Journal of Personality and Social Psychology
1989, Vol. 57, No. 1, 100–108

0022-3514/89/$00.75

Emotion-Specific Effects of Facial Expressions and Postures on Emotional Experience

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A total of 74 Ss were induced to adopt expressions of fear, anger, disgust, and sadness in Experiment 1. Each expression significantly increased feelings of its particular emotion compared with at least two of the others, a result that cannot be explained by a single dimension. Postures should play the same role in emotional experience as facial expressions. However, the demonstrated effects of postures (Riskind, 1984) could also represent a single dimension of variation. In Experiment 2, subjects were induced to adopt postures characteristic of fear, anger, and sadness. Again, the effects were specific to the postures. These two studies indicate that emotional behavior produces changes in feelings that specifically match the behavior.

When people are induced to act happy, they feel happier. When people are induced to act angry, they feel angrier. A number of experiments have demonstrated that this effect occurs for facial expressions of these emotions and others (see Laird, 1984, for a review; see also Kappas, Hess, McHugo, Lanzetta, & Kleck, 1987; Kellerman, Lewis, & Laird, in press; McCanne & Anderson, 1987; Strack, Martin, & Stepper, 1988). However, Winton (1986) has recently observed that the nature of this facial feedback effect is unclear, because the number of expression conditions used in the research is usually too small.

Resolution of this issue is important to understanding the processes that generate emotional feeling. Since Darwin (1872/1904) and James (1884), various theorists have argued that the experience of an emotion is at least partly a product of the bodily changes and actions that occur during an emotional episode. Theories of this general sort are gaining increasing acceptance (Adelman & Zajonc, in press). Both the older peripheral feedback theories and their more modern counterparts (e.g., Izard, 1977; Laird, 1974, 1984; Leventhal, 1980; Tomkins, 1962, 1982; Zajonc, 1985) have assumed that the patterns of emotional response are more or less specific to the feelings. That is, they have assumed that the combined effect of facial expressions and the other components of emotional response is to produce corresponding emotional experience. In this view, frowning would be expected to make someone feel more angry than sad or afraid. Any other kind of effect would require substantial revision of all of these theories.

Winton (1986) called the prevailing view the *categorical* model of facial feedback. He identified a second possibility, that facial expressions might affect only a single dimension, probably that of pleasantness–unpleasantness. This alternative he labeled the *dimensional* model of facial feedback. He also observed that in most of the research on facial feedback, only two facial expressions are compared, most often one positive and one negative. Sometimes a neutral expression condition is added, but these conditions might represent two or three points on a single continuum. As a consequence, we cannot tell whether the observed differences represent categorical or unidimensional effects. When, for example, subjects report feeling angrier when frowning and happier when smiling, these differences may only reflect differences on the single dimension of pleasantness.

Emotion theories differ widely in how complex they assume emotional differences to be. However, at least two (Russell, 1980; Watson & Tellegen, 1985), three (Russell & Mehrabian, 1977), or more (e.g., de Rivera, 1977; Smith & Ellsworth, 1985) dimensions seem required to adequately describe the variations in emotional experience. The issue posed by Winton (1986) might be recast, therefore, as between unidimensional and all more complex positions. Consequently, in the remaining discussion we simply refer to unidimensional and multidimensional theories. The latter we take to include completely categorical positions (e.g., Izard, 1977).

Winton's (1986) critique also specified the methodology for resolving the issue. To decide whether we need one or more than one dimension to describe facial feedback effects, we must compare more than two expressions and measure independently a variety of feelings. The unidimensional model would predict that an expression of, for example, anger, would increase equally feelings of anger and also of other unpleasant emotions such as sadness and fear. Some more complex, multidimensional models would predict that an angry frown could affect feelings of other emotions in addition to anger but that the largest gain would be in anger and that all negative emotions would not be equally increased.

Previous research contains some parts of the required array of observations, but not all. For example, Laird (1974) used only two expressions but measured a range of emotional feelings. The effects were quite specific. For example, in the anger expression, subjects reported feeling more anger, but there were no changes on factor scales labeled *remorse* and *anxiety*, which

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actually contained items more like sadness and fear. However, this study used only two expressions.

Only two studies seem to have used enough expressions to test the unidimensional versus the multidimensional possibility. In one, three expressions were used: anger, sadness, and fear (Laird, Wagener, Halal, & Szegda, 1982, Study 2). The effects of these expressions were precisely what multidimensional theories would predict. However, this was a study of the effects of emotional state on memory, and the dependent variable was memory for emotional material, not a direct assessment of mood itself. A similar study (Laird, Cuniff, Sheehan, Shulman, & Strum, in press) also used three expression conditions—anger, sadness, and happiness—and also found effects on memory that were inconsistent with the unidimensional model. In sum, the existing research certainly suggests that facial expressions should produce categorical or multidimensional effects, but all of the evidence is indirect.

Study 1

What is needed is a study in which a number of facial expressions are manipulated, and a number of feelings measured. Because the most likely candidate for a single dimension is the pleasantness dimension, we decided to use only negative emotions. If distinctive effects could be demonstrated among these, the effects could not be attributed to a single, pleasant–unpleasant dimension. The four expressions used in this study were anger, sadness, fear, and disgust. These four were chosen because they were the negative emotions whose facial expressions have been shown to be culturally universal (Ekman, Friesen, & Ellsworth, 1972; Ekman et al., 1987; Izard, 1971). They are also the only four negative emotions that are contained in both Izard's (1977) and Plutchik's (1980) lists of basic or primary emotions.

The measures of emotional feelings also needed to be diverse. In addition to the four emotions being manipulated, we included the other two that appear on all of the lists cited above: happiness and surprise. We also included agreeableness and interest, which are on Izard's (1977) list, and seem like Plutchik's (1980) acceptance and anticipation. Finally, we included pity for reasons that were irrelevant to this study.

Thus, subjects' faces were manipulated into expressions of fear, anger, sadness, and disgust, and their feelings assessed on scales of those four emotions and also happiness, surprise, interest, agreeableness, and pity. If the unidimensional explanation of previous facial feedback research was correct, and the single dimension was pleasantness, we would expect few differences among conditions. Whatever differences there were would presumably preserve the single order in which the expressions or feelings fell along the pleasantness dimension. In contrast, if multidimensional explanations were correct, we would expect that each expression condition would increase the feelings of its specific emotion more than any other.

Method

Subjects

The subjects were 80 undergraduate volunteers, 37 men and 43 women. No differences between men and women were found in any of the analyses. Six subjects were subsequently removed from the analyses because they revealed some awareness of the experimental hypotheses.

Procedure

Subjects were recruited for a study described as concerned with brain lateralization. This was part of an elaborate cover story intended to disguise the true purposes of the experiment. When the subjects arrived for the experiment, they were told that although many brain functions had been thought to be located on either the left or right side of the brain, new evidence suggested that this was true only when task demands were light. To test this possibility, we would measure EEG activity with recording electrodes held against their head, and then give them two tasks to perform at once. One of these tasks would be to listen to a series of musical tones to be played into their left ear. Because of contralateral projection of the auditory system and the right hemisphere specialization for artistic appreciation, this would be expected to produce right hemisphere activity. The conflicting task was to contract and relax various groups of muscles in their face. The face muscles, it was explained, were especially useful in this case because of their direct connections to the brain by way of the cranial nerves.

All of this was, of course, to provide a plausible context in which subjects could be induced to contract and relax facial muscles into expressions of the various emotions. After any questions had been answered, the experimenter attached the headphones and a cap holding some silver cup recording electrodes. The electrode leads went nowhere, but appeared to be connected to a large polygraph that sat whirring in the corner of the room. As the electrodes were being attached, and as if it were an afterthought, the experimenter explained that there was one source of error in the EEG measurements, which was caused by the "normal, moment-to-moment fluctuations in mood that we all have." To control for this, the subject was asked to be aware of his or her emotional feelings during the trial and then to report them on a brief emotion rating form.

Each subject received one trial in each of the anger, sadness, fear, and disgust expressions. Subjects were randomly assigned (with the constraint that there be equal numbers in each order) to one of four orders of expressions: (a) fear, anger, disgust, and sadness; (b) anger, disgust, sadness, and fear; (c) disgust, fear, sadness, and anger; and (d) sadness, fear, anger, and disgust.

Before each trial, the subjects were instructed to relax all the muscles in their face. Then the instructions for each of the expression conditions were as follows:

> *Fear.* Raise your eyebrows. And open your eyes wide. Move your whole head back, so that your chin is tucked in a little bit, and let your mouth relax and hang open a little.
>
> *Anger.* Draw your eyebrows together and down. Contract the muscles at the corner of your jaw by clenching your teeth.
>
> *Disgust.* Narrow your eyes a bit by squinting a little. Raise your upper lip toward your nostrils, letting your nostrils flair out a little, if that's convenient.
>
> *Sadness.* Lower your eyebrows, especially the outer corners. With your mouth closed, push up lightly with your lower lip.

The directions for the anger expression are those used in numerous previous studies demonstrating effects of facial feedback (e.g., Laird, 1974). The instructions for the sadness expression were adapted from a study by MacArthur, Solomon, and Jaffee (1980). Both this expression and the fear expression were also used in a study showing the effects

of expressions on memory (Laird et al., 1982). The disgust expression instructions were devised for this experiment.[1]

After each facial position had been created so that it appeared both appropriate and unstrained, the experimenter asked the subject to maintain the expression and then played the tones in the subject's left earphone. The tones lasted about 6 s, and at their conclusion the subjects were asked to relax and to fill out the emotion rating scale, describing how they felt during the trial.

The emotion rating scale contained rating scales for nine emotions: fear, anger, disgust, sadness, surprise, interest, happy, agreeableness, and pity. Each scale consisted of a straight line, 4½ in. long, labeled at one end *Do not feel at all* and at the other end *Feel very strongly.* Subjects made a slash through the line at the point that represented their feelings. The distance of the slash from the *Do not feel at all* end was measured in quarter inches, so that scores represented the number of quarter inches from the zero end. Thus, scores could range from 0 to 18.

The tones were essentially identical on each trial, but their order was not changed during the experiment. Thus, each tone pattern appeared equally often in each of the expression conditions.

At the conclusion of the final expression trial, subjects responded to a questionnaire containing increasingly specific questions about the purposes of the experiment. Six subjects revealed that they were aware that the facial positions had some effect on emotional feelings. At least 4 of these subjects seemed to have come to this awareness because the effect was so pronounced, saying things like "I noticed that when I was in the sad expression, it made me feel sad—was it supposed to?" All of these subjects were excluded from the analyses. Of the 6 subjects excluded, 1 was in Order 1, 2 were in Order 2, and 3 were in Order 4.

Results

Each of the emotion rating scales was analyzed separately in a 4 × 4 analysis of variance (ANOVA), in which order group was a between-subjects variable and expression condition was a within-subjects variable.

For each of the four target emotion ratings (anger, fear, sadness, and disgust), there were significant differences between expression conditions. None of the order-group main effects or Order × Expression interactions were significant. These results are summarized in Table 1. Note that in every case, an emotion rating is highest in its corresponding expression. Subjects reported feeling most fearful when in a fear expression, most angry in an anger position, most disgusted in the disgust expression, and most sad in the sad expression. The differences between individual means were tested by the Tukey HSD test. The fear ratings were significantly higher in the fear expression than in any of the other three expressions. Similarly, the sad ratings were higher in the sad expression than in any other expression.

The results for the anger and disgust ratings were slightly more complex. The anger ratings were significantly higher in the anger expression than in either the fear or sad expression, but did not differ significantly from the disgust expression. Similarly, the disgust ratings in the disgust expression differed significantly from those in the fear and sad expressions, but did not differ significantly from those in the anger expression.

In addition to these differences in the target feelings, there were also differences on some of the other ratings. In the fear expression, subjects reported feeling more surprise, and in the sad expression they were less happy, less interested, and less agreeable than in the other expression conditions. There were no effects of the expressions on ratings of pity.[2]

Discussion

Unidimensional Versus Multidimensional Models

The results are quite clearly inconsistent with a unidimensional interpretation of facial feedback effects, because every expression increased its corresponding emotional feeling significantly over at least two of the other expression conditions. Thus, no unidimensional factor could produce this pattern of results.

Although the results fit the general multidimensional expectations quite nicely, they were more complex than anticipated. Every expression produced the highest ratings of its corresponding emotion, but in some cases these did not differ significantly from one of the other expressions. In particular, the anger expression seems to have produced some disgust and the disgust expression some increase in anger.

The results for the other emotion ratings reveal some other impurities in the effects of the expressions. For example, the fear expression did not induce any of the other negative emotions, but did produce increased feelings of surprise. The sad expression did not increase any other emotions, but significantly reduced happiness, interest, and agreeableness. Thus, each of the four expressions seems to have produced at least one other emotional effect in addition to increasing its appropriate emotional feeling.

This array of additional effects of expressions seems at first glance to be chaotic and unpredictable. In fact, it was not predicted, but is very consistent with many multidimensional models of emotion, in which emotions are arrayed in a two- or three-dimensional space (Plutchik, 1980; Russell, 1980; Russell & Bullock, 1985). For example, in Russell and Bullock's scaling of judgments of the facial expressions of others, disgust and an-

[1] These expression instructions do not reproduce completely the patterns of individual muscle movements that characterize naturally occurring facial expressions (e.g., Ekman & Friesen, 1975). In many previous studies using this technique, we have found that most subjects are unable to contract individual facial muscles at will, even with substantial training that reveals the experimental purpose. Furthermore, attention to these molecular changes is so demanding that it interferes with normal emotional response. Instead, we have found that if the subjects are encouraged to adopt the major features of an expression, and to do so in a relaxed way, they naturally adopt the remainder of the expression as well.

[2] In previous research with this expression manipulation paradigm, individual differences have often been observed. Relationships with other self-perception tasks suggest that these differences reflect stable differences in the kinds of cues that generate feelings and self-awareness for an individual (Laird, 1984). Assessing such individual differences might have been fruitful in this experiment. However, the usual technique for assessing these differences has been response to just this expression manipulation paradigm. Thus, such an assessment here would have been rather circular in its logic. Because subjects were not separated, it is reasonable to assume that this sample included both subjects who were more responsive to self-produced cues and whose feelings were affected by the manipulations and subjects who were relatively unresponsive to self-produced cues and who were unaffected by the manipulations. The inclusion of the latter group is obviously a conservative procedure, because their effect would only be to reduce average differences.

Table 1
Emotional Feeling Ratings in the Four Expression Conditions, for All Subjects

	Expression condition				*F* ratio (*df*s = 3, 198)		
Rating	Fear	Anger	Disgust	Sad	Expression (E)	Order (O)	E × O
Fear	5.1_a	3.7_b	3.8_b	3.9_b	4.33**	0.68	0.88
Anger	2.7_c	5.9_a	4.7_{ab}	3.6_{bc}	14.07**	0.50	0.34
Disgust	2.9_c	4.1_{ab}	4.5_a	3.4_{bc}	3.81*	1.00	2.00
Sad	3.5_b	3.9_b	3.8_b	5.3_a	5.55**	1.33	1.15
Surprise	6.4_a	4.8_b	5.3_{ab}	4.4_b	4.00*	0.01	0.63
Interest	11.1_a	10.4_a	10.6_a	9.1_b	5.29*	0.01	1.81
Happy	9.1_a	8.1_{ab}	8.5_{ab}	7.6_b	2.54[a]	1.51	1.61
Agreeable	10.4_a	9.1_b	9.8_b	9.1_b	2.92	0.22	0.34
Pity	2.2	2.5	3.0	3.2	1.57	0.06	1.44

Note. Means with different subscripts differ significantly at $p < .05$.
[a] For this F, $p = .057$.
* $p < .05$. ** $p < .01$.

ger were very near each other, as were fear and surprise. In fact, of the emotions scaled, these two pairs were the closest. Thus, the secondary emotions produced by the expressions were those that were nearest to each other in the scaling of expressions.

The anger–disgust and fear–surprise overlaps are also compatible with a recent study of cultural universals in expression (Ekman et al., 1987), in which subjects were asked to judge pictures chosen to represent pure emotions. When the subjects were asked to identify a secondary emotion, all of the secondary emotions perceived in fear photographs were surprise. Similarly, many of the secondary emotions for the anger photos were disgust, although some anger photos elicited other secondary judgments.

Russell and Bullock's (1985) multidimensional model also fits neatly the unpredicted decreases in feelings of interest, happiness, and agreeableness in the sadness expression. Happiness and sadness are on opposite sides of their circle, so it makes sense that an increase in one should be associated with a decrease in the other. Russell and Bullock did not include expressions of interest, but *bored,* its opposite, is adjacent to sadness in their structure. In sum, the unexpected effects of expressions were in every case consistent with other research on the dimensional structure and similarity among emotions.

The similarity between the patterns observed here and the various dimensional schemes is important in demonstrating that facial feedback effects are consistent with other emotional phenomena. If the additional relationships observed here had been wildly different, a new uncertainty about the potential role of facial feedback would have been introduced. If, for example, the secondary effect of an anger expression had been surprise or joy, rather than disgust, we would have had to wonder if facial feedback was a part of normal emotional processes. Instead, the observed patterns serve to remove one potential source of doubt about the role of facial feedback.

Facial Feedback and Experimental Demand

The pattern of additional effects also reduces the likelihood that the results could have arisen from experimental demand. In a procedure such as this, it is impossible for the experimenter to be blind to the subjects' facial position. Consequently, the potential for subtle influences is always present. In this study, the effects included a number of unpredicted additional emotional changes that were consistent with the literature on the dimensions of emotion. However, at the time the experiment was run, the experimenters were unaware of this literature and had no expectations about such effects. Thus, the subjects' responses are most likely to have been descriptions of genuine emotional experiences.

This result does not rule out the possibility that the experimenters somehow influenced genuine emotional responses by some means other than the facial manipulations. Of course, all subjects who recognized the experimental hypotheses were excluded from the analyses. However, within the context of this particular study, effects that occurred outside the subjects' awareness cannot be ruled out, although in numerous previous studies using the same expression manipulation technique, this issue has been explored extensively (see Laird, 1984, for a review). For example, almost all previous research includes, as did this experiment, procedures for inquiring about subjects' expectations and excluding subjects who became aware of either the experimental hypotheses or the predicted effects. In addition, the effect of experimenter behavior has been directly measured and found to be negligible (Laird, 1974). Many studies of facial feedback effects have employed dependent variables that were not within the subjects' awareness, much less control, including, for example, reaction time on a lexical decision task involving emotion words (Kappas et al., 1987). Others have used manipulations of facial expressions that were less obtrusive and unavailable to the subjects' awareness (McCanne & Anderson, 1987; Strack, Martin, & Stepper, 1988). Finally, a number of experiments have explored individual differences in the effects of expressions. Subjects who are more strongly affected by their expressive behavior have been found to be less rather than more susceptible to experimenter influences (Duncan & Laird, 1980; Kellerman & Laird, 1982; Kellerman et al., in press). A number of other experiments indicate that subjects more responsive to facial feedback are relatively unaffected by social expectations (see Laird, 1984, for a review).

In sum, there is a substantial body of research that indicates that the effects of facial feedback are not attributable to experimental demand, and, therefore, demand is an unlikely explanation of the effects observed here. These results demonstrate that facial feedback effects are not unidimensional. Furthermore, facial feedback exhibits an organized complexity that fits with recent research on emotional structure.

Study 2

The slumped posture of dejection and the ebullient "lift" of joy are among the most expressive gestures we can make. Consequently, postures seem likely to affect feelings in the same way that facial expressions do, and numerous theorists have suggested that they do (e.g., Izard, 1977; James, 1884; Laird, 1984; Tomkins, 1962). A few studies by Riskind (1983, 1984) and his associates (Riskind & Gotay, 1982) have directly explored the effect of posture on emotional experience. However, these studies share with the facial feedback work the weakness that they compared only two postures, sometimes including a neutral position. Consequently, posture effects, too, could reflect only a single dimension of experience.

In two studies, Riskind and Gotay (1982) induced subjects to adopt either a slumped, presumably depressed, posture, or an upright and presumably confident posture. Then subjects were assigned a series of insoluble problems to work on, like those used in the learned-helplessness literature (Seligman, 1975). Subjects assigned to the slumped posture persisted less on the puzzle task than those assigned to the upright posture. Apparently, the slumped posture had produced an effect like learned helplessness or depression. In a third study, subjects reported more feelings of stress when posed in a hunched posture than when in a relaxed posture. On the basis of these studies, Riskind and Gotay concluded that posture could serve as source of cues for the self-perception of emotion. Riskind (1983) then demonstrated that a combination of facial expressions and postures affected memory as other emotion manipulations do.

Subsequently, Riskind (1984) argued that posture plays a related, but theoretically quite different, role. In three studies, he manipulated both posture, slumped or upright, and feedback, success or failure. A peripheral-feedback model would predict either additive or multiplicative effects of the two sources of depression cues. However, the results were not so straightforward. In the success condition, which matched Riskind's previous studies, the postures generally had the expected effect: The slumped posture produced less task persistence and more depression and external locus of control. In the failure condition, the effects were exactly the opposite. Subjects became more external and persisted less at the tasks if they were upright than if they were slumped. They also reported feeling more depressed on two different measures if they were upright in the failure condition.

Riskind (1984) interpreted these results as indicating that posture does not serve as a direct cue for emotional experience. Instead, he argued that posture "regulates" emotional reactions, so that the most negative results occur when posture and feedback are discrepant. Thus, Riskind concluded by disagreeing with his original hypothesis and arguing that posture does not serve as a source of cues for the self-perception of emotion.

Riskind's (1984) studies certainly demonstrate an unexpected effect of the combination of posture and success or failure. Less clear is the nature of that effect. One interpretation is that postures have the effects expected by peripheral feedback theories, except in the special circumstances of failure. Consistent with that assumption, in the one study in which Riskind and Gotay (1982) manipulated a different posture, tensed and threatened, they found the expected effects on self-ratings of stress. Perhaps, then, posture plays the role assumed by peripheral feedback theories, except in special circumstances.

To distinguish the specific effects of postures, we chose three negative postures: anger, sadness, and fear. (Disgust does not seem to have a distinctive posture.) The basic form of this study was, then, like Study 1, except that postures rather than facial expressions were manipulated. Subjects were induced to adopt postures of sadness, anger, and fear and then asked to report how much they felt these feelings, as well as each of the other five emotions in Plutchik's (1980) list of basic emotions.

One additional dimension of the study was indicated by the research on facial expressions. As we noted above, researchers have found consistent individual differences in the impact of facial expressions on feelings. While some people feel whatever emotion their face is "expressing," others do not. These differences are stable over time (Bresler & Laird, 1983; Laird & Crosby, 1974) and are related to a variety of other individual differences in self-perception tasks (see Laird, 1984, for a review). For example, subjects who feel the emotions their faces are displaying also change their attitudes to match counterattitudinal speeches (Duncan & Laird, 1977) and change their self-descriptions to fit their appearance (Kellerman & Laird, 1982). These individuals seem to define their own feelings and attributes by attention to self-produced cues from their own behavior (Laird & Berglas, 1975). In contrast, other individuals appear to pay little attention to their own behavior, and, instead, define themselves according to the situational cues implying what they are feeling.

If the parallel between facial expressions and postures is as close as we have been assuming, then individual differences in the impact of self-produced cues should affect how postures work as well. Consequently, in this study the subjects' response to self-produced cues was also measured. In previous research this response has been assessed most frequently by the basic facial feedback paradigm. Subjects are induced to smile and frown, and those who report feeling happy and angry are identified as responsive to self-produced cues. Subjects who do not respond to the expression manipulations are considered unresponsive to self-produced cues. Because in this study there was no circularity in using the expression manipulation procedure, we chose to adopt this procedure.

In sum, all subjects were induced to adopt postures of sadness, fear, and anger and then were asked to report how much they felt of each of eight emotions. If the effects of postures were multidimensional, as the effects of facial expressions were found to be in Study 1, then we would expect subjects to report feeling more sad in the sadness posture, more fearful in the fear posture, and more angry in the anger posture. However, these effects would be expected to occur more strongly among those subjects who are responsive to self-produced cues.

Method

Subjects

The subjects were 54 undergraduate volunteers, 41 women and 13 men. The data from one subject were excluded from the analyses because he revealed on a postexperimental questionnaire that he was aware of the purpose of the experiment.

Procedure

As in Study 1, subjects were told that the study concerned differences in brain hemisphere activity during various tasks. Again, recording electrodes were attached to subjects' heads, and the measures of emotional feeling were introduced as controls for artifacts in the measurements.

Posture manipulation. The principle way in which Study 2 was different from Study 1 was in the instructions for the postures. These were derived from various discussions of the postures of emotion (e.g., de Rivera, 1977; LaFrance & Mayo, 1978; Mehrabian, 1972). The final forms of the instructions evolved from pilot testing. The instructions were as follows:

> *Fear.* Please scoot to the front edge of your chair, and draw your feet together and under the chair. Now turn your upper body toward the right, twisting a little at the waist, but keeping your head facing me (front). Now please dip your right shoulder a bit and, while keeping the twist and the dip, lean your upper body slightly back as you raise your hands to about mouth level, arms bent at the elbow and palms facing front.
>
> *Sad.* Please sit back in your chair, resting your back comfortably against the chair back, and draw your feet loosely in under the chair. You should feel no tension in your legs or feet. Now fold your hands in your lap, just sort of loosely cupping one hand in the other. Now please drop your head, letting your rib cage fall and letting the rest of your body go limp. You should feel just a slight tension up the back of your neck and across your shoulder blades.
>
> *Anger.* Please put your feet flat on the floor directly below your knees, and put your forearms and elbows on the chair arms. Now please clench your fists tightly and lean your upper body slightly forward.

Subjects were randomly assigned to one of three orders of postures: (a) fear, sadness, and anger; (b) sadness, anger, and fear; and (c) anger, fear, and sadness. In this way, the position of the posture in the sequence was counterbalanced.

After the subjects had maintained the posture for 15 s, they were asked to rate their feelings on eight scales: Fearful, sad, angry, happy, agreeable, interested, disgusted, and surprised. Each adjective was rated by marking a slash through a 6-in. line, labeled at one end *Did not feel at all* and at the other end *Felt very strongly.* The ratings were scored by counting the number of quarter inches from the *Did not feel at all* end. Thus, scores could range from 0 to 24.

When subjects were induced to adopt emotional postures, they might have adopted corresponding facial expressions as well. Any subsequent effects on feelings might then have been mediated by their expressions rather than their postures. To explore this possibility, subjects' faces were videotaped during the posture manipulations. At the conclusion of the experiment, two judges who were blind to the experimental hypotheses and the subjects' condition independently rated any emotion they could detect in the subjects' faces. The judges agreed that emotion could be detected in only 6% of the posture trials, involving 8 subjects. In only one case did the judged emotion match the posture, fear. This was on the fear trial for 1 subject. In all other cases, the judged emotion was a smile of happiness. Consequently, facial expressions could not have mediated any observed effects of postures.

Facial expression manipulations. Each subject received two trials each of a smile and frown expression manipulation. The frown manipulation was identical to that used in Study 1. The smile manipulation was that used in numerous previous studies, and consisted of asking subjects to "draw the corners of your mouth back and up." In other ways, the expression manipulation procedure was like that in Study 1, except that the emotion rating scales were the eight used in the posture procedure.

The scoring for this task was like that used in a number of earlier studies (e.g., Duncan & Laird, 1977, 1980; Kellerman & Laird, 1982; Kellerman et al., in press). Scores on the happy adjective for the first frown trial were subtracted from happy scores on the first smile trial. Scores on the angry adjective on the smile trial were subtracted from the angry scores for the frown trial. Then these two scores were added. The same scoring procedure was followed for the second pair of a smile and a frown trial. These composite scores were, therefore, positive if the subject was happier when smiling and angrier when frowning.

Although the sign of these scores reflects whether subjects were responsive to self-produced cues from their facial manipulations, the magnitude of the scores reflects a variety of other factors, including the way in which subjects use the scales and, perhaps, their degree of autonomic arousal. Therefore, following previous practice, subjects were assigned to the self-produced cue group only if their scores were positive on both pairs of trials. If not, they were assigned to the situational cue group.

At the conclusion of the experiment, subjects responded to a "funnel" questionnaire directed at detecting whether they recognized any relationship between their behaviors and their feelings. After this was completed, the general purpose of the study was described, and the subjects were asked to identify which emotions the three postures had been intended to represent. Then the debriefing was completed.

Results

In the expression manipulation procedure, 20 subjects were identified as more responsive to self-produced cues, and 34 were classified as more responsive to situational cues.

The effects of postures were then analyzed in a three-way mixed analysis of variance, with cue response group and order as between-subjects variables and posture as a within-subject variable. Each of the eight emotion ratings was analyzed separately. There were no significant effects of order.

Main Effects of Posture

The results are most clearly presented by beginning with the main effects and then discussing the moderating interactions with cue response. In the basic analysis of the posture effects, significant differences between postures were observed in three of the eight emotion ratings. Fear ratings differed significantly between postures, $F(2, 102) = 3.06$, $p < .05$. As predicted, the fear ratings were highest in the fear posture. Similarly, the anger ratings were highest in the anger posture, $F(2, 102) = 14.19$, $p < .01$. The surprise ratings were also highest in the fear posture, $F(2, 102) = 9.03$, $p < .01$. This result was consistent with the broader effects of facial expressions observed in Study 1. Although the sad ratings were highest in the sad posture, these differences were not significant. Overall, then, these results indicate that at least the fear and anger postures affected emotional feelings as expected. These results are summarized in Table 2.

During the debriefing, subjects were asked to identify what feelings the postures were supposed to produce. Only the one excluded subject recognized that the postures were intended to match natural emotional postures, but once the purpose and general nature of the postures were explained, the majority of

Table 2
Mean Mood Rating Scale Scores by Posture

Scale item	Posture: Fear	Sadness	Anger	*F* ratio value
Fearful	3.00	1.86	2.43	3.06*
Sad	1.88	1.94	1.54	1.07
Angry	0.08	1.29	2.10	14.19**
Surprised	5.65	3.51	4.37	9.03**
Happy	10.24	9.84	9.65	2.95
Agreeable	11.31	11.88	11.41	1.38
Interested	12.22	12.04	11.40	1.24
Disgusted	1.64	1.19	1.43	1.07

* $p = .05$. ** $p < .001$.

Table 4
Mean Mood Rating Scale Scores for Posture by Type of Cue Response Excluding Subjects Who Misidentified Posture

Scale item	Fear	Sadness	Anger	Comparison *F* ratio
Self-produced				
Fearful	3.93	1.80	2.60	6.70**
Sad	1.20	2.67	1.20	5.98**
Angry	0.13	1.00	1.93	6.30**
Situational				
Fearful	1.85	1.67	1.67	1.0*
Sad	1.56	1.48	1.44	1.0*
Angry	0.04	1.11	1.37	7.35**

* $p < 1.0$. ** $p < .05$.

the subjects correctly identified the postures. However, seven subjects thought the fear posture was supposed to produce surprise, and five subjects thought the sad posture was supposed to produce relaxation.

These misidentifications suggest that the posture manipulations had not been successful for these subjects. To test this possibility, the analyses were repeated after excluding those subjects who had misidentified the postures. These results are summarized in Table 3. Exclusion of these subjects produced two changes. One was to reduce somewhat the effects of the fear posture on surprise ratings, although these remained significantly different. The second, more important change, was to render the effect of postures on sad ratings significant, $F(2, 80) = 3.82$, $p < .05$. These changes suggest that indeed the posture manipulations had been unsuccessful for the excluded subjects, and that postures did affect all three of the target emotions as expected.

Interactions With Cue Response

In the analyses excluding subjects who misidentified the postures, the only target emotion for which the interaction between cue response group and posture condition was significant was sad. The sad interaction reflected a greater impact of the sad posture on the self-produced cue group than the situational cue group. However, the interaction provides a relatively weak test of the predicted relationships. Consequently the effects of postures were tested separately in each of the two cue groups, using planned comparisons that assessed the difference between the scores for a given emotion in its posture in contrast with the two other postures (Hays, 1981).

Table 3
Mean Mood Rating Scale Scores Excluding Subjects Who Misidentified Posture

Scale item	Posture: Fear	Sadness	Anger	*F* ratio value
Fearful	2.60	1.71	2.00	3.67*
Sad	1.43	1.90	1.36	3.82*
Angry	0.07	1.07	1.57	16.63**
Surprised	4.43	3.24	3.83	4.41*
Happy	10.19	9.90	9.62	2.64
Agreeable	11.17	11.62	11.60	1.10
Interested	11.86	11.86	12.48	1.42
Disgusted	1.36	1.14	1.29	0.27

* $p < .05$. ** $p < .001$.

In the self-produced cue group, the effects of postures on their corresponding emotion ratings were substantial and significant. In all three target emotions, the ratings were significantly higher in the corresponding posture than in the other two postures. These results are summarized in Table 4. Thus, the effects of postures in the self-produced cue group were as predicted. In contrast, in the situational cue group, the differences were much smaller and not significant, with the exception of the analysis of the anger ratings. Thus, it appears that the effects of postures were most pronounced among the subjects who were more responsive to self-produced cues. In this group, each posture significantly increased feelings of its corresponding emotion.

In the analyses of the other emotion ratings, planned comparisons were not appropriate, because no predictions had been made. However, these ratings did reveal two significant interactions between posture condition and cue response group. The interaction in the ratings of happiness, $F(2, 80) = 4.57$, $p < .05$, indicated that scores were significantly lower in the anger condition for the self-produced cue group, whereas the situational cue group means did not differ, by the Tukey HSD test. There was also a significant interaction between cue response group and posture, $F(2, 80) = 3.31$, $p < .05$, in the surprise ratings. The only mean that differed from any of the others was that for the fear posture condition in the self-produced cue group.

In sum, the results demonstrate clear, specific effects of emotional postures on emotional feelings. These effects are clearest when subjects whose postures were incorrectly manipulated were excluded and among subjects responsive to self-produced cues.

Discussion

The results of posture are parallel to those of the facial expressions in Study 1. In both cases, subjects induced to adopt

emotionally expressive behaviors, either facial expressions or postures, reported feeling the emotions they were expressing. In both studies the effects were also quite specific. A posture of anger, sadness, or fear increased that emotion more strongly than any other. Thus, for postures, as for facial expressions, the effects on experience reflect more than a single dimension of variation. These results suggest, then, that postures do provide a source of information that leads to emotional experience.

What then, of Riskind's (1984) paradoxical effects of posture in combination with failure? Our results do not bear directly on this question, but they do help to define the context in which the paradox occurs. Because a sad posture produced feelings of sadness in both a success condition in Riskind's studies and in a rather neutral context in this study, the anomaly probably has to do with the interaction with failure. Just what that interaction might be is much less clear.

One possibility is that the sadness induced by postures may interfere with the cognitive processing and elaboration of the information from the failure feedback. In discussing the effects of emotion on memory, Isen (1985) has suggested that sad experiences may not be as well integrated into the cognitive system as other kinds of memories, and perhaps such an effect occurred in Riskind's (1984) studies. Another question that is unresolved is whether the effects were produced directly by the postures or indirectly by way of the emotional feelings the postures produced.

These two studies bear on some recent criticisms by Matsumoto (1987) of the facial feedback research. His objections have been of two general sorts, methodological and meta-analytic. First of all, he worried about the procedures used to induce facial expressions in the facial feedback research. He observed that the expressions produced by this kind of manipulation (a) might not be as distinctive as they should be, (b) might have been too weak or too intense, (c) might have been too protracted, or (d) might not have remained in place over the course of the whole trial period. These four potential difficulties would all serve to reduce any impact of the manipulated expressions on emotional feelings. Thus, they would seem to explain why facial feedback effects would not be observed. Indeed, as Matsumoto notes, many of these concerns were raised earlier by Hager and Ekman (1981) as possible explanations for a failure to demonstrate a facial feedback effect (Tourangeau & Ellsworth, 1979).

The impact on potential facial feedback effects of Matsumoto's (1987) fifth methodological observation seems similar. He pointed out that the stimuli used to test facial feedback have been complex and might have aroused more than one emotion. Again, however, the apparent impact of this problem is to minimize the likelihood of observing facial feedback effects. In sum, all of the potential methodological problems he cited would probably obscure the effects of facial feedback.

Matsumoto's (1987) second point derived from a meta-analysis of 16 facial feedback studies, which produced a mean effect size of $r = .343$. He characterized this as "only small to moderate" and concluded that "the contribution of facial feedback to emotional experience is less than convincing" (Matsumoto, 1987, p. 773). Why he reached this conclusion is somewhat unclear, for two reasons. The first is that the potential methodological weaknesses that he described in the first part of his article suggest that the observed effect size would underestimate the actual magnitude of the effect. His earlier arguments certainly suggest that facial feedback effects should be taken more seriously than the observed effect sizes would imply.

The more important point is that Matsumoto's (1987) judgment about this size of effect differs importantly from that of Rosenthal (1984), whom he cited as a source for this meta-analytic procedure. Rosenthal reported that psychologists tend to underestimate the importance of apparently modest effect sizes. He then pointed out that an effect size of .32 (his example) in fact has considerable practical importance (Rosenthal, 1984, p. 130). Following his argument, then, it appears that an effect that generates an r of .343 does represent a reasonable base on which to build a theory.

Furthermore, most of the theories that predict facial feedback effects also assume that other factors contribute substantially to emotional experience. In the alternative we prefer, posture, overt action, expressive language, autonomic arousal, and situational cues have all been explicitly assumed to contribute (Laird, 1974). In Study 2 we demonstrated the potential contribution of posture. Many of the other hypothesized cue sources also have been shown to contribute to emotional feelings (see Laird, 1984). At this point, we have virtually no information about the relative importance of these various potential contributors, or how they may interact. At the very least, however, it is clear that a moderate effect of facial feedback is not necessarily inconsistent with many theories of emotional experience.

In sum, facial feedback and posture both produce effects on feelings that are relatively specific to each distinctive expressive behavior, although the behaviors may also affect other, theoretically related feelings as well. These broader effects of expressive behavior fit very closely the patterns of relationship among emotional feelings revealed by other studies. The effects of both postures and facial expressions seem clearly to be multidimensional or categorical, rather than unidimensional. Thus, these "peripheral" effects seem to be sufficiently specific and sufficiently substantial to play the kind of role proposed for them by James (1884) and later neo-Jamesian emotion theorists.

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Received February 3, 1988
Revision received December 22, 1988
Accepted January 9, 1989 ■