

SOCIAL JUDGMENTS ARE INFLUENCED BY BOTH FACIAL EXPRESSION AND DIRECTION OF EYE GAZE

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In the current study we examined how emotional expressions influence two social judgments, approachability and trustworthiness, and how the effect of emotional expression is modulated by the direction of the signaller's eye gaze. For both social judgments, happy faces were judged more positively than all other emotions, while neutral faces were judged more favorably than faces displaying negative emotions. Angry and disgusted faces were given the most negative ratings, significantly more so than sad and fearful faces. Direction of eye gaze modulated the degree to which angry, happy, and neutral expressions influenced social judgments, which reflected the manner in which direction of eye gaze influenced the perceived intensity of these emotional expressions. The results suggest that the perception of direct threat, coupled with emotional intensity, both play a key role in the process of making social judgments.

In our daily lives we continually make judgments about other individuals that influence our subsequent social behavior. When individuals are unknown to us, their facial appearance becomes one of the most salient social indicators. In particular, an individual's facial expression signals important information regarding their internal state and behavioral intentions (Ekman, 1997). Utilizing this

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information is pertinent to the ability to regulate social behavior appropriately and deficits in the ability to accurately recognize emotional expressions can have dramatic ramifications on an individual's capacity to engage appropriately in the social world (Blair, 2003).

There has been a recent focus on investigating how people make social judgments, such as whether to approach or avoid others, from an individual's general facial appearance (Bar, Neta, & Linz, 2006; Oosterhof & Todorov, 2009; Richell et al., 2005; Todorov, Baron, & Oosterhof, 2008; Todorov, Said, Engell, & Oosterhof, 2008; Winston, Strange, O'Doherty, & Dolan, 2002). Two of the most studied social judgments are those of approachability, which assesses the likelihood of moving towards another individual, and trustworthiness, which assesses the reliability of another individual. Studies have typically presented faces displaying emotionally neutral expressions, and have shown that individual faces tend to vary in both their perceived approachability and trustworthiness (Adolphs, Tranel, & Damasio, 1998). These studies with affectively neutral faces have also shown that approachability and trustworthiness judgments are moderately¹ correlated (Adolphs et al., 1998), suggesting that the precise information used to guide these judgments might differ to some degree. In this study, we examined ratings of both trustworthiness and approachability, as the extent to which social cues such as emotional expression and eye gaze differentially influence these social judgments is yet to be explored.

The capacity to make appropriate social judgments has been shown to be impaired in people with bilateral amygdala lesions (Adolphs et al., 1998) and other individuals with disorders characterized by abnormal amygdala functioning, such as autism, schizophrenia, and Williams syndrome (Bellugi, Adolphs, Cassady, & Chiles, 1999; Frigerio et al., 2006; Hall et al., 2004; Jones et al., 2000). The involvement of the amygdala in the process of making social judgments may reflect the important role the amygdala plays in the processing of emotionally salient stimuli and events, especially when related to threat (see Vuilleumier, 2005, for a review). The evaluation of potential threat in particular, appears to be central to the process of making a social judgment (Adolphs, 2002, 2003).

In line with the proposal that the perception of threat plays an important role in making social judgments, studies have demonstrated that emotionally-neutral faces perceived to be displaying anger are evaluated more negatively than emotionally-neutral faces perceived to be displaying other emotions (Oosterhof & Todorov, 2009; Richell et al., 2005; Winston et al., 2002). Two recent studies examining how distinct facial expressions influence approachability judgments to emotional faces have also demonstrated that threatening faces (in particular, angry faces) were rated as less approachable than other negative expressions (e.g., sadness), positive expressions (e.g., happiness) and neutral nonexpressive faces (Porter, Coltheart, & Langdon, 2007; Willis, Palermo, & Burke, in press).

Of interest, not all potentially threatening faces appear to be equally unapproachable. Specifically, angry faces were considered less approachable than fearful faces

1. We note that this correlation is moderate when compared to a maximum possible correlation of 1.0. However, as noted by Yovel and Kanwisher (2008) the maximum possible correlation between two tests is not 1.0, but determined by the reliability of the two tests. As such, when the upper bound of correlation is unknown then a "moderate" correlation does not necessarily imply that approachability and trustworthiness are different constructs.

(Porter et al., 2007). Angry faces may be considered more threatening (and thus less approachable) because they signal a direct threat, in the form of aggression towards the individual decoding the emotion, whereas facial expressions of fear typically signal an indirect threat, indicating the presence of threat in the environment, the source of which is ambiguous and therefore is unlikely to be perceived as directly threatening (Ewbank et al., 2009). Disgusted faces, like angry and fearful faces, can also be considered threatening. However, no previous studies have examined how disgusted faces influence social judgments. Predictions regarding how disgusted faces would influence social judgments are not immediately obvious, because disgusted faces can signal indirect threat in the form of physical contamination, such as bodily waste products (Anderson, Christoff, Panitz, De Rosa, & Gabrieli, 2003) or a direct threat when elicited in response to socio-moral violations, such as paedophilia (Miller, 2004). In this study, we examined social judgments given to disgusted faces. If disgusted faces were perceived to signal an indirect threat, then we would expect them to be rated as approachable/trustworthy as fearful faces. On the other hand, if disgusted faces were seen as conveying a direct threat to the observer, we would expect them to produce judgments more like those made to angry faces.

Facial expressions of emotion not only signal threat, but also signal an individual's behavioral intention to approach or avoid another. For instance, facial expressions of anger and happiness are argued to be approach-oriented, that is, an angry or happy person is likely to approach another individual, whereas facial expressions of fear and sadness are thought to be avoidance-oriented, such that a fearful or sad person is likely to avoid another (Davidson & Hugdahl, 1995). Todorov (2008) argues that a key aspect of making a social judgment involves determining another individual's approach/avoidance orientation. Thus, the perception of emotion, as it signals the other person's behavioral intention to approach or avoid, will subsequently influence the particular social judgment ascribed to an individual (Todorov, 2008).

Like an individual's facial expression, the direction of one's eye gaze is also a salient social signal. Adams and Kleck (2005) contend that an individual's direction of eye gaze also reflects their behavioral intention to approach or avoid others, such that direct gaze is likely to be associated with approach motivation, whereas averted gaze is typically associated with avoidance motivation. Moreover, direction of eye gaze is thought to interact with one's facial expression, such that the perceived intensity and speed of correct recognition of approach-oriented emotions (i.e., anger and happiness) is enhanced for faces displaying direct eye gaze, whereas faces thought to portray an avoidance orientation (i.e., sad and fearful) are perceived as more intense and categorized more efficiently when displaying averted eye gaze (Adams & Kleck, 2003, 2005).

The finding that direct eye gaze enhances the perception of anger has been replicated in a number of studies (Bindemann, Burton, & Langton, 2008; Graham & LaBar, 2007; Sander, Grandjean, Kaiser, Wehrle, & Scherer, 2007). In contrast, evidence suggesting that the processing of fearful and sad expressions is enhanced with averted gaze is less convincing, with some studies finding the opposite, that is, enhanced processing of fearful and sad faces with direct gaze or failing to show evidence of an influence of eye gaze on perception of these faces (Bindemann et al., 2008; Graham & LaBar, 2007). Similarly, mixed findings have been reported for the effect of eye gaze on the perception of happiness, with some studies demonstrating

enhanced processing of happy faces with direct eye gaze but others failing to demonstrate modulation by gaze direction (Bindemann et al., 2008; Sander et al., 2007). No previous studies have explored how the direction of a signaller's attention modulates the perception of disgusted faces. Adams and Kleck (2005) have proposed that disgusted expressions signal an avoidance orientation, suggesting that averted gaze would enhance perception of disgusted faces. While no studies have examined how direction of eye gaze modulates perception of neutral faces, head direction has been shown to influence recognition of neutral faces, with forward facing faces recognized more accurately than averted faces (Hess, Adams, & Kleck, 2007), suggesting that neutral faces may be considered approach-oriented like angry and happy faces.

In the current study, we explored the extent to which the process of making social judgments of approachability and trustworthiness reflects an evaluation of one's approach/avoidance orientation. As both facial expressions and eye gaze are understood to signal an individual's approach/avoidance motivation (Adams & Kleck, 2003, 2005), the trustworthiness and approachability of angry, disgusted, fearful, sad, happy, and neutral faces, with both direct and averted gaze, were evaluated in the current study. Thus, in addition to clarifying how emotional expressions influence the precise social judgments ascribed to one's facial appearance, we also examined the interaction of eye gaze and emotional expression when making these social judgments. We anticipated that angry faces, as they signal an approach orientation, would receive more negative social judgments when displaying direct than averted eye gaze. In contrast, we expected that happy and neutral faces, which apparently signal an approach orientation would receive more favorable social judgments when displaying direct eye gaze than averted eye gaze. We also expected that disgusted, fearful faces and sad faces, which are thought to signal an avoidance orientation, would be judged more negatively with averted eye gaze than direct eye gaze.

We also collected emotion recognition and emotional intensity ratings for these faces. There is evidence to suggest that the perception of emotional intensity is significantly correlated with the precise social judgment ascribed to a face. For instance, the perception of negative emotion (e.g., anger, fear, sadness) from affectively neutral faces has been associated with more negative social judgments, whereas the perception of happiness is associated with more positive social judgments (Richell et al., 2005; Winston et al., 2002). Given that direction of eye gaze has been found to modulate emotional intensity and emotion recognition of certain facial expressions (Adams & Kleck, 2003, 2005; Bindemann et al., 2008; Graham & LaBar, 2007; Sander et al., 2007), it was important to collect these ratings, as this would enable us to ascertain if the effect of eye gaze on these social judgments reflected its effect on emotion recognition and/or the perception of emotional intensity.

To summarize, in the current study we sought to further our understanding of the precise type of information extracted from a face that determines an individual's perceived approachability and trustworthiness, by examining how emotional expressions and eye gaze influence these social judgments. Specifically, we sought to contrast social judgments of approachability and trustworthiness between emotional categories, in particular the threatening categories of anger, disgust, and fear. We also intended to establish how the signaller's eye gaze modulated approachability and trustworthiness judgments given to distinct emotional faces.

METHOD

PARTICIPANTS

Eighty-two undergraduate students participated in this study for course credit. We predicted that differential effects of emotional expression and eye gaze upon the two social judgments would be more likely to be apparent with a between-subjects design. Thus, 42 participants (21 female), whose ages ranged from 18 to 37 ($M = 22.21$, $SD = 4.37$) rated approachability, while an additional 40 participants (20 female), whose ages ranged from 18 to 47 ($M = 22.27$, $SD = 6.34$) rated trustworthiness.

STIMULI

The stimuli were photographs of the faces of 20 different individuals (ten female), each displaying an angry, disgusted, fearful, happy, sad, and neutral expression, for a total of 120 faces. The faces were taken from the Karolinska Directed Emotional Faces (KDEF) database (Lundqvist, Flykt, & Öhman, 1998). We created two stimulus sets, each set comprised 20 individual faces displaying each of the six emotional expressions, half of these individual faces were presented with direct gaze, while the other half displayed averted gaze; half were male and half were female. If an individual face was presented with direct gaze in stimulus set one, they were presented with averted gaze in the stimulus set two and vice versa. In addition, whether averted gaze was to the left or to the right was randomly determined for each face. Gaze was manipulated using Adobe Photoshop by moving the irises to the left (or right) of both eyes. Examples of the stimuli are displayed in Figure 1. Participants were randomly assigned to one of the two stimulus sets, and an equal number of participants rated each set.

The faces (256 grey levels, 72 ppi) were scaled to be the same size, covering a visual angle of $5.2^\circ \times 7.6^\circ$. Stimulus presentation was controlled using Superlab (Cedrus Corp.) and viewed on a 17-inch monitor (screen size, 1024×768 pixels) on Dell OptiPlex GX745 computers, at a viewing distance of approximately 60 cm.

SOCIAL JUDGMENT TASKS

Approachability. We used an approachability task that has been used in our research previously (Willis et al., in press; Willis, Palermo, Burke, McGrillen, & Miller, 2010). Participants were instructed to imagine being on a crowded street on their way to meet a friend. They were asked to pretend that they were lost and in a hurry and as a consequence, needed to ask someone for directions in order to meet their friend on time. They were asked to imagine seeing each face in the crowd and to indicate the extent to which they agreed with the following statement "I would approach this person to ask for directions."

Trustworthiness. We devised a trustworthiness scenario, matched in detail and complexity to the approachability task, in which participants were asked to indicate whether they would trust a stranger with their camera. Participants were instructed to imagine being on a crowded street while on holiday. They were asked to pretend that they had been taking photographs of a famous monument, when a stranger offers to take a photograph of them in front of the monument with their



FIGURE 1. Example stimuli showing angry, disgusted, fearful, happy, neutral, and sad facial expressions with direct (top) and averted (bottom) eye gaze. Stimuli displaying both left and right averted eye gaze were presented in the experiment.

camera. For each face, they were asked to imagine that this person offered to take a photograph of them with their camera and to indicate the extent to which they agreed with the following statement. "I would trust this person with my camera."

In both the approachability and trustworthiness tasks, the faces were presented one at a time on a white background, in a randomized order. Responses were made on a 9-point Likert scale from -4 (strongly disagree) to $+4$ (strongly agree). The face, statement, and scale remained on the screen until a response was made. Participants were asked to use the full range of the scale when completing the task.

Comparison of Tasks with those of Adolphs et al. (1998). To date, the most widely used measures of approachability and trustworthiness are those developed by Adolphs and colleagues (1998). When judging approachability, participants are asked to indicate how much they would want to walk up to each person and strike up a conversation. When judging trustworthiness, participants are asked to imagine trusting each person with either all their money or with their life. When participants rate the trustworthiness and approachability of neutral faces, these two measures are moderately correlated ($r = .52$, Adolphs et al., 1998).

Although people have judged approachability and trustworthiness with these scenarios, we did not feel that they were very realistic, and thus we employed scenarios that were more indicative of the situations we encounter in our daily lives. To ensure that the correlation between trustworthiness and approachability with our scenarios were similar to those of previous studies we collected approachability and trustworthiness ratings from 46 students (36 female), whose ages ranged from 18 to 51 ($M = 24.17$, $SD = 9.25$) when viewing 100 neutral faces from the Karolinska Directed Emotional Faces (KDEF) database (Lundqvist et al., 1998) and the Radboud Faces Database (RAFD, Langner et al., 2010). Each participant rated the 100 faces on both social judgments. Task order was counterbalanced between subjects.

We used the same analysis of Adolphs and colleagues (1998), in which each individual subject's correlation between the two social judgments (across the 100 faces) was averaged across participants (Adolphs, personal communication, April 18, 2010). We also obtained a moderate correlation, ($r = .56$) between our two measures, which was not significantly different to the correlation reported by

Adolphs et al. ($r = .52$, Fisher's z transformation, $z = .26$, $p = .795$), indicating that the correlation between our two measures was comparable to that of Adolphs et al.

Emotion Recognition and Intensity Rating Task. After judging the approachability or trustworthiness of the faces, participants then judged the expression and rated the emotional intensity of each of the faces. Participants were shown each face again and were asked to indicate whether the expression displayed on the face was angry, disgusted, fearful, happy, neutral, or sad. Participants selected an appropriate emotion label from the six options, which were displayed below each face until a response was made. We assessed the intensity with which the participants perceived the chosen emotion was displayed in the face by asking participants to rate on a 7-point scale the intensity with which the selected emotion was conveyed by each face, where 1 was *not at all intense* and 7 was *very intense*.

RESULTS

SOCIAL JUDGMENT RATINGS

Mean approachability and trustworthiness ratings are displayed in Figure 2. A three-way mixed model ANOVA was conducted on the mean social judgment ratings with the within subjects factors of Gaze (direct, averted) and Emotion (angry, disgusted, fearful, happy, neutral, and sad) and the between subjects factor of Judgment (approachability, trustworthiness). The Greenhouse-Geisser epsilon adjusted value is reported in all instances where the sphericity assumption was violated. All subsequent planned comparisons were Bonferroni corrected.

There was a significant main effect of Emotion, $F(2.75, 220.00) = 588.48$, $p < .0005$, $\eta_p^2 = .88$. Pairwise comparisons were conducted between each emotional category to examine our first aim, which was to explore how social judgments differ between distinct emotional categories. As shown in Figure 2, happy faces were judged more favorably than faces of all other expressions, $t(81) > 16.28$, $p < .0005$, $d > 1.78$, for all comparisons. In contrast, angry and disgusted faces were rated more negatively than faces of other emotions, $t(81) > 12.88$, $p < .0005$, $d > 1.00$, for all comparisons. There was no significant difference in ratings given to angry and disgusted faces, $t(81) < 1$. Neutral faces were rated significantly more positively than fearful and sad faces, $t(81) > 13.65$, $p < .0005$, $d > 1.64$, for both comparisons. There was no significant difference in ratings given to sad and fearful faces, $t(81) = 1.74$, $p > .05$.

As a significant Emotion \times Judgment interaction emerged, $F(2.75, 220.00) = 4.36$, $p < .0005$, $\eta_p^2 = .05$, we considered the effect of Emotion on the two social judgments separately. A large main effect of Emotion emerged for both approachability, $F(2.80, 114.98) = 425.03$, $p < .0005$, $\eta_p^2 = .91$, and trustworthiness judgments, $F(2.58, 100.43) = 208.98$, $p < .0005$, $\eta_p^2 = .84$. Pairwise comparisons performed separately for each social judgment, revealed the same pattern of effects reported above. There was also no evidence to suggest a significant difference between the approachability and trustworthiness ratings for any emotional category, $t(80) < 1.83$, $p > .431$, for all comparisons. However, inspection of Figure 2 suggests that this significant interaction likely reflects the existence of larger differences between emotion categories for approachability judgments compared to that evidenced for

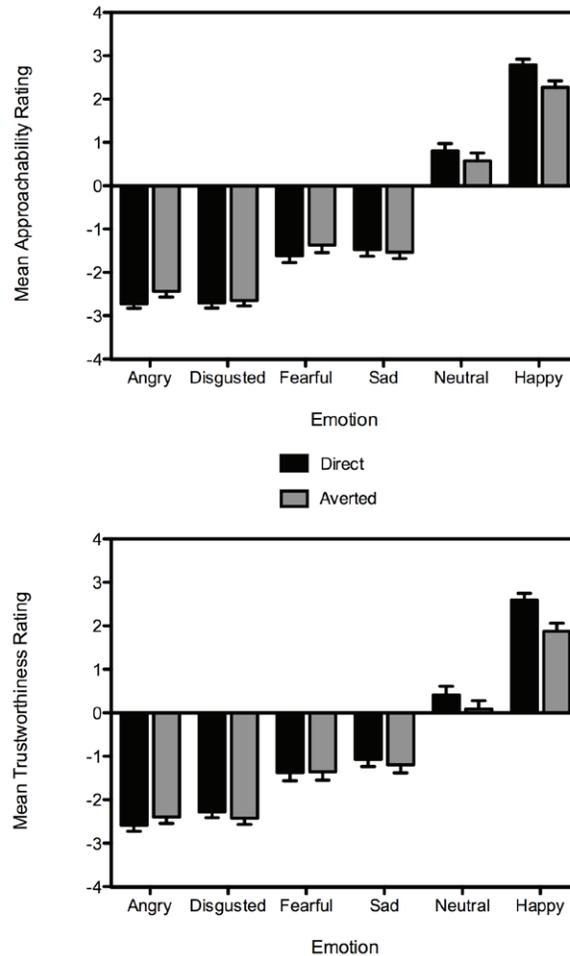


FIGURE 2. Mean approachability (top) and trustworthiness (bottom) ratings for each emotional face displaying direct and averted eye gaze. Standard error bars are shown in this and all subsequent figures.

trustworthiness judgments, which is also indicated by a comparison of effect sizes between the two social judgments, for the main effect of Emotion and pairwise comparisons between emotional categories.

A significant main effect of Eye Gaze, $F(1, 80) = 13.55, p < .0005, \eta_p^2 = .14$, was moderated by a significant interaction of Eye Gaze \times Emotion, $F(3.98, 318.78) = 24.15, p < .0005, \eta_p^2 = .23$. However, when we investigated the effect of Emotion separately for faces with direct and averted eye gaze, these analyses revealed that emotion exerted the same pattern of results as reported for the main effect, for both direct and averted gaze faces. We subsequently investigated the Emotion \times Eye Gaze interaction by comparing ratings between direct and averted gaze separately for each emotion in order to investigate our second aim of establishing how a signaller's eye gaze modulates social judgments distinct emotional faces. These analyses revealed that angry faces were considered significantly

less approachable/trustworthy when displaying direct eye gaze than averted eye gaze, $t(81) = 4.10, p < .001, d = .28$. In contrast, happy and neutral faces were judged significantly more approachable/trustworthy when displaying direct eye gaze than averted eye gaze, $t(81) > 4.27, p < .0005, d > .23$. There was no evidence to suggest that eye gaze modulated the ratings ascribed to disgusted, fearful, or sad faces, $t(81) < 2.27, p > .156$, for remaining comparisons. A significant Eye Gaze \times Judgement interaction also emerged, $F(1,80) = 5.83, p = .018, \eta_p^2 = .07$. We performed two paired samples t-tests to examine the effect of eye gaze separately for the two social judgments. Direction of eye gaze modulated trustworthiness judgments, with faces displaying averted ($M = -.90, SE = .13$) expressions judged more negatively than those displaying direct gaze ($M = -.72, SE = .11$), $t(39) = 3.68, p = .002, d = .022$. In contrast, approachability judgments did not significantly differ between faces displaying averted ($M = -.86, SE = .12$) and direct ($M = -.82, SE = .10$) eye gaze, $t(41) = 1.09, p = .568$. Finally, the Eye Gaze \times Emotion \times Judgment interaction was nonsignificant, $F < 1$.

EMOTION RECOGNITION

We also analyzed mean emotion recognition accuracy and emotional intensity ratings via a three-way mixed model ANOVA. We adopted the aforementioned approach to explore main effects of Emotion and Emotion \times Eye Gaze interactions. This then enabled us to ascertain the extent to which the effects of emotion and eye gaze on social judgments reflected their influence of emotion recognition and emotional intensity ratings.

Analysis of facial expression recognition performance revealed significant main effects of Emotion, $F(3.00, 239.64) = 43.77, p < .0005, \eta_p^2 = .35$, and Eye Gaze, $F(1, 80) = 40.89, p < .0005, \eta_p^2 = .34$, along with a significant Emotion \times Eye Gaze interaction, $F(3.86, 308.91) = 15.86, p < .0005, \eta_p^2 = .17$. No main effect of Judgment emerged, nor did any other significant interactions, $F < 2.39, p > .05, \eta_p^2 < .03$, for all remaining effects.

Mean emotion recognition performance is displayed in Figure 3. Pairwise comparisons exploring the main effect of Emotion revealed that happy faces were recognized significantly more accurately than faces depicting all other expressions, $t(81) > 5.96, p < .0005, d > 0.96$, for all comparisons. Angry faces were recognized more accurately than sad, fearful, disgusted, and neutral faces, $t(81) > 6.09, p < .0005, d > 0.88$, for all comparisons. Sad and fearful faces were recognized more accurately than neutral and disgusted faces, $t(81) > 3.40, p < .05, d > 0.58$, for all comparisons. There was no significant difference between emotion recognition accuracy for sad and fearful faces, nor for disgusted and neutral faces, $t(81) < 1$, for both comparisons.

We investigated the significant Emotion \times Eye Gaze interaction by performing six planned pairwise comparisons between recognition performance for direct and averted eye gaze, separately for each emotional expression, averaged across social judgment. Pairwise comparisons revealed that emotion recognition for angry, neutral, and sad facial expressions was poorer when displaying averted, compared to direct eye gaze, $t(81) > 3.31, p < .01, d > .041$, for each comparison. Direction of eye gaze did not significantly affect emotion recognition performance for facial expressions of disgust, fear, and happiness, $t(81) < 2.23, p > .168$, for each comparison.

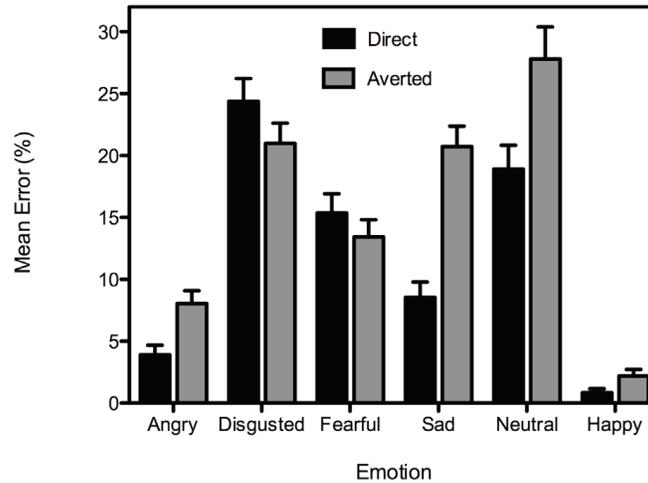


FIGURE 3. Mean percentage error for facial expression categorization performance for faces displaying direct and averted eye gaze, averaged across the two social judgments.

EMOTIONAL INTENSITY RATINGS

Mean emotional intensity ratings are displayed in Figure 4, averaged across approachability and trustworthiness judgment groups.² Analysis of emotional intensity ratings revealed significant main effects of Emotion, $F(2.64, 210.81) = 63.15$, $p < .0005$, $\eta_p^2 = .44$, and Eye Gaze, $F(1, 80) = 16.28$, $p < .0005$, $\eta_p^2 = .17$, along with a significant Emotion \times Eye Gaze interaction, $F(3.36, 268.68) = 4.87$, $p < .002$, $\eta_p^2 = .06$. A significant main effect of Judgment emerged, $F(1, 80) = 12.01$, $p = .001$, $\eta_p^2 = .13$, indicating that participants who completed the trustworthiness task provided higher ratings of emotional intensity. However, there was no evidence of any significant interactions with Judgment, $F < 1.32$, $p > .269$, $\eta_p^2 < .17$, for all remaining interactions.

We first examined the main effect of Emotion, by performing all possible pairwise comparisons. As shown in Figure 4, these comparisons revealed that disgusted faces were rated significantly more emotionally intense than all other expressions, $t(81) > 3.25$, $p < .030$, $d > .40$, for all comparisons. Happy and angry faces were judged significantly more emotionally intense than fearful, neutral, and sad faces, $t(81) > 3.90$, $p < .005$, $d > .35$, for all comparisons. There was no significant difference between intensity ratings given to angry and happy faces, $t(81) = 1.08$, $p > .05$. Fearful and sad faces were judged as more emotionally intense than neutral faces, $t(81) > 5.17$, $p < .005$, $d > .72$, for both comparisons. Finally, fearful faces were considered more emotionally intense than sad faces, $t(81) = 4.22$, $p = .001$, $d = .32$.

2. We analyzed intensity ratings for all faces and only those for which expressions were correctly recognized. A similar pattern of results emerged for both analyses; therefore we report the analysis performed on emotional intensity ratings for all faces.

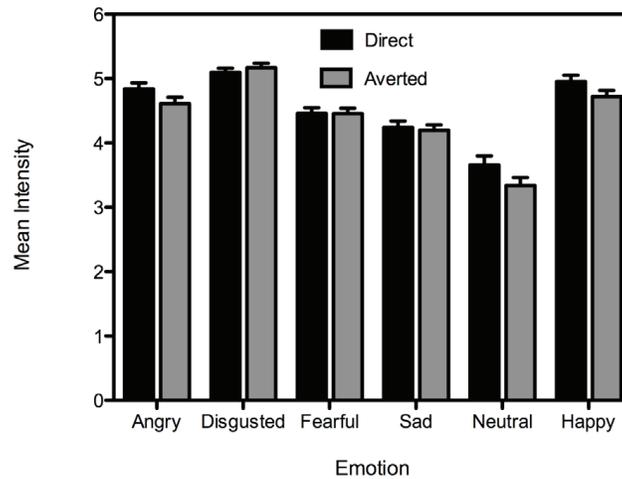


FIGURE 4. Mean emotional intensity ratings for emotional faces displaying direct and averted eye gaze, averaged across the two social judgments.

We then investigated the significant Emotion \times Eye Gaze interaction by performing six planned pairwise comparisons between emotional intensity ratings for faces displaying direct and averted eye gaze, separately for each emotional expression, which were averaged across Judgment. Pairwise comparisons revealed that angry, happy, and neutral faces were judged as more intense when displaying direct eye gaze, compared to averted eye gaze, $t(81) > 2.81$, $p < .05$, $d > .26$, for each comparison. Direction of eye gaze did not significantly affect intensity ratings for disgusted, fearful, and sad faces, $t(81) < 1.08$, $p > .286$, for each comparison.

DISCUSSION

An initial aim of the present study was to examine how judgments of approachability and trustworthiness differed between emotional categories, particularly for the threatening categories of anger, disgust, and fear. The results clearly show that people use the expressions displayed by the faces of others to make strategic decisions about who to approach and who to trust. Crucially, the expressions are not simply divided into positive and negative categories, but rather the nature of threat conveyed by the expression appears to determine the precise judgment provided to the face. Our results support the suggestion that a core component of making a social judgment involves assessing how potentially directly threatening an individual is (Adolphs, 2003), as angry faces were judged less approachable and less trustworthy than other emotional faces, except disgusted faces. Our results replicate and extend previous studies exploring the effect of emotion on social judgments, which have demonstrated that angry faces are rated as less approachable than sad, fearful, neutral, and happy faces (Porter et al., 2007; Willis et al., in press). In addition, these results also largely converge with previous studies, which have shown that emotionally neutral faces which were judged the most

untrustworthy were perceived to be displaying anger (Oosterhof & Todorov, 2009; Richell et al., 2005; Winston et al., 2002).

We were also interested in the manner in which the signaller's direction of attention modulated the effect of emotional expression on these social judgments. Social judgments provided to approach-oriented emotions (i.e., angry, happy and neutral) were modulated by the signaller's eye gaze, with angry faces judged more negatively with direct eye gaze, while happy and neutral faces were judged more positively with direct eye gaze. In contrast, there was no evidence to suggest that social judgments provided to emotions thought to be avoidance-oriented (i.e., fearful, sad and disgusted) were modulated by direction of eye gaze. Of interest, the influence of eye gaze on social judgments appeared to reflect its influence on the perceived intensity of the expression. Happy, angry, and neutral faces were judged more intensely with direct eye gaze, presumably accounting for the more extreme social judgments provided to these emotional faces when displaying direct eye gaze, compared to averted eye gaze. Moreover, direction of eye gaze did not modulate the perception of emotional intensity for fearful, sad, and disgusted faces, which is consistent with the absence of an influence of eye gaze on social judgments ascribed to these emotional faces.

An unexpected finding in the current study was that there was no significant difference in social judgment ratings provided to angry and disgusted faces. While angry faces were expected to receive the most negative ratings as they signal a direct threat, disgusted faces can be interpreted as signalling an indirect threat when evoked in the form of physical contamination or a direct threat when elicited in response to socio-moral violations. One possible explanation for these findings may be that disgusted faces were mistaken for angry faces, as disgusted facial expressions, when recognized inaccurately, are often confused with angry expressions (Calder et al., 1996). In order to exclude this possibility we reanalyzed the data for only those emotional faces that were correctly recognized on the subsequent facial expression recognition task and the same pattern of results emerged, suggesting that the failure to find differences in social judgment ratings for angry and disgusted faces was not due to disgusted faces being perceived as angry. Also of relevance, direction of eye gaze did not exert the same effect on angry and disgusted faces, suggesting that the meaning interpreted from these emotional faces was indeed distinct. Whereas angry faces were assigned more negative social judgments when displaying direct eye gaze, eye gaze, in contrast, did not modulate social judgment ratings provided to disgusted faces, consistent with the findings observed for the avoidance-oriented emotions of sadness and fear.

It is also of interest to note that the perception of emotional intensity appeared to play an important role in social judgments, and as discussed earlier, the influence of eye gaze on approach-oriented emotions paralleled the effect on emotional intensity ratings. A possible explanation for the particularly negative social judgment ratings assigned to disgusted faces may relate to the finding that disgusted faces were rated the most emotionally intense. In fact, they were judged significantly more intense than all other negative facial expressions. We suggest that the perception of emotional intensity, along with perceived threat, are two key components of making a social judgment. Angry and disgusted faces differed with regards to emotional intensity, but they also differ in terms of their potential threat, as angry expressions invariably signal direct threat, whereas disgusted faces can

signal either direct or indirect threat. Indeed the failure to find any influence of eye gaze on social judgments assigned to disgusted faces, similar to fearful and sad faces, suggests that they were perceived as an avoidance-oriented emotion.

The effect of eye gaze on emotion recognition and intensity ratings observed in the current study replicated previous findings which have demonstrated that angry faces are recognized more accurately and perceived to be more intense when displaying direct eye gaze (Adams & Kleck, 2003, 2005; Bindemann et al., 2008; Graham & LaBar, 2007; Sander et al., 2007). Our results indicated that direction of eye gaze did not affect recognition performance or intensity ratings for sad and fearful faces. This is consistent with previous studies (e.g., Bindemann et al., 2008; Sander et al., 2007) which have also failed to replicate Adams and Kleck's (2003, 2005) finding of enhanced intensity ratings and better recognition performance when processing fearful and sad faces with averted gaze. We found that neutral faces were recognized more accurately and perceived as more intense when displaying direct eye gaze. This finding accords with a previous study, which demonstrates that neutral faces are recognized more accurately with a direct head orientation than an averted orientation (Hess, Adams, & Kleck, 2007).

We found that the manner in which emotion influenced approachability and trustworthiness judgments was largely comparable. However, the effects of emotion were larger for approachability than those demonstrated for trustworthiness. One possible explanation for the divergent findings that emerged for approachability and trustworthiness judgments may be that threat assessment is of more importance for approachability judgments than trustworthiness judgments because the threat of physical harm may play a more important role in the perception of approachability. Results also revealed that the effect of eye gaze differed for the two social judgments. More specifically, trustworthiness judgments were significantly more negative for faces with averted eye gaze, compared to faces with direct eye gaze, regardless of emotional expression. In contrast, eye gaze did not influence approachability judgments independently of emotion. These findings do suggest that there are indeed aspects of these social judgments that differ. Given that emotion appears to exert a smaller effect on trustworthiness judgments, it may be important to assess the role of individual differences, such as anxiety, in trustworthiness judgments. It is possible that judgments of trustworthiness may be modulated to a greater degree than other social judgments by an individual's trait anxiety and default tendency to trust others' motives. Research findings have demonstrated that individual differences in anxiety modulate amygdala responses to facial threat (Ewbank et al., 2009). Given the amygdala has been implicated in the process of making social judgments (Adolphs et al., 1998), future research could explore how individual differences in anxiety modulate the effect of emotion on social judgments and how such effects are modulated by the direction of eye gaze.

In sum, we have demonstrated that emotional faces exert strong effects on the judgments of approachability and trustworthiness, with the perception of direct threat and emotional intensity playing key roles in the process of making social judgments. Furthermore, we show that the signaller's attention, as indicated by their eye gaze, modulates the degree to which certain expressions influence social judgments. Thus, the current study demonstrates that both facial expressions and eye gaze convey important information about an individual's behavioral intentions, which plays a key role in guiding social judgments.

REFERENCES

- Adams, R. B., & Kleck, R. E. (2003). Perceived gaze direction and the processing of facial displays of emotion. *Psychological Science, 14*, 644-647.
- Adams, R. B., & Kleck, R. E. (2005). Effects of direct and averted gaze on the perception of facial communicated emotion. *Emotion, 5*, 3-11.
- Adolphs, R. (2002). Recognizing emotion from facial expressions: Psychological and neurological mechanisms. *Behavioral and Cognitive Neuroscience Reviews, 1*, 21-61.
- Adolphs, R. (2003). Cognitive neuroscience of human social behavior. *Nature Reviews Neuroscience, 4*, 165-178.
- Adolphs, R., Tranel, D., & Damasio, A. R. (1998). The human amygdala in social judgment. *Nature, 393*, 470-474.
- Anderson, A. K., Christoff, K., Panitz, D., De Rosa, E., & Gabrieli, J.D.E. (2003). Neural correlates of the automatic processing of threat facial signals. *The Journal of Neuroscience, 23*, 5627-5633.
- Bar, M., Neta, M., & Linz, H. (2006). Very first impressions. *Emotion, 6*, 269-278.
- Bellugi, U., Adolphs, R., Cassidy, C., & Chiles, M. (1999). Towards the neural basis for hypersociability in a genetic syndrome. *NeuroReport, 10*, 1653-1657.
- Bindemann, M., Burton, A. M., & Langton, S.R.H. (2008). How do eye gaze and facial expression interact? *Visual Cognition, 16*, 708-733.
- Blair, R.J.R. (2003). Facial expressions, their communicatory functions and neurocognitive substrates. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, 358*, 561-572.
- Calder, A. J., Young, A. W., Rowland, D., Perrett, D. I., Hodges, J. R., & Etcoff, N. L. (1996). Facial emotion recognition after bilateral amygdala damage: Differentially severe impairment of fear. *Cognitive Neuropsychology, 13*, 699-745.
- Davidson, R. J., & Hugdahl, K. (Eds.). (1995). *Brain asymmetry*. Cambridge, MA: MIT Press.
- Ekman, P. (1997). Should we call it expression or communication? *Innovations in Social Science Research, 10*, 333-344.
- Ewbank, M. P., Lawrence, A. D., Passamonti, P., Keane, J., Peers, P. V., & Calder, A. J. (2009). Anxiety predicts a differential neural response to attended and unattended signals of anger and fear. *NeuroImage, 44*, 1144-1151.
- Frigerio, E., Burt, D. M., Gagliardi, C., Cioffi, G., Martelli, S., Perrett, D. I., et al. (2006). Is everybody always my friend? Perception of approachability in Williams syndrome. *Neuropsychologia, 44*, 254-259.
- Graham, R., & LaBar, K. S. (2007). Garner interference reveals dependencies between emotional expression and gaze in face perception. *Emotion, 7*, 296-313.
- Hall, J., Harris, J. M., Sprengelmeyer, R., Sprengelmeyer, A., Young, A. W., Santos, I. M., et al. (2004). Social cognition and face processing in schizophrenia. *British Journal of Psychiatry, 185*, 169-170.
- Hess, U., Adams, R. B., & Kleck, R. E. (2007). Looking at you or looking elsewhere: The influence of head orientation on the signal value of emotional facial expressions. *Motivation and Emotion, 31*, 137-144.
- Jones, W., Bellugi, U., Lai, Z., Chiles, M., Reilly, J., Lincoln, A., et al. (2000). Hypersociability in Williams syndrome. *Journal of Cognitive Neuroscience, 12*, 30-46.
- Langner, O., Dotsch, R., Bijlstra, G., Wigboldus, D.H.J., Hawk, S. T., & van Knippenberg, A. (2010). Presentation and validation of the Radboud Faces Database. *Cognition and Emotion, 24*, 1377-1388.
- Lundqvist, D., Flykt, A., & Öhman, A. (1998). The Karolinska Directed Emotional Faces—KDEF, CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institutet, ISBN 91-630-7164-9.
- Miller, S. B. (2004). *Disgust: The gatekeeper emotion*. London: The Analytic Press.
- Oosterhof, N. N., & Todorov, A. (2009). Shared perceptual basis of emotional expressions and trustworthiness impressions from faces. *Emotion, 9*, 128-133.
- Porter, M. A., Coltheart, M., & Langdon, R. (2007). The neuropsychological basis of hypersociability in Williams and Down syndrome. *Neuropsychologia, 45*, 2839-2849.
- Richell, R. A., Mitchell, D.G.V., Peschardt, K. S., Winston, J. S., Leonard, A., Dolan, R. J., et al. (2005). Trust and distrust: The perception of trustworthiness of faces in

- psychopathic and non-psychopathic offenders. *Personality and Individual Differences*, 38, 1735-1744.
- Sander, D., Grandjean, D., Kaiser, S., Wehrle, T., & Scherer, K. R. (2007). Interaction effects of perceived gaze direction and dynamic facial expression: Evidence for appraisal theories of emotion. *European Journal of Cognitive Psychology*, 19, 470-480.
- Todorov, A. (2008). Evaluating faces on trustworthiness: An extension of systems for recognition of emotions signaling approach/avoidance behaviors. *Annals of the New York Academy of Sciences*, 1124, 208-224.
- Todorov, A., Baron, S., & Oosterhof, N. N. (2008). Evaluating face trustworthiness: A model based approach. *Social, Cognitive and Affective Neuroscience*, 3, 119-127.
- 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.
- Vuilleumier, P. (2005). How brains beware: Neural mechanisms of emotional attention. *Trends in Cognitive Sciences*, 9, 585-594.
- Willis, M. L., Palermo, R., & Burke, D. (in press). Judging approachability on the face of it: The influence of face and body expressions on the perception of approachability. *Emotion*.
- Willis, M. L., Palermo, R., Burke, D., McGrillen, K., & Miller, L. (2010). Orbitofrontal cortex lesions result in abnormal social judgments to emotional faces. *Neuropsychologia*, 48, 2182-2187.
- Winston, J. S., Strange, B. A., O'Doherty, J., & Dolan, R. J. (2002). Automatic and intentional brain responses during evaluation of trustworthiness of faces. *Nature Neuroscience*, 5, 277-283.
- Yovel, G., & Kanwisher, N. (2008). The representations of spacing and part-based information are associated for upright faces but dissociated for objects: Evidence from individual differences. *Psychonomic Bulletin & Review*, 15, 933-939.

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