EMOTIONAL BEHAVIOR AND PSYCHOPATHOLOGY: A SURVEY OF METHODS AND CONCEPTS

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Here we encounter remarkable possibilities: facial expressions of sadness (i.e., "grief muscles") lasting for extended periods of time, perhaps even months; weeping for no reason; expressive behavior revealing depressed states of mind and the predilection to suicide.

—Darwin (1872/1997, p. 184)

Charles Darwin (1872/1997) advocated that the unregulated emotions of the mentally ill provided rich examples of the universal expressions that he sought and so successfully described. Darwin’s accounts of expressive behavior drew attention to the potential importance of emotional expression in psychopathology. In the opening quote to this chapter, Darwin described what appear to be individuals suffering from depression, exhibiting sadness and grief that exceeded the typical duration of these emotions and seemed often to occur without obvious cause. Darwin also noted individuals whose absence of expressive behavior was equally revealing of the underlying mental condition: “Many idiots are morose, passionate, restless, in a painful state of mind, or utterly stolid, and these never laugh” (p. 196). In these cases, the relative absence of expression—blushing or laughing—is just as dysfunctional, and a sign of the individual’s inability to participate in typical social encounters. At the heart of these observations is the idea that a person’s functioning in life, and clues to his or her state of mind and character might be revealed in specific patterns of expressive behavior. Does emotional behavior provide
a window onto psychopathology? What evidence is there for this provocative idea?

Empirical science has only recently begun to catch up with Darwin’s prescient observations (e.g., Keltner & Kring, 1998). The purpose of this chapter is to provide an overview of the emergent methodologies used to study emotional behavior and of the empirical insights these methods have yielded. In the first half of the chapter, we focus on methods relevant to four channels of behavioral communication. Specifically, we review methods for analyzing facial expressions of emotion and the vocal and acoustic properties of speech during the expression of emotional states. Next, we consider narrative approaches, a behaviorally rich source of idiosyncratic emotional information. We end by reviewing recent advances in research on touch and tactile behaviors intended to convey emotions to others.

Following this review, we turn to three themes for considering the empirical relationship between psychopathology and emotional behavior. The first theme is that certain psychopathologies involve an excess of emotional behaviors. The second, seemingly opposite, theme is that psychopathologies often involve noteworthy absences of emotional behavior. Our final theme is that psychopathologies involve disjunctions between emotional behavior and other emotional response components that are normally well coordinated.

FOUR METHODOLOGIES CENTRAL TO THE STUDY OF EMOTIONAL BEHAVIOR

Emotions are multifaceted phenomena, involving multiple response systems that each can be measured in a variety of ways (see, e.g., chap. 1, on self-report methods, and chap. 3, on the psychophysiology of emotions, this volume). The study of emotional behavior is complex compared with other channels, such as self-report, in part because of the seemingly limitless ways to parse the behavioral stream. This chapter discusses four methodologies that researchers have identified as particularly meaningful to measure behavioral activity. Thus, in this chapter, we focus specifically on facial expression, vocal cues, touch, and narrative behavior—all of which are response systems central to emotional communication. We focus on these four aspects because the empirical literature has shown that they are a richer source of emotional information compared with other behavioral responses (e.g., postural behavior; Keltner, Ekman, Gonzaga, & Beer, 2003). Furthermore, deficits in emotional communication have been theorized as integral to the social difficulties and dysfunction at the heart of numerous psychopathologies (Keltner & Kring, 1998). Emotional behavior is important to study in the context of psychopathology because the use of naturalistic measures allows researchers to assess emotions online and unobtrusively within the stream of
spontaneous interactions (this is often not possible with, e.g., self-report measures). Furthermore, the methods we detail in this chapter to measure emotional behavior in the face, voice, touch, and narrative all provide data that robustly discriminate among discrete emotions (e.g., anger vs. disgust; compassion vs. love). To the extent that a line of inquiry seeks to document fairly specific relations between a clinical disorder and a distinct emotion (e.g., fear in anxiety disorders), the measures we detail here will be the most sensitive. Finally, the measures of emotional behavior that we discuss can be exported to other cultures or ethnic groups without significant translation difficulties, thus allowing for cross-cultural and cross-ethnic comparisons.

**Facial Behavior and the Expression of Emotion**

Facial expressions are rightly considered a grammar of the elementary social interactions of human social life and, by implication, psychopathology (Eibl-Eibesfeldt, 1989). Facial expressions are central to parent–child attachment dynamics and to how parents communicate to offspring about objects in the environment. They are part of how adolescents negotiate positions within social hierarchies. Facial expressions are central to the often unspoken flirtations between potential romantic partners. The face includes 43 sets of facial muscles; these muscles can combine into thousands of facial configurations. Of the many possible muscular configurations, only a limited set communicate emotion (e.g., Ekman, 1993). Some configurations, such as smiles or deferential displays of embarrassment, occur relatively frequently during social interaction and appear to be especially critical for adaptation.

Several characteristics have been identified that differentiate emotional expressions from other nonverbal behavior, such as gestures or emblems (e.g., Frank & Ekman, 1993). First, facial expressions of emotion (and vocal expressions as well) tend to be fairly brief, typically lasting between 1 and 10 seconds (Bachorowski, Smoski, & Owren, 2001). For example, a smile accompanying enjoyment will typically start and stop within a span of 5 seconds; nonemotional smiles of politeness, in contrast, can be exceptionally brief or quite long in duration. Second, facial expressions of emotion often involve involuntary muscle actions that most people cannot intentionally produce or suppress (Dimberg, Thunberg, & Grané, 2002). Facial expressions of anger, for example, most typically involve the action of the muscle that tightens around the mouth, which most people cannot produce voluntarily. In fact, the neuroanatomical pathways for generating involuntary emotional expressions can be distinguished from those of voluntary facial actions, such as the furrowed brow or lip press (Rinn, 1984).

Here we concentrate on two approaches oriented toward identifying discrete occurrences of emotion in the face. We should first, however, mention a widely used technique, electromyography (EMG), to record the activation of certain muscle movements, most notably the corrugator (brow
tightly) and *zygomatic major* (lip corner pull). EMG has the advantage of sensitively recording movements of these muscles, even those that are not visible to the human eye (and thus not codeable in the two systems we describe subsequently). However, EMG is less useful for measurement of emotional behavior because it does not provide differentiated measurement of negative (e.g., the corrugator is involved in numerous negative emotions, such as anger, fear, and sadness) and positive emotions.

One widely used approach that is well suited for studying specific emotional expressions is the Emotion Facial Action Coding System (EMFACS). EMFACS is a restricted application of the Facial Action Coding System (FACS), developed by Ekman and Friesen (1978) to code all visible facial muscle movements. Specifically, EMFACS codes emotion-relevant facial muscle movements derived from a previous theory using a rigorous, anatomically based approach (e.g., Ekman, 1992; Ekman, Friesen, & Hager, 2002; Ekman & Rosenberg, 1997). Learning FACS requires 80 to 100 hours. To achieve acceptable interrater reliability between two coders, a ratio can be used on overlapping data coded whereby the number of action units is multiplied by 2 and then divided by the total number of action units scored (e.g., Keltner & Bonanno, 1997). This agreement ratio can then be calculated for each event code by one or both of the coders. The elegance of EMFACS lies in its ability to translate coded facial muscle movements into a variety of discrete negative and positive emotional expressions, including anger, compassion, desire, disgust, pain, sadness, shame, embarrassment, enjoyment (i.e., Duchenne smiles), and amusement (e.g., Keltner & Bonanno, 1997). With the addition of specific postural and gestural movements, one can also identify displays of pride and love.

Another important system for coding discrete emotional expressions in the face is the Emotional Expressive Behavior (EEB) coding system (Gross & Levenson, 1993). Whereas EMFACS and other FACS-based systems code specific units of observable muscle action, EEB is more global and codes a broader range of behaviors. EEB includes rated intensities on a 0 (slight) to 3 (strong) scale for Disgust, Confusion, Fear, Sadness, Happiness and Amusement, Interest, Surprise, and Sleepiness. These intensity scales are applied to a predefined epoch of behavior (15–30 seconds is probably optimal). EEB also includes other behavioral codes such as yawns, face touching, and degree of body movement.

Comparing these two approaches, the strength of EMFACS is its precision: It allows researchers to identify the frame-by-frame unfolding of the specific muscle actions involved in emotion. This allows psychopathology researchers to identify specific millisecond occurrences of emotion as well as small but potentially important variations in emotional expression. For example, in EMFACS, more than 60 variations of anger have been documented, and one may speculate that some of these expressions systematically covary with specific emotional disorders. By contrast, in EEB, observers rate the
Touch is the most developed sensory modality at birth, contributing to cognitive and emotional development and providing a sense of security and affection (e.g., Field, 2001; Morrin et al., 2002; Stack, 2003), and likely has an evolutionary importance (Gruber & Satterfield, 1998). In this respect, we can look at the importance of touch as a means of communication and establishing social relationships.

A first function of touch is that it helps us to communicate emotions. Touching can be used to convey a person's emotions and feelings to others. For example, a study by Heinrichs et al. (2003) found that infants who were touched by their mothers demonstrated reduced salivary cortisol levels, which is a sign of decreased stress. This suggests that touch can help to reduce stress and promote feelings of safety and security. A second function of touch is that it helps to regulate social behavior. Touching can be used to regulate social interactions, such as when a child is touched by a parent to calm them down or to comfort them. A third function of touch is that it helps to regulate the expression of emotions. Touching can be used to express emotions, such as when a person is touched to convey a feeling of gratitude or to express love.

Although the exact function of touch is not yet clear, several studies have identified several functions of touch. The social role of touch is one of the most important functions of touch. Touching can be used to regulate social interactions, such as when a child is touched by a parent to calm them down or to comfort them. A third function of touch is that it helps to regulate the expression of emotions. Touching can be used to express emotions, such as when a person is touched to convey a feeling of gratitude or to express love. Touching can also be used to regulate the expression of emotions, such as when a person is touched to convey a feeling of gratitude or to express love.

William James (1890/1981) acknowledged the centrality of touch to the health of bonds between individuals. Few data exist with respect to how touch is involved in psychological disorders. The same could be said of the manner in which individuals interpret touch, that is, how they derive emotional meaning from others' tactile communication. These are two open areas of inquiry that we believe will yield significant results concerning the origins, manifestation, and maintenance of specific psychopathologies. Touch may be a good place to discern behaviorally the social dysfunction common in many disorders, perhaps through increased soothing behaviors between caregivers and offspring, fewer touching behaviors in
evidence of social withdrawal in depression or perhaps social anxiety, or the absence of touching as an index of marital and family discord in bipolar disorder (Miklowitz & Goldstein, 1997).

Taken together, the study of facial expression, vocalization, narrative emotional behavior, and touch provide the tools to identify distinct emotions as they occur in the flow of social interaction. Each method has its advantages and disadvantages, as we have tried to highlight in our brief review. These methods are especially useful to the study of emotion (and psychological disorders). We now consider three insights regarding the relation between emotion and psychopathology that the use of these methods has generated.

THEMES IN STUDYING EMOTIONAL BEHAVIOR: EXTREMES, ABSENCES, AND DISJUNCTIONS

Theme 1: Look for Extremes

Extremes in emotional behavior can be indexed in several ways. They may be evident in the intensity of the behavior, such as an anger display that involves maximal contractions of emotion-relevant facial actions. Extremes can be evident in the duration of the behavior or its frequency across some epoch of time. Within a social functional approach to emotion, which has guided much of this chapter, emotional extremes are likely to be highly dysfunctional within relationships, and specific types of emotional extremes (e.g., extreme sadness vs. extreme anger) may be markers of different psychopathologies.

Externalization and Extreme-Anger Displays

Anger may be the most destructive emotion. It is associated with harmful intent and action toward others (Berkowitz, 1989), problems within interpersonal relationships, and risky behaviors (e.g., Lerner & Keltner, 2001). One relevant study investigated facial expressions young boys displayed during an interactive IQ test that were coded using FACS. Specifically, measures of the extremity of facial expression were derived for each emotion by finding the product of the mean-intensity of emotion-relevant muscle action and the frequency of emotional display. The IQ test produced frequent embarrassment, anger, and fear as the boys made intellectual mistakes in front of an authority figure. Consistent with the hypothesis that extremes of anger relate to antisocial behavior, the externalizers displayed the most anger (Keltner, Moffitt, & Stouthamer-Loeben, 1995). Furthermore, these boys displayed the least embarrassment compared with control participants and those who internalized their emotions. This latter finding is important given the claim that individuals who are less inclined toward
self-conscious emotions (i.e., embarrassment, shame, or guilt), which motivate the adherence to social norms, are more prone to antisocial behavior.

We contend that these findings reveal important guidelines for studying relations between emotional extremes and psychopathology. One does not need to sample extensive amounts of behavior; Keltner et al. (1995) found behavioral markers of antisocial tendencies using only 2 minutes of IQ test behavior. The context for the behavior also matters. Anger in response to an authority figure is a telling and maladaptive response for young boys. Dysfunctional emotion, therefore, is especially problematic in terms of social implications vis-à-vis the specifics of the social context.

Extreme Socially Inappropriate Behaviors in Orbitofrontal Patients

In similarly motivated research, Beer, Heerey, Keltner, Scabini, and Knight (2003) have looked at the self-conscious emotion of individuals with damage to the orbitofrontal region of the frontal lobes. The orbitofrontal region of the frontal lobes, which rests behind the eye orbits (i.e., Brodmann’s areas 11, 12, 14, 47), is involved in the regulation of social behavior. Patients with orbitofrontal damage have been observed to greet strangers by kissing them on the cheek and hugging them (e.g., Rolls, Hornak, Wade, & McGrath, 1994), engage in inappropriate joking (Stuss & Benson, 1984), and inappropriately disclose personal information to a stranger (Beer, 2002).

In one study that examined inappropriately extreme emotion, patients with orbitofrontal damage and age-matched control participants were asked to tease a stranger. More specifically, participants were given two initials (e.g., “H.F.”) and asked to generate a nickname for the stranger in the study and tease that person on the basis of the nickname. Patients’ nonverbal displays of embarrassment and pride were coded based on a modified version of EMFACS. This demonstrated how EMFACS reveals important clues to emotion behavior. Specifically, patients, unlike control participants, exhibited inappropriate self-conscious emotion: They displayed increased pride and reduced embarrassment, even given the fact that they teased in overly forward and even sexually suggestive ways. Extremes of emotion—in this case, pride—reveal specific psychological deficits. Here again, there are normative expectations, as in the IQ test, for emotion: Teasing a stranger is a certain source of embarrassment for most. Not so for these patients.

Theme 2: Look for Notable Absences

As William James (1890/1981) and Charles Darwin (1872/1997) long ago observed, relative absence of emotion can also be unsettling and ultimately dysfunctional. We saw this to be the case with externalizing boys and with the patients with orbitofrontal damage, who showed a relative absence of embarrassment behavior in contexts in which the emotion was normative. The absence of emotional expression is also revealing of depression.
Depression and the Absence of Emotional Responding

Although most studies of depression and emotional disturbance have concentrated on emotional experience, mounting evidence suggests that people with major depression exhibit limited emotional behavior in response to a variety of stimuli (Rotenberg, 2005). For example, compared with nondepressed control participants, people with depression have been found to exhibit fewer facial expressions, especially in positive emotion contexts (e.g., Berenbaum & Oltmanns, 1992; Gotlib & Robinson, 1982; Pogue-Geile & Harrow, 1984). These notable absences in emotional facial behaviors resonate with findings on vocal affect and communication of emotion in depression. Caregivers with depression, for example, have been found to exhibit relatively flat vocal affect, with minimal emotional intonation (Betts, 1988). Given the importance of pronounced vocal stimulation as a source of stimulation and learning for infants, these deficits are likely to have lasting implications for subsequent development. The study of narrative behavior has also yielded important insights into the absence of emotional responses in patients with depression; Bucci and Freedman (1981) found that individuals with depression exhibited greater speech dysfluencies when discussing positive emotional topics. Other theories posit a negative self-referentiality in the narrative behavior of people with depression (e.g., Rude, Gortner, & Pennebaker, 2004), with increased usage of negatively valenced and self-referential word usages, pointing to a provocative thesis that depression represents a notable absence of positive emotion representation in vocal affect and speech content. Thus, evidence from multiple behavioral response systems (facial behavior, vocal properties of speech, and narrative) converges on the theme of notable absence in depression.

Absence of Self-Conscious Emotions in Autism

One of the central social disturbances associated with autism is difficulties with theory of mind (e.g., Capps & Sigman, 1996). Theory of mind involves an appreciation of social norms and the awareness of others’ evaluations. One might therefore expect deficits in theory of mind to relate to deficits in self-conscious emotions requiring these skills, such as embarrassment and shame, and recognizing self-conscious facial behavior in others. Here we highlight how the narrative and facial behavior approaches yield information about the absence of self-conscious emotions in children with autism. Few studies have specifically investigated embarrassment and shame among children with this condition. When asked to provide narratives of these emotions, children with autism have difficulty, providing general, factual knowledge rather than accounts of personal experiences (Capps, Yrimiya, & Sigman, 1992). Capps et al. (1992) concluded that self-conscious emotions are problematic for children with autism because of their decreased ability to engage in social referencing and perspective taking.
The recognition of self-conscious emotion involves the understanding of violations of social norms and negative social evaluations, both important aspects of theory of mind. When asked to judge emotions depicted in photos of human facial expressions, children with autism were impaired in the recognition of self-conscious emotional expressions specifically, because they performed comparably to control participants on the identification of non-self-conscious emotions such as anger or fear (Heerey, Keltner, & Capps, 2003). Children with autism tended to confuse embarrassment with “happy,” whereas they tended to describe shame as “sleepy.” Thus, absences of self-conscious emotions were most fruitfully understood using multiple avenues of behavioral data, including narratives to understand the lack of self-conscious emotional experience and facial behaviors to see a failure even to perceive these emotional states in others.

**Theme 3: Disjunction and Malfunction**

Within the study of emotion, it is assumed that the many response systems (e.g., communication, physiology, expressive behavior) are modestly interrelated. Empirical reviews of studies of university students have typically found that the report of emotional experience and the expression of emotion in the face correlate at about $r = .3$ (e.g., Matsumoto, 1987). This correlation makes sense within a functional analysis of display: Displays of emotion are more evocative of responses in others and thereby regulate interactions in adaptive ways when the expressions covary with experience. A nonverbal display of romantic love or of anger, for example, is likely to have much greater potency when accompanied by the experience of the specific emotion.

Historically, diminished emotional expressiveness, or flat affect, has been considered a prominent emotional feature of schizophrenia (e.g., Bleuler, 1911/1950; Kraepelin, 1919/1971). Modern experimental investigations using emotionally evocative stimuli have found that patients with schizophrenia are less facially expressive than nonpatients in response to emotional films (e.g., Berenbaum & Oltmanns, 1992; Kring & Neale, 1996), cartoons (Dworkin, Clark, Amador, & Gorman, 1996), and during social interactions (Krause, Steimer, Sänger-Alt, & Wagner, 1989). If one were to discuss emotions in schizophrenia simply in terms of behavior, we would conclude that patients with schizophrenia are simply less facially expressive across a variety of emotion elicitors and consider this as an example of a “notable absence.”

In the case of schizophrenia, a richer story unfolds when experiential data are included with behavioral measures. Specifically, research suggests that patients with schizophrenia exhibit significantly fewer positive and negative facial expressions in response to emotionally evocative pictures and film clips compared with healthy controls, yet these patients report having levels of emotion in response to emotional stimuli that are similar to or greater
than those of nonpsychiatric control participants. Schizophrenia thus involves an unusual disjunction between experiential and behavioral response systems (e.g., Berenbaum & Oltmanns, 1992; Kring & Neale, 1996).

These findings raise intriguing questions about other kinds of disjunctions that might be observed in psychopathology. One might examine disjunctions between emotional display and other channels, such as physiological response. This kind of inquiry applied to depression or bipolar disorder (Gruber, Johnson, Oveis, & Keltner, 2006) would help ascertain whether their disjunctions reflect some general incoherence in emotional response.

CONCLUSIONS AND FUTURE DIRECTIONS

Pioneers in the field of psychology were drawn to the question of how emotions are involved in psychopathology. They pursued this line of inquiry for a very good reason: The study of emotion and psychopathology offers the promise of several conceptual gains in the two fields (e.g., Keltner & Kring, 1998). For affective scientists, study of the relations between emotions and psychopathology still remains one of the clearest routes to understanding the function of a particular emotion. For example, in this review, we have discussed findings showing that the relative absence of embarrassment is associated with a chronic tendency to engage in antisocial behavior, as is evident in externalizing disorders and in patients with orbitofrontal damage. Hence, by studying dysfunction, we learn about function (Oatley & Jenkins, 1992).

For clinical scientists, the kind of research we have detailed here offers similar promise for understanding the social expression and underpinnings of various disorders. More generally, individual differences in emotional behavior, present early in life, may help to explain the life course of the individual, problems the person systematically encounters, and the person's relational difficulties (e.g., Malatesta, 1990). This framework, which treats emotional behavior as one mediator between person and environment, could readily be extended to the study of specific psychopathologies.

The four methodologies of measuring emotional communication that we have detailed—facial expression, vocalization, narrative, and touch—are likely to be central to the manner in which psychopathologies shape the environment and the life course. In the case of schizophrenia, defined by decreased outward displays of emotion, interventions that help patients to match their internal feelings with their outward displays may therefore have positive effects on interpersonal adjustment. To the extent that there prove to be fairly specific expressive markers of a particular disorder—say, reduced embarrassment with autism (e.g., Heerey et al., 2003)—researchers might be better able to identify individuals prone to the disorder earlier in development using markers of emotional behavior (e.g., Kagan, Reznick, & Gibbons, 1989). Studies of emotional expression and psychological disorder, still
in a nascent stage, could help refine the classification, understanding, and treatment of individuals with various disorders.

REFERENCES


(Original work published 1872)


