

Smiles When Lying

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Subtle differences among forms of smiling distinguished when subjects were truthful and when they lied about experiencing pleasant feelings. Expressions that included muscular activity around the eyes in addition to the smiling lips occurred more often when people were actually enjoying themselves as compared with when enjoyment was feigned to conceal negative emotions. Smiles that included traces of muscular actions associated with disgust, fear, contempt, or sadness occurred more often when subjects were trying to mask negative emotions with a happy mask. When these differences among types of smiling were ignored and smiling was treated as a unitary phenomenon, there was no difference between truthful and deceptive behavior.

Nearly 20 years ago Ekman and Friesen (1969) theorized that because people usually attend more to facial expression than to body movement, a liar would attempt to disguise and censor facial expressions more than hand or foot movement. As they hypothesized, observers were found to be more accurate in detecting deceit when they viewed the liar's body without the face than when they saw the face alone or the face and body together (although the absolute level of accuracy at best was rather meager; Ekman & Friesen, 1969, 1974; Hocking, Miller, & Fontes, 1978; Littlepage & Pineault, 1979; Wilson, 1975; and Zuckerman, DePaulo, & Rosenthal, 1981).

Although the face would mislead the untrained eye, Ekman and Friesen (1969) said that involuntary expressions of emotions might leak despite a liar's efforts at disguise. The easy-to-see macroexpressions often would signal the liar's deliberately intended false information, and the more subtle aspects of facial activity, such as microexpressions, would nevertheless reveal true feelings. "In a sense the face is equipped to lie the most and leak the most, and thus can be a very confusing source of information during deception" (Ekman and Friesen, 1969, p. 98). Until now no one has attempted to identify such subtle facial clues to deceit. Those experiments on lying that measured facial behavior considered only the macro category of smiles, laughter, or both. As would be expected, no difference between lying and truthfulness was found in most studies (Finkelstein,

1978; Greene, O'Hair, Cody, & Yen, 1985; Hemsley, 1977; Hocking & Leathers, 1980; Knapp, Hart, & Dennis, 1974; Krauss, Geller, & Olson, 1976; Kraut, 1978; Kraut & Poe, 1980; McClintock & Hunt, 1975; Mehrabian, 1971; O'Hair, Cody, & McLaughlin, 1981; Riggio & Friedman, 1983; and a review by Zuckerman et al., 1981).

In this study we measured more subtle aspects of facial expression, distinguishing among different types of smiling. The materials examined were videotapes in which the subjects first truthfully described enjoyable feelings and then lied, concealing negative emotions and falsely claiming positive feelings. Previous studies of these videotapes have reported clues to deceit in body movements and vocal behavior (Ekman, Friesen, & Scherer, 1976). Viewing the facial expressions in these videotapes convinced Ekman and Friesen that none of the techniques for measuring facial expression available when these videotapes were gathered, in the early 1970s, would succeed in discriminating between the smiles of actual enjoyment and the smiles of feigned enjoyment masking negative emotions. It took Ekman and Friesen 8 years to develop the tool they thought necessary for the task, their fine-grained, comprehensive facial measurement technique, the Facial Action Coding System (FACS) (Ekman & Friesen, 1978). In this article we report the findings from the first use of FACS to measure facial expressions when people deliberately lie.

Most relevant to the particular deceit we studied is Ekman and Friesen's (1982) distinction between felt and false smiles. Felt happy smiles,¹ they said,

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¹ A. J. Fridlund (personal communication, May, 1986) has raised the question of whether our use of the term *felt* for this class of behavior presumes that subjects are always aware of their subjective feelings of enjoyment. Although this might often be so, it is not the essential char-

include all smiles in which the person actually experiences, and presumably would report, a positive emotion. These positive emotions include: pleasure from visual, auditory, gustatory, kinesthetic or tactile stimulation; amusement and delight; contentment and satisfaction; beatific experiences; relief from pain, pressure or tension; and enjoyment of another person. We hypothesize that the common elements in the facial expression of all such positive experiences are the action of two muscles: the zygomatic major pulling the lip corners upwards towards the cheekbone; and the orbicularis oculi which raises the cheek and gathers the skin inwards from around the eye socket. (Ekman & Friesen, 1982, p. 242)

Figure 1 shows an example of such a smile. Our first hypothesis is this: Felt happy expressions occurred more often when people frankly described positive feelings (the honest interview) than when people deceptively claimed to be enjoying themselves although they were actually having strong negative feelings (the deceptive interview).

A false smile is

deliberately made to convince another person that positive emotion is felt when it isn't. There are two kinds of [such] smiles. In a phony smile nothing much is felt but an attempt is made to appear as if positive feelings are felt. In a masking smile strong negative emotion is felt and an attempt is made to conceal those feelings by appearing to feel positive. (Ekman & Friesen, 1982, p. 244)

We did not consider phony smiles in this study because they are said to occur only when nothing much is felt, and our subjects reported feeling either positive feelings in the honest interview, or negative feelings, which they tried to conceal, in the deceptive interview.

We did measure masking smiles, which Ekman and Friesen said can be detected because "[s]igns of the felt emotions the masking smile is intended to conceal may persist and provide evidence that the smile is false" (Ekman & Friesen, 1982, p. 247). A masking smile thus combines the smiling action (*zygomatic major*), which is part of the felt smile, with traces of the muscle movements from one or another of the negative emotions. Our second hypothesis is the following: Masking smiles occurred more often when people deceptively claimed to be enjoying themselves although they were actually having strong negative feelings.

These distinctions do not exhaust the repertoire of smiles, but there is no reason to expect that any other type of smiling—which might differ in the muscles recruited, intensity of action, timing, or symmetry—would occur differentially in the honest interview as compared with the deceptive interview. Ekman (1985) described 17 other types of smiling. Almost half of these are conversational signals (Ekman, 1979), regulating the back and forth flow of conversation. The listener response smile is an example of one of the most frequent of these conversational facial signals. This is "a coordination smile used when listening



Figure 1. An example of the felt happy smile, showing the appearance changes produced by the muscle around the eye, orbicularis oculi, as well as the muscle that pulls the lip corners upwards, zygomatic major.

to let the person speaking know that everything is understood and that there is no need to repeat or rephrase. It is the equivalent to the "mm-hmm," "good," and head nod it often accompanies" (Ekman, 1985, p. 157). (Other forms of listener response were described by Dittmann, 1972, and Duncan, 1974.) Listener response smiles and the other conversational signal smiles were not analyzed because we believe them to be part of any conversation, whether honest or deceptive.

Method

Deception Scenario

Student nurses were videotaped in each of two standardized interviews. In both interviews, the subject watched a short film and answered an interviewer's questions concerning her feelings about it. The interviewer sat with her back to the screen, unable to see what the subject was watching. The subject sat facing the screen and the interviewer. In the first minute of each interview the subject answered questions concerning her feelings about what she was seeing as she watched the film. Then the film ended, and for the next 2 to 3 min the interviewer continued to ask questions about the experience. The interviews averaged close to 3 min, with a range of from 2 to almost 5 min.

In the honest interview, the subjects were in a relatively unstressful situation. Nature films designed to elicit pleasant feelings were shown, and subjects were instructed to describe their feelings frankly. In the deceptive interview, subjects saw a film showing amputations and burns, intended to elicit strong unpleasant emotions. They were instructed to conceal negative feelings and to convince the interviewer they were watching another pleasant film. The emotional ratings provided immediately after each interview confirmed that the appropriate emotions were aroused. The mean rating on happiness was 7.16 (on a 9-point scale) in the honest interview and 0 in the deceptive interview; the mean ratings on fear, disgust, sadness, and pain were all between 4 and 5 in the deceptive interview and 0 in the honest interview.

This scenario was designed to resemble the lie of the depressed inpatient who, after a few weeks in a mental hospital, conceals anguish with a mask of positive feeling to win release from supervision so as to be able to commit suicide. The scenario required concealing strong negative emotions, felt at the moment of the lie, with a mask of positive feeling.

acteristic. Instead we posit that felt happy expressions will be found most often in circumstances that people would usually describe as enjoyable; and that felt happy expressions typically occur with simultaneous physiological activity that is distinctive to that expression (for such evidence, see Davidson, Ekman and Friesen, 1987; Fox and Davidson, 1987).

The stakes for success or failure were also high, although not life itself. The dean of the school of nursing invited the student nurses to volunteer to participate in a study of communication skill (100% volunteered). We explained that they would see the type of upsetting material they would soon be confronting in an emergency room. They were told that they would need to conceal any fear, distress, or disgust to obtain cooperation from the patient and family by appearing confident and optimistic. Our experiment was a preview, we said, and a test of how well they could accomplish this. The subjects thought that the measure of how well they did on this test was whether the interviewer would be able to guess when they were lying.² We told them about pilot data that showed that experienced, successful nurses did well in our task. Subsequently, we (Ekman and Friesen, 1974) found a correlation between how well subjects misled groups of observers who watched their videotapes and their supervisors' ratings a year later of how well they worked with patients, $\rho = .62, p < .01$.

In two respects—lying about strong negative emotions aroused at the moment of the lie and the very high stakes for success or failure in lying—our deception scenario differed from virtually all the other experimental deception scenarios devised by other investigators. Also, unlike many other experiments on lying, these subjects did not know they were being videotaped until after the experiment was over.

Verisimilitude dictated that we not attempt to separate the negative emotions aroused by the negative film (the analog to the patient's anguish) from the fear of being caught and any more general stress associated with lying. They were confounded on purpose. Another limitation in our scenario was that there was no control for the order of the honest and deceptive interviews. The honest interview always came before the deceptive interview, because we found in pilot studies that when the order was reversed, the negative impact of the negative films lingered, spilling over into what was intended to be a positive experience in the honest interview. We will consider in the discussion the effects of these features of the deceptive scenario on the results.

Subjects

Forty-seven student nurses were recruited after they had been admitted to but before starting in the School of Nursing. Ten subjects were not able to maintain the deception, admitting in the first minute or two that they were watching a very upsetting film. We found no differences on either the MMPI or Machiavelli test between the subjects who confessed and the subjects who completed the deceptive interview. The confessors did tell us afterwards that their difficulty in lying has been a lifelong characteristic.

Five subjects made mistakes in following the instructions and their records could not be used. One subject refused consent when, after the experiment, she was told it had been recorded on videotape. The mean age of the remaining 31 female subjects was 20.7; the range was from 19 to 26. All of these subjects reported after the experiment that it had been helpful in preparing them for their work as nurses, and all of them volunteered when offered an opportunity to go through the experiment a second time.

Measurement of Facial Expression

Measurements were made from black and white videotapes, which had been focused to show a close-up, head-on view of the subject's face. The camera was concealed although the subjects did know an audiotape was being recorded. The measurements were based on Ekman and Friesen's (1976, 1978) Facial Action Coding System. FACS is the first and only anatomically based, comprehensive, objective technique for measuring all observable facial movement. Measurement requires that a trained scorer "dissect" an observed expression, decomposing it into

the elemental facial muscular actions that produced the facial movement. The scores for a particular expression consist of the list of muscular actions that are determined to have produced it.

Although it would have been possible to score all facial movements, we chose to use a modification of Ekman and Friesen's technique (EM-FACS) that is more economical, so that scoring required only 10 min for each minute of behavior, rather than the 100:1 ratio if all facial movements were scored. Scorers decomposed an expression into its elemental muscular actions whenever any 1 of 33 predefined combinations of facial actions were observed. These 33 combinations of facial actions include all of the facial configurations that have been established empirically (Ekman & Friesen, 1975, 1978) to signal the seven emotions that have universal expressions: anger, fear, disgust, sadness, happiness, contempt, and surprise.

The scoring, however, was done in descriptive, behavioral terms, not in terms of these emotions. The scorer identified the occurrence of particular facial muscle actions, such as pulling the brows together, brow raising, nose wrinkling, and so forth, rather than making inferences about underlying emotional states such as happiness or anger, or using descriptions that mix inference and description, such as smile, scowl, or frown.

Usually the scorer can easily identify when a facial movement that must be scored has occurred, because the change in appearance is abrupt, changing from an expressionless face or from one expression to another. Similarly, most facial movements disappear in a noticeable fashion. The scorer locates when these readily identifiable facial movements occurred in time and then describes the movements in terms of the muscles that produced them. Occasionally, the same facial configuration is held on the face for a prolonged period and it may be difficult to determine if it should be treated as a single expressive event or as more than one event. We use changes in the intensity of the facial movement to break such prolonged movements into more than one scorable event. Facial muscle movements are scored on a 5-point intensity scale, and increases of 2 points or more in the extent of muscular contraction are treated as new events.

The scorers did not know whether the interviews they scored were honest or deceptive and were unfamiliar with the design or purpose of the experiment. The videotaped interviews were randomly assigned to two highly experienced scorers who had either 1 or 4 years experience measuring facial behavior. Interscorer reliability was evaluated by using a ratio in which the number of facial actions on which the two persons agreed was multiplied by two and then divided by the total number of facial actions scored by the two scorers. This agreement ratio was calculated for all events observed by one or both scorers. Agreements between scorers that no scorable behavior was occurring were not included in the ratio. The mean ratio across all scored events was .77, which is comparable to the level of reliability reported by Ekman and Friesen (1978).

The facial muscular action scores provided by the scorers for each interview were then converted by a computer dictionary into emotion scores. Although the dictionary was originally based on theory, there is now considerable empirical support for the facial action patterns listed in it for each emotion (see review in Ekman, 1984). In addition to providing scores on the frequency of the seven single emotions (anger, fear, disgust, sadness, happiness, contempt, and surprise) and the co-occurrence of two or more of these emotions in blends, the dictionary also allows for subdividing the happiness scores into felt happy expressions, masking smiles, and various other types of smiling activity.

² Across all subjects the interviewer did no better than chance, and her accuracy did not improve over the course of the experiment. Because the interviewer could not tell when the subjects were lying, her own behavior would not have provided any useful feedback to the subjects about their performance.

Felt happy expressions are defined as the action of the zygomatic major and orbicularis oculi, pars lateralis muscles, with no muscular activity associated with any of the negative emotions. Masking smiles are defined as the action of the zygomatic major muscle and muscles associated with fear (risorius, or the combination of frontalis and corrugator), disgust (levator labii superioris, alaque nasi or levator labii superioris, caput infraorbitalis), contempt (buccinator), sadness (triangularis, or corrugator and frontalis, pars medialis), or anger (orbicularis oris, or corrugator and levator palpebrae superioris). Figure 1 shows a felt happy expression. Figure 2 shows examples of the masking smiles. In order to compare our findings with those from previous studies that failed to distinguish different types of smiles, we summed all smiling. This total smiling score included both felt happy smiles and masking smiles and other actions of the zygomatic major muscle. A total negative emotion score also was obtained. It was the sum of all of the instances in which any negative emotion was shown in any part of the face, not accompanied by smiling.

Results

Because the length of the interviews differed across subjects, all scores were converted from raw frequency to frequency per minute. Dependent *t*-tests showed, as expected, no significant difference in total smiling between the honest and deceptive interviews. Differences in negative emotional expressions could not be compared, because such expressions never occurred in the honest interviews, and virtually never were shown in the deceptive interviews.

A repeated measures MANOVA was computed with interview condition (honest and deceptive) as the independent variable and two dependent variables (felt happy expressions and masking smiles). There was a significant effect for interview condition, $F(2,29) = 4.31, p < .023$. Both univariate tests between interview conditions for the dependent variables were significant. As predicted, Table 1 shows that felt happy expressions decreased and masking smiles increased from the honest to deceptive interviews. Table 1 also shows that felt happy smiles do not disappear during deception, but there are fewer of them and more of the masking smiles.

Although this analysis supports the conclusion that, on average, felt happy expressions occurred more frequently in honest interviews and masking smiles more frequently in deceptive interviews, it cannot reveal how many individual subjects would be correctly classified using these behavioral indices. Table 2 presents this information. In the first two rows, a subject was tallied in the "hit" column if the hypothesized difference between honest and deceptive interviews was found on that measure. Small differences were ignored by requiring that differences be greater than twice the standard error of measurement. A subject was considered a "miss" if the difference was counter to the hypothesis; and "unclassified" if there was no score for either interview, if the scores were the same, or if the difference was less than twice the standard error of measurement. In the third row, a hit was tallied if the predicted difference occurred on at least one of the two measures and was not counter to prediction on the other measure. If the difference was counter to prediction on at least one measure and was not as predicted on the other measure, it was considered a miss. If the two measures were in the opposite direction or there was no score on both



Figure 2. All three masking smiles show evidence of negative emotions leaking through the smiling appearance produced by the zygomatic major muscle. The hint of disgust in the top and middle figures is from the action of levator labii superioris, caput infraorbitalis, which raises the upper lip. In the bottom figure a trace of sadness is apparent, caused by the action of the triangularis muscle pulling the lip corners down on the right side of the picture.

Table 1
Smile Measures in the Two Interview Conditions

| Interview condition | Type of smiling expression | | | |
|-----------------------|----------------------------|-----------|----------|-----------|
| | Felt happy | | Masking | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Honest | 2.49 | 2.0 | .80 | 1.31 |
| Deceptive | 1.57 | 1.08 | 1.18 | 1.46 |
| <i>F</i> ^a | 6.85 | | 5.25 | |
| <i>p</i> | .014 | | .029 | |

^a *df* = 1, 30.

measures, it was considered unclassified. The last row required that the predicted differences occur on both measures. Binomial tests were computed by comparing the number of hits and misses. Table 2 shows that there were many more hits than misses, although about half the subjects could not be classified.

Discussion

Two types of smiles distinguished truthfully describing a pleasant experience from deceptively describing an unpleasant experience. When enjoyment was actually experienced, smiles that included the activity of the outer muscle that orbits the eye (felt happy expressions) occurred more often than when enjoyment was feigned. When subjects attempted to conceal strong negative emotions with a happy mask, smiles that contained traces of the muscular activity associated with negative emotions (masking smiles) occurred more often than when no negative emotions were experienced. These findings confirm Ekman and Friesen's (1969) early prediction that the face may display subtle clues that can provide accurate information about felt emotions despite concealment efforts. These findings contradict nearly all of the studies by other investigators since then that measured smiles. This contradiction arises from two sources.

First, only in this study were different types of smiles distinguished. When we disregarded the type of smile, whether it was a felt happy expression or a masking smile, and like other investigators simply considered smiles as a unitary phenomenon, we too found no difference between the honest and deceptive interviews. Second, our deception scenario was relevant to emotion, whereas most of the scenarios used by prior investigators were not. Smiles will not always provide clues to deceit. Indeed, Ekman (1985) has argued that no behavioral clue is specific to deceit itself, evident only when people lie and absent when they are truthful. Clues to deceit instead must be inferred on the basis of knowledge of the particular deceit one suspects may be occurring. If our subjects had not been experiencing strong negative emotions evoked by the films they were viewing and by their fear of being caught, there would have been no negative emotions to leak through their masking smiles, and that measure would not have differentiated the deceptive interviews from the honest interviews. Similarly, if our subjects had not been experiencing enjoyment evoked by the films they watched in the interview in which they had been told to honestly de-

scribe their feelings, there would not necessarily have been more felt happy expressions in that interview than in the deceptive interview.

Facial expressions (and many vocal and bodily clues as well) are most likely to provide clues to deceit when the lie is about emotion, especially emotion felt at the moment of the lie. Even when the lie is not about feelings, Ekman (1985) theorized that feelings about lying—fear of being caught, guilt about lying, or duping delight (the pleasure and excitement of the challenge of fooling someone)—may produce behavioral clues to deceit. Those feelings will not occur in every lie. In our deception scenario, the subjects were not guilty about lying because they had been told to lie and given an acceptable justification for doing so. But they were afraid of being caught because they thought their success in lying was relevant to their chosen career. In none of the previous deception experiments has there been so much at stake.

Although our deception scenario had the virtue of having high stakes, two aspects of its design should be considered as possibly contaminating the findings. First, the order of the interviews was *not counterbalanced*. We made this decision because we had found in pilot studies that the unpleasant feelings aroused by the amputation-burn film seen in the deceptive interview lingered. We therefore placed the deception session in which the subject had to conceal negative feelings second, always preceded by the honest interview in which the subjects frankly described pleasant feelings aroused by viewing positive films. We can think of no reason, however, why our findings could be attributed simply to order effects, why felt happy smiles might be expected to decrease and masking smiles with traces of fear, disgust, anger, contempt, or sadness to increase simply because of order.

A second feature of the design did affect one of the findings and how it should be interpreted. In the deceptive interview there were two sources for the negative emotions aroused: the amputation-burn film and the fear of being caught lying (detection apprehension). This dual source for the arousal of negative emotions in the deceptive interview causes no problem in interpreting our finding that felt happy smiles occurred less in this interview than when the subjects actually had pleasurable feelings in the honest interview. Nor does it call into question whether the masking smiles seen most often during the deceptive interview were specific to this situation of trying to conceal negative feelings. Such masking smiles do not occur just because someone is watching an amputation-burn film (Ekman, Friesen, & Ancoli, 1980). But there is ambiguity about the source of one of the negative feelings that leaked through the

Table 2
Number of Subjects in Which the Type of Smile Differentiated Between the Honest and Deceptive Interviews

| Type of smile | Hits | Misses | Unclassified | <i>p</i> |
|------------------------|------|--------|--------------|----------|
| Felt happy expressions | 10 | 1 | 20 | .006 |
| Masking smiles | 7 | 1 | 23 | .035 |
| Either measure | 13 | 2 | 16 | .004 |
| Both measures | 4 | 0 | 27 | |

masking smile. We cannot know whether the traces of fear in the smiles were aroused by the film or by fear of being caught lying. The traces of disgust, anger, contempt, or sadness were, however, probably aroused by the film rather than by the task of having to deceive.

It would have been possible to design a deception scenario in which people were not concealing strong negative feelings, as most others have done (cf. Zuckerman et al., 1981). Such deception scenarios, however, have little relevance to the situation we were attempting to model (the patient concealing plans to commit suicide). For such patients, traces of fear in masking smiles might also be due to either the anguish that motivates their self-destructive plan or to detection apprehension. In either case, the clue that they are lying is that the smiles are not felt smiles but masking smiles.

Another factor that may limit our results is the fact that nearly one-fourth of the subjects confessed, unable to maintain their lie throughout the short deceptive interview. Our findings can only be generalized to those people—75% in our study—who can maintain a deception when strong negative feelings are aroused. Not everyone can do this. For those who cannot lie in such a situation, our findings are not relevant. For them there is no issue about how to detect their lie, for they confess it.

Although the decrease in felt smiles and the increase in masking smiles was significant for the subjects as a group, our analysis of each individual's performance revealed that the face provided clues to deceit in fewer than half of the subjects. One explanation might be that such clues were available only among those who felt the most enjoyment in the honest interview and the most negative emotions in the deceptive interview. The subjects' ratings of the emotions they felt during the interviews, which were gathered immediately after each interview, failed to support this hypothesis. Those correctly classified on each measure (hits) did not report, in either the honest or deceptive interviews, emotions that differed significantly (*t*-tests) in intensity from those who could not be classified on either measure. Research underway suggests that people may differ in which aspect of their behavior provides clues to deceit—face, body, voice, paralanguage, or speech content. If that proves to be so, the cross-situational generality of such differences and their bases will become important issues to explore.

Another issue raised by our findings is whether the felt happy smile and masking smile function as social signals, recognized by participants during social interaction. The findings from a previous study (Ekman and Friesen, 1974) suggest they might not. Observers who were shown the videotapes used in this experiment did no better than chance in distinguishing the honest from deceptive faces. Did these observers not know what clues to look for, or might the behavioral differences that distinguish felt happy from masking expressions be too subtle to see without slow motion observation?

We believe that the smiles we distinguished are visible. Although we knew what to look for, we found no difficulty in spotting them at real time. Another reason to believe that these subtle facial clues can function as social signals comes from research in progress. We are studying how well different groups within the criminal justice system can detect deceit when viewing the videotapes used in this experiment. Although most did

no better than chance, some were accurate; those who were accurate mentioned using facial clues to make their decision.

If we are correct and these facial clues are visible, why do most people not use them in trying to judge who is lying? Ekman (1985) suggested that many people learn through their normal life experience to ignore such clues to deceit, collusively cooperating in being misled so they can avoid dealing with the consequences of uncovering a lie. This speculation, however, is far removed from the present findings. The first empirical step is to determine whether the facial behaviors we found to distinguish the honest and deceptive interviews can be recognized by people who have been told what facial clues to look for and who are motivated to succeed in detecting deceit. If people can learn to do so, then further research could determine the benefits of this knowledge when an observer is exposed to the full range of behavior available in social interaction, which includes much more than the face.

Apart from the specific issue of lying and its detection, the results more generally indicate the value of precise measurement of facial expression and the validity of the distinctions among different types of smiling proposed by Ekman (1985) and Ekman and Friesen (1982). Although there have been no other studies of the masking smile and research is needed to replicate our findings, there have been a number of studies of the felt happy smile. These studies all support Ekman and Friesen's (1982) description of how a felt happy smile differs in appearance and function from other types of smiling.

Four studies used Ekman and Friesen's (1982) specification that felt happy smiles are marked by the action of the zygomatic major and orbicularis oculi muscles. Ekman, Friesen, and Ancoli (1980) found that such felt happy smiles occurred more often than three other types of smiling when people watched pleasant films; and only felt happy smiles correlated with the subjective report of happiness. Fox and Davidson (1987) found that in 10-month-old infants, felt happy smiles occurred more often in response to the mother's approach and other types of smiles occurred more often in response to the approach of a stranger. And only felt happy smiles were associated with left frontal EEG activation, the pattern of cerebral activity repeatedly found in positive affect. Matsumoto (1986) found that depressed patients showed more felt happy smiles in the discharge interview as compared with the admission interview, but there was no difference in the rate of other kinds of smiling. Steiner (1986) found that felt smiles but not other types of smiles increased over the course of psychotherapy in patients who were judged to have improved.

Ekman and Friesen (1982) also proposed that felt happy smiles would differ from other smiles in the amount of time it took for the smile to appear, how long it remained on the face before fading, and in the time required for the smile to disappear. Two studies have shown the utility of these measures of timing, which are, however, much more costly to make than the measurement of which muscles are recruited. Bugental (1986) found that women showed more felt happy smiles with responsive than unresponsive children. Weiss, Blum, and Gleberman (1987) found felt happy smiles occurred more often during posthypnotically induced positive affect than in deliberately posed positive affect.

These studies collectively show that smiles should no longer be considered a single category of behavior. They can be usefully distinguished by measuring different facets of the smile. It remains to be determined how many different smiles may provide different social signals, have different functions in social interaction, and relate to different aspects of subjective experience and concomitant physiology.

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