

# Judging Approachability on the Face of It: The Influence of Face and Body Expressions on the Perception of Approachability

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The aim of the current study was to examine how emotional expressions displayed by the face and body influence the decision to approach or avoid another individual. In Experiment 1, we examined approachability judgments provided to faces and bodies presented in isolation that were displaying angry, happy, and neutral expressions. Results revealed that angry expressions were associated with the most negative approachability ratings, for both faces and bodies. The effect of happy expressions was shown to differ for faces and bodies, with happy faces judged more approachable than neutral faces, whereas neutral bodies were considered more approachable than happy bodies. In Experiment 2, we sought to examine how we integrate emotional expressions depicted in the face and body when judging the approachability of face-body composite images. Our results revealed that approachability judgments given to face-body composites were driven largely by the facial expression. In Experiment 3, we then aimed to determine how the categorization of body expression is affected by facial expressions. This experiment revealed that body expressions were less accurately recognized when the accompanying facial expression was incongruent than when neutral. These findings suggest that the meaning extracted from a body expression is critically dependent on the valence of the associated facial expression.

*Keywords:* facial expression, body expression, social judgments, emotion, social behavior

In our everyday social interactions, we are frequently faced with situations in which we are required to decide whether to approach or avoid other individuals, from deciding which stranger to sit next to on a crowded bus, to whom to approach for directions when we are lost. Because these individuals are unknown, our decisions are predominantly guided by an individual's facial appearance and body posture. Recent studies have focused on our capacity to judge

approachability from the faces of other individuals and have usually used faces with emotionally *neutral* expressions that vary naturally in their perceived approachability. There is a high degree of consistency among ratings that healthy adults provide when judging the approachability of these neutral faces (Adolphs, Tranel, & Damasio, 1998), which suggests that we rely on similar cues from an individual's facial appearance when making judgments of approachability.

Neuroimaging studies involving healthy individuals have demonstrated that increased amygdala activation emerges when viewing those faces that are ascribed the most negative social judgments (e.g., Engell, Haxby, & Todorov, 2007; Todorov, Said, Engell, & Oosterhof, 2008; Winston, Strange, O'Doherty, & Dolan, 2002). In addition, the ability to make appropriate approachability judgments from emotionally neutral faces appears to be impaired in people with abnormal amygdala functioning as a consequence of bilateral amygdala lesions, autism, schizophrenia, and Williams syndrome (Adolphs, Tranel, & Damasio, 1998; Bellugi, Adolphs, Cassady, & Chiles, 1999; Frigerio et al., 2006; Hall et al., 2004; Jones et al., 2000). The relationship between amygdala dysfunction and inappropriate social judgments is thought to exist because an important component of making a social judgment involves assessing how potentially threatening the other individual is, a function that is often attributed to the amygdala (Adolphs, 2002, 2003). This proposal is supported by a recent approachability study using *expressive* faces, which showed that angry faces, which can indicate a direct threat to the observer, were rated as less approachable than negative but nonthreatening sad faces (Porter,

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Coltheart, & Langdon, 2007). Thus, abnormal approachability ratings are likely to reflect an impairment in evaluating threat from the social environment. This difficulty might underlie the abnormal social behavior often displayed by individuals with the aforementioned clinical conditions.

The association between impaired social judgments, such as approachability, and clinical disorders is one reason why in recent years there has been increasing research interest in understanding the cognitive and neural mechanisms involved in making social judgments from an individual's facial appearance and the potential role that the perception of emotion plays in making such judgments (Bar, Neta, & Linz, 2006; Oosterhof & Todorov, 2009; Todorov, Baron, & Oosterhof, 2008; Todorov, Said, Engell, & Oosterhof, 2008; Willis, Palermo, Burke, McGrillen, & Miller, 2010). However, faces are not the only nonverbal means by which we can communicate our emotional states and influence another individual's social behavior. Body gestures also play an important role in social communication, and, like facial expressions, they can be successfully recognized as belonging to distinct emotional categories (Atkinson, Dittrich, Gemmell, & Young, 2004; Van den Stock, Righart, & de Gelder, 2007). Moreover, the amygdala has been implicated in the recognition of emotional expressions from both the face and body, indicating that these two processes share common neural substrates (for reviews see, de Gelder, 2006; Heberlein & Atkinson, 2009). Given that the amygdala has been associated with both the capacity to make social judgments and the recognition of body gestures, we would expect that an individual's body expression, like their facial expression, should also provide an important source of information when attempting to decide whether to approach an individual. Despite this prediction, no previous studies have investigated approachability judgments given to emotional bodies, in either healthy or disordered populations.

In the current study, we therefore sought to explore how emotional information from the face and body influences approachability judgments. In Experiment 1, we compared the manner in which face and body expressions influence approachability. After demonstrating how face and body expressions influence approachability when presented in isolation, we aimed to extend these findings in Experiment 2 by examining how emotional information from the face and body is integrated when judging the approachability of face-body composite identities. The findings of Experiment 2 indicated that judgments of approachability given to face-body composites were largely driven by an individual's facial appearance. In Experiment 3, we then sought to understand how facial expressions influence the perception of emotional bodies by assessing how the categorization of body expressions was affected by accompanying facial expressions that were either congruent or incongruent in valence.

### Experiment 1

The purpose of Experiment 1 was to assess approachability judgments given to faces and bodies displaying expressions of anger, happiness, and also a neutral pose. We know that individuals discriminate between emotional categories when making approachability judgments from faces (e.g., Porter et al., 2007) and therefore predicted that angry faces would be considered less approachable than neutral faces, whereas happy faces would be considered more approachable.

As the perception of threat is thought to play an important role in the assessment of approachability (Adolphs, 2002, 2003), we expected that a similar pattern of results would emerge for approachability judgments given to bodies.

## Methods

### Participants

Eleven (8 female) students participated in the experiment for course credit. Ages ranged from 20 to 31 ( $M = 22.36$ ,  $SD = 3.61$ ). All participants had normal or corrected-to-normal vision.

### Stimuli

**Facial expression stimuli.** The stimuli were gray-scale photographs of the faces of 10 individuals (5 female), each displaying an angry, happy, and neutral expression selected from the Karolinska Directed Emotional Faces (KDEF) database (Lundqvist, Flykt, & Öhman, 1998). Participants rated the approachability of 30 faces. The faces (256 gray levels, 72 ppi) were scaled to be the same size subtending a visual angle of approximately  $1.9^\circ \times 2.9^\circ$ . Examples of the facial expression stimuli used in this experiment are displayed in Figure 1.

**Body expression stimuli.** The stimuli were whole-body photographs of 10 different individuals (five female), each displaying an angry, happy, and neutral emotional expression. The stimuli were taken from The Bodily Expressive Action Stimulus Test (BEAST, de Gelder & Van den Stock, submitted) and have been described in a number of their previous studies (e.g., van de Riet, Grèzes, & de Gelder, 2009; Van den Stock et al., 2007). For this experiment, the individual's face was completely removed from each photograph, thus ensuring that the individual's facial expression did not influence approachability ratings. In total, participants rated the approachability of 30 bodies. The bodies (256 gray levels, 72 ppi) were scaled to be of a similar size subtending a visual angle of approximately  $3.8^\circ \times 14.3^\circ$ . Examples of the body stimuli used in this experiment are also displayed in Figure 1.



Figure 1. Examples of face (top row) and body (bottom row) stimuli, which are shown displaying an angry expression (left), neutral expression (middle), and happy expression (right).

## Procedure

**Approachability task.** The approachability task we used has been used in our research previously (see Willis et al., 2010). In this task, participants were asked to imagine being in a situation in which they were on a crowded street on their way to meet a friend. They were instructed to pretend that they were lost and in a hurry and needed to ask someone for directions to meet their friend. For each person, they were asked to imagine seeing them in the crowd and to indicate the extent to which they agreed with the statement “I would approach this person to ask for directions.” Each response was made on a 5-point Likert scale from  $-2$  (strongly disagree) to  $+2$  (strongly agree). Stimuli were presented in a randomized order, one at a time on a white background. At the beginning of each trial, a fixation cross was presented for 500 ms. Each image was presented in the center of the screen, along with the statement and response scale. The stimuli, statement, and response scale remained on the screen until a response was made by mouse click. After each response, an intertrial interval occurred for 500 ms. Participants completed two blocks. In one block, they were asked to rate the approachability of a series of faces displaying angry, happy, and neutral expressions. In a second block, participants judged the approachability of a series of bodies, displaying angry, happy, and neutral expressions. Block order was counterbalanced across participants. Stimulus presentation was controlled using Superlab (Cedrus Corp.) and viewed on a 17-in. monitor (screen size,  $1024 \times 768$  pixels) on Dell OptiPlex GX745 computers, at a viewing distance of 60 cm.

**Emotion recognition task.** After completing the approachability tasks, we assessed the ability of participants to recognize the emotion displayed by the face and body stimuli. Participants were shown each image again and were asked to indicate whether the expression was angry, happy, or neutral. Participants selected an appropriate emotion label from the three options, which were displayed underneath each image. Each image and the three emotion labels were displayed on the screen until a response was made. Again, participants completed two blocks. In one block, they were asked to label the expressions of the faces. In a second block, they labeled the expressions of the bodies. Block order was counterbalanced across participants.

## Statistical Analyses

The primary analysis conducted was a two-way repeated measures analysis of variance (ANOVA) on the mean approachability ratings with the within-subjects factors of Emotion (angry, happy, and neutral) and Part (face and body). We also analyzed mean emotion recognition accuracy via a two-way repeated measures ANOVA. Because this analysis revealed differences in emotion recognition, we also conducted a two-way mixed model ANOVA on the mean approachability ratings for only those faces and bodies for which the emotion had been correctly recognized by the participant. In this and all subsequent experiments, the Greenhouse-Geisser epsilon adjusted value is reported in all instances where the sphericity assumption was violated. All subsequent planned comparisons are Bonferroni corrected.

## Results and Discussion

Mean approachability ratings for faces and bodies of each expression are displayed in Figure 2. Results revealed a significant

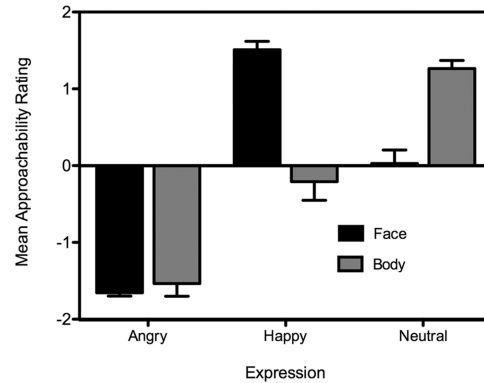


Figure 2. Mean approachability ratings for faces and bodies of each expression. Standard error bars are shown in this and all subsequent figures.

main effect of Emotion,  $F(2, 20) = 125.39, p < .0005, \eta_p^2 = .93$ , moderated by a significant Part  $\times$  Emotion interaction,  $F(2, 20) = 56.56, p < .0005, \eta_p^2 = .85$ , indicating that the effect of emotional expression on approachability ratings differed for faces and bodies. There was no significant main effect of Part,  $F(1, 10) < 1, p = .432, \eta_p^2 = .06$ .

We first performed planned pair-wise comparisons comparing approachability ratings between emotional expressions, separately for faces and bodies. For faces, happy faces were significantly more approachable than neutral and angry faces, whereas angry faces were significantly less approachable than neutral faces,  $t(10) > 8.24, p < .0005, d > 2.99$ , for all comparisons. In contrast with faces, neutral bodies were significantly more approachable than happy and angry bodies, with angry bodies judged significantly less approachable than happy bodies,  $t(10) > 5.17, p < .005, d > 1.91$ , for all comparisons.

We also conducted planned pair-wise contrasts comparing approachability ratings between faces and bodies, separately for angry, happy, and neutral expressions. Happy faces were judged more approachable than happy bodies, whereas neutral bodies were considered more approachable than neutral faces,  $t(10) > 5.92, p < .005, d > 2.57$ , for both comparisons. However, there was no difference between approachability ratings given to angry bodies and faces,  $t(10) = 0.78, p > .05, d = 0.25$ .

Results from the analysis of emotion recognition revealed a significant main effect of Emotion,  $F(2, 20) = 12.00, p < .0005, \eta_p^2 = .55$ , but no significant main effect of Part,  $F(1, 10) = 1.93, p = .195, \eta_p^2 = .16$ . A significant Part  $\times$  Emotion interaction also emerged,  $F(1.28, 12.75) = 6.65, p = .018, \eta_p^2 = .40$ , indicating that emotion recognition accuracy differed for faces and bodies. Planned pair-wise comparisons were conducted separately for faces and bodies, comparing emotion recognition accuracy between emotional expressions. These comparisons revealed that angry faces were recognized significantly more accurately than neutral faces,  $t(10) = 3.985, p = .027, d = 1.70$  (see Figure 3). All remaining comparisons failed to reach significance,  $t(10) < 3.19, p > .090, d < 1.36$ . In addition, there were no significant differences when recognition performance was compared between faces and bodies for each expression,  $t(10) < 3.07, p > .108, d < 1.56$ , for all comparisons.

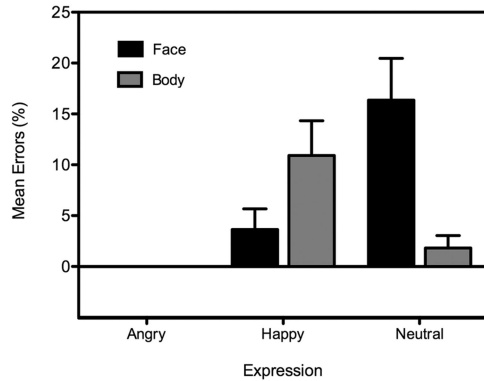


Figure 3. Mean percentage error for recognition performance for faces and bodies of each expression.

Given that angry faces were recognized more accurately than neutral faces, we then also analyzed approachability ratings for only those faces and bodies with expressions that were correctly recognized in the subsequent emotion recognition task. This analysis also revealed a significant Part  $\times$  Emotion interaction,  $F(2, 20) = 51.00, p < .0005, \eta_p^2 = .84$ . Planned comparisons revealed the exact same pattern of results as demonstrated in the analyses of approachability ratings given to all faces and bodies.

For both faces and bodies, angry expressions were less approachable than neutral and happy expressions. There was also no significant difference between approachability ratings given to angry faces when compared with angry bodies. Thus, these results indicate that participants are sensitive to threat in their environment, whether displayed by faces or bodies.

The approach value of happy and neutral expressions varied for faces and bodies. As predicted for faces, those displaying happiness were more approachable than those that were neutral. However, neutral bodies were judged as more approachable than happy bodies. Furthermore, a direct comparison of approachability judgments given to faces and bodies for happy and neutral expressions demonstrated that happy expressions were considered less approachable when portrayed in the body compared with the face, whereas neutral bodies were instead judged to be more approachable than neutral faces. These findings suggest that the meaning communicated by certain emotional expression differs depending on whether the expression is conveyed in the face or the body.

Here, we have demonstrated the way in which emotional faces and emotional bodies influence approachability judgments when presented in isolation, in an ambiguous context. However, faces and bodies are normally seen together, not in isolation, thus it may be the case that the precise manner in which face (body) expressions influence approachability is dependent upon the valence of the accompanying body (face) expression. Previous studies have shown that the recognition of emotional faces and emotional bodies is influenced by the surrounding context (Aviezer et al., 2008; Kret & de Gelder, 2010). That is, the meaning interpreted from face and body expressions appears to be contingent upon the particular context in which the face and body expressions are seen. Thus, in Experiment 2, we turned to examine approachability judgments provided to whole face-body composite identities.

## Experiment 2

In this experiment, we sought to investigate approachability judgments assigned to face-body composite images. We asked participants to judge the approachability of face-body composites that were either congruent (e.g., happy face and happy body) or incongruent (e.g., happy face and angry body). An initial aim of this experiment was to ascertain whether face and body expressions make equal contributions to the perception of approachability when presented in combination. Given the wealth of important social information readily obtained from an individual's face, we might expect that we rely more heavily on the information conveyed by an individual's face than their body when making an approachability judgment. A crossover interaction emerged in Experiment 1, where happy faces were considered more approachable than neutral faces but neutral bodies were judged more approachable than happy bodies. Given this, if the emotional information displayed by a person's face is more influential in determining their approachability rating than their body expression, we would predict that a composite identity comprising a happy face and happy body would be considered more approachable than a composite identity comprising a neutral face and neutral body.

Moreover, if approachability judgments are driven by the facial expression, we might expect that approachability ratings provided to composite identities comprising a happy face would be the same regardless of whether the body expression was happy or neutral (and the same for a neutral face with either a happy or neutral body). In contrast, approachability judgments provided to composite identities comprising happy or neutral bodies would likely be modulated by the accompanying facial expression, that is, ratings would differ between composite identities displaying happy or neutral faces regardless of the body expression. Finally, because angry expressions were considered the least approachable when displayed in both the face and body in Experiment 1, we expected that a composite identity displaying both an angry face and angry body would be less approachable than those portraying happy and neutral expressions in the face and the body.

In addition to establishing whether facial expressions influenced approachability judgments to a greater degree than body expressions, an additional aim of the current experiment was to determine whether there was an interaction between body expression and facial expression in influencing approachability. Previous studies have shown that emotional context influences the recognition of emotional faces and emotional bodies. For instance, judgments of facial expression are influenced by the expression displayed by an accompanying body, with an incongruent body expression resulting in reduced facial expression recognition accuracy, compared with a congruent body expression (Aviezer et al., 2008; Meeren, van Heijnsbergen, & de Gelder, 2005; Van den Stock et al., 2007). Thus, we predicted that the influence of face expressions on approachability would be contingent upon the accompanying body expressions and vice versa. In particular, given the apparent importance of threat assessment when making approachability judgments, we might expect that the influence of facial expressions on approachability would be reduced in the presence of a threatening body (i.e.,

angry body) compared with a nonthreatening body (i.e., happy or neutral).

## Methods

### Participants

Twenty-four (14 female) students participated in the experiment for payment. Ages ranged from 18 to 61 ( $M = 22.21$ ,  $SD = 8.42$ ). All participants had normal or corrected-to-normal vision.

### Composite Stimuli

The facial expression and body expression stimuli described in Experiment 1 were used to create the composite stimuli. To create the composite identities, we made 10 pairings of the individual faces with individual bodies of the same sex. For each composite identity, we created each possible composite pairing of facial expression (angry, happy, and neutral) and body expression (angry, happy, and neutral). For each composite identity, there were nine unique conditions, and across the experiment, a total of 90 stimuli were rated, with 10 exemplars in each condition. The faces were scaled in size and carefully merged with the body to create a composite identity. The composite stimuli subtended a visual angle of approximately  $3.8^\circ \times 17.1^\circ$ . An example of each composite identity pairing is displayed in Figure 4.

### Procedure

The approachability task was the same as that described in Experiment 1. Stimulus presentation was controlled using Superlab (Cedrus Corp.) and viewed on a 17-in. monitor (screen size,  $1024 \times 768$  pixels) with a Dell OptiPlex GX745 computer, at a viewing distance of approximately 60 cm.

### Statistical Analyses

The primary analysis conducted was a two-way repeated measures ANOVA on the mean approachability ratings with the factors of Body Expression (angry, neutral, and happy) and Facial Expression (angry, neutral, and happy). To establish whether the emotion of the face played a more important role than the emotion of the body in determining perceived approachability, we performed pair-wise comparisons (Bonferroni adjusted) between approachability ratings given to the happy, neutral, and angry con-

gruent composite identity conditions (i.e., happy face and happy body, neutral face and neutral body, angry face and angry body). We also assessed whether approachability judgments provided to composite identities comprising happy faces differed between those composite identities comprising either happy or neutral bodies and likewise whether judgments provided to composite identities comprising neutral faces were modulated by whether the accompanying body expression was happy or neutral. Similarly, we also assessed approach judgments provided to composite identities comprising either happy or neutral bodies to establish whether approach judgments differed depending on whether the accompanying facial expression was happy or neutral. This was performed separately for composite identities displaying happy and neutral bodies.

To examine whether the effect of facial expression differed depending on the body expression, we calculated difference scores between each pair of facial expressions (e.g., angry vs. happy etc.), separately for each body expression. We then performed pair-wise comparisons (Bonferroni adjusted) to compare how facial expression difference scores (e.g., angry vs. neutral) differed between the three body expressions.

## Results and Discussion

Mean approachability ratings for each condition are displayed in Figure 5. The analysis revealed significant main effects of Body Expression,  $F(1.60, 36.79) = 39.29$ ,  $p < .0005$ ,  $\eta_p^2 = .63$ , and Facial Expression,  $F(2, 46) = 384.89$ ,  $p < .0005$ ,  $\eta_p^2 = .94$ , along with a significant Body Expression  $\times$  Facial Expression interaction,  $F(2.81, 64.57) = 8.58$ ,  $p < .0005$ ,  $\eta_p^2 = .27$ , indicating that the effect of body expression differed depending on the emotional valence of the facial expression. Pair-wise comparisons on the congruent composites (i.e., same face and body expression) revealed that happy composites were judged as significantly more approachable than neutral and angry composites, whereas angry composites were less approachable than neutral composite identities,  $t(23) > 5.73$ ,  $p < .0005$ ,  $d > 1.60$ , for all comparisons. In addition, results demonstrated that approachability judgments given to composite identities comprising either happy or neutral bodies were more approachable when the accompanying facial expression was happy than when neutral,  $t(23) = 12.35$ ,  $p < .0005$ ,  $d > 1.92$ , for both comparisons. In contrast, approachability judgments provided to composite identities comprising happy faces did not significantly differ when the body expression was



Figure 4. Examples of composite stimuli comprising a) angry facial expressions, b) neutral facial expressions, and c) happy facial expressions, each shown with an angry body expression (left), neutral body expression (middle), and happy body expression (right).

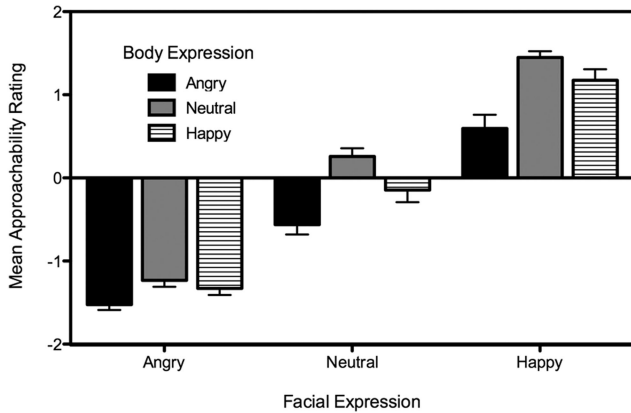


Figure 5. Mean approachability ratings for face-body composite identities.

happy compared with neutral, and, likewise, approachability judgments provided to composite identities composed of neutral faces did not differ significantly when the body expression was happy as opposed to neutral,  $t(23) < 3.11$ ,  $p > .079$ ,  $d < .064$ .

In this experiment, we showed that happy composites were considered significantly more approachable than neutral composites and also demonstrated that approachability judgments given to composite identities comprising either happy or neutral faces did not significantly differ when the body expression was happy compared with neutral. These results reveal that an individual's facial expression exerts a greater influence on their perceived approachability than their body expression. These findings indicate that neutral bodies are only considered more approachable than happy bodies when they are presented in isolation (i.e., in the absence of a face), as observed in Experiment 1. These results suggest that people preferentially rely on an individual's face when making an approachability judgment.

Difference scores between facial expressions were found to differ depending on the body expression of the composite identity. As shown in Figure 6, the effect of facial expression was reduced when the body expression of the composite identity was angry. More specifically, difference scores between angry and happy facial expressions were smaller for composite identities comprising angry body expressions, compared with those composed of happy and neutral body expressions,  $t(23) > 3.69$ ,  $p < .05$ ,  $d > .57$ . Similarly, the difference between angry and neutral facial expressions was reduced when the bodies were angry rather than neutral,  $t(23) = 4.10$ ,  $p = .005$ ,  $d = 1.12$ . No other significant differences emerged,  $t(23) < 2.69$ ,  $p > .05$ ,  $d < .61$ , for all other comparisons.

Despite the reliance on faces, body expressions do exert some influence on an individual's perceived approachability, particularly when the body displays direct threat. Specifically, the effect of facial expression (i.e., the difference between approachability judgments given to composites displaying different facial expressions) was smaller for composite identities composed of angry body expressions compared with those comprising neutral or happy body expressions. This suggests that although facial expressions exert a large effect on approachability judgments, the presence of a threatening body expression reduces the perceived ap-

proachability of a composite identity, consequently minimizing the effect of facial expressions on perceived approachability, in comparison with the effects observed when the body expression is nonthreatening.

Although it is apparent that information displayed in a person's face exerts a larger effect on approachability judgments than that information depicted in an individual's body, it is not apparent what particular process may be driving this effect. Does this effect reflect a complete failure to attend to the body expression? Or, rather, is the perception of a body expression affected by the valence of an accompanying facial expression?

### Experiment 3

Previous studies have demonstrated that body expressions influence the categorization of facial expressions (Aviezer et al., 2008; Meeren et al., 2005; Van den Stock et al., 2007), and thus it seems unlikely that the strong influence of facial expression on approachability judgments reflects a complete failure to attend to the body expression. A more plausible explanation may be that an individual's facial expression may influence the perception of an individual's body expression. To date, no studies have explored how discrete facial expressions influence the categorization and, hence, perception of accompanying body expressions. We sought to examine this in the current experiment. Participants completed a body expression categorization task for us to examine whether the presence of an incongruent facial expression impairs the way in which we perceive a body's emotional expression. For completeness, we also assessed how facial expression recognition performance was influenced by body expressions for the same composite stimuli.

### Methods

#### Participants

Twenty (17 female) students participated in the experiment for course credit. Ages ranged from 18 to 40 ( $M = 22.65$ ,  $SD = 5.89$ ). All participants had normal or corrected-to-normal vision.

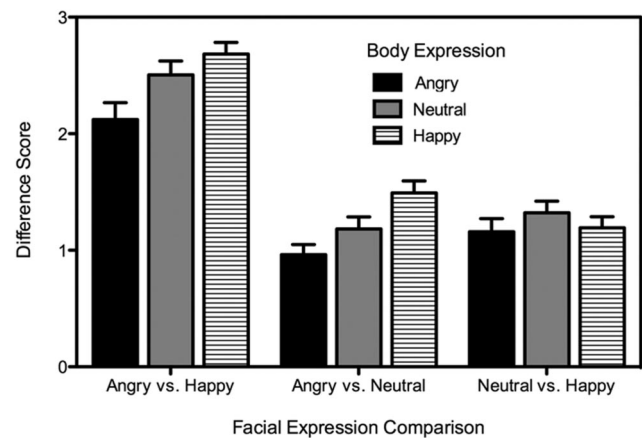


Figure 6. Mean approachability difference scores for each facial expression comparison, separately for each accompanying body expression.

## Stimuli

The composite stimuli described in Experiment 2 were used in the current experiment (see Figure 4).

## Procedure

Participants completed two emotion categorization blocks. In the facial expression categorization block, they were asked to categorize the facial expression of each composite identity as angry, happy, or neutral by pressing one of three marked keys. In the body expression categorization block, participants were instructed to categorize the body expression of each composite identity as angry, happy, or neutral by pressing the appropriate key. Participants were instructed to respond as quickly and accurately as possible. Block order was counterbalanced between participants.

Stimulus presentation was controlled using Superlab (Cedrus Corp.) and viewed on a 17-in. monitor (screen size, 1024 × 768 pixels) with a Dell OptiPlex GX745 computer, at a viewing distance of approximately 60 cm.

## Statistical Analyses

The primary analysis conducted was a two-way repeated measures ANOVA with the factors of Body Expression (angry, happy, and neutral) and Facial Expression (angry, happy, and neutral). This analysis was performed on mean percentage error data and median correct reaction time (RT) data separately for the facial expression and body expression categorization tasks. To ascertain how facial expressions influenced *body expression categorization*, we performed planned pair-wise comparisons (Bonferroni adjusted), comparing body expression categorization performance among the three facial expressions, separately for each body expression. For *facial expression categorization* performance, we assessed how body expression influenced facial expression categorization by performing planned pair-wise comparisons (Bonferroni adjusted), comparing facial expression categorization performance among the three body expressions, separately for each facial expression.

## Results and Discussion

### Body Expression Categorization

**Errors.** There was a significant main effect of Body Expression,  $F(2, 38) = 10.61, p < .005, \eta_p^2 = .36$ , and a significant Body Expression × Facial Expression interaction,  $F(4, 76) = 10.26, p < .0005, \eta_p^2 = .35$ . The main effect of Facial Expression failed to reach significance,  $F(2, 38) = 2.49, p = .096, \eta_p^2 = .12$ . As shown in Figure 7, results indicated that angry bodies were recognized significantly less accurately when paired with happy faces, compared with recognition performance when angry bodies were paired with angry and neutral faces,  $t(19) > 3.94, p < .01, d > .092$ , for both comparisons. In addition, categorization of happy bodies was significantly more accurate when the facial expression was happy than when angry. No other significant differences emerged,  $t(19) < 1.61, p > .05, d < .53$ , for all other comparisons.

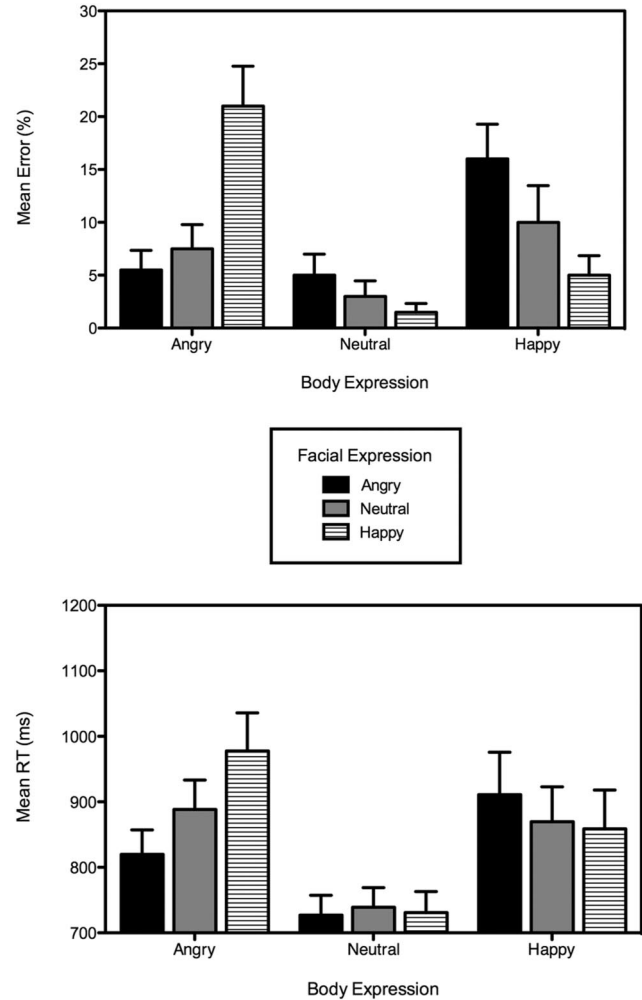


Figure 7. Mean percentage error (top) and mean RT (bottom) for body expression categorization performance, presented separately for each accompanying facial expression.

**Median RT.** There was a significant main effect of Body Expression,  $F(2, 38) = 11.79, p < .0005, \eta_p^2 = .38$ , and a significant Body Expression × Facial Expression interaction,  $F(4, 76) = 3.59, p < .010, \eta_p^2 = .16$ . No main effect of Facial Expression emerged,  $F < 1$ . As Figure 7 suggests, results indicated that angry bodies were recognized significantly faster when paired with angry faces than when paired with happy faces,  $t(19) = 3.54, p = .006, d = .67$ . No other significant differences emerged,  $t(19) < 2.08, p > .05, d < .38$ , for all other comparisons.

As anticipated, recognition of body expressions was affected by the associated facial expression. Results demonstrated that recognition performance was poorer when the associated facial expression was incongruent, compared with when it was congruent. This effect appeared to reflect interference caused by the incongruent facial expression when categorizing the emotion of angry body expressions because the recognition of angry body expressions paired with happy faces was less accurate than the recognition of angry bodies paired with neutral or angry faces.

**Facial Expression Categorization**

**Errors.** There were significant main effects of Body Expression,  $F(2, 38) = 6.47, p = .004, \eta_p^2 = .25$ , and Facial Expression,  $F(1.40, 26.58) = 4.05, p = .042, \eta_p^2 = .18$ . A significant Body Expression  $\times$  Facial Expression interaction also emerged,  $F(4, 76) = 5.68, p < .0005, \eta_p^2 = .23$ , suggesting that facial expression categorization performance was affected by the accompanying body expression. Pair-wise comparisons indicated, as Figure 8 suggests, that neutral faces were recognized significantly less accurately when paired with an angry body than when paired with a neutral body,  $t(19) = 5.25, p < .0005, d = 1.15$ . No other significant differences emerged,  $t(19) < 2.73, p > .05, d < .67$ , for all other comparisons.

**Median RT.** There was a significant main effect of Facial Expression,  $F(2, 38) = 17.13, p < .0005, \eta_p^2 = .47$ , and a significant Body Expression  $\times$  Facial Expression interaction emerged,  $F(2.60, 49.48) = 9.43, p < .0005, \eta_p^2 = .33$ . No main

effect of body expression emerged,  $F < 1$ . As Figure 8 reveals, categorization of angry facial expressions was significantly faster when the composite body expression was angry than when happy or neutral,  $t(19) > 3.58, p < .001, d > .90$ , for both comparisons. In addition, categorization of neutral faces was significantly quicker when paired with a neutral body expression than a happy or angry body expression,  $t(19) > 3.98, p < .005, d > .63$ , for both comparisons. No other significant differences emerged,  $t(19) < 1.95, p > .05, d < .29$ .

For facial expression categorization, we found that body expressions also influenced the accurate categorization of emotional faces. Specifically, we found that accurate categorization of neutral faces was impaired when accompanied by angry body expressions. We also found evidence of a congruency effect when categorizing angry facial expressions, such that angry facial expressions paired with angry body expressions were recognized significantly faster than when paired with neutral or happy bodies. This effect indicates that the presence of an angry body expression appears to facilitate the recognition of an angry facial expression.

**General Discussion**

The primary aim of the current study was to examine how body and facial expressions influence judgments of approachability. In addition to understanding how face and body expressions influence approachability judgments when presented in isolation, we also sought to examine how face and body expressions influence approachability judgments when presented in the context of a whole face-body identity. To clarify the manner in which the perception of a body expression is influenced by the valence of an accompanying facial expression, we also examined how emotion recognition of bodies was influenced by the valence of an accompanying facial expression and vice versa.

In Experiment 1, angry faces were judged significantly less approachable than neutral and happy faces. We also demonstrated that angry bodies were considered significantly less approachable than neutral and happy bodies. These results extend previous findings by demonstrating that both faces and bodies displaying angry expressions are considered the least approachable. These results are in line with the findings of Porter et al. (2007), which showed that angry faces were rated as less approachable than happy, sad, and fearful faces. Our results also converge with studies of trustworthiness, which have demonstrated that faces that are perceived as angry are considered less trustworthy than faces perceived to be displaying other emotions (Oosterhof & Todorov, 2009; Richell et al., 2005; Winston et al., 2002). In Experiment 2, we demonstrated that facial expressions exert a larger effect on an identity's approachability. However, we did find that the effect of facial expression was reduced in the presence of an angry body expression, suggesting that the presence of threat, whether it is displayed in the face or the body, does play an important role in influencing an individual's perceived approachability. Thus, these results support the suggestion that a core component of making an approachability judgment involves assessing how potentially threatening an individual is (Adolphs, 2003).

In Experiment 2, we aimed to determine whether an identity's facial expression exerts a larger influence on their perceived approachability than their body expression. We found that this was indeed the case because congruent identities comprising happy

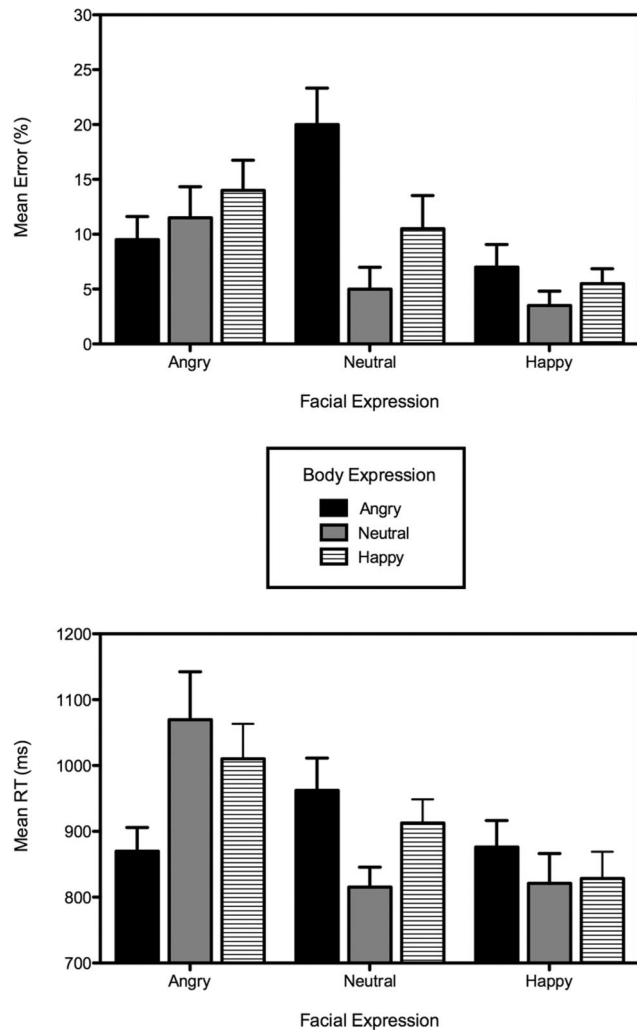


Figure 8. Mean percentage error (top) and mean RT (bottom) for facial expression categorization performance, presented separately for each accompanying body expression.



face and happy body expressions were considered significantly more approachable than both neutral and angry composite identities. These findings converged with the effect of facial expression that was observed in Experiment 1 and indicated that the information extracted from an identity's facial expression is more instrumental in determining their approachability than their body expression.

We suspected that the findings that emerged in Experiment 2 indicated that an individual's facial expression played an important role in influencing the perception of an individual's body expression. The results of Experiment 3 indicated that the presence of an incongruent facial expression disrupted the perception of a body's emotional expression. Results demonstrated that facial expressions *interfered* with the accurate categorization of body expressions, such that performance was disrupted when the facial expression was incongruent, compared with when it was neutral or congruent. A different pattern emerged when the influence of body expressions on facial expression categorization was considered. Rather than interfering with the categorization of facial expressions, congruent body expressions *facilitated* the speed of accurate recognition of congruent facial expressions because facial expression categorization was significantly faster when the body expression was congruent than when neutral.

Interestingly, we found that the effect of happy and neutral expressions on approachability differed between faces and bodies. Although happy faces were significantly more approachable than neutral faces, the reverse pattern was evident for emotional bodies, with neutral bodies considered more approachable than neutral faces. One reason why neutral faces may have been considered less approachable than neutral bodies is that neutral faces are often perceived as emotionally negative (Lee, Kang, Park, Kim, & An, 2008; Richell et al., 2005; Winston et al., 2002). Indeed, in Experiment 1, recognition of neutral faces was significantly poorer than recognition of angry faces. Inspection of the incorrect classification of neutral faces revealed that 94% of these errors were caused by misclassifying neutral faces as angry. In contrast, of the few errors made recognizing neutral bodies, all of these errors involved misclassification of neutral bodies as happy. These findings provide preliminary evidence to suggest that neutral bodies may be more likely to be perceived as positive in valence, whereas neutral faces are more likely to be perceived to be depicting negative emotion. The plausibility of this suggestion could be explored in future research by investigating how the perception of emotional valence from neutral expressions varies for faces as compared with bodies, which to our knowledge is yet to be explored.

An unexpected finding from the current study was that happy bodies were considered less approachable than happy faces. One explanation for this finding may relate to the fact that the faces displayed direct eye gaze. Direct, as compared with averted eye gaze, has been associated with enhanced intensity and speed of correct recognition of happy faces (Adams & Kleck, 2003, 2005) and increases the attractiveness of faces (Mason, Tatkov, & Macrae, 2005). The direct eye gaze displayed on the happy faces may have contributed to the faces appearing more welcoming and therefore more approachable than the happy bodies, for which the source of the happiness is more ambiguous. Future studies could examine how the signaler's attention influences approachability judgments by examining how judgments provided to happy faces

differ depending on whether the faces are displaying direct or averted eye gaze. If the presence of direct eye gaze is important in determining the approachability of happy faces, one would expect that happy faces displaying direct eye gaze would be perceived as more approachable than happy faces displaying averted eye gaze.

Another possible explanation for the divergent findings observed for happy expressions might be that happy bodies were perceived to be displaying such extreme levels of happiness that they may have been considered less approachable than faces displaying more moderate levels of happiness. Consistent with this suggestion is the (nonsignificant) trend in Experiment 2 for the composite identities comprising happy faces and happy bodies to be rated as less approachable than composite identities comprising happy faces and neutral bodies (see Figure 5). This proposal could be explored in more detail by investigating whether an interaction between emotional intensity and emotional valence underlies the approachability judgments ascribed to emotional faces, bodies, and composite identities.

In conclusion, we have demonstrated that the perception of threat plays a key role in judgments of approachability from faces and bodies presented in isolation and from whole face-body composites. We demonstrate that the precise judgments given to whole face-body composites are driven largely by the valence of the facial expression, although the extent to which a facial expression influences approachability judgments is moderated by the presence of an angry expression. Our results suggest that the meaning interpreted from a body expression is dependent on the particular valence of an accompanying facial expression. Future research exploring the effect of emotional valence and emotional intensity on the perception of approachability judgments could provide important insights into the processes that underlie the influence of emotional expressions on approachability judgments.

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