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Differentiation in Preschooler's Categories of Emotion

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Two studies ($N = 68$, ages 2;0–3;11; $N = 80$, ages 2;6–4;11) explore the idea that, rather than starting with a separate mental category for each discrete emotion, children start with two broad categories (positive and negative) and then differentiate within each until adult-like categories form. Children generated emotion labels for (a) facial expressions or (b) stories about an emotion's cause and consequence. Emotions included were happiness, anger, fear, sadness, and disgust. Both conditions yielded the predicted pattern of differentiation. These studies of younger children found the face more powerful in eliciting correct emotion labels than had prior research, which typically relied on older preschoolers.

Keywords: emotion understanding, labeling, differentiation, categorization

Adults cope with the complex emotional world they face, in part, by categorizing many different events as instances of the same emotion. They might categorize one person as angry based on a facial expression, another based on that person's situation, and still another based on a display of hostile behavior. Mental emotion categories allow people to identify specific emotions and discriminate one kind of emotion from another—anger from sadness from fear and so on. Doing so allows us to predict and influence the course of an emotional episode. The present studies are part of a larger project on how *children* categorize emotions.

The most common, albeit sometimes implicit, assumption is that children begin with a separate mental category for each separate emotion, at least for the "basic" emotions. One possible basis for this assumption is the idea that certain facial expressions evolved as signals for specific emotions (Ekman, 1972; Izard, 1971; Lenti, Giacobbe, & Pegna, 1997). An evolutionary account of emotion requires not just the production of emotion faces but their recognition as well (Fridlund, 1994); there is no adaptive value in producing an unrecognized signal. Emotion signaling implies a set of mental categories by means of which facial expressions are understood: the "happy face" is interpreted as happiness, the "sad face" as sadness, and so on (e.g., Denham & Couchoud, 1990; Izard, 1971; Markham, & Adams, 1992).

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Support offered for emotion signaling theory includes research on infants. The ability to recognize the specific emotion conveyed by a facial expression has been theorized to be in place well within the first half year of life (Izard, 1971). By 7 months, infants who hear a happy vocalization look longer at a "happy face" than at a "sad face" (e.g., Kahana-Kalman & Walker-Andrews, 2001; Soken & Pick, 1992). By 12 months, infants are thought to use this early understanding of facial expressions to guide their own behavior through social referencing (e.g., Hertenstein & Campos, 2004). From a detailed review of this evidence (Widen & Russell, 2008a), we concluded that although it is clear that infants perceive and respond to other's emotions, it is not clear that infants are interpreting what they perceive in terms of discrete separate emotions. They might not yet have adult-like categories for separate emotions.

We have been developing an alternative account of that and other evidence, according to which children initially understand emotions in terms of very broad categories—feels good versus feels bad—and then gradually differentiate those categories into narrower, more adult-like ones. Our closest neighbors in this endeavor are theorists who describe children's differentiation of their own emotional experience (e.g., Bridges, 1930; Fischer, 1980; Lewis, 1998), although our evidence has focused on differentiation in their understanding of others' emotions (Bullock & Russell, 1986; Widen & Russell, 2003).[1]

Our Differentiation Model is based on two key observations (Widen & Russell, 2003). First, when preschoolers were sorted, irrespective of age, by the number of different emotion category labels they used for facial expressions, the cross-sectional data

[1] Another Differentiation Model that focuses on older children's understanding of others' emotions describes the development of children's ability to attribute two simultaneous emotions (e.g., Harter & Whitesell, 1989). In this model, children (5 years) can initially attribute two emotions of the same valence (e.g., sadness and anger) to two different objects. Over the course of middle childhood, they move through two levels of development until, around age 10, they can attribute two emotions of the opposite valence to the same object.

suggested that labels emerged in a systematic order (Widen & Russell, 2003, 2008b, 2008c). Children who use only one label most likely use *happiness*. Children then add either *sadness* or *anger*. Next, children use all three labels (*happiness*, *sadness*, *anger*), and later add a fourth, either *fear* or *surprise*. Children then use all five labels. Finally, they add *disgust*. In three studies, the percentage of children who fit this pattern was 81, 78, and 86% (Widen & Russell, 2003, 2008b, 2008c, respectively). Where a child falls in this pattern (termed Labeling Level) has also been shown to predict performance on a range of emotion tasks, above and beyond what can be predicted by age alone (Widen & Russell, 2008b, 2008c).

Second, even when presented with an equal number of facial expressions for each emotion, children use different emotion labels with different frequencies; the order from highest to lowest is typically *happiness*, *sadness*, *anger*, *fear*, *surprise*, and *disgust* (Gosselin & Simard, 1999; Izard, 1971, 1994; Widen & Russell, 2003). This pattern had been observed for children's "correct" responses, but the same order was also found for children's "incorrect" uses (Widen & Russell, 2003, 2008b), suggesting that differential use of emotion labels reflects children's developing category system.

Extending the Differentiation Model Beyond Facial Expressions

The evidence just cited all pertained to facial expressions, raising the question of whether the Differentiation Model is relevant to emotion in general. Research limited to faces may not reveal how children categorize emotions in many everyday situations. The primary purpose of the two studies reported here was therefore to extend the Differentiation Model to another cue to emotion: information about the causes and consequences of a specific emotion. Studies have shown that children can label the emotion conveyed by brief stories describing causes and consequences (e.g., Reichenbach & Masters, 1983; Widen & Russell, 2002), but this method has not been used to test a Differentiation Model.

The Relative Power of Facial Expressions

The studies reported here also allowed us to address another issue. Emotion Signaling Theory predicts that facial expressions provide children the toehold they need in acquiring information about emotions (e.g., Izard, 1971, 1994). Imagine a child encountering someone who is afraid. The child can learn from the encounter what label adults use for that emotion, what situation caused that emotion, what behaviors ensue, and so on. However, the child must first know that the person is afraid. The child needs a toehold to begin the process, and Emotion Signaling Theory suggests that facial expressions provide that toehold. The association of face and emotion is the bedrock on which a full "script" for each emotion is built. Thus, this theory predicts that the face is the most definitive cue to emotion, whereas all other cues are acquired through a probabilistic association with the face-emotion pairing.

In light of this theory, one finding is surprising. Twelve studies have assessed the relative power of facial expressions and another cue to emotion in eliciting the emotion concept: (a) the emotion's label (Camras & Allison, 1985; Russell, 1990; Russell & Widen, 2002a, 2002b; Widen & Russell, 2004) or (b) stories describing the causes or consequences or both of the emotion (Balconi & Carrera, 2007; Reichenbach & Masters, 1983; Smith & Walden, 1999; Widen & Russell, 2002, 2004, in press; Wiggers & van Lieshout, 1985). As anticipated by emotion signaling theory, two facial expressions were more powerful cues to the specific emotion than the comparison cue: the "anger face" (Reichenbach & Masters, 1983; Russell & Widen, 2002a; Widen & Russell, 2002; Wiggers & van Lieshout, 1985) and the "surprise face" (Camras & Allison, 1985; Smith & Walden, 1999; Widen & Russell, in press; Wiggers & van Lieshout, 1985).[2]

However, these two faces were the exception rather than the rule: 11 of the 12 studies found an *overall* Face *Inferiority* Effect: Recognition was lower for faces than for the comparison cue (Balconi & Carrera, 2007; Camras & Allison, 1985; Reichenbach & Masters, 1983; Russell, 1990; Russell & Widen, 2002a, 2002b; Smith & Walden, 1999; Widen & Russell, 2002, 2004, in press; Wiggers & van Lieshout, 1985). (The one exception was Markham & Adams', 1992, study in which children's overall labeling performance did not differ significantly given emotions' causes and consequences or facial expressions.) The Face Inferiority Effect was strongest for sadness, fear, and disgust; for these emotions, the effect was robust whether mode of presentation was the independent or dependent variable and whether children were asked to categorize, free label, choose from an array of faces, or describe the cause or consequence of the emotion. One potentially important factor in the Face Inferiority Effect is that the children in the majority of these studies were older preschoolers: In seven of these studies, the children were 4 years or older (Balconi & Carrera, 2007; Reichenbach & Masters, 1983; Russell, 1990; Smith & Walden, 1999; Widen & Russell, 2002, in press; Wiggers & van Lieshout, 1985); three studies included children as young as 3 years (Camras & Allison, 1985; Russell & Widen, 2002a; Widen & Russell, 2004); and only one study included 2-year-olds (Russell & Widen, 2002b). Thus, the relative power of face compared to other emotion cues remains largely unknown for younger preschoolers. The evidence on infants' response to the emotions of caregivers suggests that facial expression may play a larger role in a child's understanding of emotion for children younger than those included in the studies reviewed in this paragraph.

Overview of the Current Studies

In two studies, young preschoolers' were asked to label the emotion conveyed by each of five facial expressions and, separately, by stories about the corresponding emotion's antecedent cause and behavioral consequence. By "label," we mean that children responded to the question "How does Judd feel?" with whatever label they came up with. We did not require them to choose from a prespecified list of labels. These data allowed us to explore two issues: (a) Does the pattern of differentiation found when the cue is a facial expression replicate when the cue is information about the situational cause and behavioral consequence of the emotion? And (b) is the facial expression consistently a more powerful cue than is the story?

[2] Not all of these 11 studies made statistical comparisons between the modes of presentation, but for each study the trend was in the reported direction.

Study 1 focused on young preschoolers (2- and 3-year-olds), with mode of presentation (face vs. story) as a between-subjects factor. (Pilot work suggested that younger 2s were often unable to sit through both story and face modes of presentation.) To our knowledge, no prior study had presented emotion stories to 2-year-olds, and so Study 1 must be considered exploratory. Study 2 focused on somewhat older preschoolers (2;6–4;11 years), and mode of presentation (face vs. story) was a within-subject factor.

Study 1

Method

Participants. Participants were 64 children (32 girls and 32 boys) enrolled in daycares and preschools in or near Vancouver, British Columbia. All children were proficient in English (as indicated on the consent form by the parent, by the daycare workers' opinion, and by the experimenter's opinion of the child's fluency in conversation). There were 32 children (16 girls and 16 boys) in each of two age groups: 2-year-olds (24 to 35 months; $M = 30.0$ months, $SD = 3.4$ months) and 3-year-olds (36 to 47 months; $M = 41.8$ months, $SD = 3.6$ months). The sample was ethnically diverse, reflecting the population of the city in which the study took place, Vancouver, BC, Canada.[3]

Materials.

Facial expressions. A set of six black-and-white 5″ × 7″ photographs of a 12-year-old boy posing one neutral expression and five prototypical facial expressions of emotion (happiness, sadness, anger, fear, disgust) were used. The photographs had been selected by Camras, Grow, and Ribordy (1983) to meet Ekman and Friesen's (1978) criteria for particular discrete emotions. Each face contained the specified pattern of action units (AUs) as defined by Ekman and Friesen's (1978) Facial Action Coding System for the specific emotion: "neutral" (no AUs), "happiness" (AUs 6 + 12 + 25), "sadness" (AUs 1 + 4 + 15), "anger" (AUs 4 + 5 + 7 + 10 + 26), "fear" (AUs 1 + 2 + 4 + 5 + 20 + 25), and "disgust" (AUs 7 + 9 + 25). These expressions can be found as .bmp files at http://condor.depaul.edu/~lcamras/images/

Stories of emotional events. One story describing a stereotypical emotion-eliciting event and a behavioral response was created for each of five emotions (see Table 1) based on prior work in our lab in which children had generated causes and consequences for specific emotions (Russell, 1990; Russell & Widen, 2002a). Each story was matched with a drawing depicting the story's focal object. Thirty-six university-aged adults (mean age = 19.5 years) free labeled the emotion implied by the stories: For happiness and fear, 100% labeled the story correctly; for sadness and anger, 97%; and for disgust, 94%.

Procedure. On the initial visit to the child-care facility, the experimenter spent time playing with each child with parental consent until the child seemed comfortable with the experimenter. On a subsequent visit, the experimenter invited each child to play a game. Before beginning the game, and at each transition point, the experimenter briefly described what she and the child would do next, and asked for the child's consent to proceed. The "game" lasted less than 10 min and consisted of two phases. The first phase was a priming session. For the second phase, the categorization task, the child was randomly assigned to either the face or the story condition, and the child was asked to freely label Judd's emotion.

Table 1
Five Emotion Stories

Emotion	Story
Happiness	. . . it was Judd's birthday. All his friends came to his birthday party. They all ate birthday cake. Judd got lots and lots of presents. Then Judd and his friends played some games. Judd gave his friend a big hug.
Sadness	. . . Judd went to feed his pet gold fish. But it was not swimming. It was not even in the fish tank. Judd's fish had died. He really missed his fish.
Anger	. . . Judd was at daycare. He spent a long time building a block tower. So long, in fact, that the block tower was very tall. But then a boy came and touched his beautiful tower. Judd said, "Be careful." But the boy knocked it over anyway. Judd wanted to yell at that boy and hit him.
Disgust	. . . Judd found an apple. It looked big and juicy. Judd took a big bite. Then he saw that there was a worm in the apple. He spit it out as fast as he could and threw the apple on the ground. He did not want to touch it.
Fear	. . . Judd was in his bed. He was all alone and it was very dark. He heard something moving in the closet. He didn't know what it was. He wanted to hide under the bed. Then he heard the closet door open. Judd wanted to run away.

There were five such trials, one for each emotion, presented in various random orders.

Priming. A priming procedure identical to that described by Widen and Russell (2008c, Study 2) was used to ensure that the target emotion labels were as accessible as possible in each child's vocabulary. Priming increases the number of labels used while decreasing the proportion of labels used "incorrectly."

Faces. In the face condition, the experimenter introduced the six photographs of faces by saying, "I brought some pictures of a boy named Judd. Would you like to look at them with me? Okay, here is a picture of Judd [showing the neutral expression]. Do you know what Judd is going to do? He is going to show us how he feels sometimes." The experimenter then showed the child the five emotional expressions, one at a time in a separate random order for each child. For the first emotional face, the experimenter said, "One day, Judd felt like this [pointing to the face]." For each of the other faces, the experimenter began, "One week later, Judd felt like this [pointing to the picture]." While showing each face, the experimenter asked, "How do you think Judd feels?" Responses were not corrected and all were mildly praised (e.g., "Good answer"; "You are good at this game."). If no response was given, the experimenter used various prompts (e.g., "Have you ever made this face?" "What do you think happened to make Judd feel this way?"). If the child still did not respond, the experimenter went on to the next photograph, and, after the other trials, returned to any to which the child had not responded.

Stories. In the story condition, the experimenter introduced the stories by saying, "I'm going to tell you some stories about things that happened to a boy named Judd. After each one, you get

[3] Information as to the race, ethnicity, and SES of the children in this sample was not collected. The population of Vancouver is 59.0%, European, 18.5% Asian, and 22.5% other (based on mother tongue, 2006 Census) (City of Vancouver, 2008).

to tell me how you think Judd feels. How does that sound? Remember, listen carefully, because you have to tell me how Judd feels." The experimenter then presented the stories one at a time in a random order. The first story began, "Once upon a time," and the other stories began, "One week later . . ." After each story, the experimenter asked, "How do you think Judd feels?"

At no time, in either mode of presentation, did the experimenter use the word *emotion*, provide any emotion labels, or otherwise direct the child to try to use an emotion label beyond asking how Judd was feeling.

Scoring. The scoring key for the freely produced labels was drawn from Widen and Russell (2003), who described its development based on the ratings of two judges blind to the source of the labels. The labels that occurred in this study and that were scored as correct were: for happiness, *happy*, *good*; for fear, *scared*, *frightened*; for disgust, *disgusted*, *yucky*; for anger, *angry*, *mad*, *grumpy*; and for sadness, *sad*. Responses could vary from what was just listed in syntax or by being embedded in a phrase (e.g., *very scared*). These were all the labels children used in the current study that came close to specifying the one of the target emotions.

Results

Use of emotion labels and the Differentiation Model.

Use of labels. The children had a total of 320 (64 children × 5 emotions) opportunities to provide a label. Of their responses, 190 (59.4%) were emotion labels (whether "correct" or "incorrect"), and 130 (40.6%) were other responses (e.g., "I dunno"). Use of emotion labels increased strongly with age. The 2-year-olds had 160 opportunities to label a stimulus; of their responses, 52 (32.5%) were emotion labels. For the 3-year-olds, 138 (86.3%) were emotion labels. Age made a large difference even within the group of 2-year-olds: The younger 2s (2;0–2;5) had 80 (5 trials × 16 children) opportunities to provide a label, and of their responses, only 12 (15.0%) were emotion labels. The older 2s (2;6–2;11) already showed an increase in emotion labeling: 40 (50.0%) of their responses were emotion labels. The number of emotion labels (whether "correct" or "incorrect") generated did not vary with mode of presentation. In each mode, children had 160 opportunities to provide a label and provided 95 (59%) emotion labels.

Differentiation Model. To test the Differentiation Model, we analyzed all children's emotion labels, both "correct" and "incorrect." First, to explore children's differential use of emotion labels, we asked whether, even when presented with an equal number of stimuli for each emotion, children were more likely to use some emotion labels than others. The frequencies for use of each emotion category label are shown in Table 2. The rank order, from highest to lowest, was *sadness*, *happiness*, *anger*, *fear*, and *disgust*. Importantly, the rank order was similar for total uses, for "correct" and "incorrect" responses, and for stories and faces. There were some differences from this order, but never by more than one rank. (In prior studies, *happiness* was generally used more frequently than *sadness*, but here there was only one positive stimulus and four negative ones. In prior studies, a surprise stimulus was typically included and was often interpreted as happy.)

Next, we examined the pattern predicted by the Differentiation Model (Widen & Russell, 2003). Figure 1 shows the version of the Differentiation Model applicable to the current study. Because we included five emotions, the Differentiation Model predicts that children fall into six clusters: Those at Labeling Level 0 use none of the target labels. Those at Labeling Level 1 use one label, *happiness*, and so forth, up to those at Labeling Level 5, who use all five (*happiness*, *sadness*, *anger*, *fear*, *disgust*). Children were sorted (irrespective of age, "correctness," or mode of presentation) by the number of different emotion category labels they used. For each such group, Figure 1A shows the number and age of children whose actual labels were those predicted by the Differentiation Model. The data fit the Differentiation Model well: 82.8% (53) of the 64 children fit the predicted pattern.

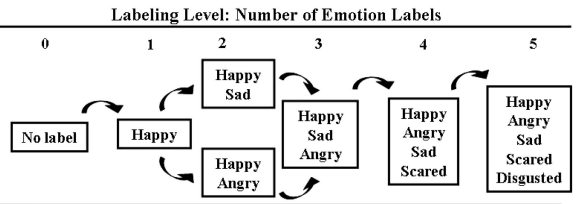
Table 2
Frequency of Children's Use of Each Emotion Label in Study 1

Use	Emotion label				
	Sadness	Happiness	Anger	Fear	Disgust
Total	67	55	43	16	9
"Correct" vs. "incorrect"					
"Correct"	33	41	24	16	6
"Errors"	34	14	19	0	3
Mode of presentation					
Stories	38	32	16	6	3
Faces	29	23	27	10	6

Note. By each "emotion label," we mean a cluster of synonyms for each emotion category; see text for scoring of labels. The maximum number of responses for each cell was 320 (64 children × 5 trials).

Sixteen children used no labels (Labeling Level 0). If a child used only one label, that label was predicted to be *happiness* (Labeling Level 1); 6 of 12 (50.0%) children at this level used *happiness* (4 used *sadness*, 1 used *anger*, 1 used *fear*). For two labels, 9 of 10 (90.0%) who used two labels used *happiness* and *sadness* or *happiness* and *anger* (Labeling Level 2) (1 used *sadness* and *anger*); for three labels, 9 of 12 (75.0%) who used three labels used *happiness*, *sadness*, and *anger* (Labeling Level 3) (2 used *happiness*, *sadness*, and *fear*; 1 used *happiness*, *sadness*, and *disgust*); for four labels, 8 of 9 (88.9) who used four labels added *fear* (Labeling Level 4) (1 added *disgust*); and for five labels, 5 of 5 (100.0) added *disgust* (Labeling Level 5). The frequency for each of the nonpredicted combinations was low. This percentage of children who fit the Model was significantly higher ($p < .001$) than the 20.0% expected by chance alone.[4] Because each child had

[4] The number of children who would have fit the Model by chance alone was calculated by, first, counting the total number of combinations possible for each number of labels (e.g., for two labels used out of the five target labels, there were 10 possible combinations) and the number of those combinations that were correct in the Differentiation Model (i.e., 2 of the 15 possible combinations of two labels were correct: *happiness* and *sadness*, *happiness* and *anger*). Next, to calculate the number of children expected to fit the model by chance, we multiplied the number of children who produced that number of labels (e.g., 10 children used two labels) by the number of correct combinations divided by the total number of possible combinations (i.e., 9 * [2/15] = 1.2). This process was repeated for each number of labels used (0 to 5), and the numbers expected by chance for each were added together (20.01) and divided by the number of children in the sample (64).



A. Stories and Faces

	0	1	2	3	4	5
N	16	6	9	9	8	5
Mean Age (Months)	29.9_a	32.7_{ab}	37.6_{bc}	38.4_{cd}	41.0_{cd}	44.0_d
SD	4.8	7.1	5.3	5.6	4.0	2.7

B. Faces

	0	1	2	3	4	5
N	8	0	1	7	7	2
Mean Age (Months)	29.9_a		31.0_{ab}	39.0_{bc}	40.3_{bc}	46.0_c
SD	2.9		0.0	6.1	3.8	0.0

C. Stories

	0	1	2	3	4	5
N	8	6	8	2	1	3
Mean Age (Months)	29.9_a	32.7_a	38.4_b	36.5_{abc}	46.0_{bc}	42.7_c
SD	6.4	7.1	5.0	4.9	0.0	2.9

Figure 1. Systematic emergence of emotion labels in Study 1. The number of children who used the individual labels in the specified set of labels for different stimuli, and the mean age and standard deviation for each Labeling Level, is given for the stories and faces together (A), the face (B), and story (C) modes of presentation separately.

only limited opportunities to use the labels (and only one opportunity to use it "correctly"), this amount of agreement with the predictions of the model is encouraging. Further, seven additional patterns were observed to account for the remaining 17.2% of the sample, and no one additional pattern was frequent (range: 1–4). Age increased significantly with Labeling Level from 30 months at Labeling Level 0 to 44 months at Labeling Level 5, $F(5, 47) = 9.76$, $p < .001$ (Figure 1A). The correlation between age and Labeling Level was significant, $r = .70$, $p < .001$.

Of greater interest, the Differentiation Model replicated *within* each mode of presentation. Label use (Figure 1B) of 78.1% (25) of the 32 children in the face mode fit the Model, which was significantly higher ($p < .001$) than the 34.2% expected by chance.[5] Label use (Figure 1C) of 87.5% (28) of the 32 children in the story mode fit the Model, which was significantly higher ($p < .001$) than the 44.7% expected by chance. The proportion that fit the model in each mode of presentation did not differ significantly (independent samples $t_{62} = .99$, $p = .33$).

Mode of presentation and "correct" responses. To examine the relative power of faces versus stories as cues to emotion, we asked whether children's responses were "correct" as to the specific emotion. Of the total number of opportunities (320) to provide a label, 37.5% (120) were emotion labels scored "correct" for the stimulus given, and the rest were scored as incorrect; 21.9% (70) were emotion labels scored "incorrect" for the stimulus and 40.6% (130) were other responses (e.g., "I dunno").

As expected, correct performance increased with age, independent groups *t* test, $t_{62} = 6.21$, $p < .001$: Performance was significantly lower for 2-year-olds (percent "correct" = 20.8%, $SD = 27.4$) than for 3-year-olds (65.2%, $SD = 29.7$). Each emotion was significantly different from the others, dependent sample *t* tests ($df = 63$), *p*s $< .04$; the rank order from highest to lowest was happiness (64.1%), sadness (51.6%), anger (37.5%), fear (25.0%), disgust (9.4%).

Correct use was marginally higher in the face mode than in the story mode, independent groups $t_{62} = 1.88$, $p = .06$: percent correct for face = 51.4% ($SD = .38.6$); for story, 34.8% ($SD = 31.9$). By separate Chi square tests, performance was significantly higher in the face mode than in the story mode for sadness ($N = 64$, $\chi^2 = 5.07$, $p = .02$) and anger ($N = 64$, $\chi^2 = 6.67$, $p = .01$); there were no significant differences between modes for happiness, fear, or disgust.

Discussion

Young 2-year-olds produced too few emotion labels to draw firm conclusions about this age group. Despite this caveat, this study yielded interesting results. The Differentiation Model provided a description of the specific set of emotion labels used by a large majority of children. Fifty-three of the 64 children in this study fit the Model, and the frequency of any one other combination of labels used by the remaining 11 children was low. The Differentiation Model was replicated with faces, in what is now a robust finding. Indeed, it is encouraging that the Differentiation Model replicated in a study in which the child was presented with only one stimulus per emotion. More importantly, the Differentiation Model was replicated equally strongly with stories about causes and consequences. This finding suggests that the model is not limited to children's categorization of facial expressions, or, for that matter, of cause and consequence stories. Rather, the Differentiation Model describes the categories children possess for the domain of emotion, a set of categories used whatever the specific cue to emotion that the child happens to encounter.

The difference between modes of presentation is clarified by scoring responses as correct or incorrect. Doing so, we see that between their second and fourth birthdays, children improved greatly in their ability to label emotions in an adult manner. Performance was of course higher for some emotions than for others. Importantly, the rank order of the emotions was the same for faces and stories. This finding reinforces the conclusion that our results describe children's underlying system of categories for emotion rather than something unique to a particular source of information. There was one perhaps telling difference on the Differentiation Model between the face and story mode: The median Labeling Level in the face mode was 3; in the story mode it was 2. Perhaps for this age group, faces are more likely to elicit differentiated emotion categories than are stories.

The typical finding of a Face Inferiority Effect was not found here. Indeed, Face was marginally superior, but this effect was carried by two emotions (anger and sadness) for each of which the face was the significantly stronger cue. This result for the anger face has been found before (e.g., Widen & Russell, 2002, in press), but the result for sadness is a novel finding. This finding will be pursued in the next study. Finally, we found no significant Face Inferiority Effect with this age group for fear or disgust.

[5] The percentage expected by chance is determined by the number of children who used one of the predicted combinations divided by all possible combinations for that Labeling Level (e.g., there are five possible combinations for those children who use one label, but only one combination for those who use five labels). Thus, the percentage of children expected to fit the Model by chance varies with each sample.

Study 2

The primary purpose of Study 2 was to establish more firmly that the Differentiation Model holds for emotion stories, and not just faces, when data are gathered with a broader age range (2.5- to 4-year-olds) and with small changes in method from Study 1. Because the young 2-year-olds generated so few labels in Study 1, we chose 2.5 as the youngest age, and we took steps to increase the chances that the child would generate a label. With this older sample, we could also use a more powerful, within-subject design to explore the effects of mode of presentation.

Study 2 was designed to be very similar to Study 1: The set of emotions was the same, facial configuration was the same (except presented as realistic drawings rather than photographs), and the set of stories was the same (except the gender of the protagonist was changed). In the current study, we modified the design of Study 1 in eight ways: (a) The sample size in the current study was increased to 80 children. (b) The age groups were modified: Younger 2s (2;0–2;5) were excluded because of their low level of responding in Study 1, so that the younger age group was 2;6 to 3;5, and an older age group of 4;0 to 4;11 was added. The addition of 4-year-olds was expected to yield more children at higher Labeling Levels. (c) To address the question of whether children could and would label stories on demand, we added an animal labeling trial before the first categorization trials. The children were asked to label brief descriptions of common animals (cat, dog, rabbit). This trial also served to train children to label stories. (d) The happy trial was a gate-keeper and a training trial so that we could be sure that all the children in the sample were willing and able to free label emotion stimuli. Therefore, the happy trial was presented first and included both the face and the story. To be included in the sample, children had to label this trial as *happiness*. (e) To ensure that the children understood the stories, we also asked a simple question about the facts of the story (e.g., for the anger story, in which Joan builds a block tower, the fact question was: Did Joan build her tower from blocks or Lego?). (f) Mode was a within-subject factor: Each child was presented with both the stories and, separately, the faces. This change increased the number of children in each group, and also enabled us to draw stronger conclusions regarding mode of presentation. (g) In Study 1, all the stimuli were limited to a facial expression posed by a boy and stories about the same male protagonist. In Study 2, we used drawings of a young girl displaying prototypical facial expressions of the target emotions (Tremblay, Kirouac, & Dore, 1987). Realistic drawings of faces were chosen on the grounds that we already knew that the Differentiation Model replicated well for photographed faces in 3- to 5-year-olds, and so showing that it replicated for these new stimuli would be an additional piece of information. (h) Thus, in the stories, the protagonist was changed to a girl (Joan) to correspond with the facial expressions.

Method

Participants. Participants were 80 children (40 girls and 40 boys) enrolled in daycares and preschools in or near Boston. All children were proficient in English (as indicated on the consent form by the parent, by the daycare workers' opinion, and by the experimenter's opinion of the child's fluency in conversation). There were 40 children (20 girls and 20 boys) in two age groups: young preschoolers (31 to 42 months; $M = 37.7$ months, $SD = 2.63$ months), and older preschoolers (49 to 59 months; $M = 54.0$ months, $SD = 3.16$ months). The sample was representative of the ethnic composition of the area: 80.3% of participants were White, 3.95% Asian, 3.95% Hispanic, 5.55% of mixed ethnicity, and 6.58% other.

Materials.

Photographs of animals. The animal pictures were three color photographs, one each of a cat, dog, and rabbit.

Facial expressions. A set of six black and white $3'' \times 4''$ drawings of a girl, one with a neutral facial expression and five displaying facial expressions of emotion were used (Tremblay, Kirouac, & Dore, 1987). These drawings were designed to meet Ekman and Friesen's (1978) criteria for the display of particular discrete emotions. The emotions were happiness, sadness, anger, fear, and disgust.

Stories of emotional events. Children were presented with the same stereotypical emotion-eliciting stories, and illustrations, used in Study 1, except that the protagonists' name was Joan (see Table 1).

Procedure. The procedure of Study 2 was identical to that of Study 1 except as noted. Following priming, the children heard brief descriptions of common animals (cat, dog, rabbit) (e.g., This kind of animal can purr and likes to catch mice) and were encouraged to label it before the experimenter showed them the corresponding picture. The three animals were shown, in different random orders. The animal labeling trials served as a practice session.

For the categorization task, the happy trial for all children was first and because all children labeled both faces and stories this trial included both modes of presentation. Thus, the experimenter introduced the happy trial with, "Once upon a time, there was a girl named Joan. One day, it was Joan's birthday. All her friends came to her birthday party. They gave her lots of presents. They all ate birthday cake. Joan jumped up and down and clapped her hands. And she looked like this [show happiness face]. How does Joan feel?"

Children were then randomly assigned to either the story-first or the face-first condition, and the experimenter continued with the next stimulus. Half the children labeled the faces first; half stories. In the story mode, if the child did not respond to the question, "How does Joan feel?" the experimenter repeated the story and the question. If the child still did not respond, the experimenter asked, "How would you feel if . . ." and repeated the story with the child as the protagonist. If the child still did not respond, the experimenter went on to the next story. After the children were asked how the protagonist felt in each story, they were also asked a question about the event of the story (happiness: Did Joan get some presents or no presents; sadness: Was Joan's pet a kitten or a fish; anger: Was Joan's tower made of blocks or Lego?; fear: Was Joan chased by a lion or by a dog; disgust: Did Joan bite an apple or a pear?).

Scoring.

Animal labeling. The labels scored as correct in the cat category were *cat*, *kitty*; in the dog category, *dog*; in the rabbit category, *rabbit*, *bunny*. Children used no other labels.

Emotion trials. The happy trial served as a screening device: The child had to label the happy trial as happiness to be included in the sample. Four children were excluded from sample on this criterion (2 boys, 2 girls); all were under 3 years of age. The labels

that children used that were scored as correct for each category were: for happiness, *happy*, *good*; for fear, *scared*, *nervous*; for disgust, *disgusted*, *yucky*; for anger, *angry*, *mad*, *grumpy*, *grouchy, frustrated*, *annoyed*, *cross*; and for sadness, *sad*, *hurt*.

Results

Understanding of stories. To assess children's understanding of stories, we analyzed their responses to the fact questions. Mean percent correct was 98.0 ($N = 80$; range: 96.2–98.8). They understood the stories.

Use of emotion labels and the Differentiation Model.

Use of labels. The children had a total of 640 (80 children × 8 stimuli) opportunities to provide a label. (The happy trial was omitted because it was used as a gatekeeper trial and all children included in our sample had therefore responded correctly). Of the 640, 592 (92.5%) were emotions labels (whether "correct" or "incorrect"), and 48 (7.5%) were other responses (e.g., "I dunno").

In this study, we took a number of steps to increase the likelihood that children would respond with an emotion label (animal labeling training trial, happy training/gate-keeping trial, excluding those younger than 2.5 years). Our efforts were highly successful: Children in the current study were more likely to respond with an emotion label than were children in Study 1. Indeed, the young preschoolers' level of responding was so high that it left little room for an increase with age: The older preschoolers had 320 opportunities (40 children × 8 trials) to label an emotion stimulus; of these, 301 (94.1%) were emotion labels. The younger preschoolers did almost as well: of their 320 opportunities, 290 (90.6%) were emotion labels. (Even the youngest half of this younger group [$N = 20$, 2;7–3;2] offered an emotion label on 91.3% of trials).

Use of emotion labels (whether "correct" or "incorrect") did not vary significantly with mode of presentation: 95% of responses were emotion labels in the face mode, 90% in the story mode.

Differentiation Model. To test the Differentiation Model, we analyzed all children's responses, both "correct" and "incorrect." Because the happy trial was used as a gatekeeper and included both a face and a story, children had only half as many opportunities to respond to the happy stimulus. Thus, use of the label *happiness*, for whatever stimulus, was excluded for the analysis of differential frequency of label use. To explore children's differential use of emotion labels, the frequencies for use of each emotion category label are shown in Table 3. The rank order, from highest to lowest, was *anger*, *sadness*, *fear*, and *disgust*. There were some differences from this order, but never by more than one rank. Importantly, the rank order was similar for total uses, "correct" use and "errors," and for stories and faces.

Next, to examine the pattern predicted by the Differentiation Model (shown in Figure 2), children were sorted (irrespective of age, "correctness," or mode of presentation) by the number of different emotion category labels they used on the categorization task. The number of children who fit each predicted pattern was counted. In this study, because all the children had used *happiness* in the happy gate-keeping trial, no children were in Labeling Level 0. Figure 2A shows the number of children who used one of the combinations of labels predicted by the Model and the mean age of each Labeling Level. The data fit the Differentiation Model well: 87.5% (70) of the 80 children were described by this model.

Table 3
Frequency of Children's Use of Each Emotion Label in Study 2

Use	Emotion label			
	Sadness	Anger	Fear	Disgust
Total	214	228	66	19
"Correct" vs. "incorrect"				
"Correct"	114	108	58	18
"Errors"	100	120	8	1
Mode of presentation				
Stories	128	85	29	15
Faces	86	143	37	4

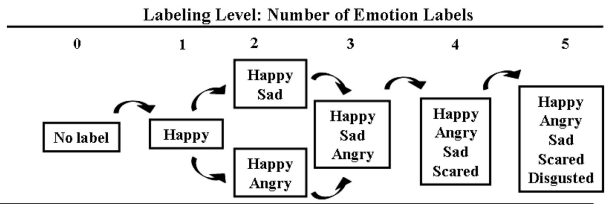
Note. By each "emotion label," we mean a cluster of synonyms for each emotion category; see text for scoring of labels. The maximum number of responses for the Total, "correct," and "incorrect" cells was 800 (80 children × 5 trials × 2 modes). The maximum number of responses for cells Mode of Presentation cells was 400 (80 children × 5 trials).

If a child used only one label, that label was predicted to be *happiness* (Labeling Level 1); 3 of 3 (100.0%) children who used only one label used *happiness*. For two labels, 8 of 8 (100.0%) who used two labels used *happiness* and *sadness* or *happiness* and *anger* (Labeling Level 2); for three labels, 16 of 18 (88.9%) who used three labels used *happiness*, *sadness*, and *anger* (Labeling Level 3) (1 used *happiness*, *sadness*, and *fear*; 1 used *happiness*, *anger*, and *fear*); for four labels, 33 of 38 (86.8%) who used four labels added *fear* (Labeling Level 4) (4 added *disgust*; 1 used *happiness*, *sadness*, *fear*, and *disgust*); and for five labels, 10 of 10 (100.0%) added *disgust* (Labeling Level 5). This proportion of children who fit the Model was significantly higher ($p < .001$) than the 20.7% expected by chance alone. Four additional patterns were observed to account for the remaining 12.5% of the sample. The number of children showing any of these patterns was low (1–4). Age increased significantly with Labeling Level from 35 months at Labeling Level 1 to 50 months at Labeling Level 5 (Figure 2A), $F(4, 67) = 5.90$, $p < .001$. Age correlated significantly with Labeling Level, $r = .43$, $p < .001$.

Of greatest importance, the Differentiation Model replicated within each mode of presentation. For faces (Figure 2B), 90% (72) of the 80 children fit the Model, which was significantly higher ($p < .001$) than the 8.2% expected by chance; for stories (Figure 2C), 87.5% (70) of the 80 children fit the Model, which was significantly higher ($p < .001$) than the 14.2% expected by chance. The proportion that fit the model in each mode of presentation did not differ significantly (dependent sample $t_{79} = 1.09$, $p = .28$).

Mode of presentation and "correct" responses. Next we focused on children's "correct" responses to examine the relative power of faces versus stories as cues to recognizing the specific emotion conveyed. Of the total number of opportunities (640) to provide a label, 298 (46.6%) were emotion labels scored correct for the stimulus given, and the rest were scored as incorrect; 294 (45.9%) were emotion labels scored "incorrect" for the stimulus and 48 (7.5%) were other responses (e.g., "I dunno").

As expected, correct use increased with age, independent groups $t_{78} = 5.33$, $p < .001$: Young preschoolers' (mean percent correct = 34.4%, $SD = 21.1$) performance was significantly lower than older preschoolers' (57.8%, $SD = 18.1$). Each emotion was



A. Stories and Faces						
N	0	3	8	16	33	10
Mean Age (Months)		34.7_a	38.2_a	43.1_b	49.9_b	49.1_a
SD		2.1	2.3	9.1	7.8	8.1
B. Faces						
N	0	4	13	19	35	1
Mean Age (Months)		35.5_a	39.4_b	45.3_b	49.2_b	58.2_a
SD		2.4	3.9	9.6	8.1	0.0
A. Stories						
N	0	7	23	18	17	5
Mean Age (Months)		36.9_{ab}	43.4_b	46.3_c	51.5_c	55.0_a
SD		2.5	8.4	9.4	5.6	2.8

Figure 2. Systematic emergence of emotion labels in Study 2. The number of children who used the individual labels in the specified set of labels for different stimuli, and the mean age and standard deviation for each Labeling Level, is given for the stories and faces together (A), the face (B), and story (C) modes of presentation. The *N*s for the individual story and face modes do not always add up in the Stories and Faces section because mode of presentation was a within-subject factor; thus, a child might not have been in Labeling Level 5 in either the face or story mode, but could have used all five target labels between the two modes and thus reached Labeling Level 5 overall.

significantly different from the others except sadness and anger, dependent sample *t* tests ($df = 79$), $ps < .001$; the rank order from highest performance to lowest was sadness (71.9%), anger (66.3%), fear (36.9%), disgust (9.4%). (Recall that happiness was a gate-keeper such that 100% of the children were correct.)

Correct use did not differ significantly by mode overall, $t_{79} = 1.34$, $p = .18$: proportion correct for face = .48 ($SD = .25$); for story = .46 ($SD = .28$). Based on a Chi square test, each of the four emotions, however, showed a significant effect of mode. The face was the more powerful cue for anger ($N = 32$, $\chi^2 = 32.00$, $p < .001$)[6] and fear ($N = 27$, $\chi^2 = 27.00$, $p < .001$). The story was the more powerful cue for sadness ($N = 21$, $\chi^2 = 21.00$, $p < .001$) and disgust ($N = 13$, $\chi^2 = 13.00$, $p < .001$).

Because mode of presentation was a within-subject factor, we could assess emotion signaling theory's hypothesis that children's recognition of faces provides the toehold for emotion understanding. One prediction from this hypothesis is that children who can recognize the emotion implied by a story can also recognize that same emotion implied by a facial expression—but not vice versa. That is, the hypothesis implies no (or very few) cases of children recognizing the emotion from a story but not from a face. Based on 320 (80 children × 4 emotions) responses, some children were "correct" on labeling neither face nor story for a given emotion ($M = 39.5\%$), and some were "correct" on both ($M = 31.5\%$). The interesting cases occurred when a child "correctly" labeled one but not the other. Contrary to the face-as-toehold hypothesis, the proportion of cases on which children were "correct" on the face but not on the story (16.8%) was not significantly different from the cases on which children were "correct" on the story but not on the face (12.8%), dependent samples $t_{79} = 1.34$, $p = .18$.

Discussion

Study 2 relied on small methodological changes from Study 1 to coax children as young as 2.5 years of age to generate emotion labels. These changes were successful, yielding a large number of labeling responses to analyze. The major result was strong support for the Differentiation Model. Seventy of the 80 children in Study 2 fit the Model, and the various patterns of label use produced by the remaining 10 children were each infrequent. The Differentiation Model replicated for both faces and stories.

Study 2 did yield more mixed results than did Study 1 on the power of faces versus stories. In important respects, both modes of presentation yielded similar results. For instance, in this sample, the median Labeling Level for both modes was Labeling Level 3. The rank order of emotions in each mode of presentation was generally the same (except for a reversal between sadness and anger). This similarity of results suggests that free labeling taps changes in children's underlying system of categories for emotion rather than something unique to a particular source of information. At the same time, faces were the more powerful cue to correct labeling for fear and anger, but stories emerged as the more powerful cue for disgust and sadness.

General Discussion

Our first conclusion is that it is possible to use freely generated emotion labels to study the understanding of emotion in preschoolers as young as 2.5 years of age. We observed a dramatic increase from Study 1 to Study 2 in the number of labels generated by the preschoolers. For example, older 2-year-olds (2;6–2;11) generated an emotion label on 50% of trials in Study 1 and on 91% of trials in Study 2. The research designs do not allow us to say exactly which changes in method accounts for this change in results. We suspect that the most important differences between the studies were the introduction of the animal labeling task and use of the happy trial as a training trial.

One caveat to the power of the added steps in Study 2 is that children's proportion of "correct" emotion labels did not increase as dramatically as did the proportion of labels overall Consider the children's responses to sad, angry, scared, and disgust stimuli (i.e., omitting the happy trial, which was used as training trial in Study 2). In Study 1, children's percent "correct" for these four emotions was 30.9%. In Study 2, with the added steps intended to increase labeling, proportion "correct" was 46.6%. Thus, while children's overall level of generating labels doubled in Study 2, the majority of the additional labels were "incorrect." On the other hand, an analysis of their "incorrect" labels led to the major substantive conclusions of the present study.

Differentiation Model

The main question we posed in this study concerned the possibility that preschoolers' categories of emotion undergo a process

[6] To test the effect of mode for each emotion separately, we examined children who were correct in one mode but not the other. Children who were correct in neither or both modes were omitted. This step allowed a separate Chi square for mode for each emotion.

of differentiation. The results of Study 2 were remarkably similar to those of Study 1 on this question. In both studies, children's use of emotion labels was systematic. The Differentiation Model described the emotion labels used by the young preschoolers (2- and 3-year-olds) in Study 1 as well as by the somewhat older preschoolers (2.5- to 4-year-olds) in Study 2. In all, the Differentiation Model held for 121 of the 144 children examined in the two studies. More importantly, the Differentiation Model held for both modes of presentation.

Figure 3 illustrates our hypothesized process of differentiation by showing the modal labels used by children at each Labeling Level for all 121 children who fit the Differentiation Model. Figure 3 shows the number of children at each Labeling Level, the labels used by those children, and, tellingly, the stimuli for which the labels were modal. Combining data from two different studies allows no firm conclusions, but Figure 3 does illustrate with data the idea of differentiation.

Figure 3 shows that in general categories used by children at one Labeling Level become subdivided by children at a higher Labeling Level. Children at Labeling Level 1 (mean age = 33 months) used *happiness* to label not only the smiling "happy face" and the happy story but, indeed, also all faces shown to them and all stories told to them. At Labeling Level 2 (mean age = 37.9 months), some children used *happiness* and *sadness*, others used *happiness* and *anger*. In either case, children used these labels liberally. *Happiness* was used more narrowly than in Labeling Level 1, and the negative term was used broadly for most negative faces and stories. At Labeling Level 3 (mean age = 41.4 months), children used three labels (*happiness*, *sadness*, *anger*) with fewer events falling into each category, but still more events than would be seen with adults. At Labeling Level 4 (mean age = 48.1 months), children used four labels (*happiness*, *sadness*, *anger*, *fear*) to cover the 10 emotional stimuli. For example, even though they did not use the label *disgust*, they were not silent when faced with a disgust face or story. They assimilated these stimuli to their four categories.

Figure 3 highlights a difference in the interpretation of children's responses implied by the traditional Emotion Signaling perspective and by our perspective. Although we scored children's labels as correct or incorrect, we used scare quotes around the word "correct," and we qualified the scoring as matching an adult standard. On the traditional view, a child who labels the "anger face" as *angry* is simply correct; that child has "recognized" the emotion. The child who labels the same face as *sad* has made a mistake. From our perspective, in contrast, even correct labels need not indicate "recognition" in an adult sense, and a correct label may mean much as the same as an incorrect label. To illustrate, consider two children at Labeling Level 2. The child at Labeling Level 2a uses *sad* to label all negative emotions. The child at Labeling Level 2b uses *angry* to label all negative emotions. For these children, therefore, the meaning of *sad* is apparently the same as the meaning of *angry*, and only the label is different. Or, at least, that is the hypothesis suggested by this analysis.

One could question the use of children's emotion *labels* to represent their current level of emotion understanding. Empirical

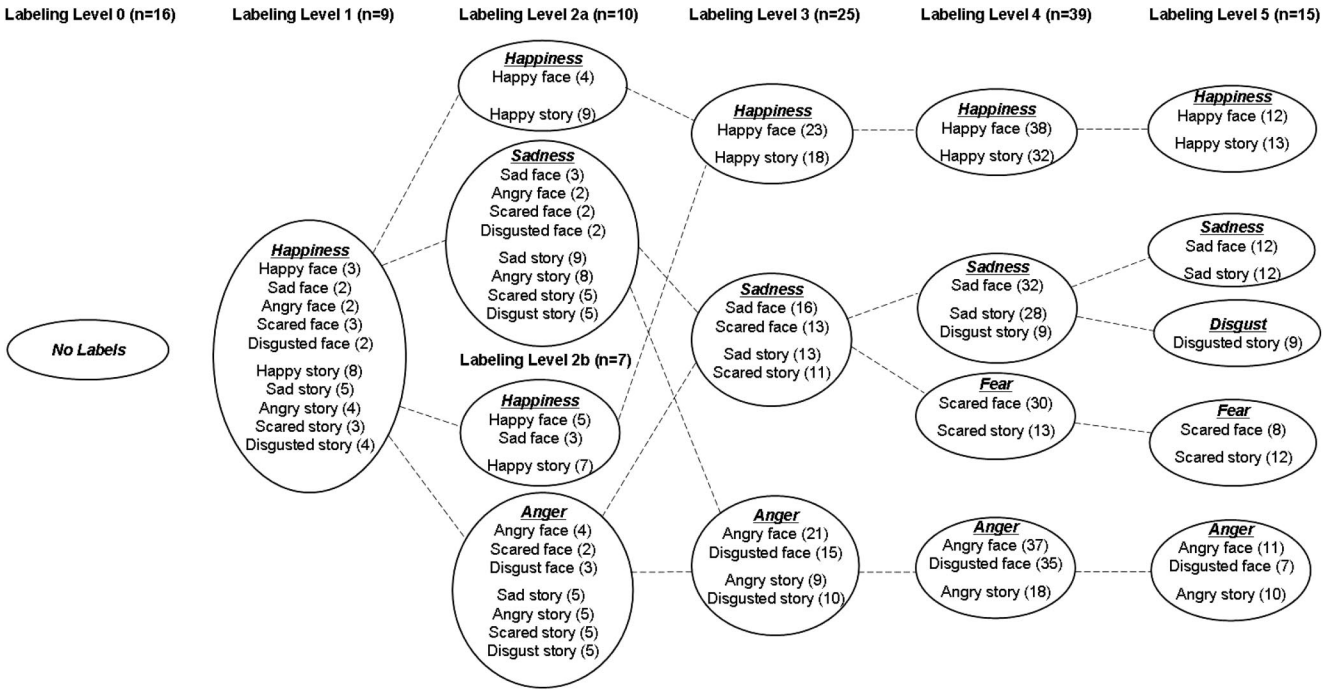


Figure 3. Modal labeling response (and number of children who gave that label) for each stimulus at each Labeling Level. The data from Studies 1 and 2 were combined. The dotted lines show our expected flow of differentiation, although the modal responses shown did not always follow that pattern. There was only one tie in modal label for a stimulus: For the angry face, two children at Labeling Level 2a labeled it happy, two labeled it sad; the tie was given to sad.

efforts have been made to tease apart children's emotion concepts from their understanding of emotion labels, and results of such studies show that, even when labels are not used, children's performance on emotion tasks increases only gradually just as it does on the free labeling task. Studies that have used match-to-sample categorization tasks in which the target emotion is defined by one or more exemplars of the target facial expression (e.g., Markham & Adams, 1992; Russell & Widen, 2002b) have shown that children's emotion categories are initially broad and then gradually narrow as age increases. For example, when children were looking for the "anger faces," the youngest children included all the negative faces (anger, disgust, fear, sadness), and with age the category gradually narrowed as children first excluded the "sadness face," then the "fear face;" even the oldest preschoolers still included the "disgust face" in the anger category (Russell & Widen, 2002b). Other studies have asked children to describe the causes of different emotions (e.g., Harris, Olthof, Meerum Terwogt, & Hardman, 1987; Russell, 1990; Russell & Widen, 2002b; Widen & Russell, 2004). This task is more verbally demanding but does not require the child to label the emotion. On this task, children's performance is higher for early emerging categories in the Differentiation Model (happiness, sadness, anger) than for later-emerging categories (fear, surprise, disgust). Future research might use other approaches to further disentangle emotion categories from emotion labels.

Mode of Presentation

Although mode of presentation was a secondary factor in the design of these two studies, our findings on this factor do raise questions about the assumption that faces provide the toehold for the mental category for each separate emotion. Conversely, they also raise questions about the prior empirical support of a Face Inferiority Effect.

Our prediction on this matter is not the simple opposite of the prediction from Emotion Signaling Theory; rather, our perspective leaves as an empirical question what role facial expressions play in the development of each emotion category. One possibility is that smiling and crying faces are the cues that allow children to distinguish positive from negative. When children then differentiate within the broad negative category to form narrower, more adult-like categories, the children may or may not use facial differences to guide that differentiation. For example, when children differentiate the negative category into angry versus sad, faces might again provide the toehold for the distinction, but, alternatively, children might use behavioral consequences (hostile vs. withdrawn behavior). And when even later the child differentiates anger from disgust, causes might be the initiating factor.

Our results here with mode of presentation allow only tentative conclusions. Neither study found an overall main effect for mode of presentation for these young preschoolers. This relative equality between modes was itself interesting in light of (a) the predictions of the face-as-toehold theory and (b) previous support for a Face Inferiority Effect. Perhaps the current lack of support for a Face Inferiority Effect occurred largely because the children in our samples were younger (2 to 4 years) than the children in the majority of prior studies (typically 4 years and older). We conclude that the general idea of a Face Inferiority Effect must be qualified by the age of the children being considered.

Our results supported a further qualification on the Face Inferiority Effect based on the specific emotion being considered. The interaction of mode with emotion has been found before, and is therefore likely a robust finding. The clearest advantage of face over story was found for anger in both studies here, as it had been found in previous studies (Reichenbach & Masters, 1983; Russell & Widen, 2002a; Widen & Russell, 2002; Wiggers & van Lieshout, 1985).

There were also differences in the relative power of faces versus stories across our two studies. First, Study 1 had found an advantage of face over story for sadness, but this effect was reversed in Study 2, even with identical stories, in identically aged subsamples, and with clear, prototypical facial expressions (albeit photographs in Study 1 and realistic drawings in Study 2). This result must be pursued in future studies to be clarified. Second, Study 2, but not Study 1, found an advantage for the face mode for fear. Perhaps because the children in our samples were younger (2 to 4 years) than the children in the majority of prior studies (4 years and older), this finding is in the opposite direction of prior findings which found a Story Superiority Effect for fear (e.g., Camras & Allison, 1985; Widen & Russell, 2002; Wiggers & van Lieshout, 1985). This potential reversal with age in the cue that children use more effectively for fear merits further investigation. Of course, cross-study comparisons require caution, but this discrepancy does suggest age as the mediating factor. Third, Study 2, but not Study 1, found an advantage for the story mode for disgust. This face inferiority effect for disgust has been found in prior research (Camras & Allison, 1985; Widen & Russell, 2004). Thus, Study 2 joins with prior research in finding that the "disgust face" is a relatively weak cue to disgust (e.g., Camras & Allison, 1985; Markham & Adams, 1992; Russell & Widen, 2002; Widen & Russell, 2003, 2004, 2008b, 2008c).

A limitation on any conclusions we can draw on mode of presentation is that the children in these studies were presented with only one exemplar of each emotion's facial expression or story: Children in Study 1 had five opportunities to label an emotion (one face or one story each for happiness, sadness, anger, fear, and disgust); in Study 2, they had nine (happy practice trial and one face and one story each for sadness, anger, fear, and disgust). Thus, although averages across emotions or across modes were likely reliable, results for single emotion in a specific mode are questionable.

The specific stories used here similarly require a note of caution. The facial stimuli used in each study had been FACS coded (Ekman & Friesen, 1978) and used in other studies (e.g., Study 1: Camras et al., 1983; Study 2: Tremblay et al., 1987). The facial stimuli used must be close to optimal. And, indeed, Study 2 used a different set of faces than had Study 1, but with similar results. The stories, however, are less well established. The stories we used were based on children's own stories about causes and consequences of emotions they generated in prior studies in our lab (e.g., Russell & Widen, 2002a), and pilot studies and fact questions examined in Study 2 indicated that children understood the stories. Nevertheless, the faces used here are likely more finely honed and selected than the stories.

Our study here thus offers a set of hypotheses on children's developing categories of emotion and on the cues that allow children to categorize the emotions of others. These hypotheses contrast in interesting ways with the standard assumptions in the

field of emotion, and our data thus encourage empirical scrutiny of these assumptions.

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