on other emotion dispositions (fear = 3.43, anger = 3.88, sad = 3.82, joy = 3.82). A main effect also emerged for gaze, $F(1, 59) = 9.19$, $p < .005$, $r = .37$, such that averted gaze faces were rated as higher overall on likelihood to experience emotion ($M = 3.77$) than were direct gaze faces ($M = 3.69$). Consistent with our expectations, these main effects were qualified by an Emotion × Gaze Direction interaction, $F(3, 177) = 18.64$, $p < .001$. Inspection of the means revealed that this interaction was due to more approach-oriented emotional dispositions (anger and joy) being attributed to direct gaze faces and more avoidance-oriented emotional dispositions (fear and sadness) being attributed to averted gaze faces (see Figure 1).

Next, a planned comparison was used on the basis of the interaction to confirm that approach-oriented emotions (contrast weights: anger = +1 and joy = +1) significantly differed from avoidance-oriented emotions (contrast weights: fear = −1 and sadness = −1) as a function of gaze direction. The outcome of this analysis was significant, $t(59) = 6.06$, $p < .0001$, $r = .62$. The planned comparison explained most of the variance attributable to the effect, though the residual variance still yielded a small Emotion × Gaze interaction, $F(3, 177) = 3.01$, $p < .05$.

Direct *t* tests were then conducted to assess the reliability of these effects within each emotion condition. As predicted, direct gaze ($M = 3.96$, $SE = .106$) relative to averted gaze ($M = 3.79$, $SE = .107$) increased the perceived likelihood of stimulus persons having an angry disposition, $t(59) = 2.41$, $p < .02$, $r = .30$. Similarly, direct gaze ($M = 3.90$, $SE = .090$) relative to averted gaze ($M = 3.75$, $SE = .093$) increased the perceived likelihood of a joy disposition, $t(59) = 2.71$, $p < .01$, $r = .33$. Conversely, averted gaze ($M = 3.67$, $SE = .102$) relative to direct gaze ($M = 3.18$, $SE = .097$) was more associated with a fearful disposition, $t(59) = -6.24$, $p < .0001$, $r = .63$. Likewise, averted gaze ($M = 3.89$, $SE = .080$) relative to direct gaze ($M = 3.75$, $SE = .090$) was also more associated with a sad disposition, $t(59) = -2.40$, $p < .02$, $r = .30$.

This study offers preliminary support for the shared signal hypothesis. Gaze direction systematically influenced the perceived emotion disposition conveyed by the neutral faces. Direct gaze led to more anger and joy dispositional attributions, whereas averted gaze led to more fear and sad dispositional attributions.

Study 2

Having demonstrated that gaze direction can influence the perceived emotional disposition of stimulus persons who are showing no emotional expression, the next step was to examine whether gaze direction would influence which of two emotions are perceived more on a face containing both types of cues. Facial displays of anger and fear were blended to form ambiguous facial expressions. Because the faces used in this study were manipulated to convey anger and fear at relatively equal levels, gaze direction was expected to influence the perception of these emotion cues and therefore to shift the dominance of one emotion over the other in the face. Calder, Young, Perrett, Etcoff, and Rowland (1996)

found that the perception of emotion in ambiguous facial displays shifts abruptly around the midpoint of blends of two different expressions. Therefore, we chose 50/50 blends as our stimuli. Two indices of emotion perception were used in the present study. One index was derived from the percentage of emotion labels applied to the faces and the other from ratings of emotional intensity of each emotion.

Method

Participants. Eighteen female and 10 male undergraduate students were recruited for this study. Participants received partial course credit and came to the laboratory in small groups of no more than 4 people.

Materials and design. Sixteen blends of posed anger and fear expressions were used. Faces were selected from the Pictures of Facial Affect (Ekman & Friesen, 1976) and the Montreal, Quebec, Canada, Set of Facial Displays of Emotion (Beaupré & Hess, in press). These faces were used to generate 8 male and 8 female anger/fear-blended facial expressions using Morph 2.5 software for Macintosh (see Figure 2 for examples). The facial blends were intended to represent approximately equal levels of expressive intensity of the two emotions, anger and fear. The 16 blended images were inspected by a Facial Action Coding System expert (see Ekman & Friesen, 1978) and were verified to be physically viable, ecologically valid expressions. In addition, 16 nonblended ("pure") emotional expressions were included as filler items.

Two sets of stimuli were constructed, each containing 16 anger/fear blends (primary stimuli), plus four anger, four fear, four joy, and four sad unblended expressions (filler stimuli). Filler stimuli were included to take the focus off the comparison of interest. Half these faces were displayed with direct gaze and half with averted gaze; half were male and half were female. The only difference between the stimulus sets was that for the primary stimuli, direct versus averted gaze alternated for each exemplar face across them (i.e., if an exemplar was presented with direct gaze in one stimulus set, it was presented with averted gaze in the other, and vice versa). The order in which gaze direction (direct vs. averted) was presented for the blended faces across the two sets was randomly determined. Gaze direction, however, was constant across sets for the filler items. In addition, whether averted gaze was to the left or to the right was randomly determined for each exemplar face. As in Study 1, gaze was manipulated using Adobe Photoshop. Participants were randomly assigned to one of the two stimulus sets, and an equal number of participants rated each set. Photographs were digitized in black and white and printed at a size of approximately 3 × 5 in. (7 × 12 cm) on separate sheets of 8.5 × 11 in. (21.6 × 28 cm) white paper. Photographs were cropped in order to display only the head and neck of each individual.

Figure 2. Example of blended emotion stimuli with direct and averted gaze. 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 at a separate table and was supplied with one of the two stimulus sets of photographs as well as with a rating booklet and pencil. Participants were instructed to go through the stimulus set in the order in which it was arranged and, for each face, to choose the one emotion label (*anger*, *fear*, *sad*, or *joy*) they felt best described the affect conveyed by each face. After categorizing the face in this way, they were asked to rate on 7-point scales the intensity with which the four emotions of interest were conveyed by each face, where 1 = *not at all intense* and 7 = *very intense*.

Results and Discussion

Analyses examining gaze direction effects are reported below first for the categorical data and then for emotion intensity ratings. These ratings were chosen because they both measure the perceived emotion conveyed by the faces. Predictions were the same for both dependent variables. Thus, when displaying direct gaze, ambiguous facial blends were expected to be given more anger than fear labels and to be rated as expressing anger more intensely than fear. However, when displaying averted gaze, the facial blends were expected to be given more fear than anger labels and to be rated as expressing fear more intensely than anger.

Categorical Data

An emotion categorization index was computed by averaging the proportion of anger and fear labels applied to the blended expressions for each observer. Using this categorization index, we computed four Wilcoxon signed-ranks test (for nonparametric data). The first set of comparisons investigated differences in the labeling of each emotion (anger or fear) across the two gaze conditions. As expected, more anger labels were given to emotion blends displaying direct gaze ($M = .42$, $SE = .05$) than to emotion blends displaying averted gaze ($M = .24$, $SE = .04$), $Z(27) = 2.79$, $p < .005$. However, fewer fear labels were given to emotion blends displaying direct gaze ($M = .41$, $SE = .04$) than to emotion blends displaying averted gaze ($M = .68$, $SE = .04$), $Z(27) = -4.03$, $p < .0001$. The second set of comparisons investigated differences in the proportion of anger and fear labels applied within each gaze condition. When displaying direct gaze, emotion blends were equally likely to be labeled anger or fear, $Z(27) = -.06$, *ns*. When displaying averted gaze, however, emotion blends were more often given fear labels than anger labels, $Z(27) = -3.86$, $p < .0001$ (see Figure 3A).

Intensity Data

A 2 (anger/fear emotion) × 2 (direct/averted gaze) repeated measures ANOVA was conducted on ratings of perceived emotional intensity. A main effect resulted for gaze direction, $F(1,$

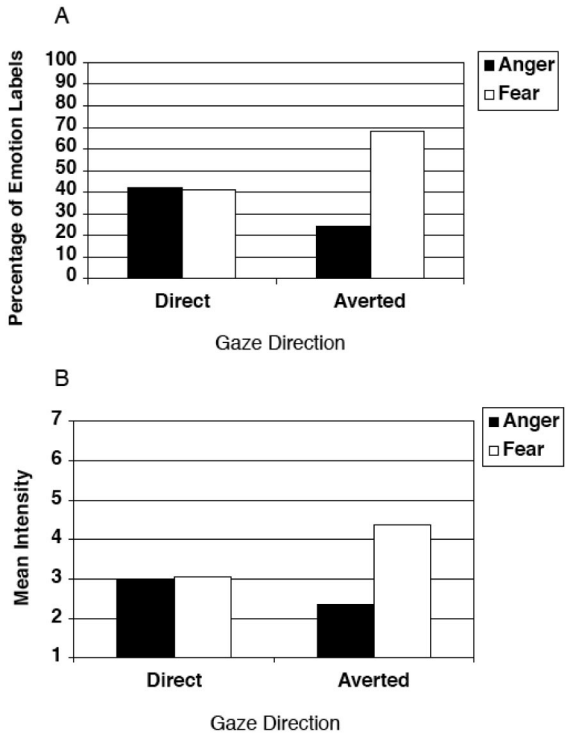

Figure 3. Perceived emotion in blended expressions as a function of gaze direction (categorical index [A] and continuous ratings [B]).

27) = 17.79, $p < .0001$, $r = .54$, such that averted gaze faces ($M = 3.37$, $SE = .15$) were rated as more emotionally intense than were direct gaze faces ($M = 3.01$, $SE = .13$). A main effect emerged for type of emotion, $F(1, 27) = 14.00$ $p < .001$, $r = .42$, such that fear was perceived as more intense ($M = 3.70$, $SE = .19$) than was anger ($M = 2.67$, $SE = .19$). These main effects were qualified by the predicted interaction between emotion and gaze direction, $F(1, 27) = 17.20$, $p < .0001$, $r = .66$. An inspection of the means revealed the predicted shift in dominance of one emotion over the other as a function of gaze direction (see Figure 3B).

Anger was rated as more intense on the emotion-blended faces displaying direct gaze ($M = 2.98$, $SE = .21$) than on these same faces displaying averted gaze ($M = 2.36$, $SE = .27$), $t(27) = -2.19$, $p < .05$, $r = .36$. However, fear was rated as more intense on faces displaying averted gaze ($M = 4.37$, $SE = .23$) than on faces displaying direct gaze ($M = 3.04$, $SE = .21$), $t(27) = 6.34$, $p < .0001$, $r = .82$. As with the categorical data, we also expected gaze direction to influence perceived emotional intensity within each emotion condition. When displaying direct gaze, there were no differences in how intensely anger and fear expressions were rated, $t(27) = -0.18$, *ns*. As anticipated, however, when displayed in conjunction with averted gaze, emotion blends were rated as more intensely fearful than angry, $t(27) = 4.26$, $p < .0001$, $r = .63$.

The differences in types of emotion labels given, and in rated intensity, across gaze direction conditions offer additional support for the shared signal hypothesis. As noted above, anger/fear blends with direct gaze were equally as likely to be labeled as fearful or angry, and at equal levels of intensity. This is not entirely surprising given that the faces used in this study were taken from sets that had been standardized to include emotional expressions of relatively equal expressive intensity on the basis of direct gaze displays. The implication of these results is that when equating the intensity of fear and anger expressions using direct gaze poses, fear expressions must be physically more intense than anger expressions in order to override the inconsistent cue provided by gaze direction in the case of the former. The dramatic shift for anger and fear perceptions in the averted gaze condition supports this interpretation and demonstrates how powerful an influence gaze direction can have in emotion perception. Study 3 was therefore conducted to examine whether gaze direction would influence the perception of unambiguous emotion displays.

Study 3

This study introduced a paired-face paradigm in which a series of two facial displays, identical in all ways other than gaze direction (direct vs. laterally averted), were presented. According to the shared signal hypothesis, it was predicted that direct gaze would increase the perceived intensity of approach-oriented emotions (anger and joy), whereas averted gaze would increase the perceived intensity of avoidance-oriented emotions (fear and sadness). In addition, previous research has demonstrated that at lower levels of expressive intensity, there is greater perceived emotion ambiguity (Hess, Blairy, & Kleck, 1997). Thus, we also varied the expressive intensity of the faces as well in order to examine whether this might impact the influence of gaze direction in emotion perception.

Method

Participants. Twenty-four female and 12 male undergraduate students were recruited from an introductory psychology course. These volunteers received partial course credit and came to the laboratory in groups of no more than 6 people.

Materials and design. Three female and three male target faces were selected from the Pictures of Facial Affect (Ekman & Friesen, 1978). Each displayed four prototypical emotional expressions: anger, fear, sadness, and joy. Facial displays of each emotion were manipulated to exhibit three levels of expressive intensity (50%, 75%, and 100% of the original expression). These stimuli were generated using Morph 2.5 software for Macintosh, which was used to interpolate between neutral and highly intense emotional expressions. This morphing technique has been previously used and validated (e.g., Hess et al., 1997; Young et al., 1997).

Each pair of facial stimuli was printed on 8.5 × 11 in. (21.6 × 28 cm) white paper (each face was approximately 3 × 4 in. [8 × 10 cm] in size). One face was placed above the other, and the otherwise identical photographs were manipulated to display either direct or averted gaze using Adobe PhotoShop (see Figure 4). Direction of averted gaze (left or right) was randomly determined for each averted gaze face, as was the placement of each photograph on the page (top or bottom). Twelve filler photograph pairs were also used. These were chosen from the same set of faces described above, only they depicted left versus right gaze pairs with no direct gaze faces included. This was done to divert attention from the comparison of interest (see description of cover

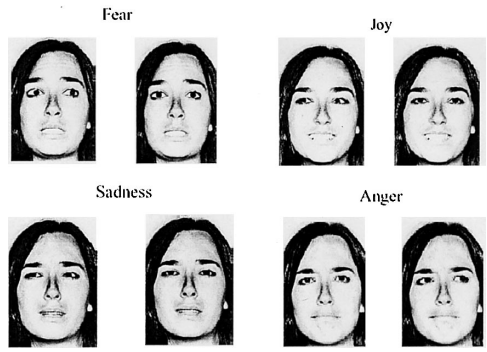

Figure 4. Example facial stimuli used in the paired face paradigm. From Pictures of Facial Affect, by P. Ekman and W. V. Friesen, 1976, Palo Alto, CA: Consulting Psychologists Press. Copyright 1976 by Paul Ekman. Reprinted with permission.

story below). In total, each participant viewed 24 pairs of faces, 12 of which represented a subset of the set of 72 pairs that were of primary interest. Thus, a total of six separate stimulus sets were prepared, each containing photographs representing the three intensity levels for each of the four emotional expressions of interest. Each stimulus was rated by an equal number of participants.

Each photograph was rated along 7-point scales for each emotion dimension (i.e., four scales anchored by 1 = *not at all* angry/fearful/sad/joyful and 7 = *very* angry/fearful/sad/joyful). These emotional magnitude scales were used to measure the perceived emotional intensity of the faces, and each face was rated on all four emotion dimensions. Note that this study was concerned with the effects of gaze on the perceived intensity of clear emotional expressions. Thus, an emotion label was provided for each stimulus pair indicating the emotion that was intended or posed by the face. This was done to ensure that differences in perceived emotional intensity were not the result of a face being interpreted as an entirely different emotion. We felt that these conditions set a stringent test of the hypothesis. Because participants made direct comparisons, we computed a difference score by subtracting ratings for averted gaze faces from direct gaze faces. Thus, negative ratings indicate an increased perceived intensity for an emotion when displayed on averted gaze faces, whereas positive ratings indicate increased perceived intensity for the direct gaze faces.

Procedure. Each participant was seated at a separate table and was supplied with one of the six stimulus sets of photographs as well as with a rating booklet and pencil. Participants first read a brief description of conjugate lateral eye movement (CLEM) research, our cover story. It stated that the purpose of the present study was to examine the effects of left versus right gaze aversion on the decoding of facial affect. Within this ostensible framework, direct gaze was purported to be included merely for the sake of generating a baseline against which to compare the ratings of left- and right-averted gaze faces. Participants were then asked to rate each face in the pair on four separate emotion scales (Anger, Fear, Sadness, and Joy). They were asked to rate both photographs in each pair separately without using the same numeric rating for both photographs in the pair.[1] Thus, each face received a rating on each emotion dimension, thereby generating an emotion profile for each face (i.e., each face, regardless of intended emotion, had corresponding ratings on all four emotion dimensions). During debriefing, only 2 participants claimed to have heard of CLEM before this study, and all participants stated that they believed the purpose of the study was to examine right versus left gaze aversion on facial affect processing.

Results and Discussion

Emotion profile ratings. The physical expressive intensity of emotional displays did not interact with gaze direction and emotional expression as anticipated and therefore was dropped from further analyses.[2] Recall that participants rated each face on all four emotion dimensions; therefore, the analyses reported below used the mean emotion dimension ratings collapsed across all facial displays. In order to test the hypothesis that gaze would differentially influence intensity judgments of emotional expressions, a one-way repeated measures ANOVA was computed with four levels (i.e., anger/joy/fear/sad emotion dimensions). The dependent variable of interest was computed as a difference score (i.e., ratings of direct gaze faces minus ratings of averted gaze faces). Thus, positive scores mean that a particular emotion was rated as more intense in the direct gaze condition, whereas negative scores mean that a particular emotion was rated as more intense in the averted gaze condition.

As predicted, a main effect for the difference scores from each emotion condition was found, $F(3, 105) = 40.68$, $p < .0001$ (see Figure 5). A planned comparison was used to directly test the hypothesis that ratings of approach-oriented emotions (anger and joy) would significantly differ from ratings of avoidance-oriented emotions (fear and sadness) as a function of gaze direction (contrast weights: anger = +1, joy = +1, fear = −1, sadness = −1). The outcome of this analysis was highly significant, $t(35) = 10.05$, $p < .0001$, $r = .86$. Furthermore, the residual variance remaining

[1] An initial pilot study revealed that without the forced-choice component in this paradigm, a majority of participants became confused about the purpose of the task and simply gave the same numeric rating for both faces in each pair for every rating. These participants later reported that they responded this way because the faces presented were in fact exactly the same except for gaze direction, revealing that they had missed that the purpose of the task was to gauge perceived not actual differences in the faces. When asked whether the forced-choice component of the task would help clarify it, most participants reported that they believed it would, which is why we included it here.

[2] Recall that the expressive intensity of facial displays was morphed to represent 50%, 75%, or 100% of the original expressive intensity of the facial poses. It was expected that there would be a positive linear relationship between the morphed expressive intensity of the facial displays and the perceived intensity of emotion conveyed. Consistent with this prediction, a linear contrast showed a clear positive monotonic relationship between morphed and perceived intensity, $t(35) = 2.47$, $p < .02$, $r = .39$. The lack of a quadratic contrast, $t(35) = .002$, $p = .97$, further supports the stepwise nature of the linear contrast. Because of increased perceptual ambiguity at lower levels of physical intensity (see Hess, Blairy, & Kleck, 1997), it was predicted that the effects of expressive intensity would interact with gaze direction and emotion type, which was not supported here. One conclusion may be that we actually undermined the predicted influence of physical expressive intensity by labeling the expression, thereby eliminating ambiguity. Alternatively, ambiguity may not enhance the influence of gaze in emotion perception unless there are clearly conflicting cues in the face, as was the case in Study 2.

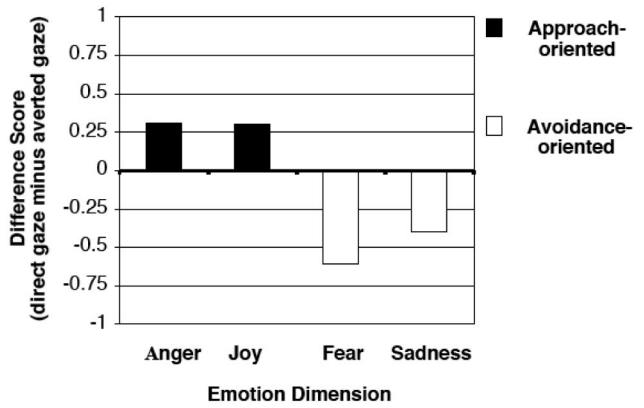

Figure 5. Effects of gaze direction on perceived emotional intensity. Note that the dependent variable was computed by subtracting emotional intensity ratings made of averted gaze faces from those made of direct gaze faces. Therefore, a negative rating indicates increased perceived emotional intensity for averted gaze faces, whereas a positive rating indicates increased perceived emotional intensity for direct gaze faces.

after the planned comparison for the Emotion Type × Gaze Direction interaction was not significant, $F(3, 105) = 1.31$, *ns*.

Finally, *t* test comparisons were conducted to examine the reliability of these effects for each emotion separately. Consistent with the approach-avoidance signal value hypothesis, anger was rated as more intense when coupled with direct gaze ($M = .31$, $SE = .08$), $t(35) = 3.70$, $p < .001$, $r = .29$, as was joy ($M = .30$, $SE = .05$), $t(35) = 5.55$, $p < .0001$, $r = .68$. However, fear was rated as more intense when coupled with averted gaze ($M = -.61$, $SE = .07$), $t(35) = -8.81$, $p < .001$, $r = .83$, as was sadness ($M = -.40$, $SE = .07$), $t(35) = -5.93$, $p = .0001$, $r = .71$.

These results provide additional evidence for the shared signal hypothesis under very stringent conditions. Direct gaze enhanced the perceived intensity of pure expressions of anger and joy, whereas averted gaze enhanced the perceived intensity of pure expressions of fear and sadness.

General Discussion

It has been previously argued that direct gaze is likely involved in the communication of increased emotional intensity, regardless of the particular emotion being expressed (e.g., Argyle & Cook, 1976; Kimble, Forte, & Yoshikawa, 1981; Kimble & Olszewski, 1980; Kleinke, 1986; Webbink, 1986). This notion has intuitive appeal. Eye contact communicates to an observer that he or she is the object of another's attention and therefore the possible target of whatever emotion is being displayed (Cary, 1978). Thus, when the facial display of a conspecific is directed at oneself, engaging in heightened perceptual processing of that display arguably has clear adaptive utility. Such processing may, for example, increase the probability of an accurate assessment of the expressor's behavioral intent and would therefore help ensure a timely behavioral response if needed (e.g., fight or flight). Recent research demonstrates that direct gaze does in fact enhance the processing efficiency of identity information conveyed by the face (Macrae et al., 2002). If direct gaze captivates the attentional resources of an observer, then such a mechanism may arguably also facilitate the processing of other types of facial information, including facially expressed emotion.

Despite the intuitive appeal of the long-standing notion that direct gaze may facilitate emotional expression processing, the present research demonstrates that the way in which gaze direction influences emotion perception actually depends on the specific type of emotion in question, whereas for some emotions, direct gaze enhances perception; for other emotions, averted gaze does. One explanation for the present pattern of findings is derived from the conceptual framework outlined in the introduction that both emotional expression and gaze behavior communicate basic behavioral motivations to approach or avoid. Thus, when congruent in signal value, gaze direction acts to enhance the perception of emotion communicated by the face. It is important to note that we neither directly measured the approach-avoidance signal value of our facial displays nor tested this construct as a mediating variable. The strength of this argument relies on the predictive value of our a priori hypotheses and the link these have to a broader conceptual framework. It is reasonable and profitable, therefore, to consider other possible explanations for these findings.

One such alternative explanation is that the effects of gaze direction on facial affect perception are driven by shared attributions of social dominance. Anger and joy expressions, for example, are not only approach-oriented emotions per se but also they are both associated with perceptions of trait dominance (Hess et al., 1997; Knutson, 1996), as is direct eye contact (Argyle & Cook, 1976). To examine this possibility, work is currently underway to examine whether approach-avoidance perception is a mediator of dominance perception, or vice versa. Another plausible explanation for our results stems from the natural co-occurrence of these behaviors. The findings reported here may be the product of a decision-making process related to the availability of information regarding the pairing of these cues. In other words, our interpretation of emotion in the face may vary as a function of gaze direction simply because we are used to seeing certain patterns of gaze direction co-occur with certain emotional displays. Seeing these cues paired differently may violate our expectations. This explanation is plausible particularly for Studies 1 and 2 in which the emotion communicated by the face was ambiguous. Finally, it is possible that separate explanations may account for the effect of gaze on each emotion. Perhaps, for example, gaze direction influences anger and fear because it indicates the source of threat (i.e., as part of an early warning mechanism), whereas for joy and sadness, gaze may simply be a social signal indicating a tendency for social engagement. In this example, averted gaze may enhance the perception of fear because it helps indicate the source of potential threat via joint attention (see Driver et al., 1999), whereas averted gaze may enhance the perception of sadness because it indicates social withdrawal and dejection. All of these potential explanations await future research attention and conceptual clarification.

Also important to address is what mechanism underlies the influence of gaze direction on emotion perception or interpretation. One potential mechanism is that gaze direction influences the perceptual salience of emotion-related cues in the face. Put differently, direction of gaze may make more conspicuous emotional cues in the face that are consistent with its signal value, whether this be approach-avoidance or dominance-submission. This explanation is consistent with both the differences in interpretation of

emotion in ambiguous facial displays (see Studies 1 and 2) and also the increased perceived magnitude of emotion in unambiguous facial displays (see Study 3). Another possible mechanism is that gaze direction is not processed as a separate cue from facial expression at all, but rather is part of the overall constellation of facially expressive cues that constitute what we perceive as a facial expression. Thus, rather than wielding an influence on how emotion cues are processed or interpreted in the face, gaze direction may itself be an important aspect of the emotional expression, thereby contributing to the overall emotion that is perceived (along with knitted brow, thinned lips, etc.). Finally, as previously noted, it is possible that these effects are driven by expectations surrounding what types of gaze behavior people believe tend to accompany specific types of emotional expressions, rather than by actual perceived differences in such emotion cues. As previously noted, as part of a decision-making process, this explanation could account for the differences in interpretation found in Studies 1 and 2, in which emotion cues are ambiguous and gaze could be used to help clarify the emotion expressed. Note that the natural co-occurrence of these cues over time could also arguably have led to gaze direction becoming an integral part of the emotional expression itself, thus influencing perception directly. This account would then also explain the differences found for perceived intensity in Study 3 to highly prototypical expressions.

Importantly, recent evidence demonstrates that gaze direction influences how efficiently unambiguous emotional expressions are processed in a speeded reaction time paradigm (Adams & Kleck, 2003), which suggests a process more primary than that found at the decision-making level. Clearly issues remain surrounding whether gaze direction should itself be considered part of the constellation of cues that are integrated in emotion communication, whether it informs a more general decision-making process or whether it acts as a separate cue that interacts with the emotion cues conveyed by the face. These questions reveal the need for continued research efforts investigating the influence of gaze direction in affect and person perception and highlight the importance of considering gaze direction as a primary variable of interest in this work.

By clarifying the role and meaning of socially relevant facial cues (i.e., facial affect and gaze direction), future research combining these cues may potentially resolve previous apparent discontinuities in the facial affect literature. For example, behavioral studies suggest that we may be innately prepared to process anger expressions (e.g., Fox et al., 2000; Hansen & Hansen, 1988; Öhman, Lundqvist, & Esteves, 2001). This finding is consistent with neurophysiological evidence implicating the amygdala in the preferential processing of potentially threatening stimuli (LeDoux, 1996). Yet, brain-imaging work reveals a more robust amygdala response to fear than to anger facial displays (e.g., Whalen, 1998). The fact that gaze influences the clarity and strength of expressed emotional communication may help explain these seemingly disparate results. For instance, based on the postulated role of the amygdala in the processing of ambiguously threatening stimuli (see Whalen, 1998), research efforts have already demonstrated that the amygdala is differentially responsive to anger and fear expressions as a function of gaze direction (Adams, Gordon, Baird, Ambady, & Kleck, 2003).

By merging two divergent areas of inquiry, the present research supports a mechanism by which gaze direction and facial expressions meaningfully combine or interact in social perception. In the present work, gaze direction influenced the perception of facial expressions of emotion and of attributions of emotional dispositions to neutral facial displays. The pattern of results across all three studies suggests that the means of influence for gaze direction may be a shared signal value, perhaps of approach-avoidance, upon which more complex social inferences are formed.

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