Facial Expression Learning

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Synonyms
Emotional Expression Development

Definition
Facial expression learning. Facial expressions are produced as the muscles of the face contract, creating facial configurations that serve communicative and emotional functions. Facial expression learning involves changes in the coordination of facial muscles such that new configurations and patterns of facial action emerge.

Theoretical Background
Facial expression learning is typically a focus of theories of emotional development. These theories differ in the importance they assign to innate versus environmental factors, and the degree to which they emphasize change in the form of facial expressions with age. Learning theory argues that the development of facial expression proceeds through both imitation and reinforcement. Infants, as young as a couple of hours of age, appear to imitate mouth opening and tongue protrusion. Early imitation would allow infants to produce multiple types of facial expressions that they perceive others performing. Reinforcement increases the rate of a target behavior (e.g., infant smiling) through an environmental contingency (e.g., excited talking) over the course of repeated pairings or trials. Imitation and reinforcement are logically necessary to multiple accounts of facial expression development.

Discrete Emotion Theory (DET) holds that the emotions of surprise, interest, joy, anger, sadness, fear, and disgust each have their own distinct facial expression. After the first months of life, infants are thought to possess the same universal and distinguishable prototypic emotion expressions as adults. These prototypic expressions are produced by affect programs. Affect programs are neurophysiological mechanisms that link subjectively felt emotions to facial expressions in an invariant fashion across the lifespan. Changes in facial expressions are thought to be due to maturation and the influence of societal display rules on underlying expressions.

Cognitive theories of facial expression suggest that newborns begin life with three primary emotion expressions: distress, pleasure, and interest. As cognitive functions grow in complexity across development, these facial expressions become more differentiated in their presentation and more tightly linked to specific contexts. The cognitive concepts that are necessary to develop the basic emotions of surprise, interest, joy, anger, sadness, fear, and disgust develop over the first 6–8 months of life and consist of perceptual and representational abilities. For example, the expression of anger requires the ability to represent a goal and realize that the goal has been blocked.

Functionalist theories of emotion view facial expressions as components of emotion. Emotion, in turn, is conceptualized as attempts or readiness to establish, maintain, or change significant relations between the infant and his or her circumstances (Campos et al. 2004). Facial expressions, then, are part of a communicative system for changing or maintaining these significant relations. An extreme functionalist perspective, stemming from evolutionary-oriented studies of animal behaviors, suggests that facial expressions need not have any intrinsic connection with emotion. Facial expressions may or may not be linked to underlying emotional processes. An infant who produces a cry-face expression to obtain a desired outcome may or may not be experiencing distress. Functionalist theories emphasize a socialization process whereby, for example, infant distress expressions in response to minor mishaps might be minimized over development by caregivers who ignore or discourage such expressions.

Dynamic systems approaches argue that facial expressions are formed by the interface of muscular, emotional, and social constituents. No individual factor is given theoretical precedence in understanding the generation of facial expressions nor is there a categorical distinction...
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between the child and their social surroundings. Both intra- and inter-individual factors interface when facial expressions occur. Each factor can emerge on a different developmental timetable (Messinger and Fogel 2007). Neonates produce Duchenne smiles (which involve raising of the cheeks and constriction of the eyes) spontaneously, before these smiles occur in situations, which might be associated with positive emotion and joy, such as face-to-face interactions with a smiling mother. The dynamic systems approach argues that emergent associations between a facial expression, the social context, and emergent emotional feelings create attractor states. Mutually reinforcing patterns of co-occurrence between these elements yields stable changes in facial expressions.

The internalization model of emotion attempts to account for the miniaturization of facial expressions with age. In this account, external facial expressions initially serve as social communications and are internalized as emotional signals to oneself. During this process, facial expressions in solitary situations become less intense and, eventually, intrapsychic symbolic images are used to regulate behavior (Holodynski and Friedlmeier 2010). Thus, an adolescent may smile to themselves about the outcome of a social situation, representing their positive feelings about what transpired, without actually producing a smile.

Important Scientific Research and Open Questions

Before birth, fetuses possess the full complement of facial muscles used in adult expressions and have the ability to contract those muscles. Nevertheless, infants appear to have a limited repertoire of facial expressions they produce at birth. Newborns without prior taste experience respond to sensory stimuli with specific facial expressions (Rosenstein and Oster 1988). Neonates’ responses to a sweet liquid solution, for example, were characterized by facial relaxation and sucking while responses to sour and bitter solutions were characterized by actions such as brow furrowing and nose wrinkling. With respect to mechanisms of facial expression learning, Meltzoff and Moore (1977) reported neonatal imitation of tongue protrusion and mouth opening facial expressions, although the imitative nature of these expressions is contested. Careful work on the imitation of facial expressions in neonates and older infants could shed light on this powerful mechanism of facial expression development.

Beginning in the second week of life, infants exhibit smiles which have a relatively mature form when they involve the constriction of the muscle around the eye. These smiles occur especially, but not exclusively, during drowsy and sleep states and do not appear to be responses to environmental stimuli. Infant smiles appear initially to be responses to perceptual stimuli such as high pitched sounds. With the development of more cognitively sophisticated recognition of perceptual stimuli, such as the outline of the human face, a preference toward smiling to visual stimuli emerges. Around two months of age, infants transition from brow knitting expressions while engaged gazing at the face of the parent, to smiles. In line with cognitive, dynamic systems, and internalizations models, this real-time transition may herald the developmental emergence of the infant’s first social smiles.

In the course of face-to-face interaction, infant smiles develop increasingly specific associations with the social context. Between one and six months, infant smiles that involve both constriction of the muscles around the eyes and mouth opening become increasingly more likely when the infant is gazing at their smiling mother. Smiling with mouth opening and eye constriction becomes an increasingly frequent component of infants’ apparently joyful engagement with their mothers. Ultimately, young infants appear to express positive emotion along a continuum. This continuum involves linked changes in the strength of the smile action, the strength of the constriction of muscles around the eyes, and the degree of mouth opening. Increases in these intensity indices are likely to be followed by similar increases in the intensity of mother smiling, although complete characterization of how infants and mothers respond to one another’s facial expressions will require continued research.

Around 8 months, infants begin to smile at interesting events and then gaze at an adult while continuing to smile. This pattern, known as anticipatory smiling, suggests that infants are smiling about the shared event. In early childhood, this patterns of gazing and smiling support increasingly complex communicative messages that reference past, present, and future events. Between 3 and 4 years of age, when children are successful in game contexts and when they gaze at a friendly adult or peer, they tend to use stronger smiles and Duchenne smiles, which involve eye constriction. However, a basic understanding of the situations in which children smile in childhood, and the social functions of those smiles with peers and others, is still lacking. One intriguing insight concerns the miniaturization of expressions (Holodynski and Friedlmeier 2010). Children between 6 and 8 years of age exhibit decreases in the intensity of their expressions of joy and disappointment in situations when they are alone. As predicted by the internalization theory of emotion (Holodynski and Friedlmeier 2010), lower levels of expression are required for children to regulate their behavior at older ages.
Through at least the first year of life, the cry-face expression, in which the brows are drawn together and the lip corners retracted, is the prototypical expression of negative emotion. The intensity of negative emotion communicated by cry-faces appears to be linked to the strength of co-occurring eye constriction and mouth opening. These actions, which appear to index the intensity of positive emotion communicated by smiles, may serve as dual-purpose indices of emotional intensity, suggesting a certain economical logic to infant facial expressions. Infant facial expressions of fear and anger appear to be variants of the cry-face and tend to be judged as distress, an undifferentiated negative emotion.

How do facial expressions of discrete negative emotions such as anger, sadness, and disgust develop? There is evidence that between 4 and 12 months, these facial expressions become increasingly associated with situations likely to elicit the corresponding emotions. Although this suggests the early development of inter-situational specificity – linkages between emotion-eliciting social circumstances and associated facial expressions – less than a quarter of infants exhibited these emotion-expression pairings at either 4 or 12 months (Bennett et al. 2005). These results make clear the importance of understanding the degree to which expressions of specific negative emotions co-occur with their expected elicitors in childhood and the need for research on how this development occurs.

A lack of clear associations between emotion-eliciting circumstances and specific facial expressions also characterizes surprise. Only about half of one-year-olds exhibit a surprise facial expression involving raised eyebrows and an open mouth in response to an unexpected event. In this case, however, a dynamic systems account suggests that associations between these facial elements of surprise emerge in particular environmental conditions (Michel et al. 1992) When infants open their mouths, for example, when mouthing toys, they also tend to raise their brows, suggesting that “surprise” expressions may emerge from facial synergies involved in early oral object exploration.

The results highlight the importance of context in attributing emotion to infants on the basis of their facial expressions. They also underscore the role of apparently non-emotional movements of the face in the emergence of what are typically understood as emotional facial expressions.

In summary, careful research on facial expressions in infancy must be paralleled by detailed descriptions of older children in order to understand how links between facial expressions and emotional and communicative contexts develop. A striking example of the need for such work concerns the mouth portion of anger expressions, which in infants involves retracted lip corners and mouth opening. By contrast, anger in older children and adults is thought to involve tightening and pressing together the lips. It is not clear how this change occurs, nor is the developmental fate of the open-mouth anger expression known. Similarly, crying and related expressions decline in childhood, perhaps particularly among boys. However, the mechanisms involved in this decline and other normative developmental changes in facial expression are not yet well understood.

Cross-References
- Emotional Regulation
- Imitation and Social Learning
- Infant Learning and Development
- Learning Human Emotion
- Learning in the Social Context
- Mimicry in Social Interaction: Its Effect on Learning
- Neuropsychology of Emotion
- Social Interactions and Learning
- Socio-Emotional Aspects of Learning

References