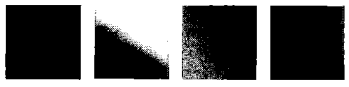
CHAPTER 21



Young Children's Understanding of Others' Emotions

SHERRI C. WIDEN and JAMES A. RUSSELL

As adults, we not only have emotions but we try to understand emotions—in a variety of ways. We have concepts for mood and temperament and for specific categories of emotions (happiness, sadness, anger, hope, envy, etc.). We judge emotions along broad dimensions of valence (feeling good vs. feeling bad) and arousal (feeling low vs. high in energy). For each emotion, we know a script, including its eliciting event, conscious feeling, facial expression, vocalization, action, physiological manifestation, and so on, aligned in a causal and temporal order. We understand that one's emotional reaction to an event depends on how that event is appraised, and that the reaction can be regulated or faked. We use these various concepts to understand and predict emotional reactions and to guide our behavior accordingly.

Adult understanding of others' emotion is preceded by a long developmental path. Our chapter discusses that path from infancy through the preschool years, with a focus on issues of taxonomy. Do children begin with an innate, or at least prepared, set of mental categories for basic emotions? Or do these categories themselves develop out of an earlier, more primitive understanding? More generally, which aspects of this understanding develop earlier and thus are easier to acquire? And what then propels change down this path?

Our perspective in this chapter is unusual, in that we believe that understanding emotion in terms of adult-like discrete categories is a relatively late development—an endpoint of a process of differentiation rather than a starting point. We focus on 2-year-olds, who, we claim, see the emotional world largely in terms of broad dimensions of valence and arousal. We begin, however, by examining relevant research on infants and toddlers, and we provide an interpretation different from that usually offered. We end with a brief survey of development in children 3 years and older, including the formation of discrete emotion categories.

OUR CONCEPTUAL APPROACH

As adults, we place emotions in a hierarchy, a simplified version of which is shown in Figure 21.1. The broadest categories are at a superordinate level. These broad categories are subdivided into more specific ones (at a basic

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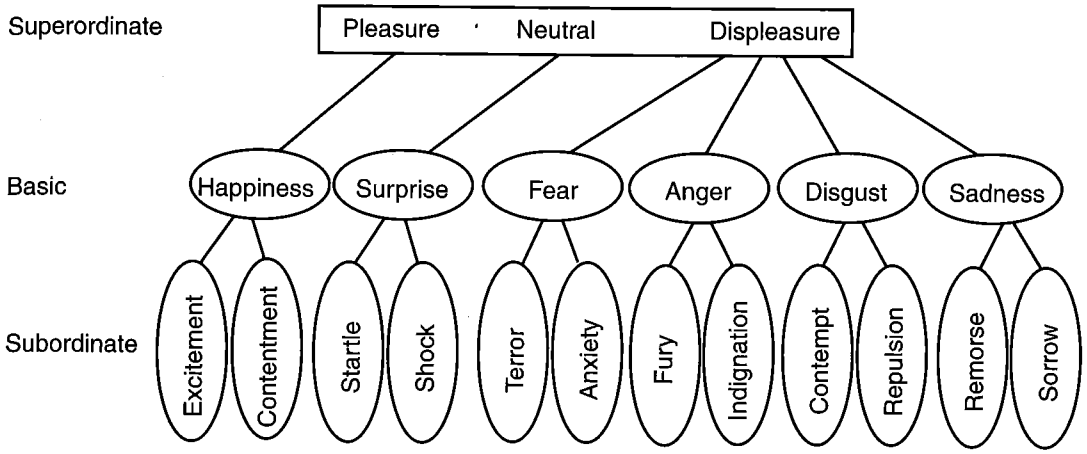

FIGURE 21.1. A hierarchical model of emotion.

level), which are further subdivided into even more specific ones (at a subordinate level). The question is where in this hierarchy children begin. Can they begin anywhere? Or do they begin in the middle (basic level) and only later acquire higher and lower levels? Or do they begin at the top and then differentiate (subdivide) the superordinate categories into ever more specific categories?

The most commonly assumed possibility is a discrete-category account. In this view, children initially understand emotions by means of discrete basic-level categories that can legitimately be labeled "angry," "scared," "sad," and the like. Children later come to understand that those emotions can be grouped together according to valence and arousal, thereby forming the superordinate level. They also subdivide the basic level to form a subordinate level (e.g., fear is subdivided into anxiety, panic, etc.). This basic-level account is consistent with the general idea that young children often start acquiring labels at the basic level of any conceptual hierarchy (e.g., Markman, 1989). For discrete-category accounts of emotion understanding, see Denham (1998), Izard (1994), Pons, Harris, and de Rosnay (2004), Saarni (1999), and Walker-Andrews (1997).

Another possibility, a differentiation account, is consistent with the general notion that cognitive development proceeds through differentiation (e.g., Werner, 1948) and is the basic assumption of our approach. Our specific differentiation account (Widen & Russell, 2003) is supplemented by a circumplex structural model (Bullock & Russell, 1984), according to which the superordinate level of Figure 21.1 is actually more complex: It consists of the two broad dimensions of valence and arousal. The result can be thought of as four broad categories (Figure 21.2), although without sharp boundaries between them: On the pleasant side are pleasure + high arousal (which we might call "excitement" broadly construed) and pleasure + low arousal ("serenity"). On the unpleasant side are displeasure + high arousal ("distress") and displeasure + low arousal ("depression").

We believe that this simple scheme is a child's starting point and captures a 2-year-old's mental taxonomy for emotions. Children then differentiate within these broad categories, eventually arriving at discrete concepts such as anger and fear. Thus the mental categories of

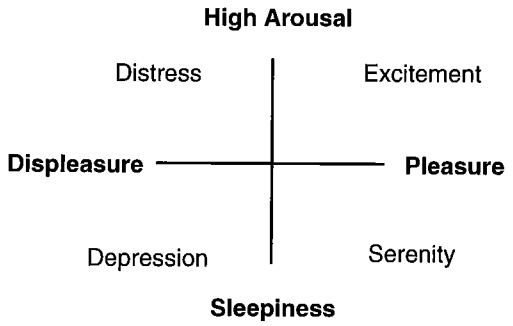

FIGURE 21.2. The circumplex model of emotion. Adapted from Bullock and Russell (1984). Copyright 1984 by the International Society for the Study of Behavioral Development. Adapted by permission of Sage Publications, Ltd.

anger, fear, jealousy, and so on are not preformed, but must be constructed though a process we describe as building a script.

Our topic in this chapter is the nature of children's *understanding* of emotion, rather than the nature of emotion per se or children's production of emotion. Still, we need to refer to emotions, and so, throughout this chapter, we write of emotions as if they could be unequivocally divided into discrete categories. We write of facial expressions as if a certain one conveyed exactly one discrete emotion. And we refer to happiness, surprise, fear, anger, disgust, and sadness as basic-level emotions. We write in this way not because we accept these assumptions, but for convenience, and to show that our developmental account of understanding is largely independent of assumptions about the emotions themselves.

INFANTS AND TODDLERS

Many researchers have claimed to find categorical understanding of emotion in infants and toddlers. In this section, we offer a different, more cautious interpretation of these studies. We rely on distinctions among "detection" (a sensory system is affected by information), "discrimination" (the ability to tell the difference between two stimuli), and "recognition" (the ability to attribute emotional meaning to a stimulus detected and discriminated); see Walker-Andrews (1997). It is recognition that corresponds to understanding.

Young Infants (<10 Months)

A common method used with the youngest infants is habituation: Infants are shown repeated trials of one kind of facial expression (e.g., happiness) until they habituate (i.e., until the time they spend looking at each face drops below a criterion). Then a different kind of facial expression (e.g., anger) is shown. Infants, including neonates, look longer at the new expression, indicating that they detect the change. Although it is tempting to suppose that the infants *recognize* happiness and anger from those expressions, the more justified interpretation is that they discriminate between features or patterns of features (e.g., see Caron, Caron, & Meyers, 1985). Perhaps infants begin by discriminating facial expressions on the basis of single features, such as curvature of the mouth, openness of eyes, or shape of brows, and later discriminate on the basis of combinations of such features. The infants may thus have formed a category of "smile"—but without any corresponding recognition of its meaning or any understanding of happiness or feeling good.

Infants have also been said to *behaviorally* match the emotional display that is presented to them in a way that reveals their recognition of that display. Thus infants (as young as 10 weeks) smile more and show more interest when viewing a positive emotional display and hearing pleasant vocalizations; infants are more agitated and distressed when witnessing an adult frowning or crying (e.g., D'Entremont & Muir, 1999; Kahana-Kalman & Walker-Andrews, 2001). Most such studies have been restricted to a positive–negative coding of infants' responses, and thus, if the infants recognized the adult display, it might well have been in terms of valence. To our knowledge, only one such study coded infants' responses in terms of specific discrete emotions (Haviland & Lelwica, 1987). This study used Izard's (1979) Maximally Discriminative Facial Movement Coding System (MAX), and thus their results are based on the assumption that certain configurations of facial movements can be used to infer one specific, discrete emotion (for a challenge to this assumption, see Camras, 1992). Haviland and Lelwica found that 5-month-olds showed increased happiness and interest when their mothers displayed happiness; that they showed increased anger but decreased interest when their mothers displayed anger; but that they did not show sadness when their mothers displayed sadness. Indeed, the babies rarely showed sadness at all. Thus, although the results of this study give some support to a discrete category interpretation, the support is weak. Furthermore, infants' reactions may not require any *understanding* of the emotion displayed. That is, even if it could be shown that infants react with anger to adult anger displays, the adult displays may simply *elicit* emotional reactions from the infants—reactions not mediated or accompanied by understanding. In addition, in these studies, infants' reactions may also have included a component of imitation.

In *intermodal* matching, infants are simultaneously shown two videos of facial expressions (e.g., happiness and sadness), accompanied by

a single voice that matches the emotion of one of the faces (e.g., Kahana-Kalman & Walker-Andrews, 2001; Soken & Pick, 1999). The measure of interest is whether infants look longer at the face that matches the emotion of the sound track than at the nonmatching face. Two conclusions emerge from this research: First, the youngest infants (from 3.5 to 5 months of age) do not show intermodal matching; instead, they show a preference for a smiling face or for the face on the right, regardless of vocalization. Second, infants about 5–7 months of age can match the voice to the target facial expression when given two emotions of opposite valence—evidence consistent with our dimensional view (e.g., Kahana-Kalman & Walker-Andrews, 2001; Walker-Andrews, 1986).

The key question is how infants respond to emotions of the same valence. To our knowledge, only one study provides such data. Soken and Pick (1999) investigated 7-month-olds' intermodal matching of all possible pairs of happiness, interest (a second positive emotion), anger, and sadness. Overall, there was a matching effect plus a preference for specific faces over others: The order of preference was interest, happiness, anger, and (least preferred) sadness. (In our account, this order translates to positive over negative and high- over low-arousal faces.) For our purposes, the interesting results came from the same-valence trials (happiness vs. interest, sadness vs. anger): Again, infants tended to match (i.e., they looked longer at the face whose emotion matched that of the voice). This finding can be interpreted as recognizing discrete emotion categories, but it could also be interpreted as matching by arousal (the second dimension in our circumplex). An even less generous interpretation is that, within valence, infants matched the level of animation in the face to the level of animation in the vocalization, without any reference to dimensions or categories of emotion.

To summarize, in our interpretation, adult emotional displays influence young infants (< 10 months) (Witherington, Campos, & Hertenstein, 2001). They respond behaviorally and emotionally to emotional actions of others. Vocal stimuli can capture their attention. Vocal, tactile, and visual displays alter their affective state (Owren, Rendall, & Bachorowski, 2003) and regulate their behavior (Campos, Thein, & Owen, 2003). Infants also evidence an early-emerging *perceptual* ability to detect and to discriminate between classes of displays. If they recognize any emotional meaning in others' displays, that meaning is in terms of valence. But neither the infants' perceptions nor their emotional responses need be mediated by any understanding of the emotional meaning of the display. We question whether before about 10 months infants are in any way *recognizing* an emotional message conveyed by a facial or vocal communiqué.

Older Infants and Toddlers (10–24 Months)

By about 10 months, infants build on their perceptual abilities to begin to find emotional meaning in faces and voices. Infants use this information to guide their own behavior and to predict the behavior of another. At this age, infants begin triadic interactions: An infant and caregiver can jointly focus on a third stimulus. Infants use these interactions to aid them in learning which events are rewarding and which are punishing, which to approach and which to avoid. Infants begin to understand the referential nature of a caregiver's signals (Moses, Baldwin, Rosicky, & Tidball, 2001). Older infants and toddlers (10–24 months) adjust their behavior according to adults' emotional displays and thus allow a more convincing demonstration that they find emotional meaning in the events they witness. This adjustment can be seen in the social referencing paradigm.

In the typical social referencing study, an infant is presented with an ambiguous stimulus (e.g., a novel toy, a visual cliff). The infant tends to look to the caregiver for clarification. The caregiver, in turn, has been instructed to display a particular emotion (e.g., happiness or fear). The measure of interest is whether the infant then approaches or avoids the ambiguous stimulus, based on the caregiver's display (e.g., Feinman & Lewis, 1983; Klinnert, Emde, Butterfield, & Campos, 1986). By 10–12 months of age, infants can indeed use another's emotional display to guide their own behavior in this situation (e.g., Sorce, Emde, Campos, & Klinnert, 1985). As age increases, toddlers engage in social referencing more reliably and more quickly (e.g., Walden & Kim, 2005).

In most studies, the caregiver displays either a positive or negative (usually fear or disgust) signal. Thus the reliable finding that infants use

this information is consistent with the idea that infants of this age interpret faces in terms of valence. For present purposes, the key question again is the infants' response to displays of the same valence. To our knowledge, only three social referencing studies have compared infants' responses to displays of more than one negative emotion (Bradshaw, 1986, as cited in Campos et al., 2003; Sorce et al., 1985; Svejda & Campos, 1982, as cited in Campos et al., 2003). Again, in these three studies, infants did respond differently to positive and negative displays. Indeed, from their review of how a caregiver's vocally expressed emotions regulated an infant's reaction to an ambiguous toy, Campos et al. (2003) concluded that "behavior regulation was a function only of the hedonic tone of the signal" (p. 117). None of the three studies found a clear behavioral difference in infants' responses to displays of the same valence, but the study by Sorce et al. (1985) comes closest. Sorce et al. included three negative emotions (fear, anger, sadness) and two positive ones (happiness, interest). The ambiguous stimulus was a visual cliff. The percentages of infants who crossed the visual cliff were 0% after a fear expression, 11% after an anger expression, 33% after a sadness expression, 74% after a happiness expression, and 73% after an interest expression. The large difference between negative and positive displays is again consistent with our dimensional perspective. The much smaller differences within the negative conditions provide limited support for a discrete-categories interpretation. Our alternative explanation for these within-valence differences is that sadness is a lower-arousal emotion than either anger or fear. Thus the sadness displays might have simply produced less of a response in infants. Recall that infants fail to respond to sadness faces in intermodal matching studies.

On one interpretation, social referencing studies suggest that toddlers find some meaning in adult displays. Because it is limited to a behavioral approach–avoidance measure, social referencing research cannot provide unequivocal evidence on just what the child understands. An alternative interpretation is that the adult facial display elicits a particular state in the infants (e.g., comfort or upset), which in turn influences their willingness to cross the visual cliff. If so, no understanding of emotion would be necessary in the social referencing situation.

The social referencing paradigm has been expanded to show that infants grasp the link between adult emotional displays and the object of that display (e.g., Moses et al., 2001; Mumme & Fernald, 2003). In these studies, infants witnessed an adult emotional display directed toward one of two objects but not the other. Both 12- and 18-month-olds were more likely to play with an object toward which the adult showed happiness and less likely to play with an object toward which the adult showed a negative emotion. None of these studies compared infants' reactions to different negative emotions. Thus these studies are again consistent with a valence interpretation and leave open the question of discrete emotion categories.

With another twist, the social referencing paradigm was used to examine children's understanding of the connection between an emotional display and the displayer's intentions or desires. In these referential understanding studies, infants (9–18 months of age) looked longer when a person's emotional display (e.g., sadness, happiness) did not predict their behavior (Barna & Legerstee, 2005; Phillips, Wellman, & Spelke, 2002). By 18 months, toddlers understood that someone could want more of a food that the children found undesirable (raw broccoli), based on emotional displays of pleasure and disgust (Repacholi & Gopnik, 1997). Thus in the second year of life, an infant is forging connections between others' emotional displays and their desires. But each of these studies again compared only happiness and one negative emotion—providing, in our interpretation, further support for the valence interpretation, but remaining silent on infants' and toddlers' understanding of discrete, basic-level emotions.

To summarize, it is plausible to suppose that older infants and toddlers (10–24 months) find meaning in emotional displays, but the question is the precise nature of that meaning. Of course, alternative interpretations are possible, and the studies reviewed here may not be capable of revealing an infant's full understanding of emotion. Still, it is interesting that in a literature with a fair number of studies conducted by researchers coming from a categorical perspective, there are no reports of infant behavior for which the only explanation would be couched in terms of their understanding discrete categories of emotions. The same data are consistent with a dimensional account.

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TWO-YEAR-OLDS

Characterizing the emotion knowledge of 2-year-olds is key to capturing the developmental sequence of emotion understanding. Two-year-olds are beginning to talk, and we begin there.

Children typically begin using emotion labels at 18–20 months of age, but their use of these labels is infrequent (e.g., Bretherton, Fritz, Zahn-Waxler, & Ridgeway, 1986; Dunn, Bretherton, & Munn, 1987). Moreover, according to parental report, most children before their second birthday have only one emotion-related word in their vocabulary: "good" (Ridgeway, Waters, & Kuczaj, 1985). Between 24 and 36 months, children add "happy," "sad," "angry," and "scared" (Ridgeway et al., 1985). This, more generally, is a time when children describe others as the subjects of subjective experiences, such as feeling "sleepy," "tired," "hot," and "cold" (Huttenlocher & Smiley, 1990). Children also possess a lexical class of "feeling": When asked, "How does this person *feel*?" and shown facial expressions of emotions, 2-year-olds provided a feeling word on 70.2% of 336 trials; more telling, 92.8% of 153 "errors" (those trials on which they provided a nontarget verbal response, other than "I don't know") were feeling words, including "tired," "bored," and other nonemotion words (Widen & Russell, 2007).

Longitudinal data on five children between their second and fifth birthdays provided by the Child Language Data Exchange System (CHILDES) allowed Wellman, Harris, Banerjee, and Sinclair (1995) to trace the development of emotion vocabularies in spontaneous speech and to infer some of the assumptions the children were making when they used emotion terms. Two-year-olds used not just "feel good" ("okay," "better") and "happy," but also "love" for positive feelings. They used "fear," "anger," and "sadness" for negative feelings. They understood that emotions are distinct from the causes eliciting them and from the behaviors and expressions resulting from them. These children did not simply use their emotion words to label their own reactions, but attributed emotions to other people, as well as to dolls and imaginary friends. They spoke of past and future emotions, not just present ones. The ways they spoke of emotions presupposed that emotions have "intentional objects" (things the emotions are about) and distinguished the objects of the emotions from their causes. In short, the CHILDES data showed that 2-year-olds evidenced a mentalistic conception of emotion.

What of their implicit emotion taxonomy? On the basis of evidence from spontaneous speech, Dunn et al. (1987) concluded that 2-year-olds could "distinguish and discuss" (p. 139) a variety of emotions. This conclusion is warranted to some degree, but the difficulty with studies of spontaneous speech is that we rarely know precisely what children mean by the emotion labels they use. When a child uses, say, "angry," the child has not been shown to mean the discrete emotion category of anger. We need experimental tasks that test this assumption.

Unfortunately, 2-year-olds are rarely included in experimental studies, and even when they are included, they produce so many "errors" that their results have been thought difficult to interpret. Traditionally, their responses are scored "correct" or "incorrect." When their "correct" responses are greater than expected by chance, this result too has been assimilated into the prevailing presumption that they understand the emotional world in terms of discrete emotions, albeit with many errors. When this assumption is examined in 2-year-olds, however, a very different conclusion emerges. When these children do not respond "correctly," they are not always silent. A closer look at 2-year-olds' responses, especially their "incorrect" ones, supports three complementary conclusions.

First, children add emotion words to their vocabulary in a systematic fashion. In a study in which children were asked to label the emotion conveyed by prototypical facial expressions of each of six basic-level emotions, children varied in the number of emotion labels they used (Widen & Russell, 2003). Some used none. Of those who used one label (regardless of age), that label was most likely to be "happy." Of those who used two, some used "happy" and "angry"; the others used "happy" and "sad." Children then added the other, either "angry" or "sad," as the third, but, on average, 10 months elapsed before the third label was added. The same pattern of results was found when children were told stories of prototypical emotional events and asked to label the emotion of the protagonist (Nelson, Widen, & Russell, 2006).

Second, when these children use the labels "sad" and "angry," they do not mean what

adults mean. For example, in the free-labeling task just described, children use their few labels for all or most of the emotional stimuli presented, not just for the ones adults would label as happiness, sadness, or anger. The same conclusion is illustrated by a categorization task (Russell & Widen, 2002a). The category was presented as a box into which only people who felt a target emotion could go. The children were then shown, one at a time, photographs of various persons, each with a prototypical facial expression of an emotion, and asked whether each person should go into the box or be left out. The verbal demands were low, and children understood the task. But they did not show a discrete adult-like category of anger. Rather, for a 2-year-old, "angry" was much broader; they were as likely to include sad, fearful, and disgusted faces as angry ones (Figure 21.3). Similarly, shown an array of prototypical facial expressions and asked to find all the angry persons, 2-year-olds rarely selected positive faces, but did select the full range of negative ones, with about equal probability (Bullock & Russell, 1984; Denham & Couchoud, 1990).

The third conclusion from these studies is that 2-year-olds understand emotional stimuli mainly in terms of the broad dimensions of pleasure (valence) and arousal. In the studies described above, the breadth of the children's categories must be understood in terms of valence. In Figure 21.3, for example, the "anger" category is extended to include all and only faces of negative valence. Other studies lead to the same conclusion. In a forced-choice study, each face was paired with each of eight other faces on different trials (Bullock & Russell, 1985). Two-year-olds' performance was above chance levels for "happy," "excited," "surprised," "scared, "mad," "disgusted," "sad," and "calm" (but not for "sleepy"). At first glance, this result seems to support a basic-level-categories approach: 2-year-olds could select the facial expression that matched the label for eight of nine emotion categories with above-chance accuracy. However, analyses of all their responses (both "correct" and "incorrect") suggests that the broad dimensions of valence and arousal may provide the better interpretation. Two-year-olds' performance was higher when the similarity of the pair of faces according to the circumplex model decreased. Similarity in the circumplex, in turn, can be interpreted in terms of similarity along the dimensions of valence and arousal. When the 2-year-olds were labeling facial expressions, their "incorrect" responses were more likely to be labels of the same valence than ones of the opposite valence in both free-labeling studies and forced-choice studies (Denham & Couchoud, 1990; Widen & Russell, 2003, Study 2; Nelson et al., 2006; Bullock & Russell, 1985).

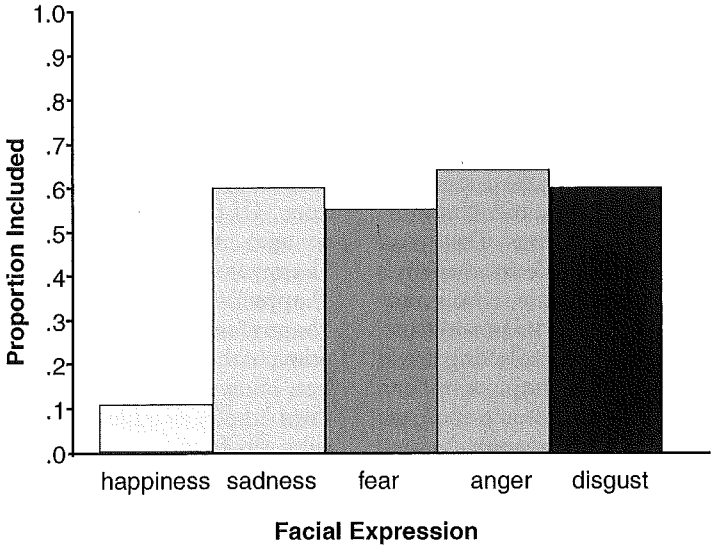

FIGURE 21.3. Faces that 2-year-olds included in the angry box.

The studies reviewed so far have relied on children's production or comprehension of emotion *words*. The fourth conclusion is that this evidence captures their underlying conceptual structure and not simply something of their word use. Recall the categorization task. An interesting feature of that study was that the anger box had been defined in two ways (Russell & Widen, 2002a): For half of the children the experimenter used the word "angry," and for the other half the experimenter used two photographs of prototypical anger facial expressions ("feel like this" [pointing]). Both ways of defining the angry box produced similar results—2-year-olds included the majority of all negative expressions in this box—even though, in the latter condition, the problem could have been solved for a discrete anger category simply by perceptual matching.

Bullock and Russell (1984; Russell & Bullock, 1986b) used yet another method that did not rely on emotion words: multidimensional scaling of judged similarity between facial expressions. Although the stimuli were facial expressions thought to convey basic discrete emotions, multidimensional scaling showed that 2-year-olds judge similarity on the basis of two broad dimensions—valence and arousal.

Two-year-olds are also learning about the causes and consequences of emotions. Wellman and Woolley (1990), in their research on understanding of desires, convincingly demonstrated that 2-year-olds can associate happiness with desired outcomes and sadness with undesired outcomes. In a study of slightly older children (as young as 3 years), Stein and Levine (1989) found that children could select a positive face for a positive outcome (e.g., receiving a toy) and a negative face for a negative outcome (e.g., losing a puppy); these same children did not, however, distinguish within negative outcomes. That is, they were as likely to select a sad as an angry face for outcomes that adults judged to elicit sadness, and the same for outcomes adults judged to elicit anger. Similarly, Trabasso, Stein, and Johnson (1981) found that 3- and 4-year-olds labeled events that frustrated their goals as both "sad" and "angry," and only older children distinguished the two. Other studies (e.g., Borke, 1971; Denham & Couchoud, 1990) have obtained similar results, again with children older than 2. We believe that 2-year-olds would show similar results, but the two studies we know of that actually tested 2-year-olds yielded mixed results (Denham & Couchoud, 1990; Widen & Russell, 2006)—presumably because tasks that are manageable for 3-year-olds might not be so for 2-year-olds.

Summary of the Research

Two-year-olds are surprisingly sophisticated in their mentalistic conception of emotion as a state separate from its causes and behavioral consequences. On the other hand, they are surprisingly limited taxonomically to the broad dimensions of valence and arousal. Children later move toward more specific discrete categories of emotion, but slowly and with difficulty (for more on this, see below). We found little evidence that children younger than 3 years understand anger, fear, and other discrete categories of emotion as such. When they use the words "scared," "angry," and so on, they seem to have in mind not discrete emotions but very broad categories of emotion, perhaps initially simply happy and unhappy ones. The evidence on 2-year-olds reinforces our cautious interpretation of evidence on those younger than 2 years.

This perspective is also consistent with the finding from the theory-of-mind perspective that 2-year-olds, lacking a full notion of belief, are limited to desire and perception (Wellman & Woolley, 1990). They attribute desires to others, and understand that fulfillment of desire leads to positive emotion, whereas unfulfilled desire leads to negative emotion. Furthermore, 2-year-olds understand desires as mental states, attributing different desires to different individuals. They therefore judge that "Bill who wants a bunny and finds one will be happy whereas Mary who wants a kitty and finds a bunny—the exact same bunny that Bill found—will be sad" (Wellman, 1995, p. 302). Two-year-olds also understand that others can perceive or fail to perceive an event (the bunny), but these children fail to understand that others can have different beliefs. To the extent that specific discrete emotions presuppose certain beliefs (Ortony, Clore, & Collins, 1987), the theory-of-mind research thus reinforces our doubts about how much 2-year-olds can understand about specific discrete emotions. That is, 2-year-olds routinely fail false-belief tasks, suggesting that they would fail to appreciate that a dog they know to be harmless could elicit fear in someone who believes it dangerous.

PRESCHOOLERS

In this section, we consider children 3 to 5 years of age, and build on the premise that 2-year-olds understand others' emotions in terms of the broad dimensions of pleasure and arousal—an understanding that complements their perception-and-desire theory of the minds of others. During their fourth year, children begin to evidence fuller understanding of beliefs (Wellman, 1995); this advance complements and perhaps underlies their fuller understanding of emotion concepts they already have in elementary form and their division of emotion into ever finer discrete categories. We present five hypotheses, which together constitute what we call the "differentiation model" of emotion understanding (Widen & Russell, 2003).

First Hypothesis

Valence and arousal dimensions continue to be important. When preschoolers make "errors," or when they judge similarity among emotions, they continue to show the influence of pleasure and arousal (Bullock & Russell, 1984, 1985; Widen & Russell, 2003). In all, seven studies to date have analyzed preschoolers' "incorrect" emotion responses on labeling faces (Bullock & Russell, 1984, 1985; Denham & Couchoud, 1990; Widen & Russell, 2002; 2003, Study 2, Study 3; 2004). At every age, valence continued to dominate children's "errors." Similar results occurred in two studies that specified the target emotion with stories rather than faces (Denham & Couchoud, 1990; Widen & Russell, 2004). Before children know other features of shame, gratitude, pride, and jealousy, they know their valence (Russell & Paris, 1994). Valence can be seen in even older children and adults (Bullock & Russell, 1984; Coren & Russell, 1992; Russell & Bullock, 1986a, 1986b; Russell & Fehr, 1994) and in a variety of cultures with a variety of languages (e.g., Russell, Lewicka, & Niit, 1989). Evidence for valence is ubiquitous.

Second Hypothesis

Children use different emotion labels with different frequencies. In spontaneous speech, children use some emotion labels more frequently than others. But the children may simply be experiencing or witnessing some emotions more frequently than others. However, in a study in which an equal number of emotions (represented as facial expressions) were presented (Widen & Russell, 2003, Study 3), the same differential frequency was found. Labels were used in the following rank order, starting with the most frequent: "happy," "sad," "angry," "scared," "surprised," and "disgusted." Differential frequency of label use for faces had been reported before (e.g., Gosselin & Simard, 1999; Izard, 1994), and the pattern was interpreted in one of two ways: (1) Some facial expressions (i.e., happiness, sadness, anger) are easier to recognize than others, or (2) some children lack some words in their vocabulary. We showed that the same order of use occurred for both "correct" and "incorrect" uses; differential use of labels was therefore not a result of the faces per se, but rather of children's interpretation of those faces. Furthermore, all children in the study had been shown in a prior task to have all six labels in their vocabulary. We thus interpret differential use of emotion labels as reflecting differences in accessibility of the emotion concepts, which in turn are correlated with the order in which the categories are acquired, as detailed in the next hypothesis.

Third Hypothesis

Emotion categories enter a child's taxonomy in a systematic order. As we have mentioned earlier, when children (2–5 years of age) were sorted, irrespective of age, by the number of different emotion category labels they used for facial expressions (or, in a separate study, emotion stories), labels were found to emerge in a systematic order (Figure 21.4) (Nelson et al., 2006; Widen & Russell, 2003). Earlier, we have described the steps up to three labels—"happy," "angry," and "sad." The next step allows two paths: Some children added "surprised," and some "scared." For five labels, the two paths merged. In the last step, "disgusted" was added. Age increased with the number of labels used, from a mean age of 30 months for those children producing no labels to 62 months for those producing five labels. Over 81% of the children (vs. the 23% expected by chance) fit the pattern of Figure 21.4. We have since replicated this result three times, and each time the proportion of children who fit the predicted pattern has been high: 78% (Widen & Russell, 2007), 86% (Widen & Russell, in press), and 91% (Nelson et al., 2006). Furthermore, children's po
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more, children's position in the scheme of Figure 21.4 predicts their categorization of emotional stimuli in separate tasks (Widen & Russell, 2007, in press), even when age is controlled for.

In many studies, children have been asked to associate emotions with emotion labels. The ubiquitous conclusion, starting with Gates (1923), is that the proportion of correct associations increases with age. A second conclusion has been that the proportion correct varies with emotion. This latter finding provides an indirect test of our scheme in Figure 21.4. Earlier-emerging categories should be more practiced and accessible; if so, then we can expect that children will be more often correct with the earlier-emerging categories. In a review of 19 studies (Widen, 2005), preschoolers' performance was highest on happiness, sadness, and anger, followed by fear, disgust, and surprise, although the order within these two sets varied with task. This overall pattern held for three response formats, whether emotions were represented by facial expressions or stories, and whether emotion labels were the independent or dependent variable. Thus our developmental sequence shown in Figure 21.4 is probably not limited to the experimental context in which it was discovered (free labeling of faces and stories).

Of course, there are far more emotions than the six shown in Figure 21.4. The evidence suggests that additional emotion concepts enter the developmental picture after Labeling Level 5. For example, given stories about emotions, preschoolers were able to label our first five emotions (happiness, sadness, anger, fear, and surprise) earlier than shame, contempt, or love (e.g., Wintre & Vallance, 1994; cf. Brody & Harrison, 1987). Similarly, they are able to describe the causes for our first five emotions earlier than those for shame, gratitude, pride, or jealousy (Harris, Olthof, Meerum Terwogt, & Hardman, 1987; Russell & Paris, 1994).

Fourth Hypothesis

Categories begin broad, but then narrow. As is evident from Figure 21.4, emotion categories begin broad. During one period in the life of many 2-year-olds, the category labeled "angry" includes all negative emotions. With time, and as new categories emerge, this broad "anger" category gradually narrows. Children continue to use "angry" for the anger face, but are less likely to use it for sadness and fear faces on the labeling task (Widen & Russell, 2003) and on the box (categorization) task (Russell & Widen, 2002a). Narrowing has also been found when children were presented with an

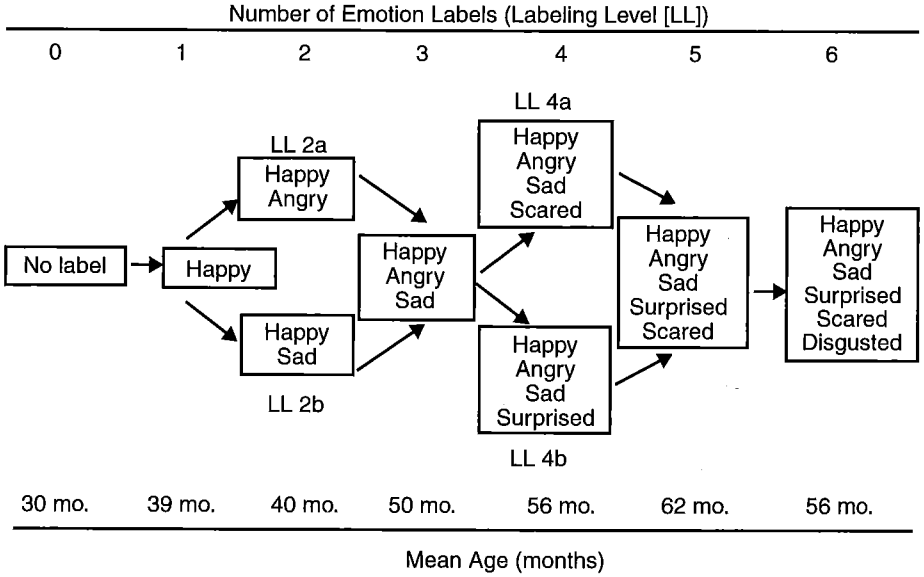

FIGURE 21.4. Systematic emergence of emotion labels. LL, Labeling Level. Adapted from Widen and Russell (2003). Copyright 2003 by the American Psychological Association. Adapted by permission.

array of facial expressions and asked to find all who displayed a particular emotion (Bullock & Russell, 1984, 1985; Bormann-Kischkel, Hildebrand-Pascher, & Stegbauer, 1990).

In our interpretation, narrowing begins when preschoolers begin to use the arousal dimension to distinguish between negative emotions. This process can be seen, for example, when preschoolers begin to exclude nontarget facial expressions from the anger box (Russell & Widen, 2002a). Thus, for the anger box, the order in which faces are excluded is predictable on the basis of arousal: Children first exclude sad faces, which are the most dissimilar to anger faces on arousal. They next exclude fearful faces and finally disgusted faces, although most 5-year-olds still include the disgusted face (narrowing is gradual and incomplete even at the end of the preschool years).

Later-emerging emotion categories also narrow with age. We had thought, based on children's free-labeling responses, that fear, surprise, and disgust began narrower (Widen & Russell, 2003), but a later categorization study showed that they begin just as broad as do happiness, anger, and sadness (Widen & Russell, 2007). Pride, jealousy, and so on similarly begin as broad concepts defined by nothing except valence, but then narrow as they take on more adult meaning (Russell & Paris, 1994). In these cases, narrowing is unlikely to be based on arousal but on other factors, as detailed next.

Fifth Hypothesis

Children form a script for each emotion category. As adults, we know that each emotion is a sequence of subevents. In fear, prototypically, a danger occurs; the person orients to it, freezes or flees, and feels unhappy; physiological arousal increases; face and voice change. The concept of fear is thus a script in which subevents unfold in a temporal and causal order. The script for sadness may include a loss, resulting in feeling bad, pouting or crying, whining, withdrawal, tears, and slow or suppressed movement. Children must acquire these scripts and their labels. In the studies described so far, it is not clear just how much of each script a child knows. For example, associating the word "scared" with a type of facial expression need not imply that the child knows other subevents of the fear script. Our fourth hypothesis suggests that scripts begin with few components (which explains their initial breadth), but then acquire new components (and hence narrow).

How is a script built? Which parts enter the script earlier and which later? Answers to such questions can hint at the process of building a script. For example, some theorists have assumed that facial expressions are the bases for constructing scripts (e.g., Harris, 1989; Izard, 1994). If so, then a reasonable hypothesis would be that witnessing different facial expressions would compel the child to differentiate a currently broad script. According to this hypothesis, a child at Figure 21.4's Labeling Level 2a (who labels all negative emotions as "angry") would soon notice that some negative facial expressions involve downcast eyes, downturned mouth, and tears (or perhaps, more generally, facial signs of low arousal), whereas other faces involve knitted brows, staring eyes, bared teeth, and clenched jaw (or, more generally, facial signs of high arousal). As a consequence, the child would then divide the initially broad category into two separate categories and then become receptive to different labels ("sad," "angry") for this second category of negative emotions (although at this level both of these categories remain broader than the adult version).

Studies of children's scripts for emotions must present a child with one part of a script (mode of presentation) and ask the child for another part (mode of response). This face-early hypothesis can then be tested by including facial expressions in one mode or the other. For example, Camras and Allison (1985) told children (preschoolers to second graders) very brief stories about a girl (e.g., "Her mother has died"). Children were asked to identify the girl's emotion, using one of two response modes: an array of labels ("happy," "angry," "sad") or an array of corresponding faces (smiling, frowning, or crying). Much to everyone's surprise, children did better overall given the label response format than given the face response format. Ten studies have now compared facial expressions to at least one other mode: (1) emotion labels (Camras & Allison, 1985; Russell, 1990; Russell & Widen, 2002a, 2002b); (2) emotion stories describing the causes and/or consequences (Markham & Adams, 1992; Nelson et al., 2006; Widen & Russell, 2002, 2006); or (3) tone of voice (Stifter & Fox, 1987). All but one study (Stifter & Fox, 1987) found a difference between modes, but

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none found that facial expressions were the stronger cues to emotion. This face inferiority effect was particularly strong for fear. The inferiority of faces was robust whether mode was the independent or dependent variable, and whether children were asked to categorize, choose from an array, label, or describe the cause or consequence of the emotion.

Instead of faces as *the* bases of emotion scripts, there is emerging evidence that no one cue type is the strongest at all ages or for all emotions. We (Widen & Russell, 2004) asked children (3 or 4 years old) to describe the causes of six different emotions, specified by facial expressions, labels, or brief stories describing behavioral consequences. Again, faces were not the strongest cues for any emotion or for either age group. Behavioral consequences were the strongest cues for 3-year-olds, especially for anger. Emotion labels were the strongest cues for 4-year-olds, especially for fear and disgust. It remains possible that facial expressions are stronger cues for even younger children and for the earliest-emerging broad emotion categories (e.g., feeling good, feeling bad), however a child may label them.

Further evidence that faces are relatively weak cues to emotion is that, even given prototypical facial expressions of emotion, children take into account the apparent sex of the person whose emotion they are categorizing. We (Widen & Russell, 2002) asked children to label someone's emotion on the basis of either a prototypical facial expression or a brief stereotypical story. The "boy's" and the "girl's" faces and expressions were actually identical, but the faces were made to appear "male" and "female" by adding gender-appropriate hairstyles. The boy's and girl's stories for each emotion were also identical except for names and pronouns. Even given these clear cues to emotion, the perceived sex of the protagonist influenced children's emotion attributions. (This evidence also implies that scripts contain gender stereotypes and are thus not equivalent to scientific accounts of each emotion.)

Insufficient evidence is available to provide a clear account of how the scripts are acquired. Perhaps the scripts for happiness and sadness begin by linking facial expressions (smiling vs. crying) to feeling good versus bad, which then soon become linked to their causes (meeting vs. not meeting desires). For anger, the script may begin instead by linking hostile behavior to feeling bad. For fear and disgust, the script may begin with a child's hearing the labels "scared" and "disgusted," which prompts him or her to search for causes that differentiate these emotions from sadness and anger. In each case, once the first link is formed, the child can then add more components. Because different cues initiate the process for different emotions, different cues are more powerful in eliciting the concepts for different emotions. Because concepts for different emotions are acquired at different ages, different cues are more powerful at different ages.

Harris (2000) rightly objected to the notion of scripts as we have so far characterized them on the standard grounds offered for appraisal theories of emotion: The emotion that occurs depends not so much on the reality of the precipitating event as on how the precipitating event is appraised. An approaching dog elicits joy in the person who appraises the dog as playful, but elicits fear in the person who appraises it as dangerous. Understanding how emotions depend on appraisals is one of the tasks for the child developing an understanding of emotion. Although they are not physical events, appraisals can be considered as subevents of the emotion process and hence as elements in the script.

Appreciating the role of appraisals presupposes an understanding that different people can have different appraisals. A person's appraisal of an event is a belief about that event. Several sources of evidence hint at the dependence of emotion understanding on belief understanding. Of course, the two are correlated, but the dependency may go in one direction. First, belief understanding does not seem to depend on emotion understanding, as shown by evidence from children with developmental disorders (e.g., conduct disorder, autism) who can understand belief but not emotion (e.g., Blair, 2002). Second, there is clear evidence that children understand false beliefs before they can make the corresponding belief-based emotion attributions (e.g., Harris, Johnson, Hutton, Andrews, & Cooke, 1989; de Rosnay, Pons, Harris, & Morrell, 2004). For example, Bradmetz and Schneider (1999) demonstrated that children understood that when she first arrived, Little Red Riding Hood believed that the wolf was her grandmother. Nonetheless, these same children said that Little Red Riding Hood felt *afraid* rather than happy to see her grandmother. Thus they had mastered the false-belief task, but could not then attribute happiness to

Little Red Riding Hood at seeing her grandmother when they knew that it was in fact the wolf. Third, Rieffe, Meerum Terwogt, and Cowan (2005) asked children as young as 4 years to explain various emotional episodes. For happiness, anger, and sadness, children spontaneously referred to desires but not beliefs. In contrast, in explaining fear, they referred to beliefs. This evidence suggests that the three earliest concepts remain tied for a time to the desire psychology of their origin. In addition, many later, so-called "social" or "self-conscious" emotions are largely defined by beliefs about the eliciting situation. Regret, for instance, has no uniquely identifying facial, vocal, physiological, or behavioral action pattern associated with it, but centrally involves feeling bad based on the belief that a prior decision or event did not turn out well.

Of course, children's understanding of emotion continues to develop beyond what we have described so far. Pons et al. (2004) identified nine different components of children's understanding of emotion. In addition to the components we have already discussed here, children come to understand (1) how reminders of an event can reactivate an emotion, (2) how emotions can be controlled, (3) that there can be a discrepancy between outer appearance of emotion and inner experience, (4) that mixed emotions can exist, and (5) that emotions depend on the morality of the precipitating event.

CONCLUSION

One particularly interesting perspective on conceptual development in general is called "theory theory" (e.g., Gopnik & Wellman, 1994). From this perspective, a child's understanding of emotion is a theory; changes in understanding are changes in the theory. A child's initial theories are powerful, are often biologically given, and aid learning, but they are relatively simple and cannot explain all the evidence the child encounters. As children encounter unexplained events and even counter-evidence, auxiliary hypotheses may be added to the original theory, without seriously altering it. But eventually, as in science, the old theory proves to be inadequate and a new theory is developed.

For emotion understanding, we propose that children's earliest theory includes the concepts of valence and arousal. As shown in Figure 21.2, these two dimensions can also be thought of as four broad categories: pleasure/high arousal, pleasure/low arousal, displeasure/high arousal, and displeasure/low arousal. Although simple, this theory allows a child to place the emotions of others in these broad categories and thus to anticipate the affective quality of their subsequent behavior, to acquire knowledge of the positive and negative quality of current events (such as a visual cliff), and to gain knowledge of the others' desires. Evidence indicates that this dimensional theory dominates the child's thinking about emotion for the second and most of the third years of life.

Emotion researchers have long debated whether emotions are understood in terms of dimensions or categories. When that debate is rephrased as a developmental question, the two sides of the debate can be reconciled. How does a child's initial broad dimensional understanding turn into the adult division of emotion into more discrete categories? Or, phrased in terms of the four broad categories, how are the broad categories differentiated into more specific ones? How are new categories acquired? And what propels these changes?

To answer the question of change, the theory theory points to the evidence facing the child. The four-category system does not allow sufficiently precise accounts of this evidence, and so the theory must be changed. The kind of evidence faced is what is eventually incorporated into emotion scripts: different kinds of emotion-eliciting situations, different overt behavior, different expressive behavior, and different labels used by the language community. This new theory still has valence and arousal as its bases, but can better accommodate the new evidence.

Another force on the child's developing theory of emotion is the development of other perceptual and cognitive abilities. Infants must acquire perceptual categories of facial actions before being able to attach emotional significance to those categories. Older children must develop a theory of mind. The concept of desire is needed for a child to understand why the same event can bring positive feelings to one but negative feelings to another. The concept of belief is needed to understand that different people can appraise the same situation differently and thus emotionally respond differently.

Gopnik and Wellman (1994) contrasted the theory theory with two other broad perspectives on conceptual development, both of

which could incorporate emotion understanding. According to the notion of innate modules, the prototype of which is a Chomskian account of language, more of emotion understanding would be universal and innate. If the categories for the basic emotions and their links to specific expressions are so viewed, then this perspective is similar to the usually encountered standard account of emotion understanding. In contrast, according to the simulation account (Harris, 1992), emotion understanding begins not with witnessing the emotions of others, but with experiencing them oneself. Presumably, the discrete categories of emotion experience are biologically given. In trying to anticipate the emotions of others, one does not rely on a conceptual theory or an innate module, but can simulate the experience in oneself. The contrast between the theory theory and the simulation theory points to the importance of studying personal experiences of emotion and their role in understanding others.

ACKNOWLEDGMENTS

We thank Lisa Feldman Barrett, Paul L. Harris, Mathew J. Hertenstein, Nicole L. Nelson, and Carolyn Saarni for their help and comments.

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