

## 8 Concepts of emotion in developmental psychology

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The concepts of anger, fear, happiness, sadness, and the like are not technical concepts. They are everyday folk concepts regularly employed by everyone. Nevertheless, they play two important roles in the psychology of emotion.

One role of an emotion concept is that of a phenomenon to be investigated. The psychologist is interested in the nature of the concepts underlying the use of such everyday words as *angry*, *afraid*, *happy*, and *sad*. For example, a child might say of someone that "he looks sad today." To understand the child's concept of sad, a psychologist might ask the child to make a facial expression that is sad, to tell a sad story, or to pick out the sad person in a photograph. The psychologist's job in examples such as this is to understand the processes involved in the development and use of the concepts children employ in their everyday affairs.

The second role of an emotion concept is that of a scientific construct in theories about behaviors and states. Everyday emotion concepts provide scientists with a ready-made descriptive taxonomy for emotional states, a convenient means of parsing an aspect of psychological reality. Izard (1977), for example, believes that there is a distinct class of psychological events, called emotions, and that there are a small number of basic emotions, which he describes by words that would have been familiar to Chaucer: fear, anger, disgust, and the like. Tomkins (1962-3) and Ekman (1972) similarly place a list of everyday emotion concepts at the core of their theories of emotion. In designing studies on emotion, psychologists employ everyday concepts in framing their hypotheses. As a consequence, emotion concepts play a role in the assumptions made, the questions asked, and the answers offered.

Which of these two roles the psychologist has in mind should determine the

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use and measurement of an emotion concept. In this chapter, we discuss emotion concepts in each of these roles in developmental psychology. We begin by discussing the nature of concepts of emotion as they exist in everyday vocabulary. This discussion draws on current cognitive and psycholinguistic research with adult speakers in an attempt to advance a set of hypotheses that will guide our later discussion. We then turn to the nature of the child's concepts of emotion. Needless to say, it would be foolish to assume that what a child understands by a term such as *anger* is just what an adult understands. We explore how our hypotheses on the nature of emotion concepts in general can help us understand how children acquire and use emotion concepts. We argue that, indeed, what a preschool child means by *fear* or *anger* is systematically different from what an adult would mean, and we offer some ideas on the development of emotion concepts. Finally, we turn to the second role of emotion concepts, their use in the psychological study of children's actual emotion states. Whereas our concern with concepts in the first sections is *descriptive*, the concern in the last section is *prescriptive*: We are principally concerned with how psychologists use everyday concepts as theoretical constructs in the study of children's emotional states as they unfold developmentally. Our theme is that this use is heuristic but problematic.

### The nature of adults' concepts of emotion

As speakers of English, we all know what such words as *emotion*, *anger*, *fear*, *happiness*, and *sadness* mean – that is, until asked to give a definition. Then, it seems, no one is sure. Problems of definition are routinely discussed by writers on emotion and have sometimes been blamed for much of the confusion and wrangling in the writings of emotion theorists. The problem may lie not in the events referred to by these words but in an inappropriate notion of how natural concepts can be defined. For many years, natural language concepts about everyday events were not distinguished from logically defined concepts, or “proper sets.” Although rarely stated, it was probably assumed that such everyday concepts as vehicle, furniture, fear, and emotion could be defined in the same way that proper sets are: by one or more individually necessary and jointly sufficient features. This classical view of concepts has appealed to most scholars, at least as far back as Aristotle. And, of course, some concepts can be defined in this way: Dollar bill, even number, corporation, and triangle can be given precise definitions and can therefore be thought of as proper sets. But, as various writers now argue, many everyday concepts cannot be so defined.

Skepticism over the classical view arose in philosophical writings. William James (1902/1929) was the first writer we know of to argue that some concepts cannot be given precise definitions. Langer (1942/1980) made a similar point, but

It was Wittgenstein's (1953) analysis of the concept of a game that drew widespread attention to the difficulties of the classical view. There is no one feature that is shared by all games and that could therefore serve as a defining feature for the concept of game. Rather, any game has some features in common with most other games. One game thus resembles other games in much the same way that one member of a family resembles the others. Following Wittgenstein, writers in various disciplines have identified natural language concepts that appear to lack defining features and whose boundaries are therefore "fuzzy" (Labov, 1973; Lakoff, 1973; Mervis & Rosch, 1981; Rosch, 1973; Zadeh, 1965).

### *Prototypes and fuzzy borders*

It is not yet clear how everyday concepts can be best characterized (Jones, 1982; Mervis & Rosch, 1981; Osherson & Smith, 1982; Smith & Medin, 1981), or even if one characterization will apply to all (Armstrong, Gleitman, & Gleitman, 1983). In psychology, Eleanor Rosch (1973, 1975, 1977) rekindled an interest in the nature of concepts by articulating one alternative to the classical view, an alternative known as prototype theory. Rosch began by noting that many natural concepts form a hierarchy of inclusion. For example, the set *fruit*, *apple*, *Mac-Intosh apple* illustrates a hierarchy with superordinate (most inclusive), middle, and subordinate (least inclusive) levels. The superordinate concept includes an indefinite number of categories at the next lower level. Fruit, for example, clearly includes apples, oranges, and pears, but coconuts, olives, and tomatoes are not so clear. Fruit is organized around its clearest examples, which are referred to as prototypes. Other instances vary in their degree of resemblance to the prototypes, with prototypes shading gradually into nonprototypes, and nonprototypes shading gradually into nonmembers. Graded membership thus creates an internal structure of a concept.

Figure 8.1 shows an inclusion hierarchy for the concept emotion. *Emotion* is at the topmost, or superordinate, level. The middle level is represented by such terms as *fear*, *love*, and *anger*. Of course, in addition to these would be less prototypical emotions such as *pride*, *envy*, and *lust*, all at the same, middle level. The number is indeterminate because there is no sharp boundary distinguishing emotions from nonemotions. Many of the middle-level categories may also be divisible, forming a subordinate level.

In a recent series of studies, the feasibility of this line of thinking (Russell, 1980b) was explored empirically (Fehr & Russell, 1984; Fehr, Russell, & Ward, 1982; Russell & Bullock, in press). As hypothesized, the concept of emotion was found to have an internal structure: Happiness, love, anger, fear, awe, respect, envy, and other middle-level categories could be reliably ordered from better to poorer examples of emotion. In turn, the goodness-of-example (or pro-

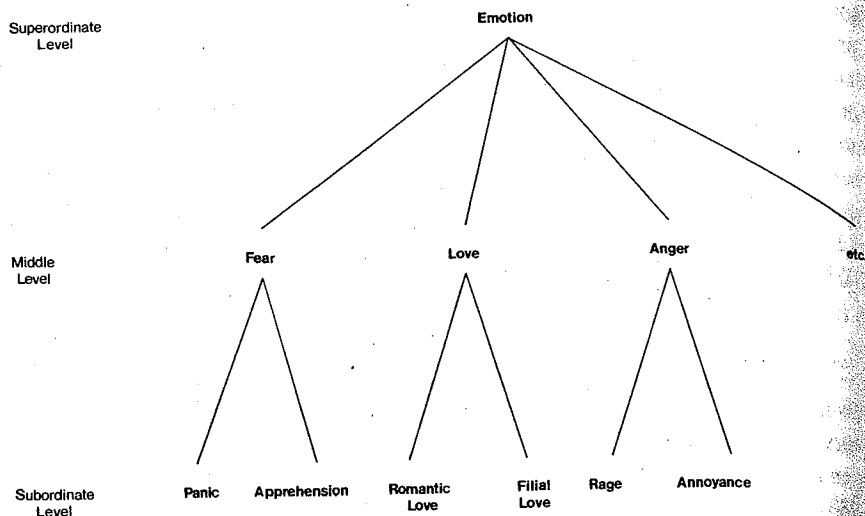


Figure 8.1. A portion of an inclusion hierarchy for emotions.

typicality) rating for each emotion was found to predict how readily it comes to mind when subjects are asked to list emotions, how likely it is to be labeled as an emotion when asked what sort of thing it is, how readily it can be substituted for the word *emotion* in sentences without their sounding unnatural, the degree to which it resembles other middle-level emotion categories in terms of shared features, and the speed with which subjects can verify that it is indeed a type of emotion. In short, converging sources of evidence showed that the concept of emotion has an internal structure and that the internal structure predicts various indices of the cognitive processing of emotion concepts. Moreover, the border separating emotions from nonemotions is fuzzy rather than clear-cut.

Middle-level emotion categories (anger, fear, sadness, etc.) also show signs of internal structure and fuzzy borders. In a series of studies, we examined how adults categorize the message conveyed by emotional facial expressions (Russell & Bullock, in press). As predicted by prototype theory, facial expressions varied in their degree of exemplariness. Some expressions were prototypical examples, others were intermediate examples, and still others were very poor examples. There were also borderline cases in which subjects could not decide whether particular facial expressions were or were not members of a particular category.

That categories of emotion consist not only of their prototypical cases but of intermediate and borderline cases seems to explain a further and too often overlooked property of emotion categories: the large degree to which they overlap in their extension. Overlap of categories is illustrated in Figure 8.2. Along the abscissa are ordered 14 different facial expressions of emotion, labeled A through



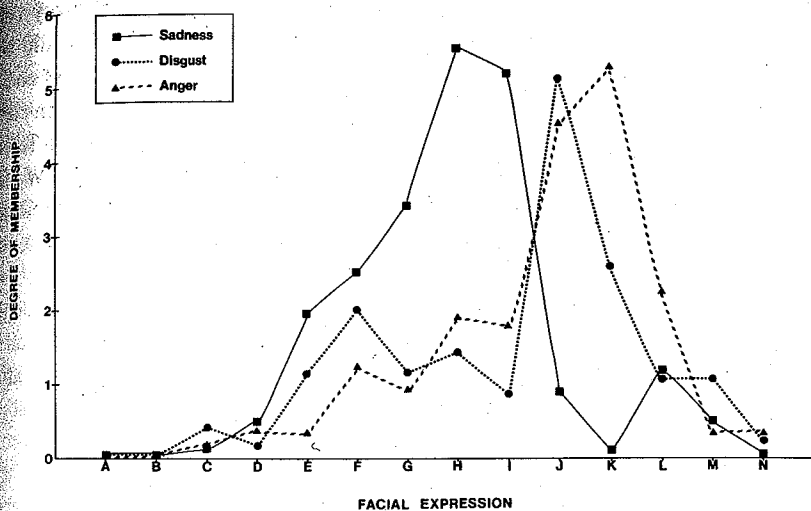


Figure 8.2. Overlap of emotion categories. Letters refer to facial expressions of emotion, the modal labels for which are as follows: A, excitement; B, happiness; C, happiness; D, calmness; E, calmness; F, sleepiness; G, sleepiness; H, sadness; I, sadness; J, disgust; K, anger; L, fear; M, surprise; N, surprise.

N, most of which were taken from the photographs of Ekman (1976). Mean ratings on the degree of membership are given on the ordinate for three categories: sadness, disgust, and anger. Although the peaks differ (and correspond to Ekman's, 1976, prototypical expressions for these three categories), all three categories are at least somewhat applicable to many of the same expressions.

#### *Dimensions and intercategory structure of emotion*

Dimensional accounts of emotion are those that emphasize continua such as pleasantness–unpleasantness along which all emotional states vary. Structural accounts are those that emphasize interrelationships among emotions. Talk about dimensions or structures is often thought of as contrasting with, or at least somewhat dissonant with, talk about categories of emotions. In our view, there is no dissonance. Consideration of categories, once their fuzzy boundaries and overlapping nature are seen, leads directly to the notion of intercategory structure, for structure represents the way in which categories overlap. And structure, in turn, leads directly to dimensions.

An interest in intercategory structure arose when Woodworth (1938) examined the "errors" subjects made when categorizing facial expressions of emotions. (Of course, if the view of emotion categories we are advocating is correct, these

were not errors, but manifestations of overlapping categories with fuzzy borders.) Woodworth found that "errors" were systematic: Subjects who did not choose the correct category for a particular facial expression nonetheless chose among a limited set of categories. From the systematic overlap of emotion categories, Woodworth derived a simple model of intercategory structure: a linear ordering. Woodworth's student, Schlosberg, noticed that the two ends of Woodworth's continuum were also occasionally confused for one another. Schlosberg (1952) therefore tied the two ends together, forming his well-known circular structural model of emotion.

The relationship between intercategory structure and the fuzziness of categories can be demonstrated more directly. Taking the 14 facial expressions used in the Russell and Bullock (in press) study, we derived a measure of the similarity between each of all possible pairs of expressions. A pairwise similarity matrix is just what is needed to produce, via a multidimensional scaling procedure, a representation of the structure of emotions. Pairwise similarity had been used in this way many times, but this time our measure of similarity was derived entirely from ratings of each expression's degree of membership in emotion categories. Specifically, the similarity between two facial expressions was defined as the correlation between their degrees of membership in 14 emotion categories. The

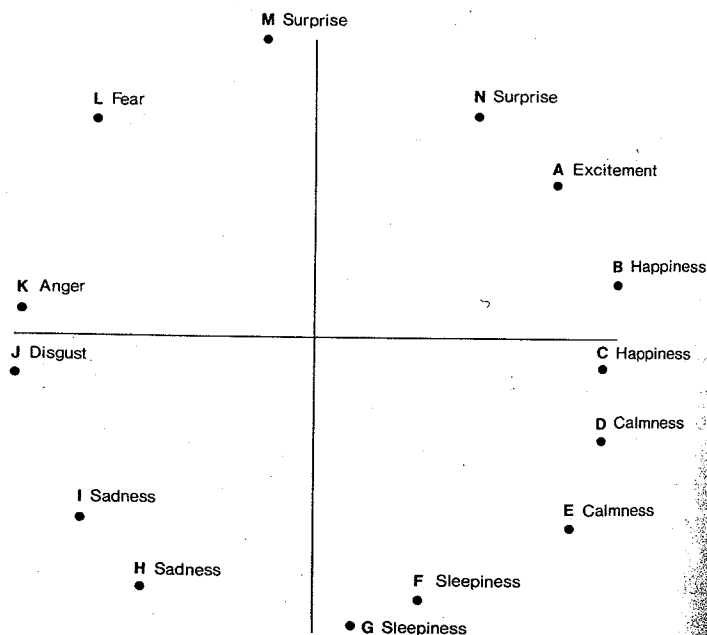


Figure 8.3. Circular order of emotion and facial expressions.

structure that resulted (Figure 8.3) placed emotions in a particular circular order in a two-dimensional space. That order corresponds remarkably closely to the circular ordering of emotions obtained by other methods (Russell, 1980a), including scaling of self-report data from both adults and children (Russell & Ridgeway, 1983) and semantic similarity ratings from Chinese, Japanese, Gujarati, and Croatian speakers (Russell, 1983).

Intercategory structures, in turn, lead directly to dimensions. Schlosberg's circular order of emotions revealed two underlying dimensions, which he initially interpreted as pleasure-displeasure and attention-rejection. Later research favored degree of arousal as the interpretation of the second dimension (Abelson & Sermat, 1962; Russell & Bullock, 1985). Did the structure of emotional facial expressions derived from our measures of prototypicality reveal the same pleasure and arousal dimensions? Confirming what is clear from inspection of Figure 8.3, values on the horizontal dimension of Figure 8.3 correlate .93 with ratings of how much pleasure is expressed by the face. Values on the vertical dimension correlate .82 with ratings of degree of arousal shown in the face.

In short, far from being in competition, categories, structures, and dimensions are interrelated aspects of the human conceptual network used to understand emotion. With hindsight, this should not be surprising. Those who have thought and written about emotion have, since ancient times, expressed their ideas in terms of lists of categories, of more general dimensions of emotion, and of relations among categories. However, as we argue next, dimensions, categories, and their interrelationships far from exhaust the contents of that network.

### *Emotion scripts*

All human beings, and probably many of our nonhuman relatives, encounter emotional states almost every day. Emotions are no small element of the social world surrounding each person. Much like the scientist interested in emotion, each person must understand how to detect emotions, how to distinguish different emotions, what brings emotions about, what settings emotions occur in, what the temporal sequence of emotion reactions can be, and what the consequences of emotions typically are. Taking the lead from Heider (1958) and Kelly (1955), we might benefit from the metaphor of person as scientist. Let us say, very loosely, that each person develops a taxonomy and theory for emotion. Categories, dimensions, and structure are metaphors with which to describe the taxonomic function of our mental processing of emotion. But clearly there is more than taxonomy to our understanding of emotion. We can describe other aspects of the folk "theory."

Consider what comes to mind when you hear the word *fear*. You may imagine some scenario like the following: A danger suddenly appears. You gasp and stare

at it. Your jaw drops, your heart pounds, your hands tremble. You try to figure out what to do, but thoughts race through your mind and you feel overwhelmed with panic. You turn and flee.

The folk theory includes knowledge that emotions occur over time, follow particular sequences, and occur in particular settings. In other words, the folk theory includes a *script* (Abelson, 1981) in which events unfold in order. The script contains prototypical causes, appraisals of the situations, physiological reactions, feelings, facial expressions, actions, and consequences.

Identification of an actual sequence of events as fear involves its implicit comparison with the script. The sequence of events narrated above might never have actually occurred in just that way. Fear may be said to exist even if the events listed occurred in a different order, or if some were altered or absent altogether. For example, you might stand and face the danger rather than flee. You might hide or inhibit some of the physiological or behavioral signs of fear. You might bluff, by ignoring the danger. You might not even believe the situation is dangerous, as in the case of phobics who readily admit that their debilitating fear is unfounded. Of course, if enough events in the sequence are absent or altered or out of order, we are unlikely to call it fear. But the border is fuzzy, and there exist cases in which so few of these events occur that one is unsure whether *fear* is the right term. The notion of script can thus be seen to extend to episodes the notion of prototype.

### The nature of children's concepts of emotion

In the preceding section, we presupposed a distinction between emotion concepts and emotion events. To say that the everyday word *fear* is understood by means of a script is to say nothing about actual instances of fear. We did not mean that fear is an act rather than real, nor did we mean that fear is a reflexlike fixed pattern of action. In turning to children's concepts of emotion, we must emphasize the distinction between emotion concepts and emotion events.

Psychologists disagree on the nature of emotion events. One position is that emotions can be divided naturally into coherent units, each a distinct, recognizable bundle of particular behaviors, expressive signs, patterns of physiological activity, and subjective experience. It is usually assumed that these coherent units correspond to basic emotion terms of the English language. Another position is that there are no natural units of emotion. Rather than forming coherent bundles, any pattern of behavior, expressive signs, physiological activity, and subjective experience is as likely to occur as any other. Other positions can be defined between these extremes, but the point here is that, whatever the reality of emotion events may be, the child must still organize, categorize, and interpret

that reality. Whether or not emotion reality consists of discrete units does not tell us how the child conceptualizes emotion. If emotion reality is discrete, the child may not know this; if reality is not discrete, the child may impose discrete categories on it.

Research on children's interpretation of emotional states has typically presupposed just the opposite. This research has generally not been thought of as being concerned with the development of *concepts*, but with how children come to "recognize" different emotions "accurately." Accuracy is taken to be conformity with an adult standard, which is usually defined as the way that adults divide emotions into a set of discrete units. Although accuracy scores can tell us some things, they may not tell the whole story.

We prefer to think in terms of the nature of the child's concepts and to ask how such concepts develop. Useful information can come from an analysis of what children do, accurately or not, when they are asked to label, categorize, or discriminate among emotions. From our perspective, the important question is whether their responses are systematic. It is when children's interpretations are systematic that we can begin to specify the bases of those interpretations — their emotion concepts — and the ways in which such concepts develop.

Children's interpretation of emotions has been addressed in a number of ways. Children have been asked to match emotional expressions with situations, to label emotional expressions, to produce emotional expressions for a given label, and to state which emotions arise in different situations. For example, investigators have asked when children come to identify such "basic" emotions as anger, fear, sadness, and happiness, and what cues they use to do so. The sources of information provided as cues include faces, emotion words, situations, or some combination of these (Borke, 1971; Felleman et al., 1983; Field & Walden, 1982; Gates, 1923; Gitter, Mostofsky, & Quincy, 1971; Gnepp, Klayman, & Trabasso, 1982; Guthrie & Smouse, 1981; Izard, 1971; Odom & Lemond, 1972; Reichenbach & Masters, 1983).

The most consistent finding from such tasks is that children's accuracy improves with age. Preschoolers typically perform at close to chance levels on most tasks. The youngest school-age children perform at levels above chance but so far from adult accuracy that it is unclear how their responses are best interpreted. Older school-age children and teen-agers are progressively more accurate, and it eventually becomes reasonable to conclude that their concepts are equivalent to those of adults.

A second conclusion is that children's accuracy varies with the emotion presented (Borke, 1971; Felleman et al., 1983; Gitter et al., 1971; Guthrie & Smouse, 1981). The general result is that happiness is identified, differentiated, and labeled more consistently than other emotion states such as fear, anger, surprise, sadness, and pain. For example, Felleman et al. (1983) asked 5-year-olds to label

photographs of facially expressed happiness, anger, and sadness. Children were most accurate at labeling happy expressions (89 to 91% correct), moderately accurate at labeling sadness (63% correct), and less accurate at labeling anger (52 to 58%). (Accuracy was defined as a match between the child's label and that provided by adults to the same expression.) Felleman et al. noted that any such result must be viewed in the context of children's emotion vocabulary: The label *happy* may have been more likely to be used and thus more likely to be overgeneralized.

Another technique is to ask children to produce facial expressions of particular emotions. Children are given a word, a facial expression to imitate, or a situation (Odom & Lemond, 1972; Field & Walden, 1982; Felleman et al., 1983). Again, preschoolers are not very good at this sort of task when accuracy is defined as producing an expression that can reliably be labeled by adult raters. There is a suggestion (Hesse & Cichetti, 1982) that young children are best at imitating facial expressions that they can label. However, because voluntary production or imitation requires special skills for which there are, even in adults, large individual differences, this technique cannot play a definitive role in assessing children's concepts.

Although most of the responses of young children are classified as "errors," there are few reports of any analyses of the pattern of these responses. This neglect is unfortunate because those investigators who have examined errors have reported a consistent pattern: Children do not err randomly (e.g., Borke, 1971; Felleman et al., 1983; Reichenbach & Masters, 1983). They tend to err by confusing emotions that are similar, according to the structural model (Figure 8.3) presented earlier. For example, children are likely to confuse anger and sadness, anger and fear, and the like. As noted above, they are most accurate at imitating or labeling happiness; this emotion is usually the only positive one included and thus, according to the structural model, maximally distinct from the other, less pleasant emotions.

In the remainder of this section, we summarize several studies from our own laboratory. In these studies we have not focused on accuracy, but rather on three other central issues: (a) What is the nature of children's emotion concepts? Are they organized around prototypes? Are they the same as adults' concepts? Or is there a change with development in the range and breadth of the content? (b) Is the emotion domain structured for children? That is, do children see emotions as varying in similarity in a systematic way? (c) What is the basis for the formation of categories and intercategory structure? We have collected information on children's interpretation of one aspect of emotions: facial expressions. Although a full account of a child's understanding of emotion clearly requires evidence concerning a number of aspects of emotion, we began with facial expressions because they are one clear medium of emotional communication available to all seeing children. We focused on a particular age group – preschoolers – because

the preschool years are the period when children are least "accurate," when they come to acquire a lexicon of emotion words, and when they refer to internal states such as emotion as potential causes of behavior.

### Matching faces with words

To ascertain the referents for child's emotion concepts, we designed three tasks in which children were asked to match photographs of emotion expressions with emotion words. Across the tasks we used a core set of photographs and words, which we shall describe here. Additional words and photographs were synonyms or alternate examples of the ones to be discussed here (for full results see Bullock & Russell, 1984; 1985; Russell & Bullock, 1985; 1986).

The facial expressions we used were portrayed in black and white photographs of female actresses (Figure 8.4). Six of the nine are from Ekman's (1976) *Pictures of Facial Affect*. The remaining three are from our own set, which were pretested and consistently labeled as the intended emotion by adults. Nevertheless, neither Ekman's labels nor our own play any role in our experiments with children. We therefore use Labels A through I, which correspond to their order according to our circular structural model of emotion (Figure 8.3).

The words covered a range intended as referents for the faces. They included *happy*, *excited*, *surprised*, *afraid* (or *scared*), *angry* (or *mad*), *disgusted*, *sad*, *sleepy*, and *calm* (or *relaxed*).

*Task 1: choosing from an array.* We presented the following task to 114 children between 3 and 5 years of age (Bullock & Russell, 1984). Each child was presented with 10 facial expressions, spread in a random array (the 9 in Figure 8.4 plus a neutral expression). An experimenter asked the child to survey the pho-

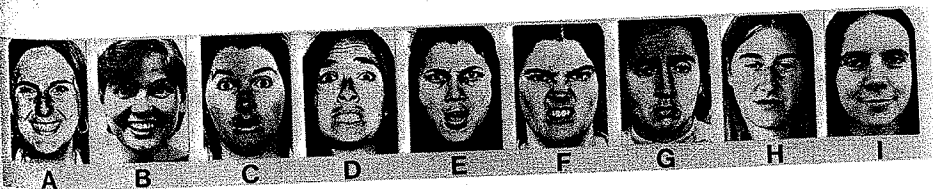


Figure 8.4. Nine facial expressions ordered according to a structural model. Photographs A, C, D, E, F, and G are taken from P. Ekman (1976), *Pictures of Facial Affect* (Palo Alto, CA: Consulting Psychologists Press, Inc.) and are reproduced here with permission. Investigators interested in using these photographs should obtain original prints from Consulting Psychologists Press rather than attempt to reproduce them from what is shown here. Reproduction inevitably further degrades the image and could introduce errors in any experimental procedure. Results obtained with degraded images would be difficult to interpret or to compare with results obtained with the original photographs. Photographs B, H, and I show actors asked by the authors to pose excitement, sleepiness, and calmness, respectively.

Table 8.1. *Proportion of "errors" that were of the two faces adjacent to the "correct" choice*

Category	Age		
	3 years	4 years	5 years
Happy	89	88	60
Excited	32	33	63
Surprised	36	43	71
Afraid	55	64	79
Scared	63	70	56
Angry	75	90	94
Mad	90	90	89
Disgusted	40	22	32
Sad	14	14	25
Calm	24	42	46

*Note:* Data are expressed as percentages. The proportion expected by chance is 22%. Italics indicate a result significantly different from chance ( $\alpha = .05$ ).

tographs and to make three choices without replacement for each emotion word. Before each choice the experimenter asked, "Which person is [emotion word]?" The words substituted are given in Table 8.1.

When scored for accuracy, the children's choices were consistent with previous findings in the literature. Examination of their "errors" was much more revealing. Our first finding was that even 3-year-olds were systematic in their choices. By "systematic" we mean that their "errors" were predictable from our structural model. Table 8.1 shows the proportion of "errors" that resulted because the first choice was the one expression to either side (according to our structural model) of the "correct" expression for that word (e.g., errors were E or G if the correct choice was F). Although there is evidence for random error with some words (*excited*, *surprised*, *sad*, and *calm*), many more of the errors were as predicted than would occur by chance. A quantitative analysis of the data in Table 8.1 confirmed this interpretation. We combined responses from all the trials and asked what proportion of errors were as predicted: 54.7% of the 5-year-olds' errors, 43.3% of the 4-year-olds' errors, and 40.1% of the 3-year-olds' errors were as predicted. Each of these results was significantly different from the 22.2% expected by chance responding ( $p < .001$  for each age group). Preschoolers were systematic in their selection of facial expressions as referents for emotion words even when they did not select the modal adult choice.

To examine the entire pattern of children's choices, we constructed histograms of their first choices for each of the test words. To illustrate, Figure 8.5 presents



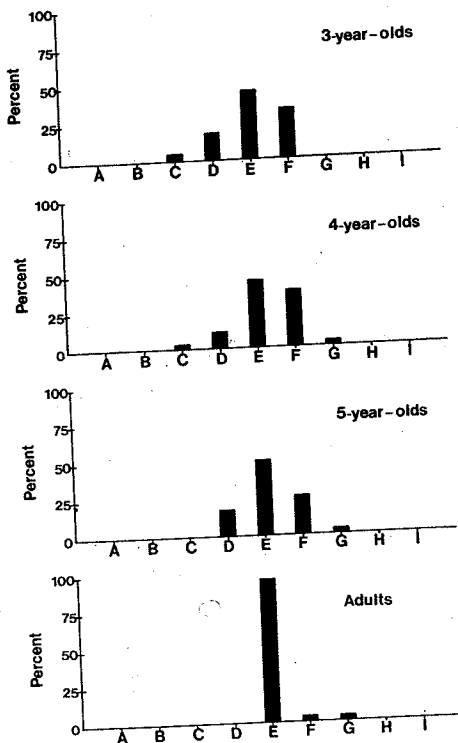


Figure 8.5. Choices for the word *mad*, Task 1.

the results for children's first choices for the word *mad*. Photographs are ordered on the abscissa in terms of their placement in the circular model. The modal response was Face E (Ekman's prototypical expression of anger) for each age group. As already indicated, children were most likely to "err" by choosing faces close to E. There was thus a focal point, the expression most likely to be chosen, with the probability of a choice decreasing with distance from the focal point. In terms of the faces we used, this means that those children who did not pick the focal expression E tended to choose Ekman's prototypical fear (D) or disgust (F) picture. This result illustrates how the circular model reveals the breadth and systematic nature of emotion categories. The general pattern illustrated for *mad* was repeated for the other words.

We also found ways in which emotion categories change with age. For most of the words, the category narrowed with age. This narrowing pattern is seen in Figure 8.5 with *mad* and is illustrated again with results for the word *afraid* in

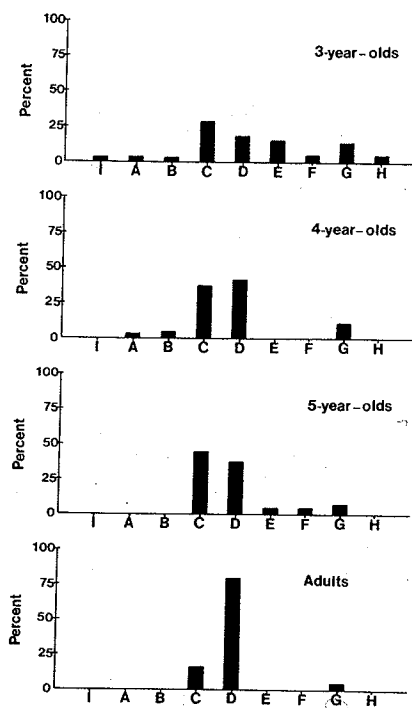


Figure 8.6. Choices for the word *afraid*, Task 1.

Figure 8.6. The range around the focal point (in this case, Face D, Ekman's prototypical expression of fear) appears to sharpen with age – or broaden as we look at each younger group. On their first choice, adults tended to agree in selecting Face D, with only a few selecting C (Ekman's surprised expression). Five-year-olds selected D and C about equally often, as did 4-year-olds. Thus, their focal point was broader than for adults. Three-year-olds had an even broader focal point for *afraid*, encompassing Faces C, D, and E. The range around a focal point for the test words *scared*, *miserable*, *disgusted*, and *happy* showed a similar change with age.

Several categories also showed a shift in focal point. The results for *surprised* (Figure 8.7) illustrate a shift. For adults, the focal point for *surprised* was C (Ekman's prototypical expression of surprise), with some choices falling to the two adjacent faces, B and D (the “afraid” expression on the unpleasant side and the “excited” expression on the pleasant side). For 5-year-olds, the focal point shifted to B (the “excited” expression), with C in a tie for second place with A (the “Happy” expression). For 4- and 3-year-olds, the focal point remained B, but A was now a more frequent choice than C (“surprised” expression). Indeed,

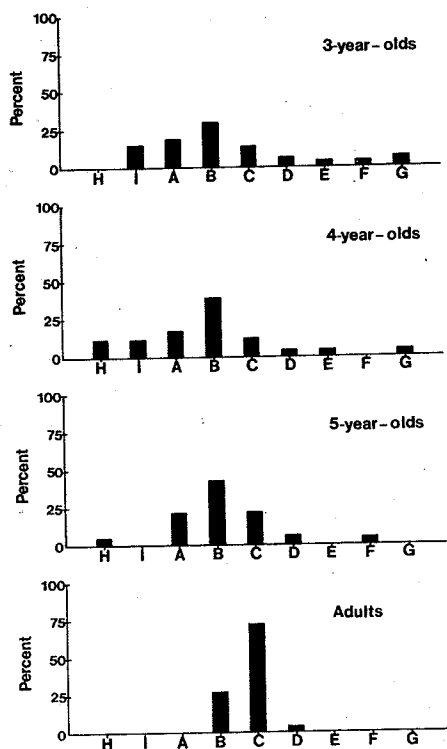


Figure 8.7. Choices for the word *surprised*, Task 1.

the adult modal choice, C, was no more likely to be chosen than was Face I (the "calm" expression). Thus, the meaning of the word *surprised* for 3- and 4-year olds was something closer to *excited* or even *happy* than the adult meaning for *surprised*. The terms *sleepy*, *excited*, and *relaxed* also displayed shifts in focal point.

To summarize, given an array of facial expressions, children as young as 3 categorize them in a meaningful way, although their categories are not equivalent to adults'. Children's categories are broader and, in a few instances, shifted relative to adults'.

*Task 2: forced choice.* Task 1, it might be argued, may have required attentional or scanning abilities (e.g., Vurpillot, 1976) beyond those of our younger children. We therefore repeated the same general procedure with a simpler task. We asked children to select a facial expression as a referent for a word, but their choice was between only two expressions, one of which was always the proto-

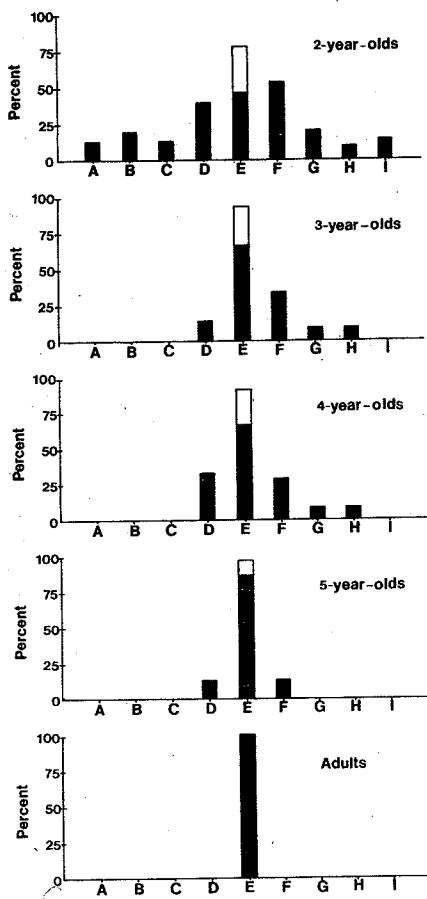
typical expression for the category named. This simpler procedure allowed us to include a group of younger subjects, 2-year-olds, and to obtain more precise data on children's categories.

We presented the following task to 240 children, aged 2 to 5 years, and 30 adults for comparison purposes (Bullock & Russell, 1985). In a given trial the subject was shown two photographs and asked, "Which person is [target label]?" The labels substituted were the same as in the previous study. For each word, we paired the target facial expression (prototypical for that category) with each of the eight other photographs of Figure 8.4. We labeled the pair according to distance between the target and alternative photo. In a Step 1 pair, the alternative photograph was adjacent to the target, according to the circular model. In Steps 2, 3, and 4, the target was paired with expressions progressively more distant. Since a photograph can be thought of as being farther from the target in either a clockwise or a counterclockwise direction, there were two test pairs for each step.

As predicted, errors were most frequent when the alternative was an adjacent expression (one step away). The likelihood of an error then decreased at each additional step. The one exception to this pattern occurred for 3-year-olds, with a reversal between Steps 3 and 4. Quantitative analyses of these data confirmed that both the main effects of Age [ $F(4,580) = 92.7, p < .001$ ] and Step [ $F(3,580) = 17.97, p < .001$ ] were significant and that their interaction was not. Separate analyses showed that distance from the target was a significant factor for every age group but the 3-year-olds.

As in the first study, we constructed histograms showing the proportion of subjects who chose each expression as a referent for each word. The patterns we had identified in the first study were apparent in these histograms as well. There was a focal point, with most "errors" at adjacent faces (one step removed) and the probability of choice declining to either side. The pattern of category narrowing with age was replicated for the words *mad*, *disgusted*, *sad*, *scared*, and *excited*. As in the first study, we also noted a shift in focal point for the words *surprised* and *excited*.

In this second study we were able to assess developmental changes in more detail than in the first study. For many of the words tested, the 2-year-olds, although responding above chance levels, could not be said to have a clear focal point at all. Rather, they seemed to treat a range of expressions as relatively equivalent. The responses of the older groups, though, showed a focal point emerging. We shall illustrate this pattern with histograms for *mad* shown in Figure 8.8. Two-year-olds were about equally likely to select Face D as E and Face F as E when paired together. The broad range of choices for 2-year-olds is narrowed somewhat for the 3-year-olds, who show a clear focal point at Face E, consistent with 4-year-olds, 5-year-olds, and adults.

Figure 8.8. Choices for the word *mad*, Task 2.

*Task 3: the boundaries of emotion categories.* In the two studies discussed so far, the child was asked to find the *best* representative for a category. In the next study, the child was asked to select all the members of the category. One prediction from our model is that each emotion category may apply to a range of expressions, and any one expression may belong to more than one category. That is, different categories overlap one another. For adults, this idea is represented by findings such as those in Figure 8.2, where degree of membership ratings indicated that, although there are prototypical expressions for each term, other expressions are applicable as well. If, as we have suggested, children's emotion concepts are broader than those of adults, we would expect them to include even more expressions within the border and hence to overlap categories even more.

Table 8.2. *Percentage of subjects agreeing that an expression is a member of a category*

	Facial expression								
	A	B	C	D	E	F	G	H	I
<i>Three-year-olds</i>									
Happy	92	100	17	0	0	8	8	67	92
Excited	58	67	25	17	17	17	8	25	42
Surprised	67	67	33	17	8	8	8	42	50
Scared	8	0	50	50	25	17	8	0	8
Mad	0	0	17	42	92	75	25	0	0
Disgusted	17	8	25	50	58	67	33	25	25
Sad	0	0	25	42	17	25	67	0	0
Sleepy	33	25	33	25	33	33	50	42	42
Calm	42	25	42	8	17	25	42	83	75
<i>Four-year-olds</i>									
Happy	92	92	8	0	0	0	0	17	67
Excited	50	83	33	0	8	0	0	0	8
Surprised	50	67	42	8	0	0	8	17	25
Scared	0	0	25	57	17	0	8	0	0
Mad	0	0	8	17	92	92	8	0	0
Disgusted	0	0	42	33	42	42	33	25	8
Sad	0	0	17	17	0	0	75	8	0
Sleepy	0	0	8	17	8	8	58	42	8
Calm	25	33	17	8	0	0	17	58	67
<i>Five-year-olds</i>									
Happy	92	92	8	0	0	0	0	25	75
Excited	58	75	17	8	0	8	0	0	17
Surprised	33	58	67	17	0	0	0	0	17
Scared	0	0	42	100	0	0	8	0	0
Mad	0	0	0	8	100	83	0	0	0
Disgusted	0	0	25	25	50	75	8	25	17
Sad	0	0	0	0	0	0	100	17	0
Sleepy	0	8	0	0	0	0	42	50	17
Calm	25	0	0	0	0	0	33	83	83

Note: Percentages of 33% or greater are in italics to indicate range and overlap of yes endorsements.

We presented the following task to 36 children. We asked the child whether or not a particular facial expression was an example of an emotion term. "Is this person [word]?" The child responded yes or no. Because the results have not been published, we shall describe them in detail. The percentage of children responding yes for each of several test words is given in Table 8.2. The results again showed the narrowing of categories. Consider the responses for the word *mad*. The 3-year-olds endorsed both prototypical (Face E) and nonprototypical expressions as members of the category *mad*. In contrast, the 4- and 5-year-olds

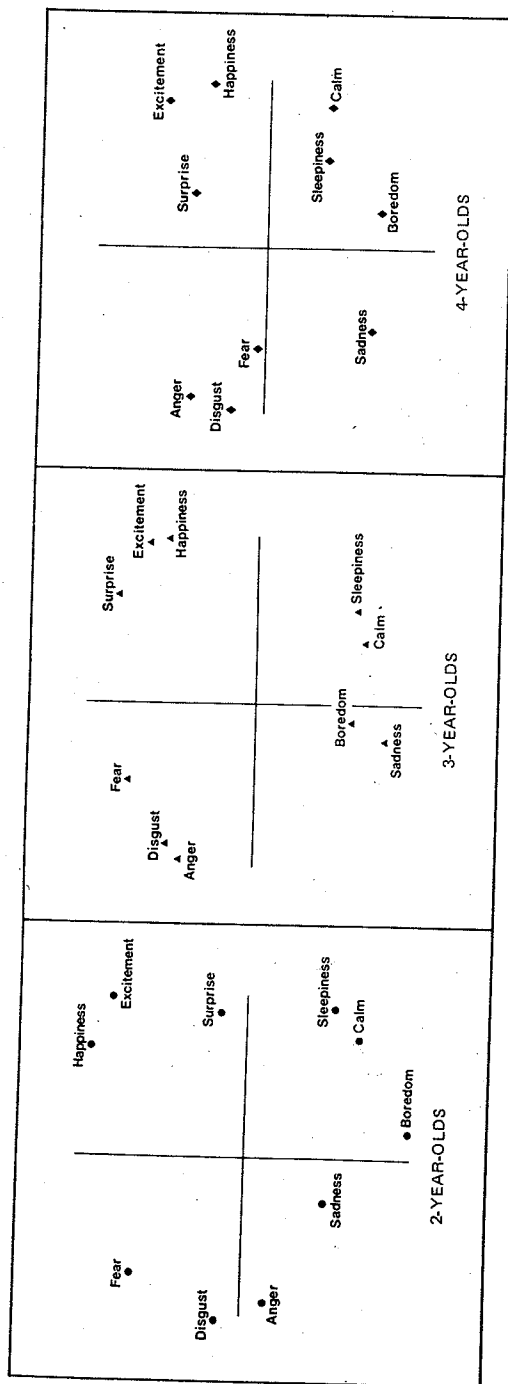


Figure 8.10. Multidimensional scaling solutions for 10 facial expressions.

showed more narrow categories. Peripheral expressions included by 3-year-olds were included by fewer 4-year-olds and no 5-year-olds. A similar pattern can be seen for almost every word. On the average, a facial expression was placed into 4.0 categories by 3-year-olds, 2.5 categories by 4-year-olds, and 2.2 categories by 5-year-olds, out of the possible nine categories listed (with placement defined as endorsement by 4 or more of the 12 subjects in each age group). The category *surprised* also showed the expected shift in focal point. For 3-year-olds, the focal point comprised Faces A and B; for 4-year-olds, Face B; and for 5-year-olds and adults, Face C. *Excited* was a word for which the category focal point was shifted in the previous studies. In Table 8.2, it is evident that there is a shift with age, but a shift not so much in the focal point as in the range of applicable expressions. For some 3-year-olds *excited* includes the whole range of positive emotions. This becomes narrowed to those expressions high in arousal, both positive and negative.

### *Dimensions and the structure of emotion*

The three studies described above indicate that children as young as 2 years impose an order on emotions, an order that is similar to but not identical to that provided by adults. The studies on categorization, however, provide only one part of the picture. We have also asked how the entire emotion domain is structured. In this work we have not focused on the structure of individual emotions, such as fear, anger, and happiness, but have examined how children perceive similarities and differences across the entire domain.

For adults, the intercategory structure of the emotion domain can be represented in terms of the circular ordering portrayed in Figure 8.3. Information for this characterization comes from multidimensional scaling procedures applied to data from tasks in which subjects are asked to indicate similarities they perceive between emotions. We have used some of the same procedures with children. The basic procedure is to ask subjects to group faces into a preordained number of "piles" – from 2 to 10. From this task we can derive a measure of similarity between pairs of expressions. This measure is the frequency with which the two expressions are grouped into the same pile, weighted in accordance with the number of piles. Multidimensional scaling procedures can then be applied to the set of pairwise similarity measures to yield a simultaneous representation of the entire set. The result of such a procedure portrays the "distance" between emotions: Closer emotions are more similar to one another; ones farther away are more different.

We collected data on preschoolers' responses to emotional facial expressions in two studies (Russell & Bullock, 1985; 1986). In each study, subjects were asked to group emotional facial expressions into specified numbers of piles. The precise procedures differed to provide tasks appropriate for the ages tested. The



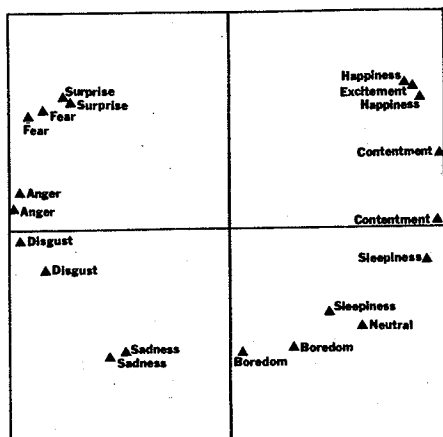
first study involved thirty adults and thirty-two 4- and 5-year-olds, who were shown 20 facial expressions. The second study involved seventy-eight 2-, 3-, and 4-year-olds, who were shown 10 facial expressions. The solutions for each age group are illustrated in Figures 8.9 and 8.10, respectively, where each facial expression is represented by a modal label given by adults. Despite some discrepancies, the overall similarity across ages is apparent. Children as young as 2 years structured the emotion domain in roughly the same ways as older children and adults.

What accounts for this similarity? An answer to this question requires a discussion of the hypothesized dimensions underlying such an ordering, the dimensions of pleasure and arousal. The axes of each solution in Figures 8.9 and 8.10 are clearly interpretable in terms of these two dimensions. Correlations of the multidimensional scaling coordinates with independently obtained ratings on pleasure and arousal (given by adults) support this interpretation. Pleasure ratings correlated .80 or above with scores on each horizontal dimension. Arousal ratings correlated .80 or above with scores on each vertical dimension.

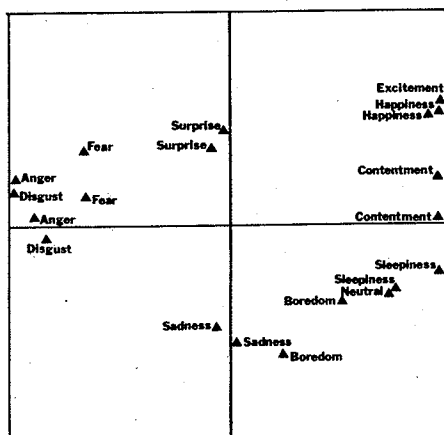
Another test of the use of the pleasure and arousal dimensions is to ask if expressions prototypical of different categories will be grouped according to their values on the dimensions of pleasure and arousal. We designed two parallel tests – one for pleasure and one for arousal – which we presented to one hundred 2- to 5-year-olds (Bullock & Russell, 1985). Each test consisted of several trials. In each trial the child was shown three photographs, each of different expressions. Two were more similar to each other on the dimension tested than the third. No knowledge of emotion words was required for this task; the subject was simply asked to judge which two of the three feelings expressed were most similar. For example, in one trial on the pleasure test subjects were shown photographs of actresses portraying fear, anger, and excitement, all high arousal states. To “pass” this item the subjects had to group together the two faces expressing displeasure (fear and anger) and leave aside the one expressing pleasure (excitement). The dimensions of pleasure and arousal were used by children as young as 3 years. The 2-year-olds’ performance fell at chance levels, but it was unclear during the testing whether they understood the task.

Evidence discussed so far on dimensions came from tasks without the use of emotion-descriptive words. We also found evidence for the same structure and same dimensions when we examined tasks that used emotion words. We took the data from the matching tasks (Tasks 1 to 3 described above) to derive pairwise similarity measures for facial expressions, much as had been done with adults to produce Figure 8.3. Again, the result was roughly the same (Bullock & Russell, 1984).

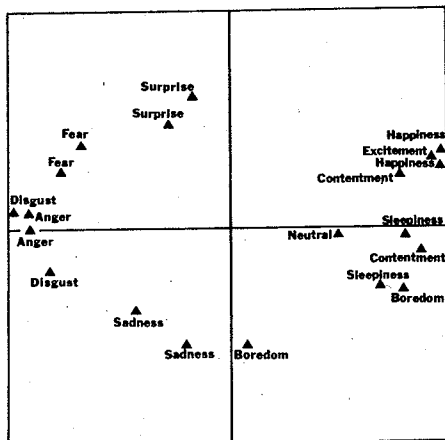
Figure 8.9. Multidimensional scaling solutions for 20 facial expressions.



Adults



5-year-olds



4-year-olds

*Summary*

The evidence we have gathered is consistent with previous findings on the accuracy of children's interpretation of emotions, although we would describe the findings differently. Improvement in accuracy corresponds to a narrowing of the category. At any given age, some categories such as happiness are used more consistently because they overlap less with other categories presented to the child. Children's "errors" are not errors but manifestations of their conceptual system.

This conceptual system exists at a very young age. Long before children are "accurate" in labeling facial expressions of emotion, they interpret those facial expressions in a meaningful way. They can categorize and judge the similarity between expressions. Their categories are broad, overlap one another, and are organized with respect to one another. Underlying this organization appear to be the dimensions of pleasure and arousal, dimensions that children can use to sort emotions adults label as distinctly different. There is a remarkable similarity in how children and adults structure the emotion domain, but the categories are not equivalent to those of adults. The major developmental changes seen in these studies is the decreasing breadth of children's categories of emotion: From age 2 on children's categories become more narrow, approaching those of adults.

Two different lines of evidence converge to reveal a systematic order underlying preschoolers' interpretation of emotional messages. One line of evidence came from tests of categories as labeled by everyday vocabulary items. The other line had little to do with language, relying on grouping of facial expressions according to perceived similarity. Because the structure seen in Figures 8.9 and 8.10 can be seen distinctly in 2-year-olds and seen in tasks that do not involve emotion labels, this structure and the dimensions that underlie it appear to represent primitive and basic processes in the interpretation of emotion. This possibility is explored in the next section.

**Development of emotion concepts: a hypothesis**

The ways in which infants and young children interpret emotions and the ways in which such interpretations change over development is fertile ground for exploring the hypotheses proposed about concepts of emotion. The order in which categories, dimensions, structures, and scripts emerge in the course of development can tell us about the fundamental nature of emotion concepts.

How does the child develop a conceptual scheme for emotions? Psychologists differ in their answers. One position is that there are something like innate emotion categories. Biological theories of emotion emphasize the evolutionary advantages of the communicative function of emotional facial expressions (Andrew, 1963; Darwin, 1872). Perception and interpretation of facial expressions

may have evolved for the same reason (e.g., Oster, 1978). If facial expressions are thought of as releasing mechanisms, again something like emotion detectors is implied. At the opposite extreme is the position that the child must learn or construct from experience every aspect of the conceptual scheme for emotions. Perhaps the culture or language community must teach this scheme. Perhaps the child constructs it via general cognitive mechanisms. Positions can be defined that lie between these extremes, and the correct position is not known.

Here we sketch one possibility that lies midway between these extremes. We suspect that children do not possess innate emotion categories, but they do not begin as blank slates either. The child begins with general constraints on how to interpret the emotion world. What those constraints are is a matter of speculation. Little is known about the developmental course of children's conceptualization of emotion. Perhaps the division of emotions into categories occurs first, with integration into the structure represented in Figure 8.3 and the abstraction of pleasure and arousal coming later. Alternatively, structure and dimensions may represent the initial perception of emotion, with differentiation into more discrete categories occurring later. No definitive evidence favors one of these solutions, but we believe that the evidence we have reviewed in this chapter lends plausibility to the second alternative, and that is the one we shall pursue here.

The constraint we emphasize is therefore that emotional states of others are initially perceived in terms of dimensions of pleasure-displeasure and degree of arousal. A variety of events in the child's world can be given meaning in terms of emotion: subjective experiences that the child undergoes, certain words spoken by caregivers, and facial and vocal expressions of the caregivers. Our proposal is that the child initially gives meaning to each such event in terms of pleasure and arousal. A subjective experience might be felt as pleasant and aroused; the caregiver's sad demeanor appears unpleasant and unaroused. This hypothesis does not deny that very young children discriminate and even categorize different emotions. What it does is specify the basis of discrimination and categorization as pleasure and arousal dimensions, rather than adultlike categories appropriately labeled anger, fear, and the like.

If our assumption is correct, the child's initial interpretation of any emotional event can be described as global and relatively "undifferentiated." The child's developmental task, then, is to differentiate within this global interpretation to reach an adultlike taxonomy for emotional states. Consider a case of jealousy: A child watches his or her teenage brother shout and glare when his girlfriend dates another boy. Our hypothesis is that a very young child does not interpret this scene as jealousy, but perceives the brother to be in a state of displeasure and high arousal. How does the child move from the global interpretation to the particular one? Our answer, in brief, is that the child learns a script about jeal-

ousy. We would rephrase the question: How does the child acquire the emotion script labeled jealousy?

There are two general, not mutually exclusive answers to this question. The first is that the surrounding community labels some episodes as particular emotions. Parents and others interpret the young child's own emotional states as well as those of others the child may observe. Older children are exposed to stereotyped narratives about romantic love, jealousy, fear, and other emotions. And, of course, children acquire a lexicon of emotion terms. Different terms may lead a child to search for different features.

The second answer is that the features that make up an emotion script are likely to be correlated. When the child observes someone with wide-open eyes and raised eyebrows, the other is more likely than not facing some threatening situation and is likely to withdraw from that situation. When the child observes another person with glaring eyes and clenched fists, that person may be facing a threat but there is more likely to be an element of frustration and injustice in the situation. The second person is also more likely than the first to make threats and to act aggressively. Thus, two episodes initially interpreted as unpleasant and aroused can come to be differentiated into fear and anger.

With these general considerations in mind we propose the following sequence of steps.

*Level 1.* Infants develop the ability to perceive gestures in others and to perceive changes in the face, voice, and posture. Research on infant's abilities to discriminate facial expressions (e.g., Caron, Caron, & Meyers, 1982; La Barbera, Izard, Vietze, & Parisi, 1976; Oster, 1978) suggests that at least by the time a child is 6 to 10 months old the perceptual abilities for extracting facial features and for combining these into a pattern are in place. However, at this stage, the child may not find any meaning in these patterns.

*Level 2.* Infants begin to find meaning in facial expressions of emotion. Initially, the meanings infants give to facial expressions are relatively undifferentiated. They are quantitative, distinguishing emotions only in terms of pleasure-displeasure and degree of arousal. These meanings facilitate social interactions and guide infants' reactions to ambiguous events. For example, Klinnert, Campos, Sorce, Emde, & Svejda (1983) report that infants as young as 10 months use their mother's facial expression as a guide for their own behavior in what is termed "social referencing." Infants approach or withdraw from a novel toy depending on their mother's facial expression. Infants also respond to ambiguous situations such as the visual cliff or the approach of a stranger either positively or negatively depending on their mother's facial expression. It is not clear from these reports, however whether the infants distinguish anything more than negative from positive expressions.

*Level 3.* The child now comes to expand the meanings attached to emotions

by distinguishing the situations in which they occur. Expressions that are similar in pleasure-displeasure or arousal are associated with different contexts, different outcomes, or different causes. Children begin to associate expressions with the immediate contexts in which they occur. For example, the child notes the context in which a smile or a frown occurs, notes that frowns or smiles go with certain tones of voice, notes that an unpleasant and aroused expression in the context of spilled milk is different from an unpleasant and aroused expression in the context of soiled diapers or a cut finger. The child learns to associate pairs of elements. These two-element combinations are the basis for emotion scripts, although at this point they are not organized into a temporal sequence. The language of emotion becomes important at this level because the child now has some basis for distinguishing different emotion words according to the situations in which they occur.

*Level 4.* From observing combinations of emotional expressions, situations, and words, the child now comes to construct emotion scripts. This involves two related processes. One is that the child associates multiple elements together. The second is that the child begins to combine the elements into temporal and causal sequences. From observing particular patterns at various times, the child begins to form generalized scripts. Labels supplied by the culture stimulate the child to differentiate among events previously treated as if they were alike. (In Chapter 9, Stein and Jewett detail a similar view on how the child comes to differentiate fear, anger, and sadness.)

The developmental sequence just outlined is, of course, oversimplified and very general. For one thing, emotion concepts develop beyond the generalized scripts suggested in Level 4. Our everyday concepts of emotion are a varied lot. Some specify little more than combinations of pleasure and arousal: Upset is displeasure and high arousal, and excitement is pleasure and high arousal. Other concepts involve a more elaborate script, including more information about the surrounding events. To be afraid is not only to feel upset, but to face a threat of future harm and to be motivated to escape that threat. Still other concepts presuppose even more: Jealousy implies certain interpersonal relationships; guilt and shame imply rules to be violated. A distinction between guilt and shame presupposes a further differentiation on the basis of internal versus external causes of the displeasure at having violated a rule.

Just as preschoolers may treat the terms *anger* and *disgust* as though they had the same meaning, some adults may treat *guilt* and *shame* as though they had the same meaning. Experts, in turn, can propose even finer distinctions. The differentiation of emotions according to their scripts does not, in our view, lead to a fixed set of emotion types. Thus, there is no end point in the developing taxonomy of emotion concepts.

## The psychology of emotional events

In this section, we turn to the study of emotion events, the phenomena behind the word *emotion*. The psychological study of emotion events flounders over seemingly intractable conceptual problems. Should everyday concepts of *emotion*, *anger*, *fear*, and the rest be used as scientific constructs, and if so how can these concepts be defined? Is behavior an adequate operational definition of emotion? If not, what would be? If an infant smiles, it is legitimate to infer that the infant is happy? When does emotion first occur in a person's life? How many emotions are there? Psychologists have yet to settle such questions and, more important, have yet to agree on how such questions might be settled.

Although everyday folk concepts need not be used by scientists to analyze emotion events, psychological theorizing about emotion relies heavily on everyday concepts and everyday thought. Notice that in the preceding paragraph it was almost impossible to write about events without assuming the categories implied by such English words as *emotion*. Analysis of everyday concepts may clarify some implicit assumptions psychologists make when everyday concepts are part of the questions asked and the theories proposed. It may also help separate genuine empirical issues from questions that are semantic, arbitrary, or impossible to answer. It may also be useful in another, more positive way: The analysis can offer hypotheses and suggestions about the nature of emotion events. One way to evaluate the perspective advocated in this chapter is to examine the answers it suggests to the sorts of questions raised above. In this section, we therefore very briefly discuss implications of our view of emotion concepts on these issues.

Writers on emotion commonly distinguish three aspects of emotion. One aspect is *emotional behavior*. Included here are such physical activities as expressive actions (via the face, vocalization, or body movements) and instrumental behaviors (such as flight and aggression). The second aspect is *emotional physiological change*. Included here are physiological indices of various sorts. The third aspect is *emotional experience*. By this, we mean affective interpretations and evaluations of external events plus subjective feelings of emotions. We perceive events as threatening, pleasant, likable, valuable, disgusting, and so on; and we feel happy, sad, angry, or whatever.

The first half of the twentieth century witnessed arguments about which of these is really emotion: subjective emotional experience, emotional behavior, or physiological activation. Modern emotion theorists have come to the realization that emotion is not any one of these events. Debate has given way to the notion that emotion is composed of all of these. But where does that leave the concept of the "emotion"? It is a mistake to say that the emotion is another event in

addition to physiological change, behavior, and subjective experience. To say so would be to commit the category mistake made famous when Ryle (1949/1963) pointed it out. To think of emotion as another event along with behavior, physiological change, and subjective experience is to make the same sort of error as thinking of the university as another thing in addition to the faculties, schools, colleges, and administration that form the university.

If emotion is not another such event, what is it? Our discussion of emotions as scripts suggests a possible hypothesis. An emotion is *composed* of these three events, including the *pattern* among them. The sequence of events and the causal links between events must be approximately right for something to count as a particular emotion. The statement that emotion is a pattern is consistent with conclusions reached by most modern emotion theorists. In Volume I, Schwartz (1982) describes emotion as just such an emergent pattern composed of subprocesses (also see in Volume I Izard's review of other similar views). Nevertheless, the conceptual and methodological implications of this statement have not been fully explored. We shall sketch one approach to the study of emotion that takes this idea as its major premise.

Which patterns are emotions and which are not? From our perspective, a quest for a classical definition of the concept of emotion is futile. It is impossible to state precisely which events are and which are not emotions. Membership in middle-level categories like anger and fear is likewise a matter of degree rather than all or none and is determined by resemblance to the prototypical pattern rather than by possession of defining attributes. Rarely do actual instances match the prototypical script in every detail, and there is no clear boundary between sufficient and insufficient resemblance. In short, the first implication of our perspective is that, when everyday concepts are used as scientific constructs, exceptions and borderline cases are endemic in matters of definition.

Operational definitions are equally problematic. Standard practice is to use expressive behaviors, verbal self-report, instrumental behaviors, and psychophysiological indices as interchangeable operational definitions of such constructs as emotion, fear, stress, and anger. From our perspective, this practice is suspect. Each operation is relevant to only one of the three aspects of emotion distinguished above. If each emotion is a pattern, no one feature of which is defining, and if different emotions overlap, then no *single* operation will suffice to capture a particular emotion. This conclusion is consistent with the recommendations on measurement offered by Izard (1982) in Volume I, recommendations based on practical efforts to measure emotion rather than analysis of everyday concepts. Taking fear as his example, Izard (p. 9) wrote:

We can set up a hierarchical table of data sets that go from least to most convincing with respect to their contribution to the identification of a specific emotion.

a. Escape-avoidant behavior (child fleeing) (Br), alone



- b. Vocal expression or scream (V-ex), alone
- c. Facial expression (F-ex), alone
- d. Br + V-ex
- e. Br + F-ex
- f. V-ex + F-ex
- g. Br + V-ex + F-ex

That a, b, or c alone is least convincing is to speak against operational definitions as commonly understood. That Br + V-ex + F-ex is the most convincing sign of fear is to say that the case in which the child's state most closely resembles the fear script is the best example of a fear event. Of course, it is not only the presence or absence of a feature that contributes to resemblance to the script. Each feature has a prototypical value, and actual features vary in the extent to which they resemble that prototype. For example, if the facial expression (F-ex) Izard mentions were the prototypical fear expression, it would contribute most. If it were a milder version of the fear face, a neutral face, a blend of fear and disgust elements, or the prototypical expression of another emotion, then it would contribute less and less. We would also add that the pattern that constitutes each emotion includes events not mentioned by Izard: aspects of the situation, the person's appraisal of the situation, and the subjective experience of emotion.

The impossibility that a single operational definition will capture such concepts as emotion, anger, and fear suggests a two-step research strategy. In the first step, the everyday concepts of emotion are set aside and each of the three aspects of emotion is studied separately. Within each such domain, operational definitions are not only possible but clear-cut and used regularly. During this first step, we set aside any questions concerning which one of these is really the emotion and emphasize that each aspect is a legitimate domain worthy of scientific interest. Then, in the second step, patterns among these three processes are studied, and reliable patterns are identified and labeled. If one such pattern turns out to coincide with the pattern identified by the everyday term *anger*, then the everyday category of anger will have been empirically found to be a useful scientific construct. If new patterns are discovered, we shall have a new and empirically justified taxonomy for emotions. The idea is to move back and forth between parts and the wholes so that (a) the description of the whole (the pattern that is emotion) is the best description, and (b) the variables descriptive of the parts maximize our understanding of the patterns. Everyday categories such as anger are hypotheses to be validated rather than unquestioned assumptions.

Emotional behavior, physiological activation, and subjective feelings are undoubtedly interrelated. In the everyday manner of thinking, all three are assumed to be aspects of one event, the emotion. Hence, the everyday way of thinking leads us to infer one from the other and to assume that all three co-occur. Rather than pursue that well-worn line of thinking, we are suggesting an alternative

theoretical tack: We assume the three domains to be at least conceptually separable from one another and take the relationship among them to be an empirical question. This approach does not deny the possibility that the three domains always co-vary, but it does allow the possibility that they do not – a possibility that should be maintained, especially in the study of the development of emotion.

This simple theoretical tack puts traditional questions in the psychology of emotion in a new light. Our approach suggests that the development of emotional behavior, emotional physiological activation, and subjective emotional experience need not follow the same lines. The development of emotional behavior may turn out to be mainly a maturational process. Certain forms of emotional behavior can be seen shortly after birth. For example, full-term and premature neonates show all the facial action patterns (with possibly one exception) that are distinguishable in adults as parts of emotional expressions (Oster, 1978). In contrast, the development of emotional experience may not emerge until long after this. Moreover, the link between emotional behavior and emotional experience now becomes an explicit issue, with the obvious possibility that the link changes with development. If there is merit in this line of reasoning, the traditional mode of thinking becomes suspect. For example, we would question the inference that because an infant smiles it likes something and feels happy – the inference that emotional behavior implies subjective emotional experience.

Consider the debate in the literature over the question of when “emotion” (or anger, etc.) first occurs developmentally. In our approach, we would separately ask when physiological activation first occurs (answer: very early), when specific emotional behaviors such as smiling first occur (answer: quite early for many behaviors), and when emotional experience first occurs (answer: probably later). We do not mean to prejudge the empirical issues here, but if, as we suspect, the answers to these different questions are in fact different, then the original question of when “emotion” first occurs becomes ambiguous.

When does the *pattern* that constitutes an emotion first occur? The answer to this question will vary with how closely we demand that the actual pattern and the prototypical pattern match and what units we choose as the components of our pattern. There is no clean division between prototypical and nonprototypical patterns, and there will be no answer to the question that is not arbitrary. We can ask when all three aspects of emotion occur simultaneously (e.g., When does the child become activated, frown, and feel angry simultaneously?), but this sets a criterion for membership in the category of anger that is higher than that set for the everyday use of the term. Thus, the answer given by this criterion will be different from parental report and from the psychologist's own intuitions. The appropriate procedure, then, is to describe the developmental emergence of the pattern rather than worry about when it crosses an arbitrary border.

Should patterns be described in terms of everyday concepts? One difficulty faced by a description of emotion based on everyday folk concepts is *dissociations*. Not all actual states match the prototypical pattern. In fact, the various components that make up the pattern, far from being perfectly correlated, are poorly (and, for some, negatively) correlated. Dissociations can be anticipated on theoretical grounds. Ekman's (1972) concept of display rules implies that expressive behavior will not always correspond to subjective experience and different expressive cues will sometimes be inconsistent. More important, low correlations are a fact. Behavioral, physiological, and verbal measures of, for example, anxiety are often only minimally correlated (Martin, 1961). Individuals who respond to emotionally laden stimuli with more expressive facial patterns tend to show *smaller* psychophysiological responses than do less expressive individuals (Buck, 1976). Rachman (1978) begins his book *Fear and Courage* with a chapter aptly titled "Fear Is Not a Lump." Reviewing the clinical evidence on therapeutic attempts to alter human fears, Rachman found that an interesting result occurred whenever investigators attempted to measure more than one component of fear. Much to everyone's surprise, one component of fear often exists or changes in the absence of others. A patient may claim to experience fear of snakes but be willing to approach and even handle a snake. Another patient may lose his or her behavioral avoidance during the course of therapy but maintain physiological signs of fear. In clinical terminology, the various components of fear are discordant. As Rachman points out, if measures were taken over a broader range of emotional states from extreme calm to extreme fear, positive correlations among the components might be seen. Nevertheless, the potential independence of the components must be recognized. Indeed, Rachman defined courage as occurring when a person feels fear but approaches rather than withdraws from the feared object.

From our point of view, patterns that do not match the folk script are just as real and worthy of study as those that do. The pattern of response in teen-agers that is fear of rejection may differ from the pattern that is a preschooler's fear of strangers or an adult's fear of physical danger. Each pattern should be studied in its own right. Similarly, it matters less whether an individual's pattern of response fits the script of fear than what that pattern is and why it is that way.

Ekman and Friesen (1982) have taken an enlightening step in the description of facial expressions that parallels the approach we are advocating. The English language provides a lexicon for the description of facial actions in such words as *smile*, *frown*, *sneer*, *pout*, and *grimace*. Rather than building on this foundation, Ekman and Friesen (1982) began afresh. They developed an anatomically based system of facial action units (AUs). Each is arbitrarily labeled (e.g., AU 4), and five discernible levels of intensity are defined for each action unit. The system,

known as FACS, provides an objective, reliable, and finely grained basis for research on facial behavior. From a developmental perspective, Oster (1978) has made the most significant contribution by adapting FACS to the facial behavior of infants. Research has already shown the value of this approach.

It might be objected that an action unit has no *meaning*, whereas a "smile" does: It is a sign of happiness. Precisely. That is the primary value of FACS. It reminds us that the meaning of a facial expression must be established rather than assumed. And it cannot be established in any simple way. A smile, for example, does not always signify happiness. The polite smile of a greeting, our ability to smile under adversity, and the smile of submission must be weighed along with the evidence that, under some circumstances, amount of smiling correlates with amount of self-reported happiness (Ekman, Friesen, & Ancoli, 1980). From an ethological perspective, Kraut and Johnston (1979) provided arguments and evidence that the primary meaning of a smile is a social statement of friendliness rather than a sign of happiness. Ekman's (1972) concept of display rule provides a different theoretical rationale for the same conclusion: Smile and happiness bear no one-to-one correspondence. And if a smile cannot be equated with happiness, is any other facial expression likely to bear a closer relationship to an inner experience?

To call for setting aside such concepts as emotion, anger, love, hate, and so on invites a number of misunderstandings we would like to avoid. First, we are not denying the *existence* of emotions, anger, love, or the rest. The phenomena are real, of course. The question is how to study these phenomena in the most scientifically useful way. Ekman and Friesen (1982) did not deny the existence of frowns and smiles but provided categories more useful to a scientific description of the phenomena.

Second, our approach is not simply an appeal to study phenomena on a more molecular level. There are patterns among physiological, cognitive, behavioral, and subjective events. The study of those patterns constitutes a molar level of analysis. We do suggest beginning at a more molecular level, but only for practical reasons; we see this as a way of discovering patterns at the molar level.

Third, it might be said that our approach is not new, since that is what psychologists do now anyway. A researcher cannot assess fear but must assess physiological change, behavior, or self-reported experience. This charge we will not deny. Rather, if this is so, it seems a powerful argument for viewing the field as we do. There is now a large gap between the questions researchers ask and the answers research provides. A researcher asks when emotion first occurs, and research provides information on an infant's first smile. Our approach seeks to eliminate this gap by, first, distinguishing those questions that can be empirically answered from those that cannot and, second, suggesting a way in which molar concepts can be created by the sort of research we can actually do.

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