11. Spontaneous facial behavior during intense emotional episodes: Artistic truth and optical truth

JOSÉ MIGUEL FERNÁNDEZ-DOLS AND
MARÍA-ANGELES RUIZ-BELDA

In 1872, the pioneer of photography Eadweard Muybridge was given an intriguing commission by Leland Stanford, a California magnate interested in animal locomotion. The commission was to test whether horses really galloped in the way artists had always represented them. For example, are their forelegs actually raised symmetrically (as seen in Figure 11.1)?

With much ingenuity, given the primitive stage of photographic equipment at that time, Muybridge obtained a series of high-speed pictures that showed an unexpected and even disturbing pattern in the way horses galloped. The most characteristic conventions in the artistic representation of a galloping horse (including the symmetrical extended forelegs) did not occur at all. Galloping was actually a complex, asymmetrical pattern of leg movements. Muybridge's results were met with incredulity. The erroneous version of this movement was so strongly believed that Muybridge devised a primitive form of cinematographic projection – the zoopraxiscope, which projected his pictures as if frames of a film – in order to show how the "shocking" still representations fit a credible and smooth pattern of movement (see Figure 11.2).

We now know that laypersons and experts from different cultures – including the most careful and skilled painters – had for centuries been wrong about the movements of an extremely familiar animal that were readily visible in many common situations.

The extended debate among Muybridge's contemporaries over his findings raised an interesting distinction between "optical truth" and "artistic truth" (Mozley, 1979). Muybridge's "optically true" photographs showed the running horse with an asymmetrical, "clumsy" stride. A symmetrical and simpler stride, although fictional, has an "artistic truth" in that it communicates easily to an audience not only the

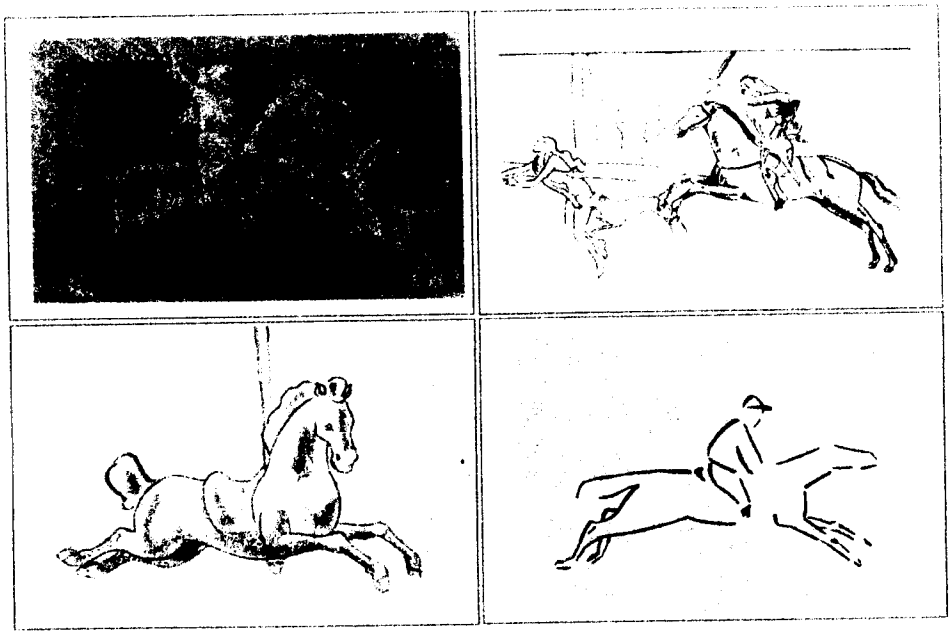

Figure 11.1. Representation of galloping horses from different cultures and times. *Clockwise from top left*: Assyrian (7th century B.C.), Botticelli's painting (15th century), Degas' painting (19th century), and a contemporary carousel horse.

physical movement but more importantly the beauty and elegance of a moving horse.

In this chapter, we ask a question not unlike that asked by Leland Stanford: What is the actual facial behavior of a happy person, an angry person, and so on? Nothing would seem more obvious than that the answer is smiling, frowning, and so on. Like Muybridge, we suggest that this conventional answer, known to artists, actors, and everyone else throughout the ages, is wrong. Although our suggestion may be met with incredulity, we show that the available evidence raises serious doubts about the conventional answer.

We suggest that smiles, frowns, and other "facial expressions of emotion" do possess an "artistic truth." That is, if a painter, actor, or layperson sets out to convey happiness or anger by a single image, then a smiling or frowning face is the right image to choose. In the absence of words, context, or further explanation, a smiling face conveys "a happy person," just as a cartoon mouse is successful in conveying "mouse," a teddy bear in conveying "bear," or a horse with the conventional stride

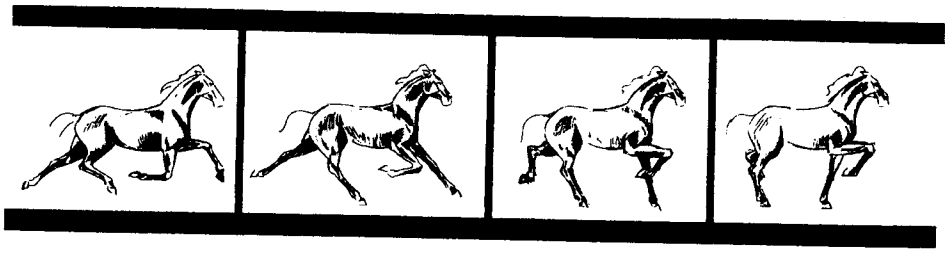

Figure 11.2. A sample of Muybridge's photographs of a galloping horse.

in conveying "galloping horse." But the everyday reality of mice, bears, or galloping horses need not coincide with these artistic images.

The study of facial behavior during emotional episodes has been dominated by what was termed in chapter 1 the *Facial Expression Program*. According to theories such as those offered by Tomkins, Izard, and Ekman, emotion triggers certain facial patterns that are recognizable to all. Unlike the galloping of a horse, these facial movements are signals that evolved as part of communication, and there is little chance that everyone is mistaken about the facial behavior of happy, angry, sad, or frightened people. Nature has selected facial behavior to maximize its communicative value. In any case, the hypothesis stemming from such theorizing is clear: The spontaneous facial behavior produced by intense emotions consists of the kinds of prototypical expressions identified by the Facial Expression Program and with which everyone is familiar (see Ekman & Friesen, 1978; Matsumoto & Ekman, 1988).

Much of the evidence offered in support of the Facial Expression Program concerns the recognition (more precisely, the attribution) of emotion from these facial expressions. Observers are typically shown photographs of posed facial behavior (often carefully selected by the experimenter). Although this research is the subject of debate (Ekman, 1994; Izard, 1994; Russell, 1994, 1995), let us assume for the moment that observers consensually and universally attribute the same specific emotions to these facial poses. We would translate such evidence as demonstrating that the poses shown to observers possess an artistic truth. What the evidence would not show is that happy people actually smile, angry people actually frown, and so forth. We therefore need evidence on their actual facial behavior recorded at the very moment in which they are feeling a particular emotion.

The Facial Expression Program would seem to suggest that such evi-

dence would be readily available. And yet very little evidence is available. We next review the evidence on recordings of adults' spontaneous facial behavior during intense emotional episodes (see Camras, Malatesta, & Izard, 1991; Oster, Hegley, & Nagel, 1992, for interesting comments on studies on spontaneous facial behavior in infants). We then describe two studies from our laboratory. Finally, we offer some hypotheses about the nature of spontaneous behavior during emotional episodes.

Landis's challenge

In 1934, Landis's review of the research on emotion concluded that observers can often understand *posed* facial expressions but cannot make much sense of *spontaneous* emotional facial behavior. Characterizing posed expressions as "social," Landis wrote:

> These social expressions may, and probably do, possess certain patterns. It still remains to be demonstrated that such patterns of reaction of facial muscles occur in emotion and if they do occur that they agree with the social expressions of emotions. (1934, p. 320)

Landis himself (Landis, 1924) had carried out probably the first controlled observation of spontaneous facial behavior in intense emotional episodes. He took still photographs of 25 persons who endured a series of 17 emotion-eliciting situations, reporting their feelings during each one. Unfortunately, Landis published only a global analysis of the facial behavior that he photographed, but the overall result was clear: striking variability in different subjects' facial behavior in the same situation, and even in subjects who reported the same feeling. There was little evidence of the expected conventional expressions for each emotion.

Landis's findings were met with the kind of incredulity that Muybridge faced – as were those of Sherman (1927) on the recognition of spontaneous expressions in infants. Admittedly, some of the skepticism stemmed from the primitive and highly obtrusive methods used, but perhaps some of the emphasis on such problems stemmed from the unexpectedness of his findings (Davis, 1934; Ekman, Friesen, & Ellsworth, 1972; Frois-Wittmann, 1930).

After Landis, few authors reported observations of emotional expressions and none with the theoretical relevance of Landis's study. For example, Thompson, (1941), Leventhal and Sharp (1965), and Eibl-Eibesfeldt (1973) obtained interesting but partial descriptions of facial

behavior in particular groups (e.g., blind children, women in labor). Landis's data were undoubtedly questionable, but his challenge remained. The principal response was to come from the Facial Expression Program.

Response from the Facial Expression Program

Most of the evidence associating emotions with the prototype facial expressions comes from judgments about posed faces. The assumption that these prototype expressions occur spontaneously (and during clear emotional experiences of the hypothesized sort) rests on a much smaller set of studies. We first discuss the most general of the studies and then focus on evidence of smiles as a sign of happiness.

Ekman (1972)

Universality of spontaneous facial expressions of emotion was tested by a single study, reported by Ekman (1972) and Friesen (1972). As recently as 1994, Ekman cited this study as the support for the application of his neurocultural theory to spontaneous behavior across cultural boundaries.

Ekman and his collaborators asked 25 American and 25 Japanese students to watch a film that included one neutral and three stressful clips. Researchers took two samples of the facial behavior of each subject during the last 3 min of the neutral clip and the entire 3 min of the last stressful clip. These samples were analyzed using an observational code, FAST (Ekman, Friesen, & Tomkins, 1971).

The most frequent facial response to the stress clips was an "expression of surprise" in the Americans, but an "expression of sadness" in the Japanese (Ekman, 1972, Table 2, p. 256). Despite such differences, Ekman interpreted the results as strong evidence of universality, demonstrated by "strikingly high" rank-order correlations between Americans and Japanese in the frequency within categories of facial actions. Ekman (1994) cited one correlation of .97.

Unfortunately, such correlations are difficult to interpret. No evidence was reported of interrater reliability of the facial scoring, but this appears to have been low; Friesen (1972) reported an overall intercoder agreement of 55% during the same experiment. Furthermore, a correlation coefficient varies greatly with the base rates (irrespective of emotion) of the coding categories. Base rates can be influenced by combining heterogeneous coding categories, and, in fact, Ekman calculated correlations across coding categories that included artificially high base rates (com-

binations of different emotional expressions or miscellaneous unclassifiable behaviors). For example, the aforementioned correlation of .97 cited by Ekman (1994) involved such combined categories (e.g., "sadness and/or fear plus disgust and/or anger" was one category).

Finally, Ekman characterized the emotional state of all subjects as "stress." By his own analysis of facial behavior, different subjects experienced different specific emotions, but Ekman had provided no independent assessments of the specific emotion experienced by each individual, either overall or moment to moment over the course of the 3-min stress film. Nor did Friesen (1972) provide specific data on the interviews that followed the films. Therefore, the study does not provide us with data about how specific emotions are associated with specific facial patterns.

Ekman, Friesen, and Ancoli (1980)

Ekman, Friesen, and Ancoli (1980) carried out a partial replication of the experiment reported by Ekman (1972) but without including a cross-cultural comparison. In this study, 35 Americans watched positive and negative films. Two main improvements were made: Subjects rated their global experience of emotion after seeing the films, and the researchers applied a new and more precise coding of facial expressions, based on the Facial Action Coding System (FACS), Ekman and Friesen's (1976) development of Hjortsjö's (1969) coding system.

We consider the positive films later, but the responses to the negative films were highly interesting. Subjects reported their emotion in terms of eight emotion categories, but the authors did not provide the average intensities of the reports of anger. The most intense of the reported emotions were "arousal," pain, fear, and surprise. The lowest were disgust and sadness (Ekman et al., 1980; Table 3, p. 1130). Nevertheless, the only specific facial expressions analyzed were those hypothesized for disgust "since very few subjects showed action units relevant to any of the other negative emotions [than disgust]" (p. 1131). In other words, apparently, the hypothesized facial expressions of other emotions did not occur. Ekman et al. also found no clear discriminative pattern between the subjects who never showed facial signs of negative emotion and the subjects who did; the subjects with no facial signs of any negative emotion reported more anger and as much disgust as other subjects. In any case, even the occurrence of "disgust expressions" showed an ambiguous and incon-

clusive pattern of correlations with self-reports of disgust and of other negative emotions.

Rosenberg and Ekman (1994)

Rosenberg and Ekman (1994) also used FACS to code facial behavior and obtained reports of viewers' moment-to-moment emotional feelings during films; this was a significant improvement on Ekman et al.'s (1980) procedure. Facial expressions were recorded while subjects watched a series of six clips; after viewing each film, subjects provided retrospective reports of their emotions while the clip was replayed. Data were reported from two of these films, selected to elicit primarily disgust and secondarily fear and other negative emotions.

In general, reports of disgust did *not* match facial expressions. The researchers then included a new variable – intensity of the reported emotion – as a way of obtaining some coherence. However, the coherence reported for *intense* reports of disgust and facial expressions of disgust is seriously flawed. In one of the films, the researchers themselves reported that the observed coherence could be an artifact because the film elicited only expressions and reports of disgust, and, therefore, any co-occurring measures would by definition agree on category.

Rosenberg and Ekman also portrayed the other film as the main elicitor of disgust, but the highest mean intensity ratings of emotion were of fear rather than disgust; in fact, 65% of the most intense reports of negative emotion for each subject were negative emotions other than disgust. Rosenberg and Ekman found no cases in which the intense reports of nondisgust negative emotions were coincident with intense emotional facial expressions, which, in our view, implies a lack of coherence between clear facial expressions and the reports of intense negative emotions other than disgust.

With respect to the disgust reports, Rosenberg and Ekman (1994) claimed that "75% of the subjects who gave a report at the same location as most intense facial expression reported disgust as the peak emotion" (p. 222), leading the reader to conclude that this sole finding represented strong evidence of the coherence between facial expression and self-reports of emotion at specific moments. Unfortunately, these "specific moments" were, in our view, *too* specific: Rosenberg and Ekman made an a priori selection of *only* the moments in which the most intense expressions and the most intense reports coincided. The claimed coherence

seems to apply only to this selected set. No data were provided about how many different kinds of faces (e.g., neutral faces) coincided with reports of intense disgust, and, even more importantly, no data were reported about how many intense expressions of disgust coincided with no reports of emotion at all. We do not know, for example, whether the film elicited a large number of intense expressions of disgust but most of the time paired with no reports of felt emotion.

Smiling and happiness

The relationship between smiling and happiness is particularly illustrative and important. Cross-culturally, observers attribute happiness to smiling with more agreement than when attributing any other emotion to any other expression. The link between happiness and smiles has also received considerable attention from Ekman and his collaborators, who claim a direct connection between smiling, particularly Duchenne smiles, and happiness (Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Ekman, Davidson, & Friesen, 1990; Ekman et al., 1980).

Ekman et al.'s (1980) aforementioned study found a coherence between the action of *zygomatic major* and the positiveness of the affective content of two films, but this finding was considered as provisional by the authors themselves because there was no clear pattern of correlation between the different measures of muscular action (frequency, duration, and intensity) and subjects' reports of happiness: None of the six analyzed patterns of correlation was significant for both films. For example, the correlation between the frequency of the action of the *zygomatic major* and the score of happiness reported during the second film was .60, while the same correlation in the first film was −.08.

In a new version of Ekman et al.'s (1980) experiment, Ekman et al. (1990) reported that the discriminative clue for happiness was the smile produced by the action of both the *zygomatic major* and *orbicularis oculi* (the Duchenne smile). On the basis of this study, Ekman (1992) implicitly criticized Ekman's (1972) and Ekman et al.'s (1980) studies, pointing out that "no account should be taken of studies that . . . treat all smiles as a single category, not separating Duchenne from non-Duchenne smiles" (Ekman, 1992, p. 37).

Unfortunately, no necessary or sufficient link between happiness and Duchenne smiles has been substantiated by other researchers. In a series of detailed observations, Schneider and Unzner (1992) found that preschoolers' spontaneous facial behavior in positive situations involved the

zygomatic reaction two to three times more often than the *orbicularis oculi* reaction:

> The assumption that only the common appearance of the zygomaticus and the orbicularis oculi reaction is a proper display for true joy . . . seems to be a premature dogmatic assumption. . . . The more parsimonious assumption, therefore, seems to be that most of the time these events triggered only low intensity joy reactions which then became manifest in the *zygomaticus* reaction alone without any visible reaction of the *orbicularis oculi.* (p. 58)

In the same vein, Fridlund (1994, p. 117) argued that wrinkles caused by the *orbicularis oculi* are not specific to smiling. For Fridlund, wincing is an occlusive, protective reflex, and it can be observed in intense facial movements; Duchenne smiles would be intense but not exclusive expressions of happiness.

Furthermore, other research reported by Ekman (1992) as supporting the relationship between happiness and Duchenne smiles confuses emotional states and emotional traits, identifying enjoyment with personal adjustment or mental health. Only one report concerned specific experiences of happiness and Duchenne smiles: Fox and Davidson (1988) found that 10-month-old infants' Duchenne smiles were more frequent in response to their mother's approach, whereas other smiles were more frequent in response to a stranger. Unfortunately, the mother's approach is simultaneously positive and social, which raises an important problem that we discuss in the next section.

Smiles as social signals

The debate about the relationship between smiles and happiness is not restricted to the distinction between Duchenne and non-Duchenne smiles. Some researchers (Fridlund, 1991; Kraut & Johnston, 1979) have raised important questions about the link between happiness and any kind of smile.

In a pioneering and innovative study, Kraut and Johnston (1979) observed facial behavior in natural settings (a bowling alley, a stadium, and the street) when people were presumably happy for different reasons (a good roll at the bowling alley, goals scored by their team at the stadium, and good weather in the street). Smiles were observed mostly during social interaction.

Fridlund (1991) measured facial electromyographic signals for smiling in subjects watching a video in conditions of varying sociality: a non-

social situation, an implicitly social situation, and an explicitly social situation. Fridlund found that action of the *zygomatic major* was better predicted by the social condition than by subjects' happiness.

Kraut and Johnston's study lacked a precise description of facial expression, and Fridlund did not analyze the action of *orbicularis oculi* in his subjects' smiles. Both of these shortcomings were overcome by Schneider and Josephs (1991), who analyzed the action of *zygomatic major* and *orbicularis oculi* in preschool children playing a competitive game. As had Fridlund, they found that the social situation played a major role in the display of smiles: Children smiled more in interactive than in non-interactive episodes. The coherence between positive emotion and Duchenne smiles was much less clear than the relationship between Duchenne smiles and other social factors: Smiles were more frequent among losers than among winners, and losers' smiles were more often Duchenne smiles and more often intense smiles, as compared with the winners' smiles.

In summary, the relationship between happiness and smiles – plain smiles or Duchenne smiles – is, at the moment, far from clear. The consensual "artistic truth" that smiles convey happiness has not, so far, been shown to correspond to an "optical truth." No clear link between happiness and smiles has been found in research on spontaneous facial behavior.

Two studies of smiling in natural settings

With these problems in mind, we are carrying out a series of studies in which we analyze all the instances of facial expression that occur during intense and natural emotional episodes.

These studies are aimed at answering a misleadingly simple question: To what extent do people display the hypothesized prototypical expressions of an emotion when they are feeling that emotion? Our studies have also been designed to test whether the social aspect of the emotional episode plays a major role in facial behavior. We have tried to keep a balance between ecological relevance and control, looking for intense and natural elicitors of emotion and an explicit assessment of the emotional experience and the facial expression of our subjects.

Gold medalists

Our first study (Fernández-Dols & Ruiz-Belda, 1995a) examined the awards ceremony at the 1992 Olympic Games. This ceremony rigidly

included three stages: two noninteractive and one highly interactive. The noninteractive stages were the medalists' waiting time behind the podium while authorities took their positions (Stage A), and the time when athletes turned toward the flag and listened to the national anthem (Stage C). The interactive stage was sandwiched between these two. The medalist stood on the podium interacting with authorities and the public (Stage B).

Winning a gold medal at the Olympic Games is probably one of the happiest events in an athlete's life, and it is hard to imagine a clearer elicitor of one intense emotion. We did not have direct access to the gold medalists whose facial behavior we studied, and therefore no self-reports of their feelings during the ceremony. However, we did ask 10 other gold medalists to rate their own emotional experience during each stage of the awards ceremony. We also asked university students to infer the emotional experience of a gold medalist during each stage. Both the experienced medalists and the lay judges judged the emotional experience of the gold medalists to be intense happiness in each of the three stages of the ceremony. All other emotions were negligible in comparison.

Even though close-ups of faces are frequent on TV and in films, they are almost exclusively of professional actors and actresses; close-up records of nonactors are rare. For the Olympics, exhaustive TV coverage provided us with high-quality records of athletes' facial behavior, which we analyzed with Ekman and Friesen's (1978) FACS. We coded all the available complete records of gold medalists' facial behavior during the three stages. Overall, 22 medalists were recorded for 398 sec in Stage A, 467 sec in Stage B, and 499 sec in Stage C. Figure 11.3 shows typical facial behavior during each of the three stages.

Table 11.1 shows the percentage of time in each of the three stages that included smiling, the hypothesized expressions of other basic emotions (Ekman & Friesen, 1978), neutral faces, and other nonprototypical configurations. A more precise description in terms of Duchenne smiles produced a similar distribution.

Happiness per se was not a sufficient cause for smiling. Stages A and C of the awards ceremony were times of intense happiness but little smiling. Smiling, such as occurred during Stage B, was a means for the medalists to express their happiness to an audience.

Facial behavior of happy people included a surprising number of facial configurations. This finding confirms that smiling might be a good conventional representation of "happiness" (an "artistic truth"), but not a necessary sign of happiness (not an "optical truth").

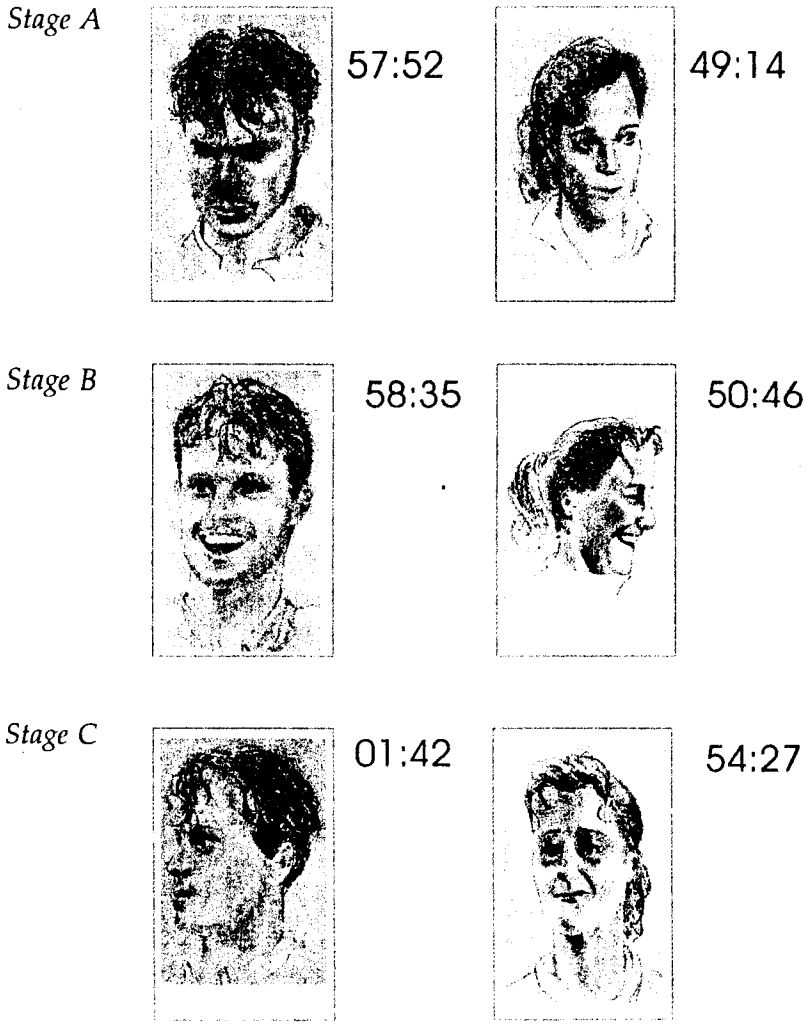

Figure 11.3. Typical expressions of two medalists during the three stages of the awards ceremony. Medalists displayed Duchenne smiles only during Stage B, whereas other expressions or neutral faces were observed during the noninteractive Stages A and C.

Soccer fans

Our second study examined ardent fans watching soccer matches on TV (Ruiz-Belda, 1995). The simple formal rules of competitive sports provide unambiguous "good" and "bad" events. For example, goals scored by one's own team are a source of instant happiness for any soccer fan.

Table 11.1. *Gold Medalists: Percentage of total time for each facial behavior across stages of the Olympics Awards Ceremony*

Facial behavior	Stage A	Stage B	Stage C
Smiles[a]	4.52	50.96	1.60
Neutral	32.41	7.71	14.43
Other expressions[b]	.50	.21	6.01
Other actions	62.56	41.11	77.96

[a]Prototypical expressions of happiness as described by Ekman and Friesen (1978).
[b]Prototypical expressions of other basic emotions as described by Ekman and Friesen (1978).

The study took place in a private home, familiar to most of the fans. We obtained 30 complete recordings; these involved 20 different fans and 6 different matches during 1994. Four fans were recorded during 3 matches, 2 fans during 2 matches, and 14 fans during 1 match. We also kept a synchronized record of the match itself and obtained fans' reports of their own emotional state. Before the match, subjects had been trained in how to report their emotional state at any time they felt an emotion and at various control points specified by the researcher. We describe here the facial behavior seen in those episodes in which fans stated in their own words that they were happy. The recorded changes of facial appearance observed immediately prior to the subjective reports of happiness were analyzed using Ekman and Friesen's (1978) FACS. We also distinguished those episodes that were clearly interactive (those that involved clear gaze interaction or verbal communication) from those that were not (the remaining episodes).

The results varied strongly according to whether the episode was interactive or noninteractive. We found 51 interactive episodes of happiness (produced by 17 fans). In 32 of these episodes (produced by 16 different fans), we found smiles. In 4 episodes (produced by 3 different fans), we found prototypical expressions of other emotions. In the remaining 15 episodes, we found other facial movements or neutral expressions.

We found 38 noninteractive episodes (from 16 fans). In 3 of these episodes (produced by 3 different fans), we found a smile. Within the category "smiles," we include both Duchenne and non-Duchenne smiles of "happiness" as described by Ekman and Friesen (1978). The scarcity of

Table 11.2. *Soccer fans: Percentage of total time for each facial behavior across interactive and noninteractive stages (Ruiz-Belda, 1995)*

Facial behavior	Noninteraction	Interaction
Smiles[a]	9.52	45.60
Neutral	7.74	8.19
Other expressions[b]	18.64	4.78
Other actions	64.08	41.42

[a]Prototypical expressions of happiness as described by Ekman and Friesen (1978).
[b]Prototypical expressions of other basic emotions as described by Ekman and Friesen (1978).

smiles contrasts with the frequency of other nonexpected expressions. In 13 of these noninteractive episodes of happiness (produced by 9 different fans), we found facial configurations described by Ekman and Friesen as prototypical expressions of surprise, sadness, and fear. In the remaining 22 episodes, we found other facial movements or neutral expressions.

These same data can also be analyzed in terms of duration, producing a direct comparison of the results from the Olympic gold medalists. As shown in Table 11.2, scoring the duration of smiling and other facial behavior confirmed the difference between interactive and noninteractive occasions. A description in terms of Duchenne smiles produced a similar distribution. Once again, smiling was not a necessary sign of happiness.

Furthermore, other data showed that smiling may not be a sufficient sign of happiness. We examined those occasions when basic emotions other than happiness were reported, and we coded the fans' preceding facial behavior. Duchenne and non-Duchenne smiles were not infrequent: Smiles were observed in 3 out of 7 fans who reported a total of 15 episodes of anger, in 1 out of the 7 who reported a total of 11 episodes of fear, 3 out of the 6 who reported a total of 7 episodes of sadness, and 1 out of the 4 who reported a total of 5 episodes of surprise. Overall, 11 out of 26 prototypical expressions observed during nonhappy episodes were smiles.

Conclusions

The inconclusiveness of the research on spontaneous facial behavior is caused, at least in the case of smiling and happiness, by an unexpectedly complex pattern of relationships between facial expression and emo-

tional experience. Our data confirm that there is a clear gap between the complex and varied expression of emotion in the noninteractive periods and the smiles observed in social interaction. This finding leads to some interesting conclusions that, it is hoped, will encourage further research.

A "social audience" effect

The fact that smiling is a joint effect of an emotional experience and an interactive encounter supports Fridlund's hypothesis of an "audience effect" for some facial expressions. Nevertheless, Fridlund's concept of social audience involves subjective levels of sociality (see Buck, 1991; Chovil, 1991; Chovil & Fridlund, 1991; Hess, Banse, & Kappas, 1995), which we did not consider in our studies. Our social audience effect is restricted to actual episodes of social interaction, which makes the concept of "social audience" more straightforward.

Another question is whether the differences between the facial behavior observed during the interactive and the noninteractive periods could be manifestations of the same emotional process. Our data suggest that gold medalists and soccer fans experienced happiness in both the interactive and the noninteractive periods, yet the facial behavior varied.

Happiness as a mere facilitator of smiling

Our main and most robust finding is that happiness does not elicit smiling in all circumstances (for example, in noninteractive circumstances). In our words, our main conclusion is that *happiness is not a sufficient cause of smiling.*

However, our study of soccer fans also hints at a further speculation concerning a more serious chasm between emotion and facial expression. The reported presence of Duchenne and non-Duchenne smiles during negative emotional episodes suggests that in some particular circumstances yet to be specified, spontaneous smiling could be a sign not of happiness but of any positive or negative emotion. In other words, there is evidence that *happiness is not a necessary cause of smiling.*

If happiness is neither necessary nor sufficient for smiling, researchers should explore alternative approaches to the relationship between happiness and smiling, and between emotion and facial expression in general. Gottlieb (1976) suggested an interesting conceptual distinction between inducing and facilitating factors. Our suggestion is that social interaction is the factor that *induces* smiling; the experience of happiness

does not induce smiling but rather *facilitates* smiling (causing variations in the amount of smiling, once smiling has been induced).

An expression of nonspecific emotion

Tests of the emotional meaning of facial behavior should be complemented with descriptions of actual facial behavior. For example, what actual facial behavior occurs during noninteractive periods of intense emotion? In the case of happiness, our data point to a complex and rapid succession of facial movements. One possible hypothesis is that this stream of facial behavior is not a sign of any specific emotion but of nonspecific emotion (Fernández-Dols & Ruiz-Belda, 1995b). The stream would be *entrained* into prototypical expressions of specific emotions only when the subject becomes engaged in social interaction. Figure 11.4 shows the expressive pattern of a soccer fan on watching a match. In a sequence of 4 sec, the fan displays a striking set of facial behaviors throughout an episode of clear and intense happiness; a Duchenne smile is clearly observed only when the episode finishes and the fan interacts with other people around him.

Alternatively, we can search for facial patterns related to isolated components of specific emotions (see Smith and Scott, chapter 10, this volume) in the apparently disorganized facial behavior observed during the noninteractive period. This hypothesis suggests that the complexity of the noninteractive period can be disentangled by looking for any possible specific pattern linked to a particular emotion or to any intense emotional episode.

An urgent need to avoid hurry

Our final oxymoron is meant to suggest that launching theoretical models as soon as some evidence seems to suggest them can be dangerous, because doing so might constrain their proponents into searching for ways to confirm that model. In our view, commitment to a premature theoretical framework was what led researchers to focus on studies of recognition (whose "artistic truth" seemed to confirm the theory) rather than on people's actual facial behavior (whose "optical truth" seems not to confirm the theory).

Researchers in the field should gather a substantial descriptive data base *before* any further theoretical development. In fact, our hunch is that our findings are only a first glimpse of an extremely complex and fas-

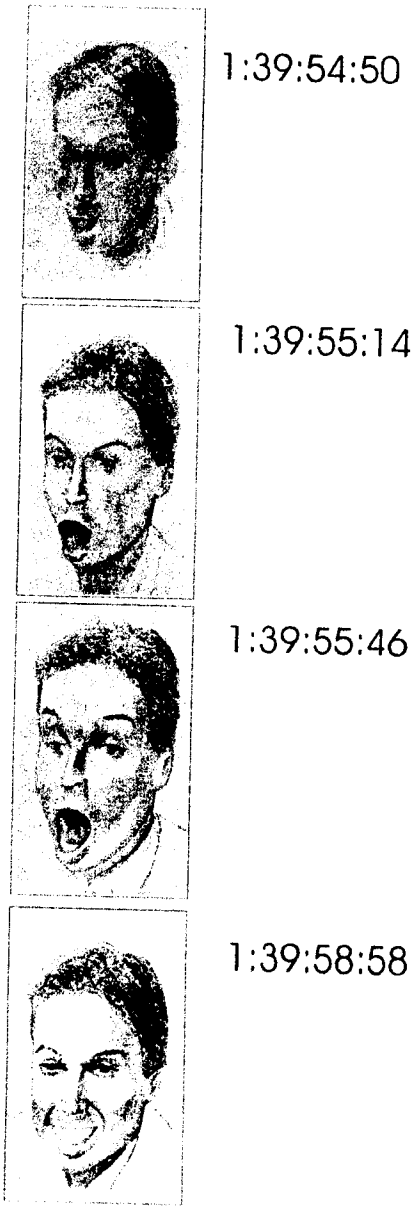

Figure 11.4. Typical expressive pattern of a soccer fan in an episode of happiness. In a sequence of 4 seconds, the fan displays a set of unexpected facial behaviors; a Duchenne smile is clearly observed only when the episode finishes and the fan interacts with other people around him (*lower frame*).

cinating "optical truth" whose complete understanding will require us to explore an exciting range of emotions and social variables across and through intense, ecologically valid situations.

References

Buck, R. (1991). Social factors in facial display and communication: A reply to Chovil and others. *Journal of Nonverbal Behavior, 15,* 155–161.

Camras, L. A., Malatesta, C., & Izard, C. E. (1991). The development of facial expressions in infancy. In R. S. Feldman & B. Rimé (Eds.), *Fundamentals of nonverbal behavior* (pp. 73–105). Cambridge, England: Cambridge University Press.

Chovil, N. (1991). Social determinants of facial displays. *Journal of Nonverbal Behavior, 15,* 141–154.

Chovil, N., & Fridlund, A. J. (1991). Why emotionality cannot equal sociality: Reply to Buck. *Journal of Nonverbal Behavior, 15,* 163–167.

Davidson, R. J., Ekman, P., Saron, C. D., Senulis, J. A., & Friesen, W. V. (1990). Approach-withdrawal and cerebral asymmetry: Emotional expression and brain physiology I. *Journal of Personality and Social Psychology, 58,* 330–341.

Davis, R. C. (1934). The specificity of facial expressions. *Journal of General Psychology, 10,* 42–58.

Eibl-Eibesfeldt, I. (1973). The expressive behavior of the deaf-and-blind-born. In M. von Cranach & I. Vine (Eds.), *Social communication and movement* (pp. 163–194). New York: Academic Press.

Ekman, P. (1972). Universals and cultural differences in facial expressions of emotion. In J. K. Cole (Ed.), *Nebraska Symposium on Motivation, 1971* (Vol. 19, pp. 207–283). Lincoln, NE: University of Nebraska Press.

Ekman, P. (1992). Facial expressions of emotion: New findings, new questions. *Psychological Science, 3,* 34–38.

Ekman, P. (1994). Strong evidence for universals in facial expressions: A reply to Russell's mistaken critique. *Psychological Bulletin, 115,* 268–287.

Ekman, P., Davidson, R. J., & Friesen, W. V. (1990). The Duchenne smile: Emotional expression and brain physiology II. *Journal of Personality and Social Psychology, 58,* 342–353.

Ekman, P., & Friesen, W. V. (1976). Measuring facial movement. *Environmental Psychology and Nonverbal Behavior, 1,* 56–75.

Ekman, P., & Friesen, W. V. (1978). *Facial Action Coding System (FACS): A technique for the measurement of facial action.* Palo Alto, CA: Consulting Psychologists Press.

Ekman, P., Friesen, W. V., & Ancoli, S. (1980). Facial signs of emotional experience. *Journal of Personality and Social Psychology, 39,* 1125–1134.

Ekman, P., Friesen, W. V., & Ellsworth, P. (1972). *Emotion in the human face: Guidelines for research and an integration of findings.* New York: Pergamon Press.

Ekman, P., Friesen, W. V., & Tomkins, S. S. (1971). Facial Affect Scoring Technique: A first validity study. *Semiotica, 3,* 37–58.

Fernández-Dols, J. M., & Ruiz-Belda, M.-A. (1995a). Are smiles a sign of happiness? Gold medal winners at the Olympic Games. *Journal of Personality and Social Psychology, 69,* 1113–1119.

Fernández-Dols, J. M., & Ruiz-Belda, M.-A. (1995b). Expression of emotion versus expressions of emotions: Everyday conceptions about spontaneous facial be-

havior. In J. A. Russell, J. M. Fernández-Dols, A. S. R. Manstead, & J. C. Wellenkamp (Eds.), *Everyday conceptions of emotion* (pp. 505–522) Dordrecht, Netherlands: Kluwer Academic Press.

Fox, N. A., & Davidson, R. J. (1988). Patterns of brain electrical activity during facial signs of emotion in ten-month old infants. *Developmental Psychology, 24,* 230–236.

Fridlund, A. J. (1991). Sociality of solitary smiling: Potentiation by an implicit audience. *Journal of Personality and Social Psychology, 60,* 229–240.

Fridlund, A. J. (1994). *Human facial expression: An evolutionary view.* San Diego, CA: Academic Press.

Friesen, W. V. (1972). *Cultural differences in facial expression in a social situation: An experimental test of the concept of display rules.* Unpublished doctoral dissertation, University of California, San Francisco, CA.

Frois-Wittmann, J. (1930). The judgment of facial expression. *Journal of Experimental Psychology, 13,* 113–151.

Gottlieb, G. (1976). Conceptions of prenatal development: Behavioral embryology. *Psychological Review, 83,* 215–234.

Hess, U., Banse, R., & Kappas, A. (1995). The intensity of facial expression is determined by underlying affective state and social situation. *Journal of Personality and Social Psychology, 69,* 280–288.

Hjortsjö, C. H. (1969). *Man's face and mimic language.* Lund, Sweden: Studentlitteratur.

Izard, C. E. (1994). Innate and universal facial expressions: Evidence from developmental and cross-cultural research. *Psychological Bulletin, 115,* 288–299.

Kraut, R. E., & Johnston, R. E. (1979). Social and emotional messages of smiling: An ethological approach. *Journal of Personality and Social Psychology, 37,* 1539–1553.

Landis, C. (1924). Studies of emotional reaction: General behavior and facial expression. *Journal of Comparative Psychology, 4,* 447–509.

Landis, C. (1934). Emotion: II. The expressions of emotion. In C. Murchinson (Ed.), *Handbook of General Experimental Psychology* (pp. 312–351). Worcester, MA: Clark University Press.

Leventhal, H., & Sharp, E. (1965). Facial expressions as indicators of distress. In S. S. Tomkins & C. E. Izard (Eds.), *Affect, cognition and personality, empirical studies* (pp. 296–318). New York: Springer.

Matsumoto, D., & Ekman, P. (1988). *Japanese and Caucasian facial expressions of emotion (JACFEE) and neutral faces (JACNeuf)* [Slides & brochure]. San Francisco: San Francisco State University.

Mozley, A. V. (1979). Introduction to the Dover Edition. In E. Muybridge, *Muybridge's complete human and animal locomotion: All 781 plates from the 1887 Animal Locomotion* (3 vols., pp. vii–xviii). New York: Dover Publications.

Oster, H., Hegley, D., & Nagel, L. (1992). Adult judgments and fine-grained analysis of infant facial expressions: Testing the validity of a priori coding formulas. *Developmental Psychology, 28,* 1115–1131.

Rosenberg, E. L., & Ekman, P. (1994). Coherence between expressive and experiential systems in emotion. *Cognition and Emotion, 8,* 201–229.

Ruiz-Belda, M. A. (1995). *La coherencia entre comportamiento facial espontaneo y emocion* [The coherence between spontaneous facial behavior and emotion]. Unpublished doctoral dissertation, Universidad Autonoma de Madrid, Madrid, Spain.

Russell, J. A. (1994). Is there universal recognition of emotion from facial expression? A review of cross-cultural studies. *Psychological Bulletin, 115,* 102–141.

Russell, J. A. (1995). Facial expressions of emotion: What lies beyond minimal universality? *Psychological Bulletin, 118,* 379–391.

Schneider, K., & Josephs, I. (1991). The expressive and communicative functions of preschool children's smiles in an achievement-situation. *Journal of Nonverbal Behavior, 15,* 185–198.

Schneider, K., & Unzner, L. (1992). Preschoolers' attention and emotion in an achievement and an effect game: A longitudinal study. *Cognition and Emotion, 6,* 37–63.

Sherman, M. (1927). The differentiation of emotion responses in infants: I. Judgments of emotional responses from motion picture views and from actual observation. *Journal of Comparative Psychology, 7,* 265–284.

Thompson, J. (Ed.). (1941). Development of facial expression of emotion in blind and seeing children. *Archives of Psychology, 37*(264).

12. Is the meaning perceived in facial expression independent of its context?

JOSÉ MIGUEL FERNÁNDEZ-DOLS AND
JAMES M. CARROLL

We see infants smile when they encounter an adult. We see adults smile when they watch a slapstick cartoon. We see people weep at homages and funerals. We see teenagers frown when their computers flash a strange message, and teachers frown when a teenager makes an inappropriate remark. Smiles, frowns, and other facial configurations described as "expressions of emotion" are highly meaningful cues in our perception of others.

This chapter concerns the meaning perceived in such facial expressions, and, specifically, whether that meaning depends on the context in which the expression occurs. (By "context" we mean the situational events that surround the facial movement, and we use the words *situation* and *context* interchangeably.) Common sense suggests *yes*. As with any behavior, facial expressions are embedded in a context; they happen at a particular time (e.g., while gazing at someone) and in a particular place (e.g., at a funeral). Psychological wisdom says that any perception is an interaction between the stimulus and its context (between the figure and its ground), and ethologists have found that animal messages get their specific meaning through context (Hinde, 1982; Smith, 1977).

What, then, are the figure–ground interactions between facial expressions and context? The answer implicit in the mainstream view of facial expression is very simple: There are none. Most research on facial expressions presupposes that they have meaning independent of their context or, in other words, that the context plays no essential role in the recognition of emotions from facial expressions. A specific facial expression means happiness, surprise, fear, or whatever, irrespective of the occasion of its occurrence. Even when feigned, a smile still means happiness, a wrinkled nose disgust.

This view implies that smiling infants and adults are perceived as

Figure 12.1. What emotion is each person feeling? Reproduced by permission of Agencia EFE, S.A. (*left*), and Frank Spooner Pictures (*right*).

happy, crying heroes and widows as sad, and frowning teenagers and teachers as angry, regardless of the context. When their facial expressions are placed back in context, some of these implications seem feasible: A crying widow at a funeral probably is sad, and a teacher frowning at an irreverent student probably is angry. Many pictures display these transparent messages: Figure 12.1 shows two such facial expressions. Who needs context to see grief in the woman and anger in the man?

Other implications are less certain. When a computer flashes a strange message, are teenagers angry or just puzzled? When infants smile to adults, are they happy or just being sociable? Are crying heroes sad in their own homage? Are smiling adults happy because the character of a slapstick cartoon has been crushed? Turn now to Figure 12.2. It is identical to Figure 12.1 except now some contextual information is available. Consider the actual contexts: The woman has just received a gold medal at the Olympics, experiencing one of the happiest moments of her life. The man has just been freed after more than a year in captivity. He is exultant on arriving home. Your first judgments – grief and anger – were feasible, but the second ones – overcome with happiness – seem at least equally feasible.

Knowledge of the context can thus lead us to doubt that a genuine (nonfeigned) smile expresses happiness, a genuine frown anger, or genuine crying sadness. If so, our everyday experience puts us at odds with the conclusion of 65 years of experimental research. How can this be so? In our view, the answer to this sensible question is that, paradoxically, most research on the relationship between facial expression and context has systematically misrepresented the context and its role in creating an emotional message. By "misrepresentation" we do not mean just artificiality. Admittedly, the ecological validity of most of these experiments is negligible; contexts have consisted of short written texts or graphic vignettes in which the smell, sounds, and specific images of the real

Figure 12.2. The woman is an Olympic gold medalist, Gwen Torrance, on the podium, living one of the happiest times of her life. The man is an American soldier kept as an Iranian hostage for 444 days; in the picture he arrives at an American base after being freed. His expression was described by Time-Life (1994) as "an unambiguous expression" of joy. Reproduced by permission of Agencia EFE, S.A. (*top*), and Frank Spooner Pictures (*bottom*)

situation disappear, and the time frame is condensed or divided. Nevertheless, creating artificial stimuli in laboratories is an acceptable way of securing a controlled environment capable of keeping the basic features of a phenomenon.

Researchers' misrepresentation has been deeper. They have mistakenly assumed that expression and context are co-equal competing sources of information and that each transmits its own emotional message. This assumption has been maintained through years of research carried out in the framework of a 65-year-old experimental paradigm, in which observers judge discordant combinations of facial expressions and contexts (i.e., the face and context suggest different emotions) in order to ascertain whether judgments about the emotional content of the combination are more predictable from the judgment of the face alone or from the judgment of the context alone. Most of the time, it has been concluded, they are more predictable from the judgment of the face alone.

In our view, expression and context do not typically compete and do not each convey an emotional message. Rather, they interact in complex and almost unknown ways. The relation of face to context is more figure to ground. Consider the way the ground generally influences the perception of a figure. For example, consider how a white background influences the perception of a gray target. It is not that the gray suggests "gray," while white suggests "white," and the observer then chooses between two competing color suggestions. Rather, the white ground makes the gray figure seem darker.

Admittedly, some contexts do convey a clear emotional message: A funeral is a sad event, and winning a gold medal is a happy one. But most contexts do not convey a self-contained message independent of the expression. A casual encounter between a baby and an adult suggests no strong emotion. The flashing, puzzling message from the computer is, by definition, an enigma. A smashed cartoon character can amuse but, even though happiness and amusement are positive emotions, we would not be willing to accept the inference that if we smile the annihilation of the character makes us happy (assuming we are not sadists).

In this chapter, we describe representative studies in this field and their main conclusions. We then describe alternative approaches that explore the nature of context and its interaction with facial expression and that show how interpretation of facial expressions depends on context. Finally, we discuss the implications of this evidence for research on facial expression.