Practical Guide to Using Video in the Behavioral Sciences

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CHAPTER 10

Analyzing Nonverbal Behavior

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OVERVIEW

This chapter offers some insight into the task of analyzing facial expressions with the degree of detail that is possible only with the assistance of video. It begins with a taxonomy of facial action—that is, the ways the face moves and the information it imparts. Facial expression configurations and dynamics are defined and described. Dr. Matsumoto and colleagues describe four primary methods of eliciting nonverbal behavior to be measured: (a) structured and unstructured interviews; (b) structured imagery, self-reference, and reminiscence tasks; (c) emotion-eliciting stimuli, for example, film clips; and (d) structured activities of emotional valence. The authors then review related video-based methods of measurement including open-ended observation and standardized facial measurement using the Facial Action Coding System (FACS). Selective measurement is discussed as an economic, standardized means of studying nonverbal expression. Selective observer judgment and three major direct-measurement approaches are described: the Maximally Descriptive Facial Movement Coding System (commonly called MAX), the System for Identifying Affect Expression by Holistic Judgment (AFFEX), and the Emotion Facial Action Coding System (EMFACS). Facial electromyography (EMG) is mentioned as an alternative or an adjunct to video analysis. The authors illustrate with examples drawn from their research indicating systematic differences in the facial expressions of people with different diagnoses of severe mental illness.

P.W.D.

This chapter presents guidelines for recording, measuring, and analyzing nonverbal behavior. We have expanded upon substantial portions of another article (Ekman &

Fridlund, 1987) to be of use to scientists whose interests lie in the assessment of nonverbal behavior, whether part of the clinical realm or not. As the bulk of our research has involved analyzing facial movements, we limit our discussion to the use of video technology in the assessment of facial behavior. The principles and guidelines that govern the assessment of other nonverbal behaviors including body movements, gaze, and speech are similar. A detailed discussion of the analysis of these behaviors can be found in Scherer and Ekman (1982).

We first discuss the different types of facial actions observed in naturally occurring interactions and the different types of information that can be gathered from the face. We then describe the two major decisions involved in examining facial behavior—namely, selecting the conditions under which to obtain samples and the methods for measuring the behavior. We then present several of our own studies that exemplify the use of video recording for the analysis of facial behavior. Throughout, we attempt to provide scientists and practitioners alike with the concepts and methods requisite for making informed decisions about measuring facial behavior.

FACIAL EXPRESSIONS

Types of Facial Actions

Several different types of information can be gathered from facial expressions, including emotions and nonemotion signals. For several reasons, we focus on techniques for measuring *emotion.* First, the techniques available for facial measurement were, for the most part, developed for studying emotion. Second, there is ample evidence that these techniques can accurately measure emotion. Third, there is increasing recognition of the importance of emotional displays in relation to internal state and in the regulation of social interaction.

Most facial actions, however, do not signal emotion. Three of these types of actions are particularly relevant to the study of nonverbal interaction:

- *Instrumental facial actions* are related to activities that help to satisfy bodily needs or manage emotion. Examples include lip wiping and wetting, lip biting, or grinding of the teeth.
- *"Emblematic" facial actions* (Ekman, 1973) are learned symbolic facial gestures whose meanings are language-like and widely shared within a culture. Examples include the wink, the facial shrug, and the tongue defiance display.
- *Conversational facial signals* (Ekman, 1979) include actions that highlight or punctuate language. These may help to illustrate one's own speech, regulate or monitor social interaction, encourage a speaker to continue, call for more information, or presage an interruption.

Types of Information That Can Be Gathered from the Face

Affective Phenomena

In unpacking visible facial behavior, we have suggested terminology for a distinction between *expression configuration,* the specific muscles used in an expression, and *expression dynamics,* the amplitude-time course of the configuration (Ekman & Fridlund, 1987). Both properties are related to emotion; expression configuration specifies the type of emotion and expression dynamics specify its strength.

There is consistent, robust evidence (see Fridlund, Ekman, & Oster, 1986) for the facial configurations that signify fear, anger, disgust, combined sadness and distress, surprise, and happiness. Evidence is weaker for distinguishing guilt or shame from sadness and distress and for measuring interest or different varieties of happiness (such as amusement, physical pleasure, and contentment). New evidence (Ekman & Friesen, 1986; Ekman & Heider, 1989) suggests a specific configuration for contempt (but also see Fridlund, in press, for an alternative, intention-movement account of facial displays).

Less is known about the dynamics of facial expression. There is evidence that intensity and duration of muscular actions vary with the strength of self-reported emotion (Ekman, Friesen, & Ancoli, 1980; Fridlund, Schwartz, & Fowler, 1984). Both configurative and dynamic features distinguish voluntarily produced facial signals of emotion from more spontaneous expressions (Ekman, Hager, & Friesen, 1981; Hager & Ekman, 1985).

Other than those facial actions currently identified as prototypic of emotion, there is no hard evidence for facial activity uniquely characteristic of moods or affective disorders. We have argued elsewhere (Ekman, 1984) that these phenomena are likely to be characterized by unique facial dynamics, but not configurations. For example, in a blue mood, one may readily feel sadness and that emotion can be called forth easily. Periods of sadness will generally be longer, more intense than usual, and more difficult to regulate. These characteristics will be even more pronounced in some clinical depressions for which the further study of facial dynamics holds promise.

Other Types of Information

Several other types of information can be gathered from facial expressions. These include personal identity, kinship, race, gender, temperament, personality, beauty and attractiveness, intelligence, and age (Ekman, 1977). Unfortunately, little empirical work has been done to study systematically the relationship between these dimensions and facial expressions, as the study of emotion has dominated research on faces.

METHODS OF ELICITING FACIAL BEHAVIOR

Several formats allow sampling of facial behavior. Each has its own advantages and disadvantages. We consider four types, all of which are commonly part of basic and

applied research: (a) structured and unstructured interviews; (b) structured imagery, self-reference, and reminiscence tasks; (c) the use of emotion-eliciting stimuli; and (d) the use of structured tasks or activities. While unobtrusive measurement of facial behavior in naturally occurring settings is theoretically important, it is most often impractical. We will briefly review each of the formats for obtaining samples of facial behavior, and the advantages and disadvantages of each.

The first two methods require interaction of the subjects with an experimenter with possibilities of reactive impact. Subjects may show facial signs of evaluation apprehension (e.g., knitting of brows) or undue politeness (e.g., appeasement smiles), and depending on the person, exaggeration or minimization of distress. For these reasons, subjects' facial behaviors while interacting with experimenters cannot be assumed to reflect accurately the emotional or motivational state without unobtrusive verification in other social situations.

All formats for eliciting facial behavior require the investigator to choose between a hidden camera or a visible camera. The hidden camera allows measurement of less reactive facial behavior, but it may pose problems in obtaining informed consent. The use of a visible camera obviates difficulties in obtaining consent but may result in attenuated or distorted facial behavior (e.g., Kleck et al., 1976). Either videotape or film recording may be employed; Walbott (1982) presented the advantages and constraints of each.

Structured and Unstructured Interviews

The unstructured interview format carries the advantages of varying length, the flexibility to explore in depth specific features of the subject's presentation, and the ability to elicit affect from someone who would be unexpressive under more restrictive conditions. While the unstructured interview format often is used effectively in clinical settings, it has some severe drawbacks in that facial behavior is likely to be very sparse. Also, comparisons across individuals are nearly impossible given the uniqueness of each interview.

Structured interviews have the advantages that the interview format is relatively consistent and subjects' facial behaviors from question to question are more readily comparable. One liability of the structured interview, however, is the inflexible transition that must occur between questions. These transitions can be jarring and often inhibit expression. Like the unstructured interview, the structured interview readily yields conversational samples but still requires long recording epochs to obtain emotional facial behavior.

Imagery, Self-Reference, and Reminiscence Tasks

Laboratory experiments on induced mood often use a variety of imagery, self-reference, or reminiscence tasks. In imagery tasks, subjects may be asked to recall, then "re-experience" personally significant emotional events. Alternatively, they are asked to imagine "affective imagery" items culled from standardized descriptions of everyday emotional situations. Self-reference tasks such as Velten statements rely on

suggestion to elicit emotion ("I feel blue"). Imagery and self-reference tasks typically employ items or statements with known (or predictable) emotional content. Reminiscence tasks do not involve prior procurement of an "item" or "situation" for eliciting emotion; they rely on free recall of material that may have varying, unpredictable emotional or motivational content.

Although imagery, self-reference, and reminiscence tasks seem to provide easy ways to elicit authentic emotion, closer analysis suggests caution. These tasks have in common the request by the experimenter to experience emotion. Thus, any expressions of induced emotion may reflect compliance as much as felt emotion, and inhibited or intensified facial behavior may occur. But these tasks have advantages over the structured clinical interview: Emotions are more potently elicited and their content specified more precisely.

These structured tasks are all economical. They can be used to evoke emotion quickly and in a relatively controlled fashion, despite their confounding with effects of compliance. The twin advantages of economy and standardization are important. Facial behavior can be very densely packed. Whatever task is employed, acquiring and measuring the facial behavior will take considerable time. Therefore, brief samples are desirable, and the fact that standard tasks can fit into brief epochs is highly advantageous.

A disadvantage of imagery and self-reference tasks is that they typically exclude conversation and thus preclude the facial expressions associated with speech. Reminiscence tasks include conversation but typically do not use standardized emotion elicitors. A good compromise is to use imagery that is guided by the subject from personal experience. Facial behavior can be sampled during the imagery. The subject is then asked to recount his or her experience of the imagery, and conversational signals (possibly mixed with emotional signals) can be observed.

Emotion-Eliciting Stimuli

The use of emotion-eliciting stimuli offers researchers a third tool with which to analyze facial behaviors. These types of stimuli are distinguished from the imagery tasks just described in that emotion is elicited by an external stimulus. Typical examples of these stimuli include film clips depicting images of particular emotional content and electrical shock.

There are several advantages to using these types of tasks. First, the same stimuli can be used with different individuals, providing a degree of standardization. Second, the stimuli are often perceived as more "real" to the subjects, as they are required to view films or experience sensations directly. In imagery tasks, there is always a question of whether the emotion is comparable to that elicited by physically real stimuli. Finally, external stimuli are readily usable in other studies.

The major caution in using emotion-eliciting stimuli concerns whether emotion is in fact elicited. For example, some researchers have used electrical shock to study facial reactions. It is questionable whether response to shock is an emotion and whether the facial reactions to shock are emotional expressions.

Second, when it is clear that the stimulus elicits emotion, it is important to know

which emotion it elicits and whether it elicits multiple emotions. It would be ideal to use stimuli that arouse single emotions such as happiness, sadness, or anger unambiguously. Unfortunately, reactions are most often complex, and people may react with different emotions.

Structured Tasks and Activities

The final way to measure facial behaviors involves the use of structured tasks or activities for individuals or groups. The tasks may target the elicitation of emotion directly or indirectly, since the engagement and completion of most types of tasks are usually associated with some type of emotion, either during or after the event. The central question is, "What is the importance of emotion and emotion-related processes in the resolution of the task?" If, for example, one believes that facial displays of emotion during the task play a central role in the regulation of the activity, then it seems appropriate to use the task in studying emotion.

The major advantage to this procedure is that it allows the researcher to obtain naturally occurring records of facial behaviors in a relatively structured, constant format. Allowing the task to take its natural course to completion, then, becomes one of the most attractive features concerning the use of these activities. The danger, of course, is that the tasks may not elicit emotion or that they may elicit reactions that are ambiguous.

MEASUREMENT OF FACIAL ACTION

Facial behavior, as we have mentioned, is densely packed. The face contains nearly 80 muscles that act in rapidly changing patterns; the muscles are capable of forming tens of thousands of facial expressions. Consequently, choices about how much facial behavior to measure are crucial. Also crucial are choices about *which* facial behaviors to measure. Many systems have been developed to structure and analyze observations of facial action, most have been developed for studying emotion to the exclusion of nonemotional facial behavior. (See Ekman, 1982, for a detailed comparison of 14 major facial coding systems.)

Figure 10.1 shows the decisions facing the investigator in choosing a facial measurement system. The first choice is whether facial behavior is to be measured comprehensively or selectively. Comprehensive measurement, while costly, may be necessary depending upon the state of knowledge about facial behavior gathered to date. Furthermore, it is the only way to discover unexpected facial actions. Selective facial measurement is the method of choice whenever the behaviors to be measured can be specified in advance. The use of selective facial measurement assumes that the investigator knows which facial actions are most pertinent to study.

Comprehensive Facial Measurement

There are two major comprehensive methods of facial measurement. One uses open-ended inferences drawn by observers of facial behavior. The other measures

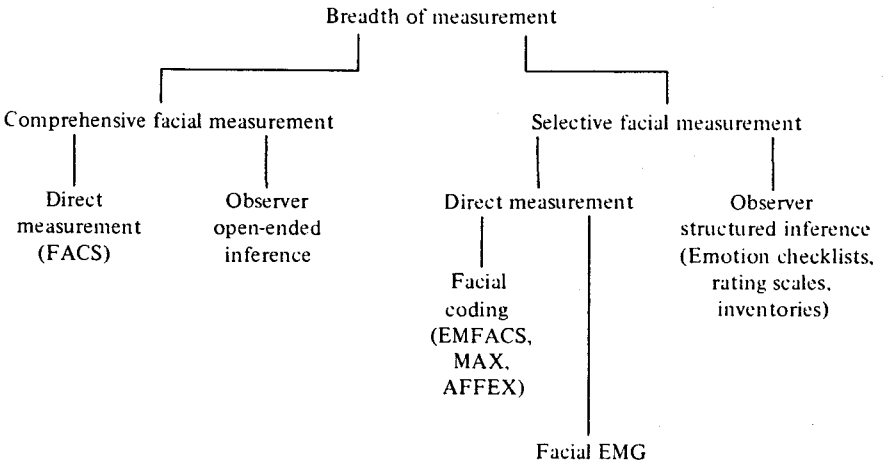

Figure 10.1. Decision tree for measuring facial behavior.

facial behavior directly. Observers may be able to infer phenomena that no direct measurement system is yet configured to detect. On the other hand, observers may miss detailed information that can be directly measured in the face.

Open-Ended Observation

Open-ended observers' reports about facial behavior are rarely employed. Yet they are among the simplest measurement methods, and they offer an unusually wide net with which to assay facial behaviors. Observers are shown videotaped facial behavior and asked to report what they see. Their responses are audiotaped and collated. The responses can be unstructured, or observers can be prompted to provide their judgments about "disorders," "moods," "traits," and "emotions." Systematically collecting observers' open-ended impressions provides valuable data on how individuals perceive subjects' affect. It allows one to incorporate into theory and research all reasonable inferences about facial behavior and affective disorders.

What kinds of observers should be used? Naive observers, trained nonexpert observers, and expert clinicians would provide different and complementary reports that could guide future hypothesis construction and testing. Should observers view videotapes that provide the full sound track? Past research has involved filtered speech or provided just the video image. However, we see no reason during initial research to forsake the ecological validity of the full audiovisual presentation. Including the sound track also simplifies separating conversational from emotional facial behaviors and the latter from referential emotion (i.e., expressions that refer to emotions felt in the past).

Comprehensive Direct Measurement of Facial Behavior

In contrast to open-ended observation in which observers supply impressions of facial behavior, here the behavior itself is measured. Comprehensive general-

purpose direct facial coding is uniquely provided by the Facial Action Coding System (FACS; Ekman & Friesen, 1976, 1978). Based on empirical findings, FACS includes 44 visibly discriminable component facial behaviors which, singly or in combination, account for all visible facial movement. Within FACS, the component behaviors are called Action Units, or AUs. AUs are scoreable according to five-point intensity ratings. Because the timing of muscular actions seems critical for discriminating types of facial behavior, FACS provides coding of AU dynamics, that is, timing of AU onset, apex, and offset. High interrater reliabilities typically are obtained using FACS.

FACS takes considerable time to learn and to use, and it requires repeated, slow-motion viewing of facial actions. For example, 1 minute of facial behavior may take as long as 3 hours to code, depending on the type of coding required. FACS is thus currently unsuitable for real-time coding. By its nature, FACS includes more distinctions than may be needed for assessing any one population. Initially, its use increases the expense and tedium of measurement. Once meaningful behavioral units are derived empirically, however, elementary measurement units can be collapsed and subtle distinctions disregarded. Flexibility in retaining and discarding AUs will be critical in early research on any topic involving facial behavior, since initial hypotheses will be largely speculative.

Selective Facial Measurement

Several methods are available for measuring facial behavior selectively. Selective measures are economical and are preferred when the facial behaviors of value are known in advance. A major liability is often their inapplicability in studying particular phenomena. Their selectivity usually is based on theoretical preconceptions that may be irrelevant for the topic under study. They do not usually separate emotional from conversational facial behaviors, and some behaviors characteristic of emotion are omitted.

Selective methods of facial measurement include both observer judgments and direct measurement. Selective direct measurement can be performed using either visual coding or facial electromyography.

Selective Observer Judgment

In the judgment approach, observers are asked to rate slides, films, or, occasionally, live presentations of facial expressions. In studying the facial behaviors associated with depression, for example, videotapes of depressed patients may be shown to judges who rate each patient as having major depression with or without melancholia using a rating scale. Scales that have been used include emotion scales (e.g., Schlosberg, 1941, 1952, 1954) and discrete emotion categories (e.g., Izard, 1971, 1972, 1977; see review of scaling and categorical approaches by Ekman, Friesen, & Ellsworth, 1982). They can be used equally well in psychodiagnosis.

Unlike open-ended observation, observer-judgment methods by nature constrain observers' responses. The constraints on observer responses make judgment methods inappropriate for exploratory studies of facial behavior in affective

disorders. Rather, construction of rating scales, categories, checklists, and so forth should follow pilot research using comprehensive measurement.

Selective Direct Measurement

In the selective direct measurement approach, facial behaviors are specified in advance and sampled at a predetermined level of precision. Specification of behavioral units proceeds from theory, research, or clinical inference. Selective direct measurement is performed using visible facial coding systems or by electromyography. Selective visible facial coding systems require a videotaped record of the patient's facial behavior. Electromyography does not require videotaping, but requires placement of recording electrodes to monitor the patient's physiological activity.

MAX and AFFEX. The major exemplars of selective direct measurement facial coding systems are the Maximally Descriptive Facial Movement Coding System (MAX; Izard, 1980), the System for Identifying Affect Expression by Holistic Judgment (AFFEX; Izard & Dougherty, 1980), and the Emotion Facial Action Coding System (EMFACS; Friesen & Ekman, 1983). MAX and AFFEX are based on recognition studies that established the cross-cultural association of certain facial expressions with specific emotion labels. Neither MAX nor AFFEX provides an exhaustive listing of possible facial behaviors. MAX, for example, provides only those 27 descriptors believed by Izard to be necessary to form judgments about seven "primary" emotions. No data are available to show that the excluded facial actions do not reflect emotion. Expression dynamics are disregarded; facial behavior is seen instead as "on" or "off."

EMFACS. EMFACS is a subsystem of FACS that uses standardized selective alternatives to measure broader, emotion-related facial actions. EMFACS considers only emotional expressions and, among those, only the AUs and AU combinations best supported by empirical findings or theory as emotion signals. EMFACS is a systematic derivation from FACS that permits confident statements about its omissions, indicated by numerous concurrent validation studies (Ekman, 1982).

Coding time with EMFACS is accelerated, albeit at the expense of subtler data—including those indicative of conversational signals or self-manipulations. Precise temporal dynamics of the facial actions are replaced by unitary demarcations of peak actions. To maintain an empirical approach in EMFACS or FACS scoring, facial actions are described in terms of numerical codes. Coders are requested not to interpret actions as emotion signals until they are tabulated post hoc and classified according to EMFACS criteria.

A number of predictions deriving from FACS emotion hypotheses have been supported (see review by Ekman, 1982). Studies of spontaneous emotional expression using self-report as a validity criterion support predictions about expressions that signal happiness, fear, distress, and disgust. Studies employing observers' attributions of emotion as a validity criterion support FACS predictions for these emotions as well as for surprise and anger.

Facial electromyography. Facial electromyography (EMG) is an alternative method for selective direct facial measurement. This technique most often involves the recording of tiny electrical discharges generated by contracting facial muscles through surface electrodes filled with conductive paste and attached to the skin with adhesive collars. Facial EMG techniques have been used to study affective imagery and mood states (Carney, Hong, O'Connell, & Amado, 1981; Fridlund, Schwartz, & Fowler, 1984; Schwartz, Brown, & Ahern, 1980; Teasdale & Rezin, 1978), posed expressions (Rusalova, Izard, & Simonov, 1975; Sumitsuji, Matsumoto, Tanaka, Kashiwagi, & Kaneko, 1977), and social interaction and empathy (Cacioppo & Petty, 1979; Vaughan & Lanzetta, 1980).

Facial EMG has three advantages over direct observation of the face. First, the EMG signal is instantaneously detectable and thereby lends itself to immediate recording. Second, the EMG signal offers a more finely graded measure of muscle activity than can be provided by visible facial coding systems or observer judgments. Third, EMG techniques detect muscle contractions that are too small or too fast to be observable (Ekman, 1982; Fridlund, 1988).

There are disadvantages to the EMG technique. Recording facial EMG requires an extensive electrode application procedure that limits the number of recordable sites (usually to three or four). Also, subjects usually are manifestly aware that they are participating in research concerning the face, which can result in distorted or attenuated facial behavior (Fridlund & Izard, 1983; Kleck et al., 1976). The leads, paste, and collars inhibit movement and may be torn by strong muscle actions. Attaching the recording discs can be problematic on males with heavy beards. If fine-wire recording is performed, implantation of the electrodes often produces irritation and pain.

A facial EMG signal may not be an accurate representation of ongoing dynamic muscle activity. The relationship between detected electrical output at an EMG site and the mechanical force exerted by a muscle may change over time as a function of fatigue (Mulder & Hulstijn, 1984).

Finally, conversational and emotional signals cannot be distinguished without an accompanying audio record. The typical surface electrodes show activity in areas considerably broader than the muscles directly underlying the electrode site. Thus, emotion signals may be confused with conversational signals from other muscles. Care should also be used in processing EMG signals to ensure that expression dynamics are not obscured by overaveraging of the signals (see Fridlund, 1979).

FACIAL BEHAVIORS AND AFFECTIVE DISORDERS

A variety of studies exist that exemplify the different ways of eliciting facial behavior and the different ways of measuring facial actions. Following is an example from our own research to illustrate the guidelines and issues raised to this point. This example comes from pilot studies of the facial behaviors associated with affective disorders.

The goal of this research was to examine the types of emotional expressions exhibited by clinically depressed patients. In the first study (Ekman & Friesen, 1981),

structured interview settings were used to elicit expression from depressed patients at the time of intake at an inpatient psychiatric facility. FACS was used to measure the facial behaviors; this allowed for a comprehensive and direct measurement of the expressions that occurred during the interview. The DSM-II (American Psychiatric Association, 1968) diagnoses of the patients were major depressive ($N = 4$), minor depressive ($N = 3$), manic ($N = 3$); and schizophrenic ($N = 2$). Results reflect combined scores from the two interview samples.

FACS measurements identified 5,987 separate expressions. Some were composed of one muscular action; others involved co-contractions of two to five muscles. About one-third (1,770) of these expressions involved actions predicted by FACS to signal emotion. Most frequent were nonemotional facial actions such as lowering or raising the eyebrows to punctuate speech.

Patients diagnosed with major depression showed more sadness and disgust and fewer unfelt-happy expressions than minor depressives. Manics showed more felt-happy and unfelt-happy and fewer anger, disgust, or sadness expressions than either depression group (see Ekman & Friesen, 1982, for distinctions concerning felt and unfelt happiness). Schizophrenics differed from manics and depressives in showing more fear expressions and fewer of the other emotional expressions.

Patient groups also differed in their nonemotional speech-punctuating facial movements. Depressives and schizophrenics showed fewer speech-punctuating facial movements than manics. Major depressives showed much more brow lowering than brow raising in punctuating speech than the other groups, whereas manics showed the opposite pattern.

In another study (Ekman & Matsumoto, 1986), a standardized interview format again was used to elicit emotional expressions from depressed psychiatric inpatients, both at admission and at discharge. The videorecords used for this study were collected by Ekman and Friesen in 1964. EMFACS was used, allowing for a selective but direct measurement of the facial behaviors of the depressed patients. The attending physician and the ward chief agreed by the time of discharge on a DSM-II depression diagnosis for each of the 17 patients included in the study. Mean age of these patients at time of admission to the hospital was 47.5 years. Patients' hospital stays averaged 68 days.

Brief Psychiatric Rating Scale (BPRS) ratings were made independently by three clinical psychologists after viewing the first 2 minutes of the admission interview. They made a second set of BPRS ratings after viewing the first 2 minutes of the discharge film. At this time, they also rated each patient on degree of clinical improvement. A single coder measured facial behavior with EMFACS. A second reliability coder independently measured the facial behavior shown by eight of the patients in focal 1-minute interview samples. Intercoder reliability of EMFACS was 0.82.

Table 10.1 shows that more felt-happy expressions and fewer unfelt-happy expressions occurred at discharge relative to admission. The number of sad expressions tended to decrease, but the change was not significant. Patients who showed sadness expressions were rated by the clinicians as less disturbed (lower BPRS scores) both at admission and discharge (Table 10.2). At admission, patients

TABLE 10.1. Number of Patients Showing Happy Facial Expressions in Admission and Discharge Interviews.

	Admission Interview	Discharge Interview
Felt-happy expressions	3	12
Unfelt-happy expressions	14	5

$X^2 = 9.63$, $df = 1$, $p = .01$.

TABLE 10.2. BPRS Ratings of Patients Who Did or Did Not Show Any Sadness Expressions.

	BPRS Rating			
	Admission Interview		Discharge Interview	
	Mean	SD	Mean	SD
Sadness expressions	32.8	8.1	19.5	1.6
No sadness expressions	38.5	7.7	24.5	5.5
p (two-tailed)	.03		.01	

who showed sad expressions did so when describing current feelings. At discharge, patients who showed sad expressions did so when describing how they *had* felt when admitted. Sadness at admission did not predict clinical improvement by discharge.

On admission, patients who showed at least one happy expression (felt- or unfelt-happy) were rated as less disturbed (mean BPRS = 30.5) than those who did not (mean BPRS 43.2, $p < .01$). This difference was independent of whether they also showed a negative emotional expression. There was almost no overlap (1 of 17 subjects) in BPRS score distributions of those who did and did not show a happy expression.

Contempt expressions and unfelt-happy expressions at admission were independently associated with *less* clinical improvement. Each expression correlated with improvement even when variance associated with the other emotion was statistically removed (Table 10.3). Severity of disturbance on the BPRS at admission was positively correlated with subsequent clinical improvement. Table 10.4 shows that when unfelt-happy and contempt expression scores at admission were added to

TABLE 10.3. Correlations Between Facial Emotion Scores on Admission and Ratings of Subsequent Clinical Improvement.

	Rank Order Correlation	Partial Correlation
Contempt	$-.54\ p < .05$	$-.69\ p < .002$ (controlling for unfelt-happy)
Unfelt-happy	$-.60\ p < .01$	$-.71\ p < .001$ (controlling for contempt)

TABLE 10.4. Severity and Emotion Measures at Admission and Clinical Improvement

Measure at Admission	
BPRS	$r = .46$, $p = .06$
BPRS + contempt + unfelt-happy	$R = .82$, $p = .005$
Unfelt-happy + contempt	$R = .79$, $p = .001$
Unfelt-happy + contempt + BPRS	$R = .82$, $p = .001$

the BPRS scores in a multiple correlation with clinical improvement, the correlation was significant. Expression scores explained 46% of the variance. When expression scores were entered first in the multiple correlation, they correlated .79 ($p < .001$) with subsequent clinical improvement. Adding the BPRS accounted for only 4% of predicted variance.

CONCLUSION

The example just given illustrates the use of structured interviews to elicit emotional expression; in other studies we employed different techniques to sample facial behavior. For example, we used imagery and self-reference tasks, in studies of emotion and autonomic nervous system activity (cf., Ekman, Levenson, & Friesen, 1983; Fridlund et al., 1984), emotion-eliciting stimuli in our studies examining cultural similarities and differences in the expression of emotion in social situations (Ekman, 1972; Friesen, 1972), and structured tasks in a study examining emotional expressions during engagement in games posing moral conflict (Matsumoto, Haan, Yabrove, Theodorou, & Cooke-Carney, 1986).

We have emphasized the analysis of facial behaviors, but we believe that the issues outlined in this chapter are pertinent to most avenues of research examining nonverbal behaviors. As the study of nonverbal behaviors grows in popularity, we hope that the understanding of the methods employed to study them and of the issues underlying those methods grow as well.