

## Do Facial Expressions Signal Specific Emotions? Judging Emotion From the Face in Context

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Certain facial expressions have been theorized to be easily recognizable signals of specific emotions. If so, these expressions should override situationally based expectations used by a person in attributing an emotion to another. An alternative account is offered in which the face provides information relevant to emotion but does not signal a specific emotion. Therefore, in specified circumstances, situational rather than facial information was predicted to determine the judged emotion. This prediction was supported in 3 studies—indeed, in each of the 22 cases examined (e.g., a person in a frightening situation but displaying a reported “facial expression of anger” was judged as afraid). Situational information was especially influential when it suggested a nonbasic emotion (e.g., a person in a painful situation but displaying a “facial expression of fear” was judged as in pain).

In the face-to-face encounters of everyday life, each person monitors the emotional reactions of others. Is she pleased? Is he annoyed? Are my listeners getting bored already? Ordinarily, when one person observes the emotional reaction of another, a variety of sources of information are available. In this article, we consider the case in which the observer has two such sources: information about the expresser's situation and about the expresser's facial expression.

The specific question we address is the relative influence of these two cues when each alone would suggest a different emotional interpretation. We think that an answer to this question is interesting not only for its own sake but also for what it implies in regard to the deeper issue of the precise message contained in a facial expression. Let us begin our discussion with the specific question of relative influence. To illustrate, suppose that you are the observer. You see a woman receive a gift, and then you see her facial reaction to the gift. A photograph of her expression is shown in Figure 1. What is the woman's emotional reaction?

When the situation and the face are put into this sort of competition, the face has a normative preeminence. The situation is a guide, not a guarantee. The situation can suggest how persons in general might typically react, but the facial reaction is part of the very reaction to be judged. Different individuals can react differently to a given situation. Suppose that the gift given to

the woman was \$5. One woman might feel surprised, another happy; a third might find the gift meager and feel disappointed, and a fourth might construe the gift as a bribe and feel angry. Suppose that the woman had been expecting an engagement ring. It is even possible to imagine a story in which a gift of \$5 is a coded message foretelling some disaster, just as a wife's receipt of a telegram in World War II usually meant the death of her husband. The objective situation (receipt of \$5) can at best provide the observer with a guidepost, a generalized expectation about how most people would react, whereas the expresser's facial expression shows part of the actual reaction. When you, as observer, have only incomplete information about the situation (you do not know what gift she has received, or what she had expected, or how she construed the situation), then facial information should become even more influential. In that case, seeing the face of Figure 1 can force you to guess that the gift is not the nice little present you first imagined but some horribly successful April fool's joke.

So, the face is normatively and psychologically preeminent—but only on certain matters. Consider a nonemotional example: On the basis of the situation, you might fully expect a man to comply with a request (he is offered a choice between compliance and death), but his negative headshake answers the question. His headshake takes precedence, because a headshake *signals* “no.” On the other hand, imagine a society in which headshakes have no more meaning than toeshakes. The headshake would be irrelevant and would not take normative precedence. To return to the topic of emotion, if the face provides no usable information about emotion, then it would have no preeminence in the judgment of emotion; if the face signals specific emotions, then preeminence would include specific emotions. (To anticipate: In this article we take a position between these two extremes.) Our point now is that the face's normative preeminence is a tool to the researcher that can help delimit precisely

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Figure 1. What is this woman's emotional reaction? Photograph reproduced by permission from Matsumoto and Ekman (1988).

what information the face can provide: Whatever information is preeminent tells us what the face clearly signals.

Most people are confident that they can read *specific emotions* from faces. When experimental psychologists first examined facial expressions under controlled conditions, they were therefore surprised to find disagreement among observers about the appropriate emotion to infer from the face alone (Feleky, 1914). Confidence had not translated into consensus, and some writers (Fernberger, 1928; Landis, 1924, 1929) suggested that in everyday circumstances observers agree on a specific emotion for a particular face only when the context supplies sufficient background information to pinpoint one emotion.

That suggestion was overshadowed, however, by the work of Tomkins (1962–1963; Tomkins & McCarter, 1964) and those he inspired (Ekman, 1972; Izard, 1971). Tomkins initiated a program of research that convinced most psychologists that at least some facial expressions are signals of specific “basic” emotions (happiness, surprise, fear, anger, disgust, contempt, and sadness, plus or minus) and were created by evolution just for that purpose. In this article we re-examine the question of what precise information the face can provide by reopening the question of how observers respond to combinations of situational and facial information.

### The Theoretical Issue

#### *A Prediction of Facial Dominance*

Tomkins (1962–1963) theorized that certain facial expressions are signals of specific emotions that are biologically pre-

wired and universally recognized. According to this widely held view (Buck, 1984; Ekman, 1972; Fridlund, Ekman, & Oster, 1987; Izard, 1971), the face is part of the emotion. Information about the face is therefore direct information about the specific emotion. From this theory follows a prediction: When the observer sees a clear, prototypical facial expression of a basic emotion, then, given the natural preeminence of the face, this facial signal should override any expectations derived from information about the situation that the expresser is in. This prediction is known as *facial dominance*. For example, in the case described above, Figure 1 is said to show a universal signal of fear, and therefore you are predicted to have judged the woman in Figure 1 as frightened, even if you first expected the gift to bring her joy.

(The only exceptions to the prediction of facial dominance should be cases of deception. Thus, we exclude from further consideration here situations in which the observer believes that the expresser is deliberately using a facial expression to create a false impression, as in the theater or in a situation in which norms of politeness dictate that smiles be used to hide negative reactions.)

#### *A Prediction of Limited Situational Dominance*

Our alternative account differs from Tomkins's (1962–1963) in the nature of facial information. From our perspective, the face does not signal specific emotions, but the observer does infer much about the expresser from the face. We propose that the observer perceives two kinds of information from the face easily and automatically. First, the observer perceives quasi-physical information. That is, the observer can see from the eyes whether the expresser is weeping, winking, looking down or up, staring at something, or looking away. The mouth shows whether the expresser is talking, shouting, yawning, laughing, smiling, or grimacing. We refer to such information as *quasi-physical* to indicate its simplest literal meaning. Thus, as quasi-physical, the smile is recognized simply as a smile—not whether it is a smile of joy, of embarrassment, of nervousness, or a polite greeting.

Second, based in part on perceived quasi-physical features, the observer infers the expresser's feelings on the general dimensions of pleasantness and arousal. These two dimensions describe primitive and universal aspects of emotional perception found in young children (Bullock & Russell, 1986) and across a range of cultural and language backgrounds (Russell, 1991). Under various names, and with slightly different interpretations, these two dimensions are key concepts in various accounts of emotion (Bradley, 1994; Cacioppo, Klein, Berntson, & Hatfield, 1993; Lang, 1994; Larsen & Diener, 1992; Mandler, 1984; Tellegen, 1985). These dimensions have also been useful in the study of facial expressions (Osgood, 1966; Russell & Bullock, 1986; Schlosberg, 1952). In the specific model used here, known as the *circumplex*, emotions and related states fall in a roughly circular order around the perimeter of the Cartesian space created when the two dimensions are treated as orthogonal axes. The circumplex specifies the similarity between specific emotions.

Of course, observers also attribute specific emotions to others, but we propose that such judgments are slow, effortful, and less consensual. When a specific emotion is inferred, it is done so on the basis of the pleasantness, arousal, and quasi-physical

actions already perceived from the face—all of which are interpreted in light of available information about the expresser's situation. To attribute a specific emotion to someone is to perceive a sufficient resemblance between that person's current state and a script for that emotion (Fehr & Russell, 1984). The script (or prototype) specifies the antecedents, feelings, physiological changes, and behavioral consequences of the emotion. Antecedent—situational information—is therefore part of the actual meaning of the concept of a specific emotion. Offense, threat, and loss are part of the meanings of *anger*, *fear*, and *grief*, respectively.

We call our position *limited situational dominance*. In explaining this phrase, we begin by noting that we accept completely the argument that facial information is naturally preeminent—but only on matters of quasi-physical information, degree of arousal, and, to some extent, pleasantness and unpleasantness. You are told that it is night and that John is lying in bed. So, you guess that he is relaxed or even asleep. Then you see John's face. His eyes are wide open and he is looking about. This facial information takes precedence. You infer that John is not relaxed or asleep but is highly aroused. On the other hand, the face does not signal a specific emotion, and therefore the face does not take precedence as to the expresser's specific emotion—hence the opportunity arises for situational dominance on the specific emotion. In the example just given, we predict that you infer from the facial information that John is highly aroused, but not what, if any, specific emotion he is feeling. So, if you also learn that John has just received an offensive letter, you might guess that he is feeling angry. If you learn that John has just received a threatening telephone call, you might guess that he is afraid. If you learn that he has just lost his family in an accident, you might guess that he is suffering grief.

### Past Research

Evidence is available on what happens when an observer is presented with conflicting facial and situational cues. Reviewers have presented this evidence as support for the theory of basic emotions (Ekman, Friesen, & Ellsworth, 1972, 1982). Ekman et al. (1972, 1982) reviewed the work of Landis (1924, 1929) and other early researchers, criticizing all research that had suggested a large role for situational information. More recent studies (Nakamura, Buck, & Kenny, 1990; Wallbott, 1988; Watson, 1972) have found the overwhelming facial dominance predicted by Tomkins's (1962–1963) theory. In the traditional research paradigm, named the *Goodenough–Tinker* procedure after the two researchers who first used this design, observers are presented with combinations of facial and situational information. Even when the situation suggested a clear and intense specific emotion (such as grief over the death of a child), facial information was more influential in determining the observer's judgment. No research using the Goodenough–Tinker procedure has found results in favor of situational dominance (Fernandez-Dols, Sierra, & Ruiz-Belda, 1993; Nakamura et al., 1990).

Not surprisingly, we are not convinced. In the first place, Tomkins's (1962–1963) and our accounts both predict that facial information is more influential in many circumstances. For example, we predict facial preeminence on matters of quasi-

physical information, pleasantness, and arousal. Therefore, an overall finding of facial dominance does not differentiate the two accounts. In many studies, some situational influence and, on occasional trials, even situational dominance have been found. Of course, whether this latter result was systematic or merely due to sampling fluctuations remains to be seen.

The other reason for our skepticism is that the typical study contains technical problems that might have biased the results toward facial dominance. First, on each trial, the observer receives two pieces of information: a *photograph* of a facial expression and a *written* description of a situation. So, face versus situation is confounded with visual versus written information. Perhaps visual material is more salient or more easily grasped.

Second, the observer typically is forced to choose one emotion from a predetermined list of so-called basic emotions (happiness, surprise, fear, anger, disgust, contempt, or sadness). This forced-choice format does not allow the observer to judge the expresser as unhappy, anxious, depressed, embarrassed, jealous, frustrated, in pain, puzzled, or any other of countless alternative interpretations. The problem here is not simply generalizability but that this response format precludes the researcher from discovering that situational information leads the observer to a kind of judgment not on the list. (Suppose that faces convey basic emotions, whereas situations convey nonbasic emotions [unhappy, anxious, depressed, etc.; Fernandez-Dols, Wallbott, & Sanchez, 1991]. If so, the situational option would be systematically excluded. We offer this suggestion as a hypothetical possibility, not as our belief.)

Third, the design is typically within-subject. The observer encounters exactly the same situation repeatedly on different trials. When the identical situation reappears, the only information that has changed is the face. The implicit demand to the observer is to make judgments that are sensitive to the changed information. Nakamura et al. (1990) explicitly told their observers to expect different reactions to the same situation. Here are their instructions: "As you might expect, the reaction of the target persons [expressers] are not exactly the same even to the same [situation]. In this experiment, we would like you to rate how the target persons felt about the [situation]. . . ." (p. 1035). With these instructions, what could cooperative observers do other than vary their judgments with variations in the face?

Fourth, finally, and most important, the face–situation combinations have typically been created through a factorial process: All situations were paired with all faces. Many such combinations force the observer to think that crucial information is missing. If the woman in Figure 1 received a gift, why is she so upset? (Indeed, the frown–gift combination is a not atypical example in these studies.) As the observer, you are forced to imagine more situational information to explain the facial reaction presented. In your imagination, the nice gift box might no longer contain chocolates but a tarantula. Frijda (1969) noted this problem long ago, but its importance seems generally to have been ignored. When the situational information is obviously inconsistent with the facial information, the observer must imagine more situational information to explain the visible features perceived in the face. Our interpretation is that the observer imagines situational information to explain the quasi-physical features (shouting, staring, etc.) and degree of pleas-

antness and arousal of the face. The methodological point is that when the face and situation are inconsistent on these matters, the imagined situation, rather than the stated situation, is what is psychologically real for observers and what they would use in determining their emotional judgment.

To summarize, we interpret the available evidence as inconclusive in differentiating the two theoretical accounts we have described. The studies carried out so far contain enough technical problems to render any conclusion doubtful, and in any case, the available evidence can be interpreted in terms of the facial preeminence of quasi-physical features, pleasantness, and arousal, rather than the facial preeminence of specific emotions. The case of the upset woman of Figure 1 receiving a gift is not as informative as it might have first appeared. If our alternative perspective is viable, then it should be possible to specify certain face-situation combinations in which the situational information reliably dominates in the choice of a specific emotion, despite the natural preeminence of facial information and even when the face shows one of the reported "facial expressions of a basic emotion."

### Overview of the Present Study

Imagine that you are told the following story:

This is a story of a woman who wanted to treat her sister to the most expensive, exclusive restaurant in their city. Months ahead, she made a reservation. When she and her sister arrived, they were told by the maitre d' that their table would be ready in 45 minutes. Still, an hour passed, and no table. Other groups arrived and were seated after a short wait. The woman went to the maitre d' and reminded him of her reservation. He said that he'd do his best. Ten minutes later, a local celebrity and his date arrived and were immediately shown to a table. Another couple arrived and were seated immediately. The woman went to the maitre d', who said that all the tables were now full, and that it might be another hour before anything was available.

You are next shown a picture of the woman in the story, the same photograph shown in Figure 1. Finally, you are asked "What emotion is this woman feeling? happiness, surprise, fear, anger, disgust, or sadness?"

The two theoretical perspectives outlined above make different predictions about how observers respond to this question. According to Tomkins's (1962-1963) view, the woman in Figure 1 is displaying a universal signal of fear and, whatever the situation described in the story, many or most people will judge her *afraid*. According to our alternative view, the woman's face in Figure 1 is extremely aroused, she is unhappy, and she is staring. The story explains these aspects of her facial behavior and suggests that she is very angry. Therefore, many or most people will judge her *angry*.

We report three studies in which observers were given just such face-situation combinations that would allow clear, differential predictions from the two perspectives outlined above. We used the Goodenough-Tinker design because no study in which it has been used has thus far (see review by Nakamura et al., 1990) found situational dominance, which we hypothesize for the cases we present. The observer was told a story about a person and then shown a photograph supposedly

of that person displaying a reported facial expression of a "basic emotion." When judged alone, the story and face suggested different emotions. We used the best available candidates for universal facial expressions: photographs published by Ekman and his colleagues. Our dependent measure was in a forced-choice format. So, in many details, we used the method that has been used in past studies of this topic.

We also introduced modifications that, if our alternative account is viable, would be enough to produce clear situational dominance. First, we did not form all possible combinations of situation and facial expression. Rather, the situation described in the story had to meet two theoretical criteria: It had, first, to explain the quasi-physical features of the specific facial expression with which it was to be paired and, second, to fit the pleasantness and arousal conveyed by that face. For example, the restaurant story narrated above was composed to be paired with Matsumoto and Ekman's (1988) prototype facial expression for "fear" (Figure 1). The story therefore had to suggest a person in an extremely aroused and intensely unpleasant state staring directly at someone or something. The story was designed to suggest anger, because the circumplex predicts that fear and anger are sufficiently close in terms of pleasure and arousal. We also used a between-subjects design and read our stories to the participant. These latter changes were introduced simply to ensure that the observers actually attended to the story and were not forced by the design of the experiment to vary their answers from one face to the next for a given story.

In the first study, observers judged the combination of a "fear" face with an anger story, an "anger" face with a fear story, and a "sad" face with a disgust story. The emotions chosen were close enough according to the circumplex (Russell, 1980) to satisfy our criteria about similarity of pleasantness and arousal but were still separate discrete emotions according to Tomkins's (1962-1963) theory. We purposely did not select the combinations of anger and disgust or of fear and surprise because the proposed facial expressions for these emotions are sometimes "mistaken" for one another in Ekman's (1972) data. We would have liked to include the combination of a "disgust" face with a sad story, but we could think of no plausible sad story that would account for the protagonist wrinkling his or her nose, presumably in response to an odor or taste.

In the second study, we sought to demonstrate that limited situational dominance is not restricted to labels for basic emotions. (In fact, we anticipated greater situational dominance when the story could suggest a nonbasic emotion and observers were allowed to choose a nonbasic emotion.) We therefore created stories that satisfied our criteria stated above but when judged alone suggested a nonbasic emotion. We used stories for puzzlement, determination, hope, and pain. The facial expressions remained the hypothesized signals for basic emotions—thus Tomkins's (1962-1963) prediction remained clear. We hypothesized that, for example, the "facial expression of anger," when paired with a situation that alone suggests puzzlement, would lead to the judgment that the expresser is puzzled.

In a third study, we replicated the results of Study 2 with stories purposely designed to be more ambiguous. We hoped to demonstrate that the results of Studies 1 and 2 could not be attributed simply to source "clarity" (defined as the amount

of agreement achieved when that source is judged alone). We therefore hypothesized that, for example, the "facial expression of anger" paired with a situation that vaguely suggests puzzlement would lead to a clear judgment that the expresser is puzzled.

### Study 1

We created three face-situation conditions: a "fear" face paired with an anger situation, an "anger" face paired with a fear situation, and a "sad" face paired with a disgust situation. For each, we studied two examples; in a between-subjects design, there were thus six experimental groups in all. A comparison group rated each facial expression alone and each situation story alone.

### Method

#### Participants

Participant observers were 175 undergraduates of the University of British Columbia (Vancouver, British Columbia, Canada), who received partial course credit for their participation. Of these, 150 were randomly assigned to the experimental groups, 25 to a comparison group.

#### Facial Expressions

From collections published by Matsumoto and Ekman (1988) and Ekman and Friesen (1976), we selected two of the facial expressions said to express anger, two fear, and one sadness. The photograph shown in Figure 1 was one of the "fear" expressions.

#### Situations

The situations were described in six short stories (presented in the Appendix). Each story was written to suggest one basic emotion and was designed to be paired with a specific facial expression. Stories are labeled by the emotion we intended the story to convey.

#### Procedure

*Experimental conditions.* Participants were tested one at a time in a session that lasted approximately 10 min. Each participant was presented one face-story combination. Each participant was read the story by the experimenter (in a clear but nonemotional style, uniform across stories) and then shown the stimulus photograph. After a few seconds, the experimenter asked "What emotion is the woman [man] feeling?" The participant was then provided a response sheet with a list of six emotion words in the following order: *happy, anger, sad, surprise, fear, and disgust* and was asked to circle the one word that "best describes how the individual is feeling."

*Comparison group.* The procedure for the comparison group was similar to that of the experimental group except, for expediency, participants rated all five facial expressions and all six stories. Participants rated the faces first, which were presented one at a time in a separate random order for each participant with the constraint that, across participants, each face be presented first the same number of times. The stories were rated next. Each story was read aloud by the experimenter, with the order determined in the same way. The story from Condition 3 was randomly chosen to be read first an extra time.

### Results and Discussion

The frequencies with which various emotion labels were chosen (by the comparison group) in the face-alone condition, situation-alone condition, and (by the experimental groups) in the face-plus-situation condition are shown in Table 1. The original norms from Ekman and Friesen's (1976) study or Matsumoto and Ekman's (1988) study for each facial expression also are shown. All three tasks yielded reasonably consistent responses: Overall, the modal option was chosen 69% of the time in the face-alone condition, 94% of the time in the story-alone condition, and 70% of the time in the face-situation condition. For all five facial expressions seen alone, and for all six stories heard alone, the modal label was as anticipated; with these data as justification, we consider the label predicted from each source alone as the label that would indicate the influence of that source on judgment of their combination.

#### Situational Dominance

To test our hypothesis of limited situational dominance, we examined the 150 responses from the six experimental groups to the various face-situation combinations. Participants chose the label consistent with the situation 105 times, the label consistent with the facial expression 17 times, and a label consistent with neither 28 times. The number of participants who chose the label consistent with the situation was significantly greater than the number who chose all others combined,  $\chi^2(1, N = 150) = 24, p < .001$ . The same pattern of results occurred within each of the three experimental conditions: Figure 2 shows confidence intervals for the proportion of participants who chose each label for the three types of face-situation combination. Indeed, the same pattern of results also occurred within each example within each condition.

#### Facial Influence

The 17 responses (11%) reported above that were consistent with the facial expression were fewer than the number that would be expected (17%) if all responses were chosen in a random fashion. Nevertheless, these 17 responses are consistent with, although not facial dominance, some influence of the facial expression. To demonstrate this effect, we set aside the 105 responses that coincided with the situation. Of the remaining 45 cases, the 17 occasions in which the label consistent with the face was chosen was significantly more than the number predicted by chance (45 responses divided by 5 response categories = 9;  $Z = 2.98, p < .01$ ). The same conclusion can be seen another way. The percentage of responses consistent with the situation (70%) given the face-situation combination was significantly less than the percentage of responses consistent with the same situation in the situation-only condition (94%);  $\chi^2(1, N = 175) = 6.28, p < .05$ . Therefore, the addition of facial information did have some influence on participants' judgments about the combination.

#### Source Clarity

Ekman et al. (1972, 1982) argued that a difference in the *clarity* of situational and facial information can bias the observer's judgment toward whichever is clearer. We had hoped that the carefully

constructed stories and highly selected, posed photographs of facial expressions would be equally clear. This does not seem to have happened. Source clarity has been operationalized as the percentage of participants who select the predicted label for that source when the source is presented alone (Ekman et al., 1972, 1982; Watson, 1972). In Study 1, when the stories were presented alone, 94% of the responses were consistent with the predicted label. When the faces were presented alone, only 69% of the responses were consistent with the emotion labels proposed by Ekman and Friesen (1976) and Matsumoto and Ekman (1988).

Given the effort that went into the creation of these sets of photographs, the difference in source clarity is itself an intriguing finding. Unfortunately, it also seems to provide an alternative explanation for our finding of situational dominance. Table 1 shows that the face and situation were about equally clear in four of the six experimental groups (90% for face; 91% for situation), and the face was much less clear in only two of the groups (44% for face; 100% for situation). For the four combinations that paired sources of approximately equal clarity, the situation-congruent label was chosen 67 times (67%), and the face-congruent label was chosen 15 times (15%). For the two combinations of unequal source clarity, the situation-congruent label was chosen 38 times (76%), and the face-congruent label was chosen only twice (4%). According to this comparison, source clarity may, indeed, have had some impact but clearly was not necessary for our finding of situational dominance.

## Study 2

In Study 2 we sought to replicate the result of Study 1 with other facial expressions, other situations, and, especially, other emotions. Specifically, we consider non-"basic" emotions. We created stories that were intended to suggest hope, determination, puzzlement, and pain, and we augmented the options in the dependent measure accordingly.

We created four types of face-situation combination (the "surprise" face combined with the hope situation, "anger" face with determination situation, "anger" face with puzzled situation, and "fear" face with pain situation), each with two examples, for a total of eight combinations. We also used a within-subject design for two reasons: first, convenience, and second, to demonstrate that a between-subjects design is not necessary to achieve situational dominance. We did not, however, ever present the same facial expression or the same situation more than once to any given participant.

## Method

### Participants

Participants were 75 undergraduates of the University of British Columbia, who received partial course credit for their participation. Of these, 50 were randomly assigned to experimental conditions, 25 to a comparison group.

Table 1  
Percentage of Participants Who Chose Emotion Labels for Face Alone (F), Situation Alone (S), and Face-Situation (F+S) Conditions: Study 1

Emotion	Story 1				Story 2			
	Norm	F	S	F+S	Norm	F	S	F+S
"Fear" face with anger situation								
Happy	0	0	0	0	—	0	0	0
Angry	<b>0</b>	<b>4</b>	<b>100</b>	<b>76</b>	—	<b>0</b>	<b>84</b>	<b>60</b>
Sad	4	0	0	0	—	0	0	4
Surprise	4	48	0	20	—	8	0	20
Fear	<b>88</b>	<b>44</b>	<b>0</b>	<b>4</b>	<b>76</b>	<b>88</b>	<b>0</b>	<b>0</b>
Disgust	4	4	0	0	—	4	16	16
"Anger" face with fear situation								
Happy	0	0	0	0	—	0	0	0
Angry	<b>76</b>	<b>44</b>	<b>0</b>	<b>4</b>	<b>85</b>	<b>88</b>	<b>0</b>	<b>32</b>
Sad	0	0	0	0	—	0	0	0
Surprise	3	16	0	16	—	8	0	0
Fear	<b>15</b>	<b>12</b>	<b>100</b>	<b>76</b>	—	<b>0</b>	<b>100</b>	<b>56</b>
Disgust	6	28	0	4	—	4	0	12
"Sad" face with disgust situation								
Happy	—	0	0	0	—	0	0	0
Angry	—	0	0	0	—	0	4	16
Sad	<b>89</b>	<b>92</b>	<b>0</b>	<b>8</b>	<b>89</b>	<b>92</b>	<b>4</b>	<b>20</b>
Surprise	—	4	4	0	—	4	0	0
Fear	—	4	4	4	—	4	0	0
Disgust	—	<b>0</b>	<b>88</b>	<b>88</b>	—	<b>0</b>	<b>92</b>	<b>64</b>

Note. Norm refers to original data from Ekman and Friesen's (1976) study or Matsumoto and Ekman's (1988) study. Percentage of responses to emotion label predicted by face alone or situation alone are in boldface. Dashes indicate that the figure is unavailable.

### Facial Expressions

Eight photographs of facial expressions (two open-mouth "anger," two closed-mouth "anger," two "surprise," and 2 "fear") were selected from those published by Ekman and Friesen (1976). None of these photographs had been used in Study 1.

### Situations

The situations were described in four short stories (presented in the Appendix). The hope story was created to be presented with a "surprise" expression. The determination story was created to be presented with an open-mouth "anger" expression. The puzzled story was created to be presented with a closed-mouth "anger" expression. The pain story was created to be presented with a "fear" expression. "Anger" expressions were paired with different stories because of the quasi-physical information shown. The open-mouthed "anger" expression was paired with determination because the teeth are clenched, showing that the expresser is exerting muscular effort. The closed-mouth "anger" expression was paired with puzzlement because the closed mouth results in restricted breathing, suggesting that the expresser has momentarily frozen action.

### Procedure

**Experimental conditions.** With two facial expressions per situation, we created two experimental groups, with 25 participants in each. The groups received the same four stories but different facial expressions. The first group was read each story combined with one of the facial expressions designated for that story; the second group was read the same four stories but combined with the second facial expressions designated for each story.

The procedure was similar to that used in Study 1 except that there were four trials rather than one. Participants were tested one at a time, and the session lasted approximately 15 min. The experimenter read the story and then presented the photograph of the face. After a few seconds, the experimenter asked "What emotion is the woman [man] feeling?" The response sheet was a list of 10 emotion words in the following order: *anger, determination, disgust, fear, happy, hope, pain, sad, surprise, and puzzled*.

**Comparison group.** The 25 participants in the comparison group were each asked to rate all eight faces and all four stories. The procedure was identical to that followed in Study 1.

### Results and Discussion

Although Study 2 was a simple extension of Study 1, a complication arose because participants' judgments of Ekman and Friesen's (1976) facial expressions showed low clarity. As a consequence, we begin by examining participants' judgments of the face alone and situation alone. We then turn to judgments of the combined cues.

#### Face Alone

Responses to the facial expressions alone (F2 in Table 2) were less consistent than would be expected from Ekman and Friesen's (1976) normative data (*Norm* in Table 2). Recognition scores (percentage of participants giving the predicted response) for the eight photographs ranged from 74 to 100 in Ekman and Friesen's data ( $M = 90.5$ ) but from 0 to 84 in ours ( $M = 48.5$ ). For seven of the eight facial expressions, frequencies of the predicted label were significantly lower than those reported by Ek-

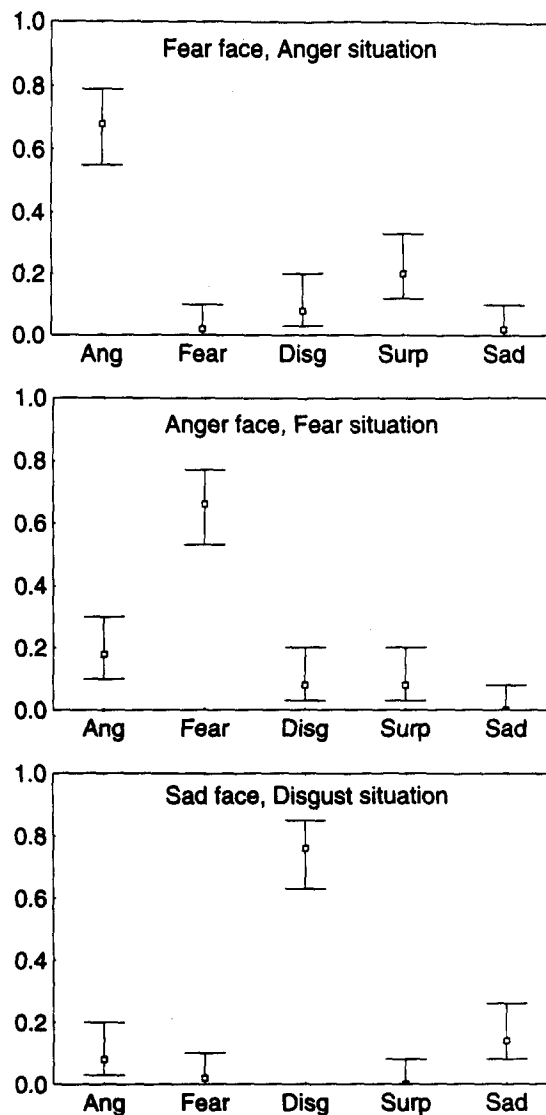


Figure 2. 95% confidence intervals for the proportion of participants who chose each emotion label for each face-situation condition in Study 1. Ang = anger; Disg = disgust; Surp = surprise.

man and Friesen (1976). This difference is most likely due to a difference in response format in the two studies. Our format provided all the response options they used, plus four additional options (*determination, pain, hope, and puzzled*), which together attracted 36% of endorsements. Especially interesting were the results for the two closed-mouth "anger" expressions: Our participants' modal response was *puzzled* rather than *anger*. More generally, for all facial expressions, at least 1 participant selected, the emotion label congruent with the situation to be paired with that facial expression. This result did not surprise us, because, on our account, faces do not signal specific emotions and because the four additional labels were selected to be close to Ekman and Friesen's in terms of pleasure and arousal. Moreover, recognition scores derived from a forced-choice response format have been found vulnerable to the exact list of options included (Russell, 1993).

Table 2  
Percentage of Participants Who Chose Each Emotion Label for Eight Facial Expressions: Study 2 and Study 3

Emotion label	Facial expression																
	"Surprise"				Open-mouth "anger"				Closed-mouth "anger"				"Fear"				
	Example 1		Example 2		Example 1		Example 2		Example 1		Example 2		Example 1		Example 2		
Norm	F2	F3	Norm	F2	F3	Norm	F2	F3	Norm	F2	F3	Norm	F2	F3	Norm	F2	F3
Anger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Determination	—	0	0	—	0	0	—	0	0	0	0	—	0	0	0	0	0
Disgust	4	0	0	3	4	0	8	20	0	8	0	19	0	4	0	12	16
Fear	0	4	0	23	4	8	0	0	0	0	0	0	0	0	100	44	52
Happy	0	0	0	0	0	4	0	0	0	0	0	3	0	0	0	0	0
Hope	—	20	4	—	4	0	—	0	0	0	0	0	0	0	0	0	0
Pain	—	0	0	—	0	0	—	0	0	0	0	0	0	0	0	0	0
Sad	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0
Surprise	96	68	80	74	64	72	0	0	0	0	0	3	0	0	0	20	28
Puzzled	—	8	16	—	24	16	—	0	0	60	80	0	64	16	0	0	0

Note. Percentage of responses to emotion label predicted by Ekman and Friesen (1976) are in boldface. Comparisons were made between Ekman and Friesen's norms and those of Studies 2 and 3 for the proportion of participants who selected Ekman and Friesen's predicted label. Proportions that differ from those of Ekman and Friesen are indicated with a subscript a and differ at  $p < .05$ . Where no number appears, it is because this response option was not given. Norm = Ekman and Friesen's (1976) norms; F2 = norms gathered in Study 2 ( $n = 25$ ); F3 = norms gathered in Study 3 ( $n = 25$ ).

Because the apparent judgments of the face were quite different in the present study from those predicted by Ekman and Friesen (1976), a distinction is made here between the modal response to the facial expressions reported by Ekman and Friesen (1976), which we refer to as the *theoretical norm*, and the modal response found in the present study, which we refer to as the *empirical norm*. On the basis of the empirical norms, the modal response was chosen on average by 64% of participants in the face-alone condition. On the basis of the theoretical norms, the predicted response was chosen on average by 49% of participants in the face-alone condition. Ekman (1994) used chance as the level against which he tested his prediction; 49% is significantly greater than chance: 10% (100% divided by 10 response options),  $Z = 6.40, p < .001$ .

*Situation Alone*

For judgments of the situation alone, the percentages of responses congruent with the predicted emotion label were adequate, although lower (overall average of 79%) than that found in Study 1 (overall average of 94%). The hope story was judged as *hope* by 84% of the participants, the determination story as *determination* by 84%, the puzzled story as *puzzled* by 64%, and the pain story as *pain* by 84% of participants. In no case did any participant select for the situation the emotion label Ekman and Friesen (1976) predicted for the face to be paired with that situation.

*Judgment of Combined Cues*

*Situational dominance.* Across all eight face-situation conditions, the 200 responses to the combined cues showed high agreement (modal response selected by 87% of participants). Participants chose the label consistent with the situation 173 times, the label consistent with the theoretical norm for the face 9 times, the label consistent with the empirical norm for the face 38 times, and a label consistent with none of these three possibilities 18 times. In this tally, judgments consistent with the empirical norm for the face are not mutually exclusive from judgments consistent either with the theoretical norm for the face or with the situation.

Whether the empirical or theoretical norms are used to describe the signal value of the face, there was clear evidence for our hypothesis of limited situational dominance.<sup>1</sup> The proportion of participants' responses that were consistent with the situation was significantly greater than 50%,  $Z = 5.16, p < .001$ . Indeed, for each face-situation condition, the label consistent with the situation was chosen significantly more often than any

<sup>1</sup> The following omnibus test, and subsequent ones, include more than one observation per participant. The assumption of independence of observations is likely violated, although to an unknown degree. To provide a conservative analysis, we used the number of participants rather than the number of observations in calculating the error term. A more trustworthy approach is to examine results from each face-situation combination separately. We therefore did so by calculating confidence intervals for each response category. The results are shown pictorially in Figures 2, 3, and 4.



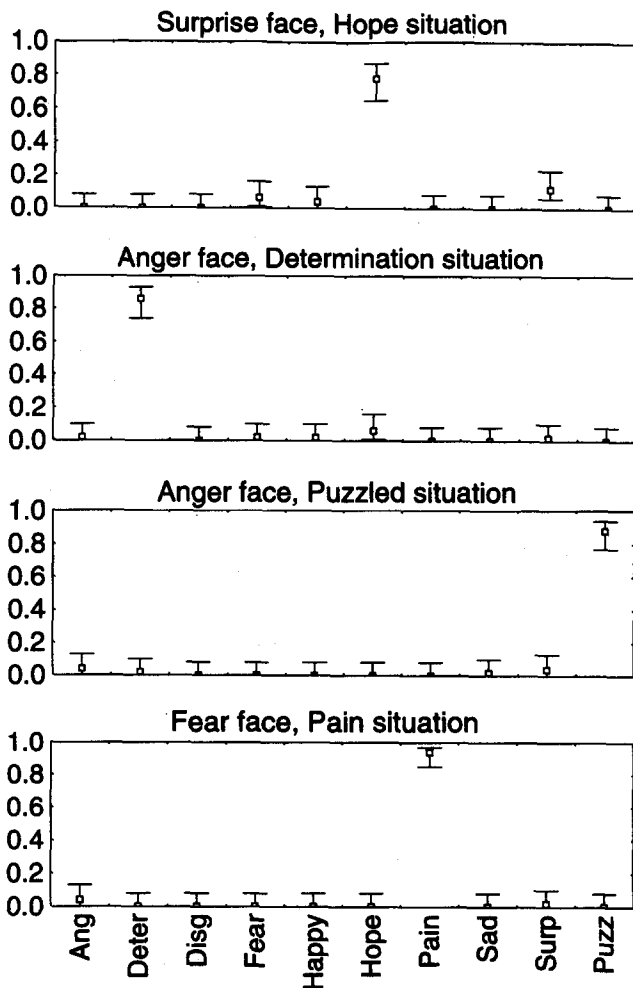


Figure 3. 95% confidence intervals for the proportion of participants who chose each emotion label for each face-situation condition in Study 2. Ang = anger; Deter = determination; Disg = disgust; Surp = surprise; Puzz = puzzlement.

other emotion label (see Figure 3). Indeed, the same pattern occurred for each example within each condition.

Consistent with our expectation of greater situational dominance here than in Study 1, the proportion of participants who chose the label consistent with the situation was greater in Study 2 (.87) than in Study 1 (.70),  $\chi^2(1, N = 200) = 5.32, p < .05$ .

**Facial influence.** The extent to which facial information affected judgments of the combinations can be analyzed with either the theoretical norms or the empirical norms. The number of participants (9) who chose the label predicted by Ekman and Friesen (1976) was less than that expected by chance (200 responses divided by 10 response categories = 20). If we set aside the 173 responses that coincided with the situation, however, only 27 cases remain. For this set, on the assumption that the 27 cases are independent, the 9 occasions in which the label consistent with the face was chosen was significantly greater than the number predicted by chance (27 responses divided by 9 response categories = 3;  $Z = 3.65, p < .001$ ). The proportion

of responses (.19) that were consistent with the empirical norms for the face was significantly greater than that expected by chance (.10);  $Z = 2.12, p < .05$ . This last result, however, is entirely due to the closed-mouth "anger" expressions being judged as *puzzled* rather than as *anger*. In this condition, both the face and situation were judged as *puzzled*, and therefore the face and situation were confounded.

### Source Clarity

The clarity of a particular facial expression was operationalized in Study 1 as the percentage of responses to that face seen alone that were consistent with the predicted label, which always corresponded to the empirically obtained mode. However, in the present data, Ekman and Friesen's (1976) predicted label for two of the facial expressions (the closed-mouth "anger" expressions) was not the most frequently chosen response. Because of this discrepancy, the clarity of the facial information becomes ambiguous. If *clarity* is defined with respect to Ekman and Friesen's (1976) prediction, then the clarity of the two closed-mouth anger expressions was 0%, and the overall clarity of the facial information was 49%. If clarity is defined with respect to the modal response obtained here, then the clarity of the closed-mouth anger expressions was moderate (60% for one expression, and 64% for the other), and the overall clarity of the facial information was 64%. (For all four situations, the modal response was the predicted label, and their overall clarity was 79%.)

If we base our analysis on Ekman and Friesen's (1976) norms (Table 2), the face and situation were equally clear in one of the eight experimental groups, and the face was less clear in seven groups. For the one condition of equal source clarity ( $n = 25$ ), the situation-congruent label was chosen 22 times, and the face-congruent label was not chosen at all. For the seven conditions of unequal source clarity ( $n = 175$ ), the situation-congruent label was chosen 151 times, and the face-congruent label was chosen 9 times. If we base our analysis on our empirical norms, we must omit the two cases in which an "anger" face was paired with a puzzled situation, because the "anger" face was judged as *puzzled*. Doing so leaves us with six conditions. One was of equal source clarity and was described above. The other five were of unequal source clarity ( $n = 125$ ); for these the situation-congruent label was chosen 107 times, and the face-congruent label was chosen 7 times. So, in either analysis, source clarity cannot account for our results, although the issue is more troubling here than it was in Study 1.

### Study 3

Study 2 was troubled by problems of source clarity. There are two potential solutions: Come up with clearer faces or with more ambiguous situations. Clear facial signals of specific emotions have been sought by scientists for well over a century (Duchenne de Boulogne, 1862/1990; Darwin, 1872/1965; Fel'eky, 1914; Izard, 1971; Ekman, 1972), and we did not feel up to the task. We therefore altered the situations of Study 2 to make them more ambiguous. We predicted that even with more ambiguous situations, judgments of the combined cues still would conform to the situation. In short, Study 3 was a replication of Study 2, but with less clear situations.

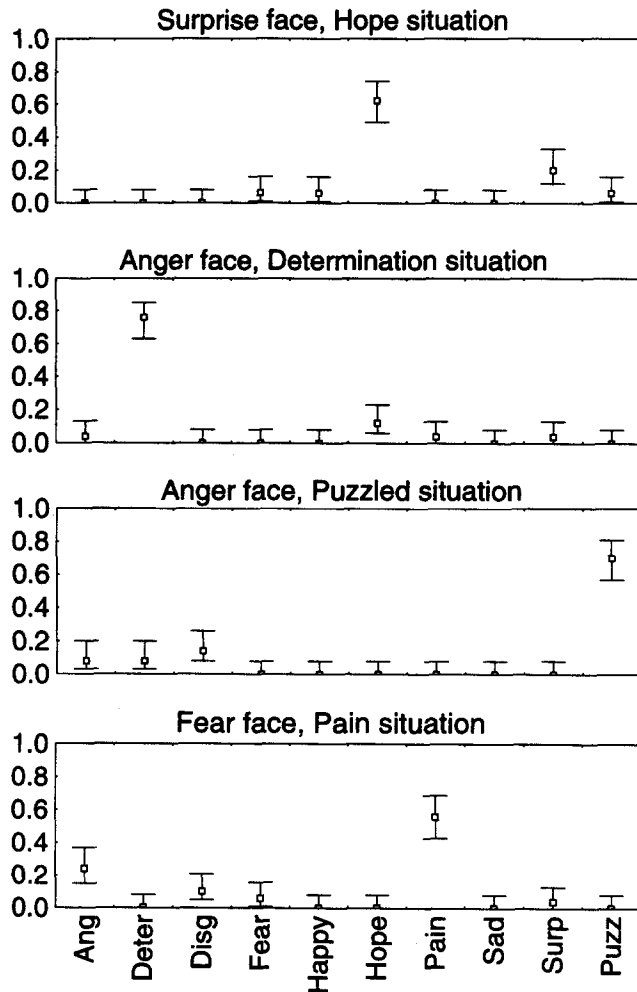


Figure 4. 95% confidence intervals for the proportion of participants who chose each emotion label for each face-situation condition in Study 3. Ang = anger; Deter = determination; Disg = disgust; Surp = surprise; Puzz = puzzlement.

### Method

The method of Study 3 was exactly the same as that of Study 2 except for the situational stories (see Appendix), which had been altered so that when they were presented alone, consensus as to the predicted emotion would be lower.

### Results and Discussion

#### Face Alone

Responses to each facial expression alone are shown (as F3) in Table 2. Overall, 55% of participants' choices of an emotion label were consistent with Ekman and Friesen's (1976) prediction. The 55% was significantly greater than chance: 10% (100% divided by 10 response options,  $Z = 7.50$ ,  $p < .001$ ). Although slightly greater than the comparable figure found in Study 2 (49%), it was not significantly so and remained well below the figures reported by Ekman and Friesen. The closed-mouth "an-

ger" expressions continued to provide interest. As in Study 2, the mode for example Number 1 was *puzzled* (80%); 0% chose *anger*. Unlike Study 2, the mode for example Number 2 was *anger* (36%); only 16% of choices were *puzzled*. We have no explanation for this discrepancy, except the possibility of order effects created by our randomization for each participant.

#### Situation Alone

Each of our four situations was more ambiguous than its counterpart in Study 2. Participants chose the predicted emotion label significantly less often in Study 3 (36%) than in Study 2 (79%),  $\chi^2(1, N = 50) = 9.44$ ,  $p < .01$ . The predicted emotion remained the modal response for three of the four stories. For the pain story, however, the modal response was *anger* rather than *pain*.<sup>2</sup>

#### Judgment of Combined Cues

Frequency of response to the face alone, situation alone, and face-plus-situation conditions are shown in Table 3. (Only frequencies for those emotion labels consistent with facial or situational dominance are shown. In other words, Table 3 is a simplified version of Table 1 with only the most relevant rows shown.) The eight face-situation conditions yielded a lower amount of consensus (66%) than was found in Study 2 (86%).

*Situational dominance.* Participants in the face-plus-situation condition chose the label consistent with (our predicted label for) the situation 132 times, with (Ekman and Friesen's predicted label for) the face 19 times, and with neither 49 times. The proportion of responses that was consistent with the situation was significantly greater than .50;  $Z = 2.26$ ,  $p < .05$ . This overall pattern was found for each face-situation condition (see Figure 4) and, indeed, within each example as well.

*Facial influence.* The number of responses that were consistent with Ekman and Friesen's (1976) predictions did not differ from chance (19 responses evidenced, and 20 expected by chance). If we set aside the 132 responses that coincided with the situation, however, only 68 cases remain. On the assumption that these 68 cases are independent, the 19 occasions in which the label consistent with the face was chosen was significantly more than the number predicted by chance (68 responses divided by 9 response categories = 7.5;  $Z = 4.46$ ,  $p < .001$ ).

#### Source Clarity

We intentionally reduced the clarity of the situational stories. The clarity of the faces remained similar to that of Study 2. In consequence, the faces (56%) were clearer than the situations

<sup>2</sup> Nevertheless, we continue to use *pain* as our predicted label for the face-situation combination. In all three studies, we used the *predicted* label for the situation as our predicted label for the face-plus-situation combination as well, so that our tests were conservative and consistent. Moreover, we believed our prediction. As we discuss later in the article, we do not believe that each source, face and situation, is judged separately as to emotion. It is the combined information that is judged. In this case, the high arousal and unpleasantness of the face in the situation described in the story are most plausibly interpreted as pain.

Table 3  
*Percentage of Participants Who Chose Emotion Labels in Face-Only (F), Situation-Only (S), and Face-Situation (F+S) Conditions, Study 3*

Emotion label	Example 1				Example 2			
	Norm	F	S	F+S	Norm	F	S	F+S
"Surprise" face with hope situation								
Surprise	96	80	4	20	74	72	4	20
Hope	—	4	56	68	—	0	56	56
"Anger" face with determination situation								
Anger	100	64	0	0	100	80	0	8
Determination	—	16	40	84	—	12	40	68
"Anger" face with puzzled situation								
Anger	74	0	4	0	92	36	4	16
Puzzled	—	80	44	84	—	16	44	56
"Fear" face with pain situation								
Fear	100	52	0	8	88	60	0	4
Pain	—	0	4	48	—	16	4	64

*Note.* The percentage of responses is given only for the emotion labels predicted by Ekman and Friesen's (1976) normative data or by our predicted interpretation of the situations. *Norm* refers to original data from Ekman and Friesen (1976). Dashes indicate that data were not collected.

(36%). Indeed, the situation was less clear than the face in six of the eight conditions. (The remaining two cases involved the troublesome closed-mouth "anger" expression.) Nevertheless, despite the superior clarity of the face, all eight combinations showed situational dominance.

### General Discussion

Like everyone else, we believe that a person often looks to another's face when trying to discover that person's emotional reaction. But what precise information do observers derive from the face? Attempts to bring facial expressions under scientific scrutiny have created controversy around this question, including the traditional controversy of categories versus dimensions. As students in introductory psychology know, one important theory of emotion teaches that certain facial expressions are easily recognized signals of specific emotions. Although common sense, this theory has not always been accepted (Landis, 1924, 1929; Woodworth, 1938), and it is once again becoming controversial (Fridlund, 1994; Ortony & Turner, 1990; Russell, 1994; but see replies by Ekman, 1992, 1994; and Izard, 1992, 1994).

Part of the controversy surrounds the appropriate methods to be used in the study of faces (Ekman, 1994; Izard, 1994; Russell, 1994). In this article, we resurrected one traditional method used to approach the problem: We examined judgments of faces paired with situations. We relied on the face's normative preeminence over situations to help delimit the precise information the observer derives from the face. On our account, the face's normative preeminence is limited to quasi-physical features, pleasure, and arousal. So, both our account and those of Tomkins (1962–1963), Izard (1994), and Ekman (1994) predict facial dominance when face and situation are discrepant with regard to these matters. The

interesting cases occur when face and situation are consistent in anticipated quasi-physical features, pleasure, and arousal, but discrepant on specific emotions.

Unlike previous studies, therefore, we did not pair all faces with all situations. Rather, for each facial expression we created situations that matched it in anticipated pleasantness, arousal, and quasi-physical information—but of course differed in anticipated specific emotion. Within this limited context, most observers judged the expresser to be feeling the emotion anticipated from the situation rather than the one allegedly signaled by the face. This basic result recurred in 22 of the 22 face-situation combinations examined in three studies.

Our finding of limited situational dominance is difficult to reconcile with the theory that the specific facial expressions included in these 22 cases signal specific emotions (Ekman, 1972; Izard, 1971; Tomkins, 1962–1963). If faces signal specific emotions, and if facial information is normatively preeminent over situational information, then our empirical results are baffling. Another, serendipitous, finding that is hard to reconcile with the same theory was the change in modal response to those same facial expressions when the response format was changed from 6 to 10 options. The 4 items that we added—*hope*, *determination*, *in pain*, and *puzzled*—drew a fair number of endorsements in competition with the supposedly "correct" answer.

Two findings in our studies might appear to lend at least some support to the hypothesis that faces signal specific emotions. First, observers often selected the emotion label predicted by Ekman and his colleagues for the face when seen alone. These high "recognition scores" for faces seen alone replicate a ubiquitous result (Ekman & Friesen, 1976; Matsumoto & Ekman, 1988). The interpretation rather than the reliability of this result is the question.

We interpret high recognition scores as partly due to the pleasantness, arousal, and quasi-physical properties of the face (e.g., the nose wrinkle of the "disgust expression" conveys an unpleasant reaction to an odor; not all emotions terms are equally applicable to this reaction) and partly due to the method of gathering judgments. That is, the forced-choice response format, within-subject design, and other features of method used here and in previous studies help funnel the observers' judgment of the face into a single category (for a discussion of these issues, see Russell, 1994). As we saw, the recognition scores vary with small changes in the response format.

There is a second finding that might seem to suggest that faces signal specific emotions: When judging the face-situation combinations, a very small but still significant number of observers in each study chose the emotion label predicted as the signal value of the face. We believe that the combination of forced-choice response format and the quasi-physical features of the face account for this effect. The forced-choice response format limited the available options severely. Tightened lips, clenched teeth, staring eyes, and the like can suggest the behavioral aspects of the expresser's emotional reaction. For example, Fridlund (1994) hypothesized that such facial actions are social signals: Stares are felt as threats, tears are felt as requests for help, and smiles are felt as greetings. In a complementary approach, Frijda (1986) hypothesized that facial actions are incipient instrumental actions, such as approach, withdrawal, biting, and so on. Observers who focus on such quasi-physical features might infer aspects of the situation that were not stated in our stories and that would, in turn, suggest a somewhat different emotional reaction. Our own account of the meaning of the face is in great need of descriptive data on how quasi-physical features of the face are interpreted. Recall as well that our observers were college students enrolled in a psychology course. College students in Western cultures are familiar with certain facial expressions as symbols (emblems) for specific emotions: just as a red heart stands for love, a smile stands for happiness (or comedy), wide open eyes stand for surprise, and a downturned mouth stands for grief (or tragedy). These same students might have encountered the theory and photographs of Ekman (1972) and Izard (1971) in their textbook.

Ekman et al. (1972) pointed to source clarity in their criticism of previous studies that seemed to suggest a greater influence from situational information than consistent with their theory. We agree, of course, that observers may be biased toward whatever source is clearer. However, Study 3 (and internal analyses in Studies 1 and 2) showed that our prediction of limited situational dominance was upheld in cases of equal source clarity or even when the face was substantially clearer. Although source clarity is undoubtedly a factor in this domain, it does not account for the influence of the situation seen here.

Our studies deliberately relied heavily on a research design used for decades. We did so with reluctance and, indeed, feel that the Goodenough-Tinker design has now reached the end of the line. It is a design at best capable of telling us what *can* happen (as opposed to what does happen ordinarily). With this design, facial dominance (Nakamura et al., 1990; Watson, 1972) and situational dominance (present studies) can both be demonstrated. Overall, we believe that a simple rule specifies

when one or the other result occurs: When face and situation are incongruent on quasi-physical information, pleasure, or arousal, then facial information will take its natural precedence over situational information. When face and situation are congruent on quasi-physical information, pleasure, and arousal, then situational information will determine the precise emotion category chosen.

It is now time to turn to other designs. We especially need research designs with more ecological relevance. The kind of still photographs of posed facial expressions paired with verbally described situations does not occur outside psychologists' experiments. We very much need information on the kinds of facial movements that actually occur in daily life, about the kinds of situations in which they occur, and on the ways in which observers spontaneously interpret such information. Laboratory experiments obviously have their place in answering theoretical questions about what can happen, but these experiments must be supplemented with information about what does happen in the nonexperimental world of face-to-face encounters.

In the future, new questions as well as methods need to be explored. For example, our studies did not address the question of what process intervenes between the presentation of the stimulus information and the observer's judgment (see Wallbott, 1988). Our studies do provide some suggestions, however. Previous writing on this topic has generally assumed that the observer judges each source separately as to the specific emotion it suggests, then weights each possible emotion (presumably by the clarity of its source), and then decides in favor of the emotion with the largest weight. Our data speak clearly against this weighted linear model of the process, which must predict that the judgment of the combined cues could not achieve greater consensus than either source judged alone. All three studies here yielded violations of this prediction. More important, Study 3 found a clear case in which the emotion predicted from the combination was qualitatively different from the modal response to each source alone. No matter what weights are assigned to the emotions from each source alone, no such qualitative shift could occur.

As an alternative to a weighted linear model, we suggest that the information from the two sources is combined before any specific emotion is judged. The face yields what information it can, and the situation does likewise. The facial reactions are then explained on the basis of situational information, and a plausible story is created, perhaps including additional information not directly observed, but inferred. Finally, the range of plausible emotions compatible with the imagined story is inferred. If one emotion is asked for, the most plausible is chosen. If the experimenter forces the observer to choose from a restricted list, then the most probable emotion from the list is chosen.

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(Appendix follows on next page)

## Appendix

## Situation Descriptions Used in the Studies

*Situations From Study 1*

*Anger: Example 1.* This is a story of a man who had recently bought a new car. Today, he is walking back to his car across the parking lot after running errands at the post office. From a distance, he can see some kids around his car. Then he sees one of them holding one of the car's hubcaps. He yells at the kids and they take off to a nearby forest waving the hubcaps in their hands. Now that he is close to his car he can see that it is certainly missing its hubcaps.

*Anger: Example 2.* This is a story of a woman who wanted to treat her sister to the most expensive, exclusive restaurant in their city. Months ahead, she made a reservation. When she and her sister arrived at the restaurant, they were told by the maitre d' that their table would be ready in 45 minutes. Still, an hour passed, and no table. Other groups arrived and were seated after a short wait. The woman went to the maitre d' and reminded him of her reservation. He said he would do his best. Ten minutes later, a local celebrity and his date arrived and were immediately shown a table. Another couple arrived and were seated immediately. The woman again went to the maitre d', who said that all the tables were now full, and that it might be another hour before anything was available.

*Fear: Example 1.* This is a story about a man who is on vacation with his family. He decided to go for a hike while the rest went down to the beach for the afternoon. He enjoyed walking through the quiet shaded mountain side. He followed a small brook in and out of large rocks and crevices. Without realizing he stumbled into a small cave which the brook must have been flowing through, and only about five yards in he sees some small bear cubs. He turns and sees the adult bear coming through the entrance of the cave. He backs away slowly as the bear approaches him growling loudly. The bear has him cornered.

*Fear: Example 2.* This is a story about a woman who had never done anything really exciting in her life. One day she decided she had to do something exciting so she enrolled in a class for parachuting. Today is the day that she will make her first jump. She and her class are seated in the plane as it reaches the right altitude for parachute jumping. The instructor calls her name. It is her turn to jump. She refuses to leave her seat. What emotion is the woman feeling?

*Disgust: Example 1.* This is a story about a woman who was earning a few dollars helping her teacher organize the biology lab. Her job was to count the contents of different containers stored in boxes in the storage room. The list of items to count ranged from frogs and worms, to human brains. The job was going quickly until she opened the container of human brains. The container was so full that she would have to take out the brains and put them in a new container to get a proper count. She put on a rubber glove and began to immerse her hand into the liquid to pull out the first brain.

*Disgust: Example 2.* This is a story of a woman who went away on quite a long business trip. When she arrived home, even at the front door, she could smell something was wrong. As she entered the kitchen the smell grew even stronger. She found that she had forgotten to take out the kitchen garbage. The rancid smell whooshed out as she closed

the bag. The bag was so full that as she carried it to the curb it tore slightly and she could feel liquid from the bottom of the bag drip down her leg.

*Situations From Study 2*

*Hope.* This is a story of a woman who went to the horse races to bet her last five hundred dollars. She bet it all on horse number 7. She is now watching the horses make the final turn down the stretch to the finish line. Horse number 9 and horse number 7 are neck and neck. It looks like horse number 7 is going to take the lead.

*Determination.* This is a story about a woman who made it onto the Olympic rowing team. She is now in the race for the gold medal. Halfway through the race she is third, but gaining on second. Two thirds of the way through the race she sees that she is in position to pass the boat in first. She rows as fast as she ever has in her life.

*Puzzled.* This is a story of a woman who is going to a McDonalds for the first time. While waiting in line, she stares up at the menu. Several people are served and without realizing it she arrives at the front of the line. The cashier says, "May I help you please?" The woman acknowledges the cashier and returns her attention to the menu.

*Pain.* This is a story of a woman who has just had her ingrown toenail operated on. She is now waiting in line to see a movie. As another movie ends, the crowd is asked to step back to let them through. Someone accidentally steps on her toe.

*Situations From Study 3*

*Hope.* This is a story of a woman who went to the horse races to bet five hundred dollars. She bet it all on horse number 7. For her to win, the horse has to finish first or second. She is now watching the horses make the final turn down the stretch to the finish line. Horse number 7 is in second place.

*Determination.* This is a story about a woman who had worked very hard and made it onto the Olympic rowing team. She is now in the race for the gold medal. Halfway through the race she is in first place out of five boats.

*Puzzled.* This is a story of a woman who went to McDonalds for lunch. After a short wait in line it is her turn to order. The cashier says, "May I help you please?" The woman acknowledges the cashier and returns her attention to the menu.

*Pain.* This is a story of a woman who went to the cinema to see a movie. She is now waiting in line to see the movie. Just as they are letting the audience into the cinema, a pair of individuals rudely push their way through the crowd bumping the woman and stepping on her bruised toe.

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