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CHAPTER 15

Facial Expression of Emotion

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The study of facial expression has been central to the field of emotion since its inception, and is the continued focus of theoretical controversy and ongoing research (e.g., Ekman, 1973, 1993, 1994; Russell, 1994). Questions as diverse as the structure, biological substrates, and universality of emotion have been addressed with studies that examine facial expression. In this chapter, we address three aims. We first briefly review the history of the study of facial expression. We then review evidence relevant to three long-standing questions: Are facial expressions of emotion best viewed as discrete systems or as dimension-based entities? Are facial expressions accurate indicators of emotion? And in what ways are facial expressions of emotion universal, and in what ways are they culturally specific? Finally, we highlight a new area of investigation—individual differences in facial expression—that promises important discoveries.

HISTORY OF THE STUDY OF FACIAL EXPRESSION OF EMOTION

Research on facial expression began with Darwin's *The Expression of the Emotions in Man and Animals* (1872/1998). To substantiate his theory that expressions are universal, Darwin obtained data from informants in different countries and analyzed observers' responses to different expressions—methods that continue to guide the study of facial expression today. Floyd Allport (1924) proposed an alternative to Darwin's account of universality—species-constant learning. Other early theorists focused on the structure of facial expressions of emotion, and on the nature of the information that expressions convey. Woodworth (1938) proposed a set of six emotion categories to bring order to the variety of responses observers gave when judging the emotion shown in expressions. Schlosberg (1954) proposed three dimensions that underlie categorical judgments. In an influential review, Bruner and Tagiuri (1954) concluded that facial expression does not provide much accurate information. In the 1950s and 1960s there was not much research on facial expression, but Plutchik (1962) and Tomkins (1962, 1963) both provided influential evolutionary accounts of facial expression. Tomkins and McCarter (1964) provided the first evidence that very high agreement could be achieved by observers in the judgment of facial expression. And Tomkins directly influenced both Izard and Ekman in their separate cross-cultural research in the late 1960s. (For a comprehensive analysis of the literature on facial expression from the turn of the century until 1970, see Ekman, Friesen, & Ellsworth, 1972).

Two developments in the late 1960s and early 1970s galvanized the study of facial ex-

pression. First, the independently conducted cross-cultural studies by Ekman and his collaborators and by Izard strongly suggested universality in interpreting facial expressions of emotion (Ekman, Sorenson, & Friesen, 1969; Ekman & Friesen, 1971; Izard, 1977). These findings countered prevailing ideas of cultural relativism, and suggested that the study of facial expression is germane to central questions regarding human nature.

Second, researchers developed objective measures of facial expression (Ekman & Friesen, 1978; Izard, 1977), which some emotion researchers used to measure facial activity itself directly, rather than studying observers' judgments of the emotions they saw in an expression (see Ekman & Rosenberg, 1997, for a sample of diverse studies measuring facial activity). Whereas previously facial activity was measured via electromyography, it is far more intrusive and less precise than scoring systems measuring the changes in the appearance of the face. For example, precise measurement clarified contradictory findings on smiles (Ekman & Friesen, 1982; Ekman & Davidson, 1993). Given these conceptual and methodological advances, the study of facial expression now extends to diverse areas of emotion research.

DIMENSIONS OR DISCRETE EMOTIONS

A central question in the field of emotion is whether emotions are better thought of as discrete systems or as interrelated entities that differ along global dimensions, such as valence, activity, or approach or withdrawal (Ekman et al., 1982; Russell, 1997; Schlosberg, 1954). Most discrete-emotions theorists take an evolutionary approach; they posit that each discrete emotion has a different adaptive function that should be served by fundamentally distinct responses. A dimensional approach argues that emotions are not discrete and separate, but are better measured and conceptualized as differing only in degree on one or another dimension (usually three dimensions have been posited). The dimensional perspective is more common among those who view emotions as being socially learned and culturally variable. Four recent developments in the study of facial expression suggest that facial expressions are fruitfully thought of as discrete systems.

Categorical-Judgment Studies

Categorical-judgment studies have addressed whether the perception of facial expressions of emotion is categorical or dimension-based (e.g., Etcoff & Magee, 1992). Studies of the categorical perception of colors and sounds find that within-category distinctions are more difficult to make than between-category discriminations (reviewed in Etcoff & Magee, 1992). On the boundary of two categories, accuracy in discrimination rises. In the studies of the perception of facial expression, continua of facial expressions were computer-generated, with each continuum defined by two endpoints that were prototypical facial expressions of emotion (e.g., anger and fear). The remaining stimuli between the endpoints included facial expressions that varied by equal physical differences. For all possible pairs within a continuum, participants were presented with two target stimuli and then a third stimuli that was identical to one of the first two stimuli, and were asked to indicate which stimulus the third stimulus resembled.

If facial expressions are perceived categorically, one would expect discriminations between faces within a category to be less accurate than between pairs of faces between categories that differed by an equal physical amount (i.e., a categorical-boundary effect). Indeed, the evidence from studies using computer-generated drawings of facial expressions (Etcoff & Magee, 1992) as well as computer-morphed photographs of facial expressions of emotion (Young et al., in press) has yielded boundary effects. There appear to be discrete boundaries between the facial expressions of emotion, much as there are perceived boundaries between different hues or sounds.

Neuropsychological Evidence: Functional Magnetic Resonance Imaging, Lesion, and Disease Studies

Studies of the central nervous system correlates of facial expressions also bear upon the dimensionality versus discrete issue. Discrete-emotions theorists have argued that the experience and perception of different facial expressions of emotion involve distinct central nervous system regions (e.g., Ekman, 1992a; Izard, 1993). Dimensional theorists have proposed that valence is primary in determining the perception of facial expressions (e.g., Russell, 1997), implying

that the same brain region might primarily be involved in the perception of different facial expressions of negative emotion. Two kinds of evidence suggest that distinct brain regions are activated in the process of perceiving different negative emotions.

First, one class of studies has presented photographs of facial expressions of emotion and, typically with the use of functional magnetic resonance imaging, has ascertained that the perception of different facial expressions elicits activity in different brain regions. The perception of fearful faces activates regions in the left amygdala (Morris et al., 1996), even when the presentation of the fear face is masked by the presentation of an immediately ensuing neutral expression (Whalen et al., 1998). The perception of sad faces activates the left amygdala and right temporal lobe (Blair, Morris, Frith, Perrett, & Dolan, 1998). The perception of angry faces activates the right orbito-frontal cortex and anterior cingulate cortex (Blair et al., 1998). The perception of disgusted faces activates the anterior insula and limbic coritico-striatal-thalamic region (Phillips et al., 1997). Studies that have measured event-related potentials on the scalp have found that angry, happy, and fearful faces elicit different event-related potentials in children as young as 7 months old (Nelson & de Haan, 1997; Pollack, Cicchetti, Klorman, & Brumaghim, 1997). Finally, preliminary evidence indicates that the stimulation of a specific brain region produces laughter (Fried, Wilson, MacDonald, & Behnke, 1998). It should be noted that whereas dimensional theorists have also claimed that distinctions among negative emotions follow from higher order, effortful inferences (Russell, 1997), the perception of some negative facial expressions of emotion activates the amygdala, which is associated with relatively automatic information processing (LeDoux, 1996).

Second, disease and lesion studies indicate that the perception of different emotions seems to be located in different brain regions. Specifically, lesions to the amygdala impair the ability to recognize fearful facial expressions and vocalizations, but not the ability to recognize facial expressions of sadness (Calder et al., 1996). Individuals suffering from Huntington's disease, which affects the basal ganglia, were unable to recognize disgust expressions accurately but were accurate in judging facial expressions of other negative emotions (Sprengelmeyer et al., 1996). Even carriers of Huntington's disease were unable to recognize facial expressions of disgust (Gray, Young, Barker, Curtis, & Gibson, 1997).

Whereas these previous studies have established that the perception of different facial expressions activates different brain regions, less is known about whether the display of different facial expressions activates different brain regions. Work in progress studying multiple emotions via brain imaging techniques should provide important findings relevant to this matter (Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Ekman, Davidson, & Friesen, 1990).

Facial Expressions of Emotion and Autonomic Physiology

Discrete-emotions theorists have proposed that different emotions, and by implication different facial expressions, are linked to relatively distinct patterns of autonomic nervous system activity. Dimensional theorists, on the other hand, expect the major dimensions of emotion meaning, most notably valence and arousal, to organize the connections between facial expression and autonomic physiology (for relevant arguments, see Levenson, Ekman, & Friesen, 1990).

Several kinds of studies have examined the autonomic patterns associated with different facial expressions. In the "directed facial action" studies, participants were asked to follow instructions to contract specific facial muscles to produce configurations resembling prototypical facial expressions of emotion (e.g., Ekman, Levenson, & Friesen, 1983; Levenson, Ekman, & Friesen, 1990). Participants' autonomic physiology was recorded as they held the prototypical facial expressions of emotion. Although methodological problems with these studies have been noted (e.g., Cacioppo, Berntson, Larsen, Poehlmann, & Ito, Chapter 11, this volume), the studies have indicated that facial configurations of negative emotion produce distinctions in autonomic activity. Specifically, anger, fear, and sadness all produced greater heart rate acceleration than disgust, and anger produced greater finger temperature than fear, indicative of increased vasodilation and increased blood flow to peripheral muscles (Ekman et al., 1983). These autonomic distinctions among negative emotions have been replicated across populations (Levenson et al., 1990), in young and elderly participants (Levenson, Carstensen, Friesen, & Ekman, 1991), in different cultures (Levenson, Ekman, Heider, &

Friesen, 1992), and in a relived-emotion task (Levenson et al., 1991). A simple valence account has trouble explaining these autonomic distinctions among the facial expressions of different negative emotions.

Other studies have linked spontaneous facial expressions of emotion to distinct autonomic responses. The oblique eyebrows and concerned gaze of sympathy were associated with heart rate deceleration, whereas the facial display of distress was associated with increased heart rate (Eisenberg et al., 1989). The elevated heart rate and respiratory response of laughter appear to be different from the autonomic responses associated with facial expressions of other emotions (Ruch, 1993). Embarrassment, which has its own distinct display, is probably associated with the blush, which differs from the autonomic responses of other emotions (Shearn, Bergman, Hill, Abel, & Hinds, 1990).

Facial Expressions and Evoked Responses in Others

Consistent with the view that facial expressions evolved to elicit distinct behaviors in conspecifics (Darwin, 1872/1998; Hauser, 1996), recent evidence indicates that facial expressions evoke fairly specific responses in observers (for reviews, see Dimberg & Öhman, 1996; Keltner & Kring, 1998). Facial expressions of anger, even when presented below an observer's conscious awareness, evoked fear-related facial and autonomic responses that were distinct from the responses evoked by smiles (Esteves, Dimberg, & Öhman, 1994). Facial expressions of distress have been shown to evoke sympathy (Eisenberg et al., 1989), and embarrassment and shame displays evoke amusement and sympathy, respectively (Keltner, Young, & Buswell, 1997). Facial expressions of different negative emotions evoke different emotions in observers, which fits a discrete-systems approach to emotion more closely than a dimensional one.

Reconciliation of Discrete-Systems and Dimensional Perspectives

We have reviewed evidence indicating that facial expressions are perceived categorically and linked to distinct brain regions, autonomic activity, and evoked responses in others. Although this evidence lends credence to the discrete-systems accounts of emotion, we believe that dimensional approaches are useful in many ways. For example, the discrete-systems perspectives may best apply to the current, momentary experience of emotion; dimensional accounts may be most productively applied to emotional experience aggregated across time, and to the study of moods. It is also possible to reconcile these two approaches. For example, although the differences among emotions may seem to be categorical in nature, the differences within a category of emotion—say among the varieties of anger—may be productively accounted for by such dimensions as intensity and unpleasantness (Ekman, 1992a; Ekman et al., 1982).

What Are the Distinct Facial Expressions of Emotion?

The preceding review raises a more general question: What are the distinct facial expressions of emotion? The literature has almost exclusively focused on seven emotions: anger, disgust, fear, happiness, sadness, surprise, and contempt (the most contested of these expressions) (Ekman, O'Sullivan, & Matsumoto, 1991; Matsumoto, 1992; Russell, 1991a). This same list of emotions has been replicated (with slight variations) in analyses of the structure-of-emotion lexicon, both in the United States (e.g., Shaver, Schwartz, Kirson, & O'Connor, 1987) and in other cultures (Romney, Moore, & Rusch, 1997); these replications suggest that this parsing of emotions is valid across methods, and not as culturally biased as some have argued (Wierzbicka, 1990).

Researchers are now examining other facial expressions of emotion by additionally studying the temporal dynamics of expression, and attending to gaze, head, and postural activity. For example, encoding studies linking expressive behavior to emotional experience have documented distinct expressions for embarrassment and shame (Keltner, 1995; Keltner & Buswell, 1997; Keltner & Harker, 1998) and sympathy (Eisenberg et al., 1989), as well as different experiential correlates of laughter and smiling (Keltner & Bonanno, 1997). Ensuing judgment studies have found that posed displays of embarrassment, shame, amusement (laughter), and sympathy do reliably convey information about emotion, but not to the same extent as the displays of the traditionally studied emotions (Haidt & Keltner, 1999; Keltner & Buswell, 1996). Finally, research has focused

on the blush (Leary, Britt, Cutlip, & Templeton, 1992; Shearn, et al., 1990) and the iconic tongue protrusion (Haidt & Keltner, 1999), both of which convey emotion.

FACIAL EXPRESSIONS AS ACCURATE INDICATORS OF EMOTION

Do facial expressions reliably convey information about emotion? This question reduces to two more specific questions that have been the subject of heated debate and contrasting opinions. First, do distinct facial expressions correspond to other indices of emotion? Second, can observers judge facial expressions of emotion accurately?

Until the late 1960s, it was widely assumed that facial expression was a noisy, unreliable system with little reliable communicative value. Authors cited myriad examples—for example, individuals smiling at the decapitation of a rat (Landis, 1924) —that challenged notions of a one-to-one correspondence between facial expression and the experience of emotion (for a review, see Ekman, 1973). Facial expression was assumed to be like the phonemes of a language: The units of communication were thought to be attached to specific events and experiences in a specific way as part of the cultural construction of emotion.

More recently, it has been claimed that facial expressions of emotion do not relate to the experience of emotion (Fernandez-Dols & Ruiz-Belda, 1997), but are instead determined by context-specific social motives (Fridlund, 1992). Although attempts to document relations between facial expression and other markers of emotion face numerous difficulties related to the elicitation, timing, and measurement of emotion (Rosenberg & Ekman, 1994), several relevant studies now exist. These studies have documented consistent and even substantial links between facial expression and other markers of emotion.

Correspondence between Facial Expressions and the Experience of Emotion

Several studies concern the relation between facial expressions and the experience of emotion as measured in self-report instruments. An early review of 11 studies with contrasting methods indicated that the effect size of the relation between facial expression and experience was small to moderate, but consistently significant across studies (Matsumoto, 1987). Studies using more precise facial coding systems have consistently found relations between facial expression and the experience of emotion. In one study, subjects' facial responses when viewing films correlated with subsequent self-reports of emotion (Ekman, Friesen, & Ancoli, 1980). "Duchenne smiles," which involve the raising of the cheeks, but not "non-Duchenne smiles," have been shown to relate to the experience of positive emotion in young and old adults (e.g., Frank, Ekman, & Friesen, 1993; Hess, Banse, & Kappas, 1995; Keltner & Bonanno, 1997; Smith, 1995). The unique facial actions of embarrassment and amusement (e.g., gaze aversion and smile controls vs. the open-mouthed smile) were found to be related in distinct ways to self-reports of those emotions (Keltner, 1995). Spontaneous laughter and smiling were found to have some distinct experiential and social correlates (Keltner & Bonanno, 1997). Reviews of the literature on humor and laughter find that the intensity of laughter or smiling correlates between .3 and .4 with self-reports of the funniness of the humorous stimuli (McGhee, 1977; Ruch, 1995). These findings are all the more impressive when one considers the logical upper limits of the strength of correlations between measures coming from such different sources. Also, certain methodological practices would increase the strength of the association between facial expression and the experience of emotion, but are used infrequently. Within-subjects designs (Ruch, 1995) and improved self-report measures yield more precise and robust associations between facial expression and the experience of emotion (Rosenberg & Ekman, 1994).

Correspondence between Facial Expression and Other Markers of Emotion

Other studies, fewer in number, have ascertained whether different facial expressions of emotion relate to other markers of emotional response. As we have seen, the production of different facial expressions relates to different markers of emotion-relevant autonomic activity (Levenson et al., 1990) and different patterns of central nervous system activity (Ekman & Davidson, 1993). Spontaneous facial expres-

sions have been shown to relate to different autonomic responses in the case of anger (see Rosenberg et al., 1998), sympathy (Eisenberg et al., 1989), and laughter (Keltner & Bonanno, 1997). Spontaneous Duchenne and non-Duchenne smiles relate to the activation of different brain regions (e.g., Ekman et al., 1990; Davidson et al., 1990). Finally, a recent study of bereaved adults' discussions of their deceased spouses found that the adults' facial expressions of anger, sadness, Duchenne laughter, and smiling tended to co-occur with distinct, theoretically relevant semantic themes (e.g., justice and loss) coded in their spontaneous verbal discourse (Bonanno & Keltner, 2000).

Studies of Accuracy in Facial Expression Judgment

Whereas most studies in which observers made judgments of facial expression have focused on agreement among observers, or between different groups of observers, a few studies have compared observers' judgments with an independent measure of what emotion is being experienced to evaluate accuracy. Ekman, Friesen, O'Sullivan, and Scherer (1980), for example, compared observers' judgments when individuals were truthfully and dishonestly describing their emotions. Accuracy was quite high when the people being judged were being truthful and poor when the people were lying. In more recent studies (Ekman, 1992b), in which observers judged facial expressions while also hearing the words, the accuracy of most observers' judgments was at chance levels when the subjects were deliberately lying. That research did show, however, that a few people can reach high accuracy; in other words, the information is present in the face to detect lies, but most people miss it. Other recent studies have found that observers can reliably differentiate individuals' spontaneous displays of embarrassment and amusement (Keltner, 1995) and love and desire (Gonzaga, Keltner, & Smith, 2000).

UNIVERSALS IN FACIAL EXPRESSIONS OF EMOTION

The search for universals in facial expression has a long and storied history (Darwin, 1872/1998; Ekman, 1973, 1998). Whether or not people of different cultures express emotion similarly in the face bears critically, although not definitively, upon the extent to which emotions are innate, evolved, and culturally determined (see Ekman, 1973). Consistent with his *Zeitgeist,* Darwin believed that facial expressions of emotion are universal; he distributed questionnaires to missionaries in different parts of the world, querying whether their observations led them to conclude that people in those faraway cultures expressed emotion in similar ways (Darwin, 1872/1998). A universalist view of facial expression, however, was short-lived. The 1930s, 1940s, and 1950s were dominated by social scientists—most notably Klineberg (1940), La Barre (1947), and Birdwhistell (1970)—who claimed that people in different cultures express emotions differently in the face. Their claims were based on faulty observational research, imprecise definitions of facial expressions, and failures by most to consider the role of display rules. Nevertheless, they guided an initial wave of research on the cultural specificity in the interpretation of emotion (reviewed in Ekman, 1973). Since then, numerous studies have been conducted that have more firmly established the universality and cross-cultural variation in facial expressions of emotion.

Evidence for Universality in Facial Expression

Four kinds of evidence point to universals in facial expressions of emotion. First, beginning with Ekman's initial work with the preliterate, isolated Fore of New Guinea and Izard's work with the a number of literate cultures, judgment studies have addressed whether people who speak different languages and espouse different folk beliefs about emotion interpret facial expressions of emotion in similar ways (for reviews, see Ekman, 1998; Izard, 1977; Russell, 1994). Conducted in dozens of cultures, these studies have typically presented participants with photographs of theoretically derived facial expressions of emotion, and have asked participants to label the expressions with a word from a list of emotion terms. The forced-choice, within-subjects methods of these studies have been critiqued (e.g., Fridlund, 1992; Russell, 1994; see responses of Ekman, 1994; Izard, 1994), and the meaning of the obtained levels of accuracy has been questioned (Russell, 1994). Nevertheless, the studies reveal that across cultures people judge facial expressions

of emotion with levels of accuracy that exceed chance, typically achieving accuracy rates between 60% and 80% (when chance levels vary between 17% and 50%). These results have led theorists of differing theoretical persuasions to conclude that people across cultures judge facial expressions of anger, contempt, disgust, fear, sadness, and surprise in similar ways (Ekman, 1994; Russell, 1994).

Several new studies, conducted in response to the critiques of traditional studies, have continued to document accuracy in the judgments of facial expressions. For example, one widespread criticism of traditional judgment studies pertains to the forced choice methods. A recent study in the United States and rural India (Haidt & Keltner, 1999), however, found that accuracy in judging facial expressions changes little when individuals are allowed to interpret the expressions in their own words (see also Izard, 1977). Another critique of traditional judgment studies is that they used posed rather than spontaneous facial expressions of emotion as stimuli. A recent study also found that observers were quite accurate in judging the spontaneous displays of amusement (i.e., laughter), anger, disgust, embarrassment, and shame (see Study 5, Keltner, 1995). Although there are clearly cultural variations in the accuracy with which individuals judge facial expressions of emotion (see Russell, 1994), as well as context effects upon judgment (Russell, 1997), the accuracy with which individuals judge facial expressions of emotion appears to be quite robust.

Second, two studies provide suggestive evidence of some universals in the expression of emotion. Cross-cultural studies of actual emotional behavior require cross-cultural equivalence in the meaning of emotional stimuli as well as the relative absence of the influence of culturally based display rules (Ekman, 1973). The first study documented that when videotaped without awareness, Japanese and U.S. students showed remarkably similar negative facial expressions in response to viewing a stress-inducing film (Ekman, 1973). More recently, it was found that 5- and 12-month-old Japanese and U.S. infants responded with similar facial, postural, and vocal expressions of anger in response to a nonpainful arm restraint (Camras, Oster, Campos, Miyake, & Bradshaw, 1992). Ethological research, although not having safeguards against a single observer's possible bias, has shown that people in different cultures display similar facial expressions, such as laughter, embarrassment, or anger during play, flirtation, or fighting, respectively (e.g., Eibl-Eibesfeldt, 1989).

Third, one study has examined the relations between facial expression and other markers of emotion across cultures. One study we referred to earlier asked participants in the United States and the Minangkabau, a matrilineal, Muslim culture in Indonesia, to configure their faces into the expressions of different emotions, during which time their autonomic physiology was recorded (Levenson et al., 1992). Importantly, deliberately making the same set of facial movements produced similar autonomic responses in the two cultures (see details above).

Finally, some studies have gathered people's reports of facial expressions associated with different emotions. Although self-reports of behavior are clearly subject to a variety of biases, this evidence could be used to address the universality of facial expression. For example, across cultures people are in high agreement that embarrassment is expressed in a nervous smile and gaze aversion (reviewed in Keltner & Buswell, 1997). Other studies that have systematically gathered individuals' descriptions of expressive behavior across cultures could be similarly synthesized (e.g., Scherer & Wallbott, 1994).

The universality of facial expression, it is important to note, by no means implies universality in other components of emotion. Facial expressions of emotion may be the most universal of the different facets of emotion because of their central role in meeting different social problems that have been observed in different cultures, such as forming attachments, negotiating status, or apologizing for transgressions (Ekman, 1992a; Keltner & Kring, 1998). Other facets of emotion, such as the descriptions people give to the private feelings of emotion, may demonstrate more cultural variation.

Evidence for Cultural Variation in Facial Expression

The claims about cross cultural variation in facial expression, often found in ethnographic studies, are dramatic. The Utku of the Arctic were claimed never to express anger in the face (Briggs, 1960). In many cultures laughter is pervasive at funerals (Keltner & Bonanno, 1997). A survey of the ethnographic literature would no doubt evince consistent and wide-

spread cultural differences in facial expressions for every emotion. These claims, however, suffer from obvious methodological problems, including questions about whether participants were responding to similar stimuli, and whether observations avoided ambiguities in such terms as "smile," "frown," and "laugh." More controlled studies have documented several ways in which cultures vary in the display and perception of facial expression of emotion.

First, individuals from different cultures differ in the emotional intensity that they attribute to facial expressions of emotion (Matsumoto & Ekman, 1989). In a first study to address this issue, Japanese participants attributed more emotion than U.S. participants to all facial expressions of emotion posed by individuals of European and Asian descent, except for expressions of disgust (Matsumoto & Ekman, 1989). Interestingly, members of the two cultures differed in which facial expression they judged to be expressing the most intense emotion: for the Japanese participants, it was the disgust expression; for the U.S. participants, it was the happiness and anger expressions. In recent work, Matsumoto and colleagues have explored how culturally relevant variables, such as power distance and individualism, account for cultural differences in the intensity of emotion attributed to facial expression (e.g., Matsumoto & Kudoh, 1993).

Second, individuals from different cultures vary in the inferences they draw from facial expressions of emotion. For example, U.S. as compared to Japanese college students were more likely to infer that an individual displaying a Duchenne smile was highly sociable (Matsumoto & Kudoh, 1993), consistent with the tendency in the United States to make dispositional inferences from social behavior. One might also expect cultures that somaticize emotional experience (e.g., Russell, 1991b) to be more likely to infer somatic responses associated with facial expressions. Other such cross-cultural predictions can be derived from the literature on emotion and culture (e.g., Mesquita & Frijda, 1992; Markus & Kitayama, 1991).

Third, recent studies lend credence to ethnographic examples that strikingly different events elicit similar facial expression in different cultures. For example, in one study Japanese students indicated that it was more appropriate to show negative facial expressions to outgroup members (Matsumoto, 1990). U.S. students, in contrast, indicated that it was more appropriate to display negative emotion to ingroup members. People from India were more likely to mention affiliation in explaining photographs of a Duchenne smile, whereas people from the United States were more likely to mention individual achievement (Haidt & Keltner, 1999), consistent with claims about independent and interdependent cultures (Markus & Kitayama, 1991). Whether these cultural differences in facial expressions are observed in real social interactions remains an empirical question.

Finally, very limited evidence points to ways in which members of different cultures vary in their actual expressive behavior. Members of different cultures are likely to vary in the latency of their facial expressions of emotion: For example, U.S. infants responded with anger more quickly than Japanese infants in the study by Camras et al. (1992). Cultures may also differ in the range of expressions used to convey a particular emotion. For example, although individuals from India and the United States agreed in their interpretation of a prototypical embarrassment display, only individuals from India indicated that a tongue bite expression—a Southeast Asian display of self-conscious emotion—expressed embarrassment. Cultures may vary most in the meaning of these iconic displays of emotion (see Ekman & Friesen, 1982, for related discussion on cultural variation in emblems). And in what is still the only study to show the operation of different display rules in different cultures, Ekman (1973) showed cultural differences in the control of facial expression. When an authority figure was present, Japanese participants more than U.S. participants masked negative emotional expressions in response to watching an unpleasant film with a smile, although they had shown nearly identical facial expressions when watching such films alone.

INDIVIDUAL DIFFERENCES IN FACIAL EXPRESSIONS OF EMOTION

Notwithstanding the conceptual and methodological promises of studying individual differences in facial expression (Keltner, 1996), it is only recently that this issue has attracted the attention of empirical researchers. We trace this oversight to two historical trends. First, the early researchers of expressive behavior, such as

Wolff (1943), focused on individual differences in a variety of expressive behaviors (such as gait, signature, or posture), but they did not consider facial expression. The study of the face may have been tainted by the pitfalls and ill repute of the study of physiognomy (Ekman, 1978). Second, researchers have concentrated on universal, prototypical facial expressions, thus ignoring individual variation in such expressions. Recent studies, however, have begun to illuminate how personality traits and psychological disorders relate to facial expressions of emotion.

Personality and Facial Expressions of Emotion

Theorists have long claimed that individual differences in emotion relate to the central processes and structures of personality (Malatesta, 1993; Pervin, 1993). Consistent with this claim, studies have documented that extraversion and neuroticism relate to facial expressions of positive and negative emotion, respectively (Keltner, 1996), consistent with self-report studies (Larsen & Ketelaar, 1991; Watson & Clark, 1992). Other studies have ascertained that individuals vary in their overall emotional expressiveness (e.g., Gross & John, 1997; Keltner & Ekman, 1996; Larsen & Diener, 1987), although there is some question concerning the correspondence between self-report measures of the disposition to experience intense emotion and expressive behavior in response to discrete stimuli (Keltner & Ekman, 1996).

These findings raise five questions for future research. First, when do these individual differences in facial expression emerge? Some work has identified individual differences in facial expression as early as 7 months of age (Izard, Hembree, & Huebner, 1987), suggesting that individual differences in facial expression may contribute to the development and continuity of temperament (Malatesta, 1990). Second, what are the biological underpinnings of these individual differences in emotion (e.g., Kagan, Reznick, & Snidman, 1988)? Third, are these individual differences in emotional expression largely due to individual differences in emotion elicitation thresholds, exposure to emotional stimuli, or baseline mood (see Bolger & Schilling, 1991; Larsen & Ketelaar, 1991). Fourth, in what contexts are relations between personality and facial expression most robust? Initial evidence indicates that these relations are most robust in familiar, ambiguous contexts (e.g., Moskowitz & Coté, 1995). Finally, how might facial expressions of emotion mediate important personality–environment relations (e.g., see Caspi & Bem, 1990)?

Psychopathology and Facial Expressions of Emotion

Early emotion theorists expressed great interest in the relations between emotions and psychological disorders (Ekman, 1984; Izard, 1971; Plutchik, 1980). Although they assumed emotions to serve important functions, they viewed emotions that are inappropriate, excessive, or insufficient to the context as potentially dysfunctional and leading to disrupted lives. Researchers have begun to attend systematically to the relations between different disorders and facial expressions of emotion (for a review, see Keltner & Kring, 1998).

Initial research has been largely descriptive in nature, ascertaining how different disorders relate to different facial expressions of emotion. For example, depressed patients exhibit limited facial expressions, particularly expressions of positive emotions (Berenbaum & Oltmanns, 1992; Ekman & Friesen, 1974; Ekman, Matsumoto, & Friesen, 1997; Jones & Pansa, 1979; Ulrich & Harms, 1985; Waxer, 1974). Schizophrenic patients have been shown to be less facially expressive than nonpatients in response to emotional films (Berenbaum & Oltmanns, 1992; Kring, Kerr, Smith, & Neale, 1993; Kring & Neale, 1996; Mattes, Schneider, Heimann, & Birbaumer, 1995), in response to cartoons (Dworkin, Clark, Amador, & Gorman, 1996), and during social interactions (Krause, Steimer, Sanger-Alt, & Wagner, 1989; Mattes et al., 1995), but they report experiencing the same or greater amount of emotion and exhibit the same amount of skin conductance reactivity (or more) as nonpatients (Kring & Neale, 1996). Adolescent males prone to aggression and delinquent behavior were shown in one study to express less embarrassment and more anger in the face than controls (Keltner, Moffitt, & Stouthamer-Loeber, 1995). This basic research pinpoints which emotions may play prominent roles in the different disorders, and dispels certain misconceptions about the emotional nature of certain disorders—for example, that individuals with schizophrenia experience flat affect.

These findings point to important lines of inquiry. First, reliance upon the known relations between emotion and autonomic and central nervous system structures can guide the discovery of physiological mechanisms that contribute to different disorders. Illustrative studies include work on depression, reduced positive affect, and resting brain asymmetries (e.g., Davidson, 1993), and work relating autism and self-conscious emotion (Capps, Yirmiya, & Sigman, 1992). Second, guided by what is known about facial expressions of emotion, research can begin to document how emotional features of psychological disorders relate to specific styles of interaction and relationships, thus producing and perpetuating the disorders (for relevant evidence and speculation, see Keltner & Kring, 1998). For example, individuals high in psychopathy show an autonomic response to facial expressions of anger but not sadness (Patrick, 1994), suggesting that they may fail to respond to others' distress in ways that usually disinhibit antisocial behavior. Finally, facial expression can be used as a measure of progress in response to treatment (e.g., Ekman et al., 1997) and trauma, such as the loss of a spouse (Bonanno & Keltner, 1997).

CONCLUSIONS

In this chapter, we have drawn upon classic and contemporary studies of facial expression to address three abiding questions: Are facial expressions of emotion best thought of as discrete systems or as entities that vary along global dimensions? Are observers accurate in judging facial expressions? And are there universal facial expressions of emotion? The answers to these three questions have proved to be affirmative, yet several questions need empirical attention. We have also examined the emergent studies of individual differences in facial expressions of emotion.

Given the breadth of issues covered in the study of facial expression, we inevitably have been unable to review important research on facial feedback (Matsumoto, 1987), the development of facial expression (Izard et al., 1987), componential accounts of facial expression (Smith & Scott, 1997), and the relation between facial temperature and the experience of emotion (Zajonc, 1985). Nor have we been able to devote significant attention to another important line of new research on facial expression: the manner in which facial expressions of emotion systematically shape social interactions (Keltner & Kring, 1998). Finally, our discussion of methods has had to be limited, and we simply note the importance of novel methods, such as quasi-experiments, the study of spontaneous expression in social interaction (e.g., Keltner, Young, Heerey, Oemig, & Monarch, 1998; Levenson & Gottman, 1983), and automated techniques for coding facial expression (Bartlett, Hager, Ekman, & Sejnowksi, 1998; Ekman, Huang, Sejnowski, & Hager, 1993).

Once largely ignored, the study of facial expression is now at the center of the emergent field of affective science. The study of facial expression will continue to be germane to basic questions about emotion, culture, and communication. The study of facial expression will present continued opportunities for the study of emotion-relevant experience and autonomic and central nervous system physiology. Finally, the study of facial expression will continue to allow researchers to seek answers to fundamental questions about human nature.

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