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CHAPTER 10

Nonverbal Expressions of Positive Emotions

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Positive emotions affect the tone of our voice, the ways in which we move our body, and the expressions on our face. In this chapter, we review research on the production and comprehension of nonverbal signals of positive emotions. We take a lifespan approach, considering research on infants and children, as well as adults. We first review the literature on the production and perception of positive emotions in the voice, the body, and the face, and provide a summary of its conclusions and limitations. We end the chapter with a general discussion and proposals for future research.

The vast majority of studies on emotional communication do not differentiate among positive emotions. The difficulty with this approach has been recognized for some time, with one theorist noting that “a comparison of results from different studies is virtually impossible if it is unclear whether . . . ‘happiness’ refers to quiet bliss or bubbling elation” (Scherer, 1986, p. 163; see also Ekman, 1992, for a similar point). Nevertheless, most contemporary studies still treat positive emotion as a unitary category. Increasingly, however, researchers are starting to go

beyond a single positive emotion to examine a range of diverse positive states and expressions. That work is the focus of this chapter.

Positive Emotions in the Voice

The human voice is a rich instrument with which to communicate positive emotions: We cheer with triumph, sigh with relief, and laugh with amusement. Some of these vocal expressions emerge early in life, whereas others develop later in childhood. In this section, we first review research on nonverbal vocalizations from infancy through adulthood, then discuss studies of emotional speech intonation in children and adults. Research into laughter is discussed in more detail by Owren and Amoss (Chapter 9, this volume).

Nonverbal Vocalizations in Infants

Vocalization is one of the first ways in which infants communicate their affective states: They coo, laugh, and smack their lips with delight. Vocalizations, including laughter,

gurgling, positively toned babbling, and cooing, appear to have an inherent signal value and are used as indices of positive affect in observational research on infant temperament (e.g., Goldsmith & Rothbart, 1999; Hane, Fox, Henderson, & Marshall, 2008).

Laughter emerges when infants are between 2 and 5 months of age (Nwokah, Hsu, Dobrowolska, & Fogel, 1994; Washburn, 1929) and appears to index intense positive emotion and arousal (Sroufe & Waters, 1976). Initial laughs sound much like early vowel-like vocalizations, but mothers appear to recognize and comment on them (Nwokah & Fogel, 1993). Laughing becomes more frequent between the second month and the second year of life (Nwokah et al., 1994), and during this period physically stimulating games, such as tickling, are potent elicitors of laughter (see Owren & Amoss, Chapter 9, this volume). Between 6 and 12 months of age, infants become more likely to laugh in response to social games, such as peekaboo, as they simultaneously become more active in these games (Sroufe & Waters, 1976). Furthermore, infant and mother laugh onsets and offsets occur increasingly close in time between 12 and 24 months, suggesting that laughter reflects and supports increasing communicative synchrony in the second year (Nwokah et al., 1994).

In contrast to laughter, many infant speech-like vocalizations seem to acquire a positive signal value for the social partner or observer because of the behavioral context in which they occur. Nonverbal vocalizations in infants are typically thought to express positive emotions when they occur during smiles. Yale, Messinger, and Cobo-Lewis (2003) examined how infants at 3 and 6 months coordinate vocalizations with facial expressions. They found that vocalizations were typically embedded within smiles: The infants smiled, vocalized, finished the vocalization, and only then terminated the smile. This suggests that the vocalizations may emphasize the affective message provided by the smile. In support of this hypothesis, recent research indicates that listeners show only moderate agreement when distinguishing the affective tenor of infant vocalizations from listening to the vocalization alone; however, agreement increases substantially when observers listen to the vocalization

as they watch the infant (Franklin, Oller, Ramsdell, & Jhang, 2011).

Nonverbal Vocalizations in Adults

In contrast with the developmental research in this area, several studies have differentiated among different kinds of nonverbal positive vocalizations in adults. Schröder (2003), for example, studied listeners' perception of affect bursts of admiration, elation, and relief. Affect bursts are "very brief, discrete, nonverbal expressions of affect in both face and voice" (Scherer, 1994, p. 170). The study found substantial variability in recognition across positive emotions. Whereas affect bursts of admiration and relief were well recognized, elation expressions seemed to lack a clear prototype. Schröder's results, however, showed that some specific positive emotions can be communicated via vocal signals.

Extending this research, Sauter and colleagues have examined nonverbal vocalizations of positive emotions that, unlike affect bursts, do not include facial expressions and need not be brief. Sauter and Scott (2007) tested Ekman's (1992) hypothesis that there are several positive emotions with distinct nonverbal vocal expressions by examining enacted vocalizations of achievement/triumph, amusement, contentment, sensual pleasure, and relief. Among English and Swedish speakers, each positive emotion vocalization was well recognized, and listeners consistently rated vocalizations as expressing the intended emotion. Sauter, Eisner, Calder, and Scott (2010) examined the acoustic cues used by listeners to judge emotions from nonverbal vocalizations. They found that each set of emotion ratings was predicted by a unique combination of acoustic measures. Relief and achievement ratings were predicted by different subsets of spectral and pitch cues, whereas amusement, contentment, and pleasure were predicted by different combinations of spectral and envelope information. This suggests that listeners employ different acoustic cues to distinguish different positive emotions.

In a related study, Sauter, Eisner, Ekman, and Scott (2010) examined the production and recognition of emotion vocalizations among English and Himba individuals, the latter from remote, culturally isolated

Namibian villages. Different positive emotions yielded different patterns of results. Laughter was recognized bidirectionally, with listeners inferring amusement from laughs by their own and the other group. Triumph and sensual pleasure vocalizations were recognized within each group, but not across groups, suggesting that the development of these vocalizations depends on culture-specific input. Both English and Himba individuals produced acoustically similar sighs in response to relief scenarios. Himba listeners, however, did not recognize relief vocalizations from either group, suggesting that sighs are ambiguous signals that can communicate a range of affective states.

In a follow-up study (Sauter, 2010), English and Himba individuals matched laughter to a smiling facial expression. Nonverbal vocalizations of other positive emotions were not cross-culturally associated with the smiling facial expression. However, only one exemplar of smiling was provided, leaving open the possibility that different positive vocalizations might be associated with different smile configurations.

Simon-Thomas, Keltner, Sauter, Sinicropi-Yao, and Abramson (2009) examined vocalizations of 22 different emotions, including 13 positive states. They found that, as in Sauter and colleagues' (Sauter, Eisner, Calder & Scott, 2010; Sauter, Eisner, Ekman, & Scott, 2010; Sauter & Scott, 2007) work, relief and amusement were the two best-recognized positive emotions. More generally, analysis of listeners' errors revealed that incorrect classifications mainly occurred within emotion families (e.g., "self-conscious," "pro-social"), suggesting that vocal signals of functionally similar emotions may overlap acoustically.

The Development of Positive Prosody

In addition to nonverbal expressions, positive emotions can be expressed vocally through speech prosody. Studies in this area have predominantly focused on the perception, rather than the production, of speech prosody. The early development of prosody perception is often investigated via looking time measures in which infants are "asked" to relate a positive speech segment to a smile. Infants can associate facial and vocal expressions of positive emotion in their par-

ents by 3 months of age (Kahana-Kalman & Walker-Andrews, 2001; Montague & Walker-Andrews, 2002), and can associate these expressions in an unfamiliar adult in the context of a peekaboo game by 4 months (Montague & Walker-Andrews, 2001). Between ages 5 and 7 months, infants can associate facial and vocal positive expressions in unfamiliar adults outside the context of familiar games (Walker-Andrews, 1997). In these studies, infants discriminate positive expressions from neutral and negative expressions. Research on the perception of different types of positive emotion is not available until much later in development.

We know of no research on positive emotional prosody production in older children. Recent research, however, has begun to explore children's ability to distinguish among different types of positive speech alongside nonverbal vocalizations, using adult expressions of triumph, amusement, contentment, and relief as stimuli (Sauter, Panattoni, & Happe, 2013). Using forced-choice tasks, Sauter and colleagues (2013) found that children as young as 5 years of age were proficient in interpreting positive emotional cues from vocal signals, although performance for both nonverbal and verbal stimuli improved through 10 years (the oldest age studied). Consistent with evidence from adults (see below), children's accuracy was higher for nonverbal vocalizations than for speech stimuli (Hawk, Van Kleef, Fischer, & van der Schalk, 2009). This is likely because processing speech automatically engages mechanisms involved in decoding speech, even when it is irrelevant to the task at hand. In contrast, nonverbal vocalizations are not language-like, so resources are fully focused on understanding the nonverbal emotional information. Recognition was better than chance for both speech and nonverbal stimuli for all of the positive emotions studied, however, demonstrating that children are able to infer positive emotional states from different vocal cues. Furthermore, the two tasks were sensitive to individual differences, with high correspondence between children's performance across the tasks.

In adults, listeners across several cultures find "happy" speech more difficult to identify than speech expressing other emotions (e.g., Scherer, Banse, & Wallbott, 2001; but see Pell, Monetta, Paulmann, & Kotz, 2009,

for a different pattern of results). Could it be that an array of distinct positive emotions would be better recognized than happiness? In a meta-analysis of vocal communication of emotion, Juslin and Laukka (2003) differentiated between happiness and love–tenderness. “Happiness” included a range of positive emotional states, including cheerfulness, elation, enjoyment, and joy, whereas love–tenderness included states such as affection, love, tenderness, and passion. The meta-analysis found evidence for some degree of recognition of prosody for these two broad groups of positive emotions. Happy speech was characterized by fast speech rate, medium to high voice intensity, high pitch level, and substantial pitch variability. In contrast, tenderness typically had slow speech rate, low voice intensity, low pitch level, and little pitch variability.

Although studies have described the prosody associated with laughter in speech (Nwokah, Hsu, Davies, & Fogel, 1999) and excitement (Trouvain & Barry, 2000), there is little research comparing speech intonation among different positive emotions. Two studies using acted emotional speech have included a variety of positive emotions. Bance and Scherer (1996) examined the recognition of emotions varying in arousal. They found that elation and happiness (unlike other emotion pairs) were rarely confused with each other, suggesting that elation and happiness are two distinct emotions. Similarly, Sauter (2006) found that listeners were able to identify a range of positive emotions from inflected speech, recognizing triumph, amusement, contentment, and sensual pleasure at better-than-chance levels. Consistent with findings from nonverbal vocalizations, amusement was the best recognized of the positive emotions. These studies offer evidence that several positive emotions can be distinguished via speech prosody.

Adopting a free-naming approach, Cowie and Cornelius (2003) tested listeners’ recognition of emotions using segments of spontaneous speech. Using these naturalistic stimuli, they found that listeners inferred several positive emotional states from speech inflection, including excitement, amusement, affection, love, pleasure, relaxation, and happiness. Cowie and Cornelius also noted that the emotions were typically perceived to be of fairly weak intensity, suggest-

ing that emotions expressed in speech tend to be weak to moderately strong and mixed rather than pure. They suggested that this may be because full-blown emotion expression competes for control with the cognitive systems that underpin the production of fluent speech.

Conclusions on Positive Emotions in the Voice

In infants, the early-emerging association between laughter and tickling in both human and nonhuman primate infants (Davila-Ross, Owren, & Zimmermann, 2009), and the increasing use of laughter in synchronized social games, is relatively well understood. Other vocalizations, such as gurgling and cooing, are used to tap individual differences in positive expressivity (Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Goldsmith & Rothbart, 1999; Hane et al., 2008) but have not been validated with respect to the contexts in which they occur or the manner in which they are perceived by observers. Almost nothing is known about positive vocal expressions in children between 1 and 5 years of age, although older children have been found to recognize a range of positive states from both speech and nonspeech vocalizations. To our knowledge, no work to date has assessed children’s vocal production of positive emotions; research in infants includes both production and perception, but research later in the lifespan typically only examines recognition (but see Cowie & Cornelius, 2003). This raises the question of how the production of vocal signals of positive emotion, as well as their recognition, develops beyond infancy.

Adults are sensitive to a range of positive emotions in vocal signals, particularly in nonverbal vocalizations, suggesting that the voice may be a particularly important means of signaling positive affective information. Notably, amusement and relief vocalizations are well recognized and show cross-cultural consistency; for other positive emotions, such as triumph, vocalizations vary more across cultural groups. These differences highlight the importance of considering a range of distinct positive emotions when assessing cross-cultural differences and consistencies in vocal and other expressions. Some positive vocalizations—such as

laughter and perhaps sighs of relief—may be fixed signals in human beings.

From childhood on, positive emotions, like negative emotions, are less easily identified from speech prosody than nonverbal vocalizations. Whether this is due to emotions expressed in speech tending to be of a weaker intensity or because the acoustic cues used in emotional communication compete with those employed in speech production is an important question for future work to address. We now turn to bodily actions that communicate positive affect.

Bodily Expressions of Positive Emotion

Although research in the domain of bodily expressions of positive emotions is limited, studies of infants, children, and adults have revealed that positive emotion is expressed through the body in various ways from early in life. We discuss two broad domains of bodily expressions of positive emotion: touch and postural cues.

A Positive Touch

In young infants, touch is affected by caregivers' responsivity during interactions. Moszkowski and Stack (2007) found that 5-month-old infants tend to use static touch (e.g., touching without moving their hands) during naturalistic interactions with their mothers. Infants use more reactive (e.g., pat, pull, grab) and soothing (e.g., stroke, finger, mouth) types of touch during periods of experimenter-requested maternal unresponsiveness (the still face). By 7 months of age, infants begin to display affectionate touch behaviors, such as patting, hugging, and kissing, which increase through 11 months (Landau, 1989). The majority of these touch behaviors are directed at the primary caregiver, suggesting that they are directed expressions of positive emotion. However, there is no evidence to date that infants of this age use specific forms of touch to communicate different types of positive emotion.

Warm touch between parent and child is associated with positive developmental outcomes in infancy. Anisfeld, Casper, Nozyce, and Cunningham (1990) randomly assigned mothers soft baby carriers ("Snugglis") designed to increase physical contact

with their infants. They found that infants in the soft baby carrier condition were more likely to be securely attached at 13 months of age than were comparison children. Likewise, Weiss, Wilson, Hertenstein, and Campos (2000) found an association between "nurturing touch" and secure attachment. At older ages (5- and 6-year-olds), Oveis, Gruber, Keltner, Stamper, and Boyce (2009) found associations between warm family touch and smile intensity in children. These findings suggest that from early infancy, touch may be an important modality for communicating positive emotion that facilitates the development of secure attachment.

Touch between adults is a topic of emerging research. In a pioneering study, Hertenstein, Keltner, App, Bulleit, and Jaskolka (2006) asked whether adults could identify specific emotions from the experience of being touched by a stranger on the arm or hand, without being able to see the touch. They found that participants were able to decode emotions including love, gratitude, and sympathy via touch at better-than-chance levels (see Hertenstein & Keltner, 2010, for evidence of gender asymmetries in decoding). The researchers also examined the most commonly used types of touch for expressing different emotions, and found that love was typically signaled with stroking, gratitude was communicated with a handshake, and sympathy was expressed with a patting movement. Furthermore, participants were able to infer emotions by merely watching others communicate via touch. The finding that participants are able to decode positive emotions from being touched has since been replicated and extended to the broad state of happiness (Hertenstein, Holmes, McCullough, & Keltner, 2009).

In addition to signaling specific positive emotions, touch may also influence how well people work together. A study by Kraus, Huang, and Keltner (2010) that examined professional basketball players found that more physical contact between players on the same team was associated with the touched individual and team performing better later in the season. This finding held even when accounting for player status, pre-season expectations, and early season performance. Results of this study support the proposition that touch can facilitate social bonding and promote cooperation and per-

formance between adults, and that touch may be a preferred modality for communicating prosocial emotions within a group.

Gestural and Postural Expressions of Positive Emotions

Infants express positive emotions through posture, gestures, and physical motion. In a frequently used temperament measure for infants and young children (Lab-TAB), positive motor activities coded include clapping, waving the arms in excitement, and banging one's hands on a table (Goldsmith & Rothbart, 1999). These patterns of movement are assumed to have a particular positive expressive value because they occur during situations designed to elicit positive emotion ("joy/pleasure episodes"). There has, however, been little systematic documentation of the proportion of infants who respond to these episodes with these types of movements, or reports on whether these movements also occur during other situations.

"Pride" is an example of a positively valenced self-conscious emotion, generally defined as the experience of positive feelings toward the self. Pride typically occurs after successful completion of a goal, and its expression involves postural and gestural, as well as facial, actions. Three-year-olds are more likely to exhibit signs of pride in response to successful completion of relatively difficult tasks compared to less difficult or failed tasks (Belsky, Domitrovich, & Crnic, 1997). Children as young as 4 years of age can accurately recognize images of pride at above-chance levels when asked whether an adult in a photo is proud, happy, or surprised (Tracy, Robins, & Lagattuta, 2005). Lewis, Takai-Kawakami, Kawakami, and Sullivan (2010) investigated pride in response to successful completion of a challenging game in Japanese and American children, as indexed by behaviors such as an erect posture, smiling, and positive self-evaluation. The proportion of early school-age children expressing pride varied by cultural group, with markedly more American than Japanese children exhibiting signs of pride (Lewis et al., 2010). Expressions of pride, then, may vary, even in school-age children, to reflect cultural values such as individual self-expression (Dennis, Cole, Zahn-Waxler, & Mizuta, 2002; Messinger & Freedman, 1992).

There is a considerable body of work showing that pride is reliably communicated via postural cues in adults across several different cultures (for a review, see Tracy, Weidman, Cheng, & Martens, Chapter 17, this volume). Most notably, there is evidence for cross-cultural recognition of the pride expression via postural cues by individuals from a preliterate, isolated culture in Burkina Faso, West Africa, as well as by North Americans (Tracy & Robins, 2008). Both groups could reliably recognize expressions of pride, regardless of whether the displays were produced by African or American targets. The Burkinabe individuals were unlikely to have learned the pride expression through cross-cultural transmission, as their exposure to people from outside their own cultural group was very limited. Further evidence for the cross-cultural consistency of the pride display comes from a study by Tracy and Matsumoto (2008), which examined displays produced by blind athletes in response to winning Paralympic Judo matches. Photographs of participants from different nations showed that those who had won produced behaviors associated with pride expressions, including raising their arms, tilting their heads back, smiling, and expanding their chests, which is the configuration of cues recognized by observers as communicating pride (Tracy & Robins, 2007).

Aside from pride, there has been a paucity of research on gestural and postural expressions of positive emotion in children and adults. Compared to other basic emotions, happiness appears to be the most difficult emotion to recognize from whole-body expressions (de Gelder & Van den Stock, 2011), but there have been few attempts to use bodily cues to differentiate more specific positive emotions. However, one notable study found evidence for an association between gestural/postural movements and love. Gonzaga, Keltner, Londahl, and Smith (2001) examined couples in romantic relationships taking part in a series of interactions. Four different nonverbal affiliation cues (head nods, Duchenne smiles, gesticulation, and forward leans) were correlated with self-reported feelings and partner estimates of love. These findings suggest the potential of research investigating the robustness and cross-cultural validity of gestural, bodily,

and facial signs of affiliative positive emotions.

Conclusions on Positive Emotions in Bodily Expressions

Touch may be a preferred modality for communicating prosocial emotions to those close to us. Infants use touch to express attachment needs to caregivers, and increased nurturing touch from caregivers is associated with secure infant attachment. In older children, warm family touch is associated with children's smile intensity. In these contexts, touch appears to reflect and support a positive emotional interplay between child and caregivers. Touch between adults predicts individuals working well together, and several prosocial positive emotions, including love, gratitude, and sympathy, can be communicated via touch.

With the exception of pride, little is known about how positive emotions can be expressed using whole-body movements. Pride is associated with a well-established set of postural cues and is consistently recognized and displayed by both children and adults across cultures. Unfortunately, studies in children have generally neglected to describe the specific ways that children express pride (e.g., erect posture may be the only postural cue) or how pride expressions change with development. Careful description of changes or continuities in pride expressions across development would provide a firm basis for continued explorations of the expression and recognition of pride in cross-cultural contexts. Investigation of pride expressions in blind individuals of various ages who do not have visual experience with pride displays represents rich ground for continued innovative research.

Positive Emotion in the Face

The smile is remarkably well recognized as a facial signature of positive emotion, with smiling expressions typically identified more easily than any other emotion in studies including one category of positive emotion (see Elfenbein & Ambady, 2002, for a meta-analysis). Throughout the lifespan, smiles are caused by the zygomaticus major muscle (AU12 in the anatomically based Facial

Action Coding System [FACS] and its application to infants [BabyFACS]), which pulls the lip corners sideways and slightly upward (Ekman & Friesen, 1978; Oster, 2006). There is, however, more than one way to smile. Duchenne smiles are caused by the additional action of orbicularis oculi (pars lateralis), which raises the cheeks around the eyes and, in adults, produces crow's feet (i.e., horizontal lines extending laterally from the outside corners of the eyes) (Duchenne, 1862/1990; Ekman, Davidson, & Friesen, 1990). Duchenne smiles index positive emotion, although this may be true of other smiles as well (see discussion below). Smiles may also involve lip parting and mouth opening. Mouth opening is a characteristic of the smiles of infants, children, and non-human primates, and perhaps of adults as well (Messinger & Fogel, 2007). Below we examine the literature on perceiving and producing different types of smiles across infants, children, and adults.

The Development of Positive Facial Expressions in Infancy

Infants' production of smiles begins at birth, but contrary to common belief, neonatal smiling is not caused by gas. Infant smiles are linked not to time since last feeding, as would be predicted by the gas hypothesis, but to infant behavioral states, such as active sleep (Emde & Koenig, 1969). Neonates smile during active sleep and drowsy states. In these states, around one-half of infants observed for 6 minutes exhibited bilateral Duchenne smiles, approximately one-third of which were at a moderate intensity level (Messinger et al., 2002). The relatively mature form of these smiles and their occurrence during sleep states characterized by high levels of limbic activity suggest a possible link to positive emotion (Dondi et al., 2007). While some neonatal smiles occur amid other mouthing and dimpling actions, making them harder to discern, others occur in the absence of such movements. Longer duration neonatal smiles are more likely to be recognized as smiles by naive observers, suggesting that these in particular may be perceived as expressing positive emotion (Dondi et al., 2007).

Recent research indicates that neonates also smile in awake-alert states (Cec-

chini, Baroni, Vito, & Lai, 2011; Dondi et al., 2007). Cecchini and colleagues (2011) found that whereas smiles during active sleep tended to occur with the mouth closed, smiles during awake periods tended to involve mouth opening. Tactile stimulation whose intensity was responsive to the infant's behavior—an unseen adult moving a finger the infant was grasping—appeared to differentially elicit open-mouth smiles, many of which also involved eye constriction (Cecchini et al., 2011). This suggests the contextual sensitivity of smiles early in life, and the possibility that open-mouth smiles are differentially reflective of arousal generated by interaction compared to other smiles.

Early positive emotion expression is social. Evidence from blind infants, for example, suggests that visually mediated social interaction is necessary to support the development of normative smiling expressions in real time and over developmental time (see Messinger & Fogel, 2007). Positive emotion itself may develop during interaction. Between 1 and 2 months of age, infants begin to engage in social smiling (Lavelli & Fogel, 2005; Oster, 1978). As infants begin smiling, their smiles tend to elicit parents' smiles (Lavelli & Fogel, 2005; Symons & Moran, 1994). The confluence of incipient positive emotion related to the initial production of the smile, together with a positive emotional response to the parent's smile, is hypothesized to create an association between the smile and the experience of positive emotion with another (Messinger & Fogel, 2007).

Evidence that different types of smiles convey different aspects of positive emotion in the first 6 months of life was provided a study involving weekly observations of infants interacting with their mothers (Messinger, Fogel, & Dickson, 2001). Duchenne smiles tended to occur more than non-Duchenne smiles when the mothers were smiling, suggesting that Duchenne smiles may be associated with reciprocating positive affect. Smiles with mouth opening occurred when infants were gazing at their mothers and may reflect the exuberance associated with positive social interactions. Despite this context specificity, smiles involving eye constriction—Duchenne smiles—also tended to involve mouth opening. These combined smiles increased over the first 6 months in the context of the infant

gazing at the mother's face while she was smiling, suggesting that open-mouth smiles became increasingly reliable indices of positive emotion with development. Combined open-mouth smiling with eye constriction is a common response to tickling and physical play from 6 to 12 months and appears to be an expression of intense positive emotion and arousal (Dickson, Walker, & Fogel, 2007; Fogel, Hsu, Shapiro, Nelson-Goens, & Secrist, 2006).

There is also evidence that smile strength indexes a single dimension of positive emotion intensity. In fact, Duchenne smiles with mouth opening involve a stronger smiling action than other smiles (Fogel et al., 2006). Moreover, tickling elicits stronger underlying smiles than peekaboo or pretend tickling, suggesting the importance of smile strength as an index of positive affect in infants (Fogel et al., 2006). Messinger and colleagues explored the possibility that there is a single dimension of positive affect expression in infants. They conducted automated measurements of the intensity of infant smiling, eye constriction, and mouth opening while 6-month-olds were interacting with their parent (Messinger, Mahoor, Chow, & Cohn, 2009; Messinger, Mattson, Mahoor, & Cohn, 2012). Infant smile intensity, eye constriction intensity, and degree of mouth opening were all correlated. Moreover, the intensity of each action predicted dynamic ratings of infant positive emotion made by untrained observers as the infant's video played.

Although the results of this study suggest that a single dimension can account for smile variation in young infants, smiling likely becomes more differentiated with age. Fox and Davidson (1988) found that at 10 months of age, infants used different types of smiles in different contexts. Ten-month-olds tended to respond to their mothers' approach with a Duchenne smile but responded to the approach of a stranger with a non-Duchenne smile. It is possible that the strength of the underlying smile also distinguished these responses. Alternatively, it may be that specific types of smiles with qualitatively different meanings are evident by 10 months of age in response to specific social elicitors.

The temporal sequencing of infants' smiles and gazes at their interaction partner may also create different qualitative meanings.

At 6 months, infants rarely smile and then gaze at the parent while smiling, doing so less often than one would expect by chance (Yale et al., 2003). However, approximately one-third of 8-month-olds and the majority of 12-month-olds will smile at a toy that performs an unexpected movement, such as a somersault, and, then turn the smile to an adult (Parlade et al., 2009; Venezia, Messinger, Thorp, & Mundy, 2004). These anticipatory smiles, in which the smile precedes the gaze toward the adult, suggest the intentional sharing of positive affect and are associated with later parent-rated social competence (Parlade et al., 2009).

With respect to perception, Bornstein and Arterberry (2003) used a visual habituation procedure to ask how 5-month-old infants categorize smiles of different intensities. Infants' responses suggested that they perceived smiles of different intensities to be similar—that they categorized different-intensity smiles as a single expression—even when the smiles were posed by different people. Moreover, work by Kuchuk, Vibbert, and Bornstein (1986) demonstrated that 3-month-old infants were able to discriminate between smiles of differing intensity and tended to prefer more intense smiles. Interestingly, infants who were more sensitive to smiling had mothers who more often directed their infant's attention to their (the mothers') smiling faces during naturalistic observations. These results suggest that infants detect similarities between smiles of different intensities, tend to prefer stronger smiles, and that their sensitivity to differences in the intensity of smiles is dependent on experiences with their caregivers.

Smiling in Children

More is known about smiling in the first year of life—when positive emotion is relatively easily induced in a laboratory playroom—than in later infancy and childhood. Nevertheless, investigations of children's positive emotion expressions suggest continuities with the form of infant smiles. In a study by Soussignan and Schaal (1996), an unfamiliar examiner presented children between 4 and 15 years of age with pleasant and unpleasant odors. Smiles that involved lip parting or mouth opening—both Duchenne and non-Duchenne—were more likely in response to pleasant than to unpleasant

odors. By contrast, smiles involving nose wrinkling or upper lip raising (potential indices of disgust) were more likely responses to unpleasant odors. Observers were also able to ascertain correctly that both Duchenne and non-Duchenne smiles with lip parting were responses to pleasant rather than unpleasant odors. The results underline the importance of smiling involving lip parting and mouth opening as expressions of sensory enjoyment.

As with infants, social communication is key to understanding smile production in preschoolers. In children between 2 and 4 years of age, simple smiles involving neither mouth opening nor eye constriction predominate in solitary contexts (Cheyne, 1976). Open-mouth Duchenne smiling (sometimes called “broad smiles”) and laughter are strongly associated, occurring at similar levels in individual 3- to 5-year-old children (Sarra & Otta, 2001). Between ages 2 and 4, boys increasingly direct open-mouth smiles to their male rather than their female peers, suggesting that this type of smiling reflects increasing sex segregation in social contact among preschoolers (Cheyne, 1976).

In early childhood, open-mouth and Duchenne smiles are associated both with experiences of success and social proximity. A set of studies by Schneider and colleagues examined preschoolers' production of smiles in experimentally manipulated games. An initial study of 3- to 6-year-olds indicated that the components of Duchenne smiles (smiling and eye constriction) were tied to social proximity; these smiles were more likely to occur while the child was playing next to the experimenter than when the experimenter was at another table (Schneider & Josephs, 1991). In a cross-sectional follow-up study, children produced stronger smiles in a game involving success and failure than in a game that did not, beginning at around 4 years of age (Schneider & Uzner, 1992). From 5 years of age, Duchenne smiles were more common when the child was successful in the game (and rewarded with a light and sound display) than when the child failed. Smiling with lip parting was more frequent in success than in failure trials at every age, suggesting the early importance of this smile configuration.

Holodynski outlines a potential role of social context in the development of smiling. Holodynski (2004) studied the expressed

positive emotion of children 6 to 8 years of age. Younger children exhibited similar levels of joy across social and nonsocial contexts, whereas older children showed markedly less strong joy when alone than when accompanied by an experimenter. Although older children minimized their expressions in the solitary condition, there were no differences in the reported experience of positive emotion across conditions and ages. Holodynski argues that these results support an internalization model, in which, with development, emotional experience gradually becomes less dependent on expression. For the younger children, then, the expression of joy is simultaneously internal and social, a marker both for self and other. For older children, salient expressions of joy are not necessary for the self, but the social function of communicating happiness to others remains. Specifically, the 7- and 8-year-olds' expressions showed a "miniaturization" effect that indexed the internalization of emotion.

Adult Smiles

In adults, the aspect of positive emotional facial expression that has received the most attention from researchers is the distinction between Duchenne and non-Duchenne smiles. There is empirical support for this distinction: Ekman and colleagues (1990) found that Duchenne smiles, but not other smiles, occurred more frequently during pleasant films, and that the level of Duchenne smiling was related to subjective reports of positive emotion. Observers view Duchenne smiles as happier than non-Duchenne smiles (Miles & Johnston, 2007), and electromyographic (EMG) recordings indicate greater evidence of mimicking Duchenne than non-Duchenne smiles (Surakka & Hietanen, 1998). Duchenne smiles have also been found to be smoother in onset and more symmetrical than other smiles (Frank, Ekman, & Friesen, 1993; but see Cohn & Schmidt, 2004; Soussignan & Schaal, 1996). Intense Duchenne smiles have been shown to be specifically associated with amusement (Hess, Beaupré, & Cheung, 2000).

Although multiple studies document differences in the perception of Duchenne and non-Duchenne smiles, recent work has noted other determinants of smile perception that contextualize and challenge this distinction

(reviewed in Abe, Beetham, Izard, & Abel, 2002; Niedenthal, Mermillod, Maringer, & Hess, 2010). Krumhuber and Manstead (2009) found that Duchenne smiles could be produced deliberately, and that viewers relied less on whether smiles were Duchenne or not, and more on symmetry and the duration of the smile's apex, as the basis for genuineness and amusement judgments. Although static images of Duchenne smiles were perceived as more emotionally positive than non-Duchenne smiles, video clips of Duchenne smiles were not perceived as more positive than video clips of non-Duchenne smiles. This highlights the importance of investigating the dynamics of smile production to attain a more ecologically valid understanding of positive emotional expression and perception. Several studies examining contextual influence, for example, have shown that social motivation can play a greater role than positive emotional experience in determining when and how people smile (Fernandez-Dols & Ruiz-Belda, 1995; Fridlund, 1991; Kraut & Johnston, 1979).

Early research indicated that smile strength is associated with the producer's feelings of pleasure (Ekman, Friesen, & Ancoli, 1980; Hess, Kappas, McHugo, Kleck, & Lanzetta, 1989) and, in video clips, with the perceiver's ratings of enjoyment (Krumhuber & Manstead, 2009). A recent pilot study of two mothers interacting with their infants also suggests that strength of smiling—the degree of contraction of *zygomaticus major*, the muscle responsible for the central smiling action—may be a central factor in adult smiling. As with infants, smile strength was associated with the intensity of eye constriction (the Duchenne marker), and with degree of mouth opening. Smile strength had the strongest associations with continuous ratings of positive emotion (Messinger et al., 2009). The results suggest that dynamic changes in smile strength may undergird the expression of positive emotion in some contexts but do not rule out the potential importance of a categorical distinction between Duchenne and non-Duchenne smiles (see also Messinger et al., 2012).

The Distinction between Smiling and Laughter

Homologies have been proposed between the nonhuman primate "play face" and the

facial configuration associated with human laughter, as well as between the primate bared-teeth display and the human smile (van Hooff, 1972). To ascertain whether these displays occur in similar or different behavioral contexts, behaviors associated with bared-teeth displays and play faces were coded in captive chimpanzees (Waller & Dunbar, 2005). Play faces were found to occur nearly exclusively in play situations, while bared-teeth displays were used flexibly in a range of affiliative contexts, suggesting that these signals are likely rooted in different motivational complexes. The authors argued that if these expressions share phylogenetic origins with human smiling and laughing, these should also be considered two distinct behaviors.

Although smiling and laughter may have distinct phylogenetic origins and have maintained distinct functions in chimpanzees, in some species these two displays may have converged over evolutionary time because both are used in affiliative social contexts (e.g., Preuschoft & van Hooff, 1996). Mehu (2011) conducted a naturalistic observational study of laughter and smiles in adult dyadic interactions. He found that spontaneous, but not deliberate, smiles were associated with laughter, suggesting that spontaneous smiles and laughter may share a motivational basis (see also Mehu & Dunbar, 2008a, 2008b). In fact, some theorists have suggested that in the human case, smiling and laughter both express positive states that differ in intensity (Sroufe & Waters, 1976; see also Redican, 1975). In support, tickling elicits both strong open-mouth Duchenne smiling and laughter in infants, and children's levels of open-mouth Duchenne smiling are associated with their laughter levels (Sarraf & Otta, 2001). Moreover, a recent report indicates that tickling can induce laughter vocalizations in both human and nonhuman primate infants and juveniles (Davila-Ross et al., 2009).

Smiles of Different Positive Emotions

Can smiling express more differentiated emotional states than simple enjoyment or happiness? Reddy and colleagues argue that infants are already capable of expressing a type of smile expression that they describe as “shy” or “coy” (e.g., Reddy, 2000). These are smiles that occur in combination with

gaze and/or head aversion, and that appear to be similar to expressions of embarrassment or shyness in older children and adults (e.g., Keltner, 1995). Draghi-Lorenz, Reddy, and Morris (2005) asked unfamiliar adults freely label expressions in 2- to 4-month-old infants from short video clips. Two of five clips that depicted infants' smiling expressions followed by gaze and/or head aversion were predominantly labeled as shyness, suggesting that infants may be perceived as expressing shy or coy smiles. However, not all smiles with gaze and/or head aversion were perceived as coy, suggesting that these smiles may be a particular type of smile that is defined by its temporal dynamics and relationship with gaze and/or head aversion (see Yale et al., 2003).

In adults, further distinctions among smile types have been tested. Ricci-Bitti, Caterina, and Garotti (1996) studied four different types of smiles that expressed sensory pleasure, joy, and elation, and a formal-unfelt smile. They found that these were well differentiated by behavioral descriptors. Sensory pleasure smiles were characterized by closed eyes in combination with a Duchenne smile, and elation smiles were marked by the upper lid being raised. In an innovative study by Campos, Shiota, Keltner, Gonzaga, and Goetz (2012), participants produced different facial expressions when asked to pose different positive emotions. Amusement typically involved a Duchenne smile and an open mouth, the same facial actions that characterize intense positive affect expression in infants. Participants posed joy with Duchenne smiles, in which the lips were parted in half of the cases, but the mouth was open in only one-third of the cases. Contentment also involved smiling—Duchenne smiling in slightly over half the cases—in which the lips tended to be pressed together. Together, these studies suggest that some positive affective states may be signaled by physically distinct smile configurations, although they do not establish whether observers are sensitive to these distinctions.

Studies examining the recognition of smiles have tended to emphasize the role of dynamic information. In one study that directly compared the perception of static and dynamic facial expressions, Fujimura and Suzuki (2010) examined calm, excited, and joyful smiles. They found that excited

and happy expressions were recognized better from dynamic stimuli, whereas calm expressions were equally well recognized from static and dynamic faces. They concluded that dynamic facial expressions may communicate a greater variety of positive states than those communicated by static presentations. Another study has found an advantage for dynamic stimuli using synthesized facial expressions (Wehrle, Kaiser, Schmidt, & Scherer, 2000). In addition to happiness, pride, elation, and sensory pleasure were included in high- and low-intensity versions. In a forced-choice task, the dynamic stimuli were better recognized than the static stimuli, and judges did particularly well with high-intensity stimuli of the different positive emotions.

A recent study that investigated both the production and perception of smiles of spontaneous amusement, embarrassment, nervousness, and politeness further highlights the importance of temporal dynamics in smiling (Ambadar, Cohn, & Reed, 2009). Examining physical cues, as well as human judgments, the authors found that viewers are able to use not only variation in morphological features but also the dynamic characteristics of different kinds of smiles. For example, in comparison with smiles perceived to signal politeness, smiles that were perceived by viewers as amused more often included open mouth, larger smile amplitude, larger maximum onset and offset velocity, and longer duration. Taking both morphological and dynamic features into account, viewers' judgments were directly related to the physical cues that differentiated between these expressions (see also Krumhuber, Manstead, & Kappas, 2006, on the importance of dynamic cues in smile perception). Together these findings suggest that distinct smile configurations, particularly those involving dynamic cues, may index different positive emotions,

Facial Cues beyond the Smile

In adults, several positive emotions, including relief and sensual enjoyment, may not involve smiles at all (see Sauter, 2010). Early observational research on facial expressions associated with sexual excitement described configurations similar to expressions of pain (Masters & Johnson, 1966). A recent study used an ingenious approach to exam-

ine the facial configurations of individuals experiencing sexual enjoyment (Fernandez-Dols, Carrera, & Crivelli, 2011). Video clips were acquired from a website of individuals who recorded their own facial behavior while masturbating to orgasm. FACS coding confirmed a similarity between sexual excitement expressions and facial configurations of pain. However, observers are able to distinguish these expressions at greater than chance levels (Hughes & Nicholson, 2008), which suggests they are subtly different. This area of research suggests that subjectively enjoyable feelings such as sexual pleasure may involve prototypical facial expressions that do not include smiling. For additional evidence, see Gonzaga Turner, Keltner, Campos, and Altemus's (2006) differentiation of the nonverbal displays of sexual desire and romantic love.

Facial expressions of a large set of positive emotions were investigated in a recent study by Bänziger, Mortillaro, and Scherer (2012). They recorded individuals dynamically enacting the positive emotions of amusement, pride, joy, relief, interest, pleasure, admiration, and tenderness while producing nonsense speech. Comparing across emotions and modalities, recognition rates varied greatly, but all positive emotions were best recognized from audiovisual signals. Also, all positive emotions were better recognized from visual than from auditory signals. Another study FACS-coded some of the enacted facial expressions, including pride, pleasure, and joy taken from the same stimulus set (Mortillaro, Mehu, & Scherer, 2011). They found limited differentiation of the action units involved in these different positive emotions, with no differences found between pride and joy, or between interest and pleasure. However, as the actors producing the facial stimuli were producing emotional speech, their facial movements may have been limited by the strong articulatory movements of the lower face that are involved in speech production.

In contrast to findings by Mortillaro and colleagues (2011), a recent study by Krumhuber and Scherer (2011) suggests that there may be distinct facial configurations associated with different positive emotions. The study examined the facial correlates of affect bursts (see the earlier discussion of the study by Schröder, 2003) of several negative emotions, as well as joy and relief, and the stim-

uli consisted of a sustained vowel to avoid coarticulation. A difference was found in the facial configurations of joy and relief, with joy often shown with the prototypical Duchenne smile configuration, while prototypical relief expressions were characterized by a low-intensity action of the lip corner puller muscle that creates smiling. They concluded that a single facial expression is insufficient to capture the many meanings of positive emotions.

Conclusions on Positive Emotions in the Face

Infants are attuned to smiles very early in life, exhibiting a preference for stronger smiles. Their sensitivity to differences in the intensity of smiles appears to be shaped by their experience with caregivers, with whom they go on to develop a system of mutual smile communication. This sets the stage for the intentional communication of positive emotion. In young children, smiling is simultaneously an internal and a social marker of enjoyment, whereas in older children smiling may increasingly be used as a means of communicating happiness to others.

In early infancy, there is evidence that both smiling and positive emotion vary along a single continuum that is indexed by the strength of smiling, which in turn is linked to the strength of the Duchenne marker (eye constriction) and mouth opening. In fact, eye constriction and mouth opening also index the intensity of the prototypical negative infant expression, the cry face (Messinger et al., 2012), suggesting these two facial actions can function to mark the intensity of both positive and negative expressions. Moreover, smiling involving eye constriction and mouth opening appear to also index enjoyment in older children.

Although it is well established that smiling is highly sensitive to social context, its relationship to felt enjoyment in adulthood is still unclear. Researchers commonly utilize categorical distinctions between Duchenne and non-Duchenne smiles, and between weaker and stronger smiles, but many are increasingly employing dynamic measures of smile intensity and trajectory. These dynamic measures distinguish spontaneous and posed smiles, and show associations with perceived enjoyment. Finally, recent research has documented facial configura-

tions of sexual enjoyment and relief that do not include smiles, highlighting the possibility that facial expressions of positive emotions in adulthood are more heterogeneous than has previously been thought.

General Conclusions

Positive Emotions across Cultures

Research on positive emotion expression has been conducted primarily in a small set of culturally similar samples. Basing our knowledge on findings from Western, and often educated, participants raises concerns about the generalizability of findings (see Henrich, Heine, & Norenzayan, 2010), and limits our understanding of differences and similarities in the nonverbal expression of positive emotions across cultures. The limited cross-cultural data available suggest that culture may play a major role in shaping signals of positive emotions (see Fogel, Toda, & Kawai, 1988; Keller & Otto, 2009; Sauter, Eisner, Ekman, & Scott, 2010), but in some research domains, including touch and smile types, work with non-Western samples is sorely lacking.

Cultures vary in their orientations to different types of positive affect. For instance, Tsai, Knutson, and Fung (2006) found that European American young adults reported that they value high-arousal positive affect, whereas Asian Americans tended to value low-arousal positive affect. One avenue through which parents and caregivers can affect positive emotional expression is by engaging, or not engaging, in particular types of play with their infants (Halberstadt & Lozada, 2011). For example, peekaboo, a game that promotes positive emotion expression with high levels of arousal, is prominent in American culture (Halberstadt & Lozada, 2011). By contrast, parents in other cultures, such as the Gusi tribe in Kenya, often engage in behaviors that discourage expressions of intense affect, including positive emotions (Richman, Miller, & LeVine, 1992).

In an exciting research program, Keller and colleagues (e.g., Keller, Borke, Lamm, Lohaus, & Yovsi, 2011) are documenting the impact of cross-cultural differences in parenting behaviors on the development of positive emotional expression. In middle-

class Germans, a cultural group they characterize as more independent, mothers responded to infant vocalizations with increasing amounts of contingent visual contact and greater time spent in face-to-face play over the first months of life (Kartner, Keller, & Yovsi, 2010). By contrast, among Nso farmers in Cameroon, a cultural group characterized as more interdependent, mothers responded to infant vocalizations with more body contact and fewer face-to-face interactions (Kartner et al., 2010; Keller et al., 2011). Moreover, Wörmann, Holodynski, Kärtner, and Keller (2012) found that Northern German mothers imitated their infants' smiles more and smiled at their infants longer during mutual gazing at 12 weeks of age than did Nso mothers. While the Northern German infants demonstrated levels of social smiling and imitation comparable to those of Nso infants at 6 weeks of age, they smiled longer and imitated their mothers' smiles more often during mutual gazing at 12 weeks. These findings raise the possibility that differential responsiveness to infant smiling can influence the development of smiling. Careful demonstration of socialization effects on the expression of positive emotion could suggest a mechanism for cross-cultural variability in emotional displays in multiple expressive modalities.

The degree to which the development of different positive emotions is dependent on culture-specific input will be important for future research. The results of Sauter, Eisner, Ekman, and Scott (2010) suggest that the role of culture-specific social learning may be different for different positive emotions. In their study, amusement and relief vocalizations were highly similar across the two groups, and, in particular, amusement sounds were well recognized. In contrast, triumph vocalizations were very different across the groups and not bidirectionally recognized (sensual enjoyment vocalizations also were not recognized bidirectionally, but that may have been due to differences in arousal cues in the stimuli). These findings suggest that the role of social learning is likely to vary across (positive) emotions.

Considerations for Future Work

This chapter has reviewed a wide range of research on nonverbal signals of positive

emotions in different modalities and across the lifespan. This research employs many innovative approaches. Examples include automated measurement of smile intensity of interacting infants and mothers (Messinger et al., 2012) and comparisons of the development of smiling in Northern European and African contexts (Wörmann et al., 2012). Novel approaches with adults include studies of intense emotional experiences from real life, such as blind athletes' displays of pride when winning judo matches in the Paralympic Games (Tracy & Matsumoto, 2008), and the use of a website with self-recorded video materials of individuals stimulating themselves to orgasm (Fernandez-Dols et al., 2011).

This review, however, also highlights a lack of continuity. In general, research on adults has emphasized perception more than production, while developmental research includes a more even balance of these domains. In particular, the literature on positive emotion expression in infants is rich with studies of the form and context of positive expressions. Infants can easily be observed in a laboratory playroom in naturalistic play with a parent, where smiling and laughter are key behaviors. Less information is available on older children and adults, although there are some studies of positive emotional expressions in ecologically valid social situations outside the laboratory (e.g., Fernandez-Dols & Ruiz-Belda, 1995; Fernandez-Dols et al., 2011; Kraut & Johnston, 1979). However, few studies of infants, children, or adults ask how a given individual's production and perception of positive emotion are related.

A recent account of the role of mimicry in smiling takes theoretical steps toward bridging the gap between perception and production (Niedenthal et al., 2010). These theorists argue that judgments of the genuineness of smiles vary across individuals and cultures but cannot be explained by differences in morphology. Instead, they proposed a model of smile perception that focuses on the role of embodiment and the viewers' beliefs. Guided by the model, Maringer, Krumhuber, Fischer, and Niedenthal (2011) found that participants whose mimicry was inhibited rated the genuine-looking and fake-looking smiles as equally genuine, whereas participants whose facial movement

was unconstrained differentiated between them. They argued that these results, obtained using synthesized smiles on avatars as stimuli, supported the model. Future research might test whether similar effects occur in judgments of actual human smiles, and consider the role of arousal in mimicry given the recent finding that stronger zygomatic activity is elicited in response to more highly aroused smiles (Fujimura, Sato, & Suzuki, 2010).

Although time course is clearly intrinsic to vocal signals, the dynamics of expression are likely important for all expressive modalities. The need to go beyond static morphological features and consider dynamic characteristics of facial expressions is likely true of gestural and full-body expressions of positive emotion as well. However, much work remains to be done to examine expressions across multiple channels, with only a handful of studies to date considering multimodal communication of positive emotions. Such research should ideally include information on gaze direction and its temporal relationship to other signals, to more fully integrate positive emotional expressions with the social contexts that support them.

A difficult issue in investigating the production of emotional expressions is how to describe the resultant signals. The standard set of descriptors provided by the FACS system has been crucial for our understanding of facial expressions. Standard sets of descriptors for other modalities might dramatically increase comparability across studies. However, characterizing signals such as human vocalizations is enormously complex. Although phonetic transcription can be used to code speech sounds, this system is not suitable for nonverbal vocalizations. All sounds can be measured in terms of spectrotemporal cues, but there is currently no system that provides a way of mapping the physical signal to a set of categories of vocal cues relevant to emotional communication.

Existing perception research is fractionated—studies use different sets of emotions, types of signals, (age) groups, and criteria for a signal to be “recognized,” which makes it difficult to compare across studies. An alternative way to provide consistency across perception studies would be use of a standardized stimulus set, or at least the inclusion of a standard set of positive

emotion descriptors. Based on the research reviewed in this chapter, a tentative suggestion may be that a key set should include happiness, sensual pleasure, relief, amusement, affection, and pride.

Finally, it is worth noting that our review suggests that different emotions may be preferentially expressed via different modalities. In a recent study, participants generated nonverbal displays of 11 emotions, including happiness, pride, love, and sympathy, using face, body, and touch (App, McIntosh, Reed, & Hertenstein, 2011). Participants favored full-body expression for pride, a facial expression for happiness, and touch for love and sympathy. The authors argue that the preferred channel of communication of different emotions is connected to their functions: The full-body expression promotes social-status emotions such as pride, facial expressions supports survival emotions, and touch is utilized for intimate emotions such as love and sympathy. The extent to which these expression–emotion pairings reflect qualitatively distinct psychological categories, as opposed to a broader class of positive emotion varying in arousal, is an exciting topic for continued study.

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