



Children's scripts for social emotions: Causes and consequences are more central than are facial expressions

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Understanding and recognition of emotions relies on emotion concepts, which are narrative structures (scripts) specifying facial expressions, causes, consequences, label, etc. organized in a temporal and causal order. Scripts and their development are revealed by examining which components better tap which concepts at which ages. This study investigated whether a facial expression or a brief story describing an emotion's cause and consequence was the stronger cue to basic-level and social emotions. Children ($N = 120$, 4–10 years) freely labelled the emotion implied by faces and, separately, stories for six basic-level emotions (happiness, anger, fear, surprise, disgust, and contempt) and three social emotions (embarrassment, compassion, and shame). Cause-and-consequence stories were the stronger cue overall, especially for fear, disgust, and social emotions. Faces were the stronger cue only for surprise. Younger children assimilated social emotions into basic-level emotion categories (sadness and anger); older children differentiated them. Differentiation occurred earlier for stories than for faces.

A key developmental task for a child is to come to understand the emotions they experience and witness. Understanding of emotion has been implicated in preschoolers' cognitive and linguistic development (e.g., Blair, 2002), their health (e.g., Rieffe, Meerum Terwogt, & Jellesma, 2008), and their later school readiness (Brown & Dunn, 1996; Garner & Waajid, 2008; Miller *et al.*, 2006; Raver, Garner, & Smith-Donald, 2007; Trentacosta & Izard, 2007). Acquisition of emotion understanding is part of the development of emotional intelligence (Barrett & Salovey, 2002; Zeidner, Matthews, Roberts, & MacCann, 2003).

One key aspect of understanding emotion is identifying different emotions: distinguishing anger from sadness from compassion. As adults, we do so using emotion scripts. Each emotion has its own script including its eliciting event, conscious feeling, facial expression, vocalization, action, physiological manifestation, label, and so on, aligned in a causal and temporal order. Attributing an emotion to oneself or to another requires that one's current experience or observation resembles the script for that

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emotion (Fehr & Russell, 1984). The general question, of which the present study is a part, is: What is the developmental progression in the formation of emotion scripts? This question has received relatively little attention, and the field lacks a full treatment of it.

One possibility is that children begin with an innate, or at least prepared, set of discrete mental categories for at least those emotions with corresponding facial expressions (e.g., Izard, 1971, 1994; Tomkins, 1962). On this perspective, certain facial expressions evolved as an emotion signalling system (Ekman, 1994; Izard, 1994; Kestenbaum & Nelson, 1992; Lenti, Giacobbe, & Pegna, 1997; Pell, 2005; Rinn, 1991; Susskind, Littlewort, Bartlett, Movellan, & Anderson, 2007; Tomkins, 1962). An evolutionary account of emotion signalling requires not just the production of emotion faces but their recognition as well (Lenti-Boero, 1994); there is no adaptive value in producing an unrecognized signal. Children (like adults) interpret facial expressions in terms of discrete emotions: the 'happy face' is interpreted as happiness, the 'sad face' as sadness, and so on (e.g., Denham & Couchoud, 1990; Harrigan, 1984; Hornik, Risenhoover, & Gunnar, 1987; Izard, 1971; Markham, & Adams, 1992; Repacholi, 1998; Repacholi & Gopnik, 1997; Wiggers & van Lieshout, 1985). 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) – implying that discrete mental categories are already in place.

With a prepared understanding of the link between emotion and facial expressions, a child can build a script of that emotion by adding information about the causes, consequences, label, and so on, as that information is acquired. In other words, the early recognition of facial expressions in terms of discrete emotions has been assumed to be the basis – the bedrock – of young children's understanding of emotion and to provide the foundation on which later learning about emotion is built (e.g., Denham, 1998; Harris, 1989; Izard, 1994; Pons, Harris, & de Rosnay, 2004; Saarni, 1999; Walker-Andrews, 1997).

There are alternative possibilities. The one we are developing is this: children initially understand emotions in very broad mental categories and over the course of development differentiate these categories into narrower, more adult-like ones (e.g., Bridges, 1930; Fischer, 1980; Widen & Russell, 2003, 2008). Initially, children begin with two categories based on a single pleasure versus displeasure dimension. It is an empirical question what cues are initially tied to these categories. The cues could be faces (smiles and frowns), or they could be a more script-based primitive theory of mind (you get what you want, you feel good; you do not get what you want, you feel bad). With time, a child might notice that some negative emotions are caused by a loss, have facial expressions that involve downcast eyes, downturned mouth, and tears, result in whining and crying, make the person withdraw or seek comfort, and show signs of lowered arousal. Other negative emotions are caused by one person blocking another's goal, have facial expressions with knitted brows, staring eyes, and clenched jaw, result in yelling, make the person approach threateningly, and have high levels physiological arousal. As a consequence, the child would then differentiate the initially broad negative emotion category into two separate categories and apply different labels to them (*sad*, *angry*) (although at this level both of these categories remain broader than the adult version). Thus, scripts are formed through differentiation. This account opens up the question of whether facial expressions are indeed the initial cues for categorization.

The discrete category account and the differentiation account predict different roles for facial expressions in a child's identification of emotion. On the first account, facial

expressions of emotion are a signalling system, and therefore should be strong cues to emotion for children. Facial cues are predicted to be the earliest cues to another's emotion for all emotions that have facial expressions and to remain the most definitive cue at all ages (e.g., Denham, 1998; Harris, 1989; Izard, 1971, 1994). On this view, faces remain the strongest cues because they are pre-wired to signal a specific discrete emotion, whereas the other aspects of the script are only probabilistically associated with an emotion and must be learned through association with the facial expression.

On the second account, there is no privileged cue to a specific emotion. Thus, at different ages and for different emotions, one aspect of the script, such as the emotion's cause, consequence, or label, may be the strongest cue (Russell & Widen, 2002; Widen & Russell, 2004). A face may or may not be the strongest cue, for example, for the youngest preschoolers and early emerging broad emotion categories. A cause (loss vs. frustration) or consequences (slumping vs. hitting) or emotion label (sad vs. angry) might be stronger cues to emotion than facial expressions for older children and later-emerging emotions (e.g., fear, disgust). Thus, as children's understanding of emotion increases, the emotion cue that is most powerful in tapping that knowledge may change.

The course of the development of scripts can be revealed by examining the power of different cues for different emotions at different ages (Balconi & Carrera, 2007; Camras & Allison, 1985; Markham & Adams, 1992; Reichenbach & Masters, 1983; Russell, 1990; Russell & Widen, 2002; Smith & Walden, 1999; Widen & Russell, 2002, 2004, in press). One study of emotion concepts in 2- and 3-year-olds supported the prediction of the discrete category view by showing a face *superiority* effect (Widen & Russell, in press; Study 1): overall, children were more likely to use the 'correct' emotion label when shown the emotion's facial expression than when told the emotion's cause and consequence; this effect was significant for sadness and anger, two early emerging emotion categories (Widen & Russell, 2003). In contrast, 10 of 11 studies with slightly older children found a face *inferiority* effect. Children's (3 years and older) labelling performance was lower when given a facial expression than when given an emotion's cause and consequence (Balconi & Carrera, 2007; Reichenbach & Masters, 1983; Smith & Walden, 1999; Widen & Russell, 2002, 2004, in press, Study 2) or label (Camras & Allison, 1985; Russell, 1990; Russell & Widen, 2002; Widen & Russell, 2004). This face inferiority effect was particularly strong for fear (Balconi & Carrera, 2007; Camras & Allison, 1985; Russell, 1990; Russell & Widen, 2002; Widen & Russell, 2004) and disgust (Camras & Allison, 1985; Markham & Adams, 1992; Russell & Widen, 2002; Widen & Russell, 2004), two later-emerging emotions. In only one study did children's (4–8 years) overall labelling performance not differ significantly given emotions' causes and consequences or facial expressions (Markham & Adams, 1992).

The studies reviewed so far were restricted to so-called basic-level emotions (e.g., anger, fear), but other studies investigated children's understanding of what have been called social emotions (e.g., embarrassment, shame, compassion, etc.; Heerey, Keltner, & Capps, 2003; Seidner, Stipek, & Feshbach, 1988; Shamay-Tsoory, Lavidor, & Aharon-Peretz, 2008). For convenience and in keeping with common practice, we distinguish basic-level from social emotions, and we use that terminology, although we doubt that the division is clear. Perhaps a better characterization would be early- versus later-emerging concepts. Children's understanding of basic-level emotions does emerge earlier than their understanding of social emotions (e.g., Brody & Harrison, 1987; Harris, Olthof, Meerum Terwogt, & Hardman, 1987; Wiggers & van Lieshout, 1985), and for continuity we will also use that terminology.

Prior studies of social emotions have not compared children's understanding of faces with other cues to social emotions because there was not a set of standardized and tested facial expressions for social emotions. A major opportunity to test the assumption of the power of faces as cues to social emotions occurred when facial expressions for compassion, embarrassment, shame, and contempt were identified (Haidt & Keltner, 1999). A set of standardized prototypical facial expressions for these emotions opened the door to the examination of the power of facial expressions relative to other aspects of the script to evoke the concept.

Overview of the current study

In the current study, we tested the competing predictions of the discrete emotions account versus the differentiation account in two ways. First, we compared the strength of facial expressions relative to cause-and-consequence stories as cues to both basic-level and social emotions. The discrete emotions account predicts that the faces will be strongest for all emotions and for all ages (4–10 years). The differentiation account predicts that although faces may be the stronger cue for some early emerging categories (e.g., anger), cause-and-consequence stories will be the stronger cue for later-emerging categories (e.g., fear, disgust, social emotions).

Second, we investigated whether differentiation describes children's acquisition of emotion concepts and, if so, the basis of that differentiation. We propose that children initially assimilate a social emotion, such as embarrassment, to a concept they already possess, such as sadness, but later distinguish the social emotion from the earlier-emerging emotion concept. Alternatively, on the discrete emotions account, recognition of facial expressions is pre-wired and emotion categories are discrete. Thus, once children have learned the appropriate label for each face, errors should be rare; before that, errors should be random.

Each child participated in two phases. In the first phase, to make labels for the target emotions accessible in the child's working vocabulary, the experimenter initiated a brief conversation in which each label was mentioned. In the second phase, children were given an emotion cue and then asked to provide a label of their choice in response to the question, 'How does Joan feel?' for nine emotions. Happiness was presented in both modes and served as a gatekeeper trial – children had to label this trial *happy* (or some close synonym) to be included in the sample. The other eight emotions were presented first in one of two modes of presentation and then in the other (counterbalanced) in a within-subjects design: in one mode, each emotion was presented as a facial expression and, in the other, as a story consisting of a stereotypical cause and behavioural consequence.

Method

Participants

Participants were 120 children enrolled in preschools and after-school care programmes in the Greater Boston area. All children were proficient in English. The sample was divided into three age groups of 40 children each (20 girls, 20 boys): preschoolers (48–65 months, mean = 58.9 months), Kindergarten–Grade 1 (65–86 months, mean = 72.5 months), and Grade 2–3 (85–130 months, mean = 99.6 months). The sample was representative of the ethnic composition of the area: 62.5% were

Caucasian, 16.7% Asian, 5.0% Hispanic, 4.2% of mixed ethnicity, and 11.6% other. On the consent form, parents were asked to indicate the highest level of education completed by each parent (as a proxy of socio-economic status (SES)) on the following six-point scale: (1) some high school; (2) high school diploma or GED; (3) some college, vocational degree, associates degree; (4) 4-year college degree (BA, BS); (5) master's degree (MA, MS); (6) doctorate (PhD, MD, MBA, JD, EdD, ThD). While education alone is not a sufficient indicator of SES, it has been used in the past as a major component of indices of SES (Hollingshead & Redlich, 1958; Norton *et al.*, 2005). Parents' mean education level for this sample was 4.9 ($SD = 1.2$).

Materials

Photographs of facial expressions

The gold standard of facial expressions of emotion are Facial Action Coding System (FACS)-coded facial expressions published by Ekman and Friesen (1976), but these faces are now considered dated (Goeleven, de Raedt, Leyman, & Verschuere, 2008). Other more recent and more modern-looking sets of FACS-coded facial expressions are now available (e.g., Montreal Set of Facial Displays of Emotion, Beaupré, Cheung, & Hess, 2000; Karolinska Directed Emotional Faces, Goeleven *et al.*, 2008; Japanese and Caucasian Facial Expressions of Emotion, Matsumoto & Ekman, 1988; The NimStim Set of Facial Expressions, Tottenham *et al.*, 2009). The nine prototypical facial expressions (happy, angry, scared, surprised, disgusted, contemptuous, ashamed, embarrassed, and compassionate) we used in the current study were developed by Haidt and Keltner (1999). This set has also been FACS coded and validated in that study by adults in two cultures (USA and India).

Stories of the causes and consequences of emotions

There was one story for each emotion (Table 1) which included both a stereotypical emotion-eliciting event and a behavioural consequence. Stories for happiness, anger, fear, surprise, and disgust were based on prior work in our laboratory in which children generated causes and consequences for specific emotions (Russell, 1990; Russell & Widen, 2002). Stories for embarrassment, compassion, shame, and contempt were elicited in the same way and then refined through piloting with adults and children. In a pilot study ($N = 12$, 7–8 years), between 58 and 75% of children used the target label (or synonym; see scoring below) for embarrassment, compassion, and shame; these figures were within the range obtained for disgust and fear (67–83%). Only 17% of children used the target label for *contempt* but an additional 42% used *anger* for this story, which is in keeping with the differentiation proposal that children would assimilate social emotions to an earlier-emerging emotion category.

Procedure

On the initial visit to the child care facility, the experimenter spent time playing with those children who had parental consent to participate in the study until each child seemed comfortable with the experimenter. On a subsequent visit, the experimenter invited each child to play a game with her. This 'game' lasted on average less than 10 min and consisted of two phases. The first phase was a priming session. In the second phase, the child was asked to label Joan's emotion based on Joan's facial expression

Table 1. Stories with causes and consequences for each emotion

Emotion	Story
Happiness	. . . it was Joan's birthday. All her friends came to her birthday party and gave her presents. Joan jumped up and down and clapped her hands.
Anger	. . . Joan was waiting in line. Then a boy cut in line in front of her. He didn't even ask. Joan shoved him out of line and yelled at him.
Fear	. . . Joan was walking down the street when a big dog started growling and chasing her. Joan screamed and ran away as fast as she could.
Surprise	. . . Joan came home, and her mom's hair was pink. This had never happened before. Joan just stared and tried to figure out why her mom's hair was pink.
Disgust	. . . Joan took a big bite of an apple. But it was rotten inside. It tasted awful. Joan spit it out as fast as she could and threw the apple on the ground. She did not want to touch it.
Embarrassment	. . . Joan spilled grape juice all over her white dress. All the kids laughed at her. Joan's face turned very red, and she looked away from everyone. She wished that she could hide.
Compassion	. . . Joan was walking on a slippery sidewalk. Joan saw another kid slip and hurt himself very badly. Joan went over to the boy to see if he was okay.
Shame/Guilt	. . . Joan took her sister's favorite teddy bear and threw it in the trash. Her sister cried and cried. Joan wanted to give it back but she couldn't because her mom had already taken out the trash. Joan stayed in her room and didn't want to talk to anyone.
Contempt	. . . Joan was at school. There was a boy in her class who always did stuff to get the teachers attention. He was always acting up in class so she would notice him. Or if the teacher wanted someone to help her, he was always wanted to be picked. Joan didn't talk to that boy, and she didn't sit next to him.

Note. The happy story began with, 'Once upon a time, there was a girl name Joan. One day . . .' Each of the other stories began with, 'One week later . . .'

or, separately, a brief story describing the cause and consequence of Joan's emotion. The happy trial included both the facial expression and the story, and it served as a gatekeeping trial: children had to label this trial as *happiness* to be included in the sample. The child was randomly assigned to either the face- or the story-first condition. There were eight trials in each mode of presentation, one for each emotion, presented in various random orders.

Simple priming

Although children acquire emotion labels at a early age (e.g., Bretherton & Beeghly, 1982), accessibility of the associated concepts can be enhanced. The purpose of the simple priming procedure was to ensure that the target emotion labels were as accessible as possible in each child's vocabulary. In simple priming, the experimenter initiated a conversation in which each of the target emotion labels was introduced by

saying, 'Today we are going to play a game about feelings. Feelings are like when you feel happy or angry. Do you ever feel *happy*? What about *angry*? Do you ever feel *angry*?' And so on, until each of the target emotion labels (*happy*, *angry*, *scared*, *surprised*, *disgusted*, *dislike*¹ [for contempt], *embarrassed*, *feel sorry for someone* [for compassionate], *ashamed*, and *just okay*) had been mentioned. The experimenter did not discuss *when* or *why* these emotions might occur. When the child spontaneously offered an example of someone feeling a particular emotion, the experimenter listened but did not comment or encourage further explanation. When presenting the emotion words, and throughout the experiment, every effort was made to use a neutral tone of voice.

Happy trial

The happy trial was always first. The experimenter began, 'In this game, I'm going to tell you some stories about things that happen to Joan. After each one, you get to tell me how you think Joan feels. How does that sound? Remember: listen carefully, so you can tell me how Joan feels'. And then continued, 'Once upon a time, there was a girl named Joan. This is what Joan looked like [showing neutral photo]. One day, it was Joan's birthday. All her friends came to her birthday party and gave her presents. Joan jumped up and down and clapped her hands. And she looked like this [showing happiness photo]. How does Joan feel?'

Up to this point, all the children had been treated identically. Children were now randomly assigned to either the story- or the face-first condition – which was thus a between-subjects condition. In each condition, the experimenter continued seamlessly on to the next emotion trial, but now the child was presented with either a facial expression or a story (instead of both as in the happy trial). After completing the first condition consisting of eight trials, the experimenter introduced the other condition by saying, 'Do you know what else I brought? I brought some pictures of (stories about) Joan. Would you like to see them?'

Faces

The experimenter presented the facial expressions one at a time in a random order. While showing each face, the experimenter said, 'One week later, Joan felt like this', and asked, 'How does Joan feel?'

Stories

The experimenter presented the stories one at a time in a random order. Each story began, 'One week later . . .' After each story, the experimenter asked, 'How does Joan feel?'

¹ We did not expect children in this age range to know the word 'contempt'. Even the synonyms for contempt (e.g., *derisible*, *derisive*, *despicable*) seemed unlikely to be a part of children's vocabularies, since college-educated adults rarely use any of these labels to label facial expressions as contempt. Thus, we selected 'dislike' as an emotion label that children were likely to understand and that also came close to the meaning of contempt. The same reasoning was used in choosing 'feel sorry for someone' for compassion.

Responding to children's responses

In both modes of presentation, 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., In the story mode, repeating the story; asking 'How would you feel if . . .') and repeating the story with the child as the protagonist. In the face mode, repeating the question, asking the child to 'Look closely. I think you can figure it out.' 'Why is Joan making this face? How does she feel?'). If the child still did not respond, the experimenter went on to the next face or story, and, after the other trials in both modes, returned to any to which the child had not responded. At no time 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 Joan was feeling.

Scoring

The participants were allowed to use any label they chose. The scoring key for basic-level emotions used in this study was drawn from Widen and Russell (2003), who described the development of a scoring key based on ratings of two judges blind to the source of the labels. That same method was used in the current study to develop a scoring key for the social emotions. The labels that children used that were scored as correct for each category were: for happiness *content, excited, glad, good, happy, proud*; for fear, *afraid, freaked out, frightened, nervous, scared, shy, worried*; for surprise, *shocked, startled, surprised*; for disgust, *disgusted, gross, icky, nauseous, sick, yucky*; for anger, *angry, annoyed, cross, frustrated, grumpy, jealous, mad*; for sad, *blue, disappointed, discouraged, lonely, sad, upset*; for embarrassment, *embarrassed*; for compassionate, *concerned, sad for someone, sorry for*; for shame, *ashamed, guilty, sorry, sorry that*; and for contemptuous, *contempt, does not like*. Responses varied 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 specific emotion.

The children had a total of 2,040 opportunities to provide a label. Of these, 890 were the target emotion labels for the given stimulus, 942 were a non-target emotion labels for the stimulus, and 208 were uncodable or non-responses (e.g., 'I dunno', silence).

Results and interpretation***Relative power of stories and faces to tap children's emotion concepts***

To investigate the relative power of stories vs. faces to tap emotion concepts, we examined a mixed design ANOVA ($\alpha = .05$) in which age group (three levels: preschoolers, Kindergarten-Grade 1, Grade 2-3), gender (two levels), and order of presentation (two levels: story first, face first) were between-subjects factors; mode of presentation (two levels: story, face) and emotion (eight levels: anger, fear, surprise, disgust, contempt, embarrassment, compassion, shame) were within-subject factors. The dependent variable was whether or not the child used the target label for each story or face, coded 1 or 0, respectively. There were no significant main or interactive effects for gender or order-of-presentation.

Based on prior research, some effects were expected. The main effect for age was significant, $F(2, 108) = 59.80$, $p < .001$: Grade 2-3s' (.56) performance was significantly higher ($p < .001$) than the two younger groups', Kindergarten-Grade 1s'

performance (.38) was significantly ($p = .01$) higher than preschoolers' (.27). Table 2 shows the proportion of children in each age group who used the target label for at least one of the emotion stimuli (face or story) for a given emotion. Although the relationship was not perfectly linear, performance improved with age. If we take as the criterion for possession of the concept 50% of children at a given age correctly using a term, we see that preschoolers possess the concepts of anger, fear, and surprise; Kindergarten–Grade 1s add the concept of compassion; Grade 2–3s the concepts of embarrassment, shame, and disgust. Contempt was yet to be acquired in this age range. There were thus large differences in the age at which different emotion concepts emerged, with anger already in place for preschoolers and with embarrassment, shame, and disgust not emerging until 5 years later.

Table 2. Percentage of children who correctly labelled each emotion category

Age	Emotion								
	Happy	Anger	Fear	Surprise	Compassion	Embarrass	Disgust	Shame	Contempt
Preschool	100.0	100.0	92.5	65.0	32.5	25.0	25.0	7.5	5.0
Kindergarten – Grade 1	100.0	100.0	95.0	77.5	52.5	37.5	25.0	35.0	5.0
Grade 2–3	100.0	100.0	97.5	97.5	82.5	77.5	67.5	67.5	30.0
Mean	100.0	100.0	95.0	80.0	55.8	46.7	39.2	36.7	13.3

Note. Bold indicates an age at which at least 50% of the children labelled that emotion correctly. To be 'correct', children had to correctly label at least one story or face for a given emotion. Each child used at least one label from the set of labels deemed correct for that emotion concept; labels that children used that were scored as correct for each category were: for happiness *content, excited, glad, good, happy, proud*; for fear, *afraid, freaked out, frightened, nervous, scared, shy, worried*; for surprise, *shocked, startled, surprised*; for disgust, *disgusted, gross, icky, nauseous, sick, yucky*; for anger, *angry, annoyed, cross, frustrated, grumpy, jealous, mad*; for sad, *blue, disappointed, discouraged, lonely, sad, upset*; for embarrassment, *embarrassed*; for compassionate, *concerned, sad for someone, sorry for*; for shame, *ashamed, guilty, sorry, sorry that*; and for contemptuous, *contempt, does not like*.

The main effect for emotion was also significant, $F(7, 756) = 142.71$, $p < .001$. The social emotions were labelled 'correctly' more frequently than disgust and contempt, which some theorists have called basic-level emotions. The rank order for emotion (from highest to lowest) was: anger (.93), fear (.62), surprise (.60), compassion (.31), embarrassment (.25), shame (.23), disgust (.22), and contempt (08). Both age and emotion main effects were qualified by interaction effects, which are described below.

The main effect for mode of presentation was significant, $F(1, 102) = 115.14$, $p < .001$. Children's performance was significantly higher in the story mode than in the face mode: story, .49; face, .32. The mode-of-presentation \times emotion interaction (Figure 1) was significant, $F(7, 756) = 30.13$, $p < .001$. The story mode was more powerful for five of the eight emotions (fear, compassion, embarrassment, disgust, and shame). For anger and contempt, there was no significant difference between modes; these two emotions were near the ceiling and floor, respectively. For surprise, the overall pattern was reversed (Figure 1), showing a face superiority effect.

The age \times mode-of-presentation interaction was also significant, $F(2, 108) = 59.80$, $p < .001$. Children's performance increased with age in both modes, but more rapidly in the story mode than in the face mode (Figure 2). In the story mode, the increase in performance was significant between each age group ($p < .001$). In the face mode, the increase in performance was more gradual than in the story mode, though performance

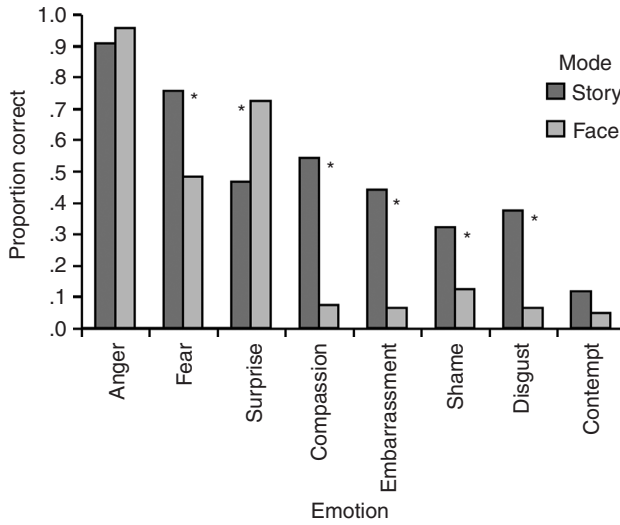


Figure 1. Proportion of children who 'correctly' labelled each emotion.

did increase significantly between each age group ($p < .05$). At each age, the advantage for the story mode was significant ($p < .01$).

Number of labels used increases with age more for stories than for faces

A richer view of children's categorization of emotion can be had by looking more broadly at all the responses (both correct and incorrect) the children made. Thus, for each emotion stimulus, we tallied the different emotion category labels used. Figure 3 shows the modal labels children used at each age when the stimuli were faces (Figure 3A) and stories (Figure 3B). (For any stimulus for which there were two modal responses, we used a generous decision rule and treated the 'correct' label as the mode.)

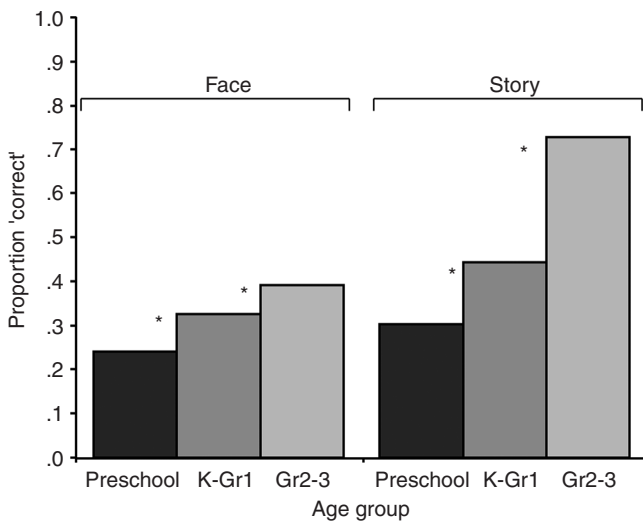


Figure 2. Proportion of children in each age group who 'correctly' labelled emotions in each mode.

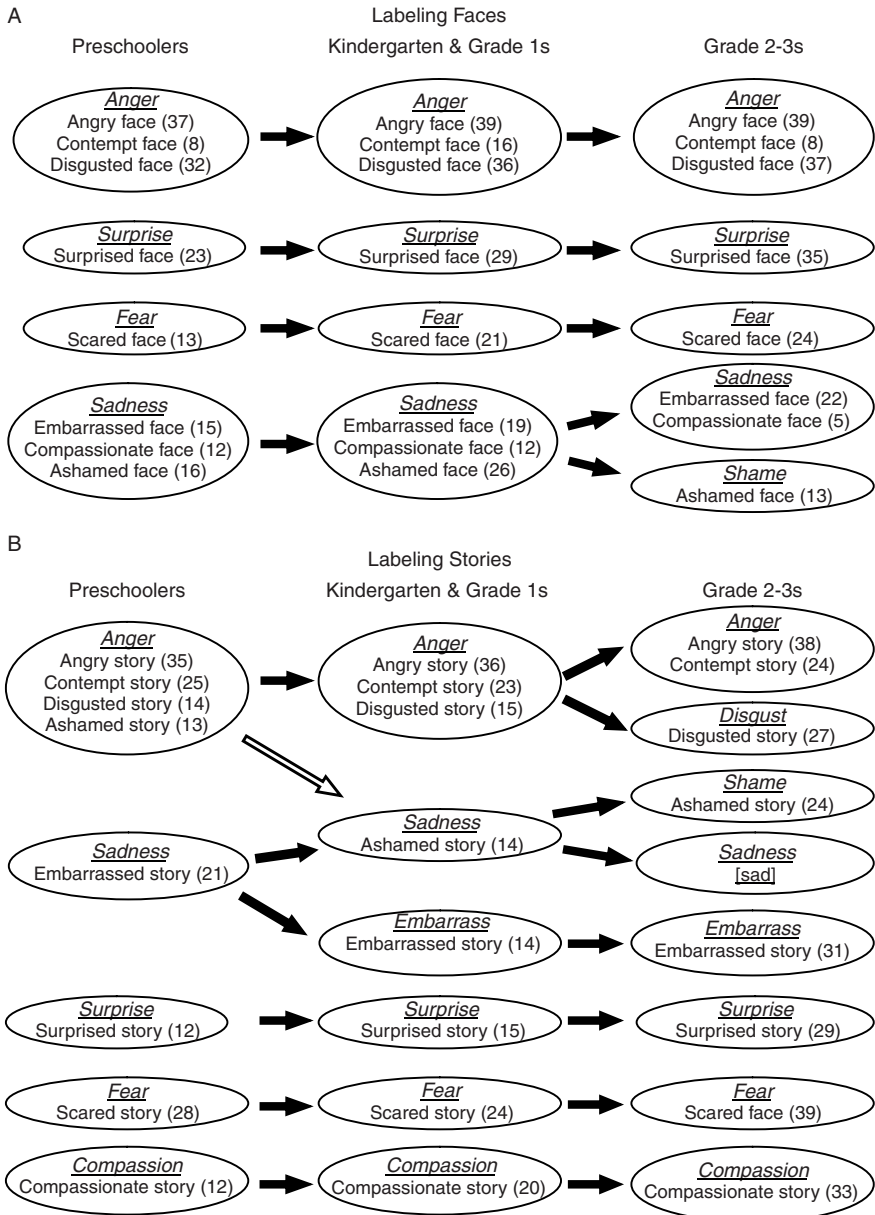


Figure 3. The modal label that was used for each (A) face or (B) story by each age group (the number of children that used the label is in parentheses). By 6 years, children did not use sadness modally for any of the stories in this study, but, based on prior research (e.g. Russell & Widen, 2002), we assume that at all ages they would have labelled sad stories as sadness.

The number of different labels that were modal increased with age more rapidly with stories than with faces.

Consider Figure 3A in which children were presented with faces. Preschoolers divided all faces into only four categories, which they labelled *anger*, *surprise*, *fear*, and *sadness*. (This column illustrates our contention that children use each emotion label to

cover a broader range of phenomena than do adults.) No change is seen when we move to the Kindergarten–Grade 1s. Some progress is seen in Grade 2–3s, who now differentiate the sadness category into sadness and shame. That is, Grade 2–3s showed five modal responses rather than four.

Now turn to Figure 3B. Here, preschoolers divided all emotion stories into five categories, which they labelled *anger*, *sadness*, *surprise*, *fear*, and *compassion*. Kindergarten–Grade 1s differentiated the anger category into anger and sadness and the sadness category into sadness and embarrassment. Thus, the Kindergarten–Grade 1s have six categories. The Grade 2–3s differentiated the anger category into anger and disgust, and the sadness category into sadness and shame. That is, the Grade 2–3s had eight categories. This is the quantitative pattern anticipated by a differentiation account.

Discussion

The current study was designed to investigate the development of children's emotion scripts and contrasted two perspectives: one in which facial expressions are assumed to be primary in all emotion categories that have facial expressions and one in which all aspects of the script are assumed to be acquired in tandem and later-emerging emotion categories differentiate from earlier-emerging categories. The results of this study support aspects of both perspectives.

Based on the results of the current and prior research, we propose that it is probable that the basis of very young children's earliest emotion categories – those broad emotion categories they label *happy*, *sad*, and *mad* – and also *surprise* is a facial expression. This face superiority effect has been shown for preschoolers for sadness (Widen & Russell, in press), anger (Russell & Widen, 2002; Widen & Russell, 2002, in press), and surprise (Russell & Widen, 2002; Wiggers & van Lieshout, 1985). In the current study, we found the face superiority effect for surprise, but not for anger.

In contrast to this face superiority effect for early developing categories and surprise, we found a face *inferiority* effect for five emotions – fear, compassion, embarrassment, disgust, and shame. Children's higher performance for these emotions on stories than on the corresponding face suggests that children are learning about these later-emerging emotion categories from their observations of the events that cause them and the behaviours that result, more than from the facial expression. Thus, causes and consequences of emotions help children learn the script for these emotions. This advantage for stories supports prior findings that stories are often stronger cues to emotion than are faces (e.g., Balconi & Carrera, 2007; Camras & Allison, 1985; Reichenbach & Masters, 1983; Widen & Russell, 2002), especially for fear and disgust (Camras & Allison, 1985; Russell & Widen, 2002; Widen & Russell, 2002, 2004). Here, we extend the story superiority effect to social emotions.

The discrete categories account (e.g., Izard, 1971, 1994; Kestenbaum & Nelson, 1992; Lenti *et al.*, 1997; Susskind *et al.*, 2007) predicts that facial expressions are primary for all emotions that have corresponding facial expressions – including all the emotions tested in the current study. That is, children should recognize that a facial expression represents a certain discrete emotion regardless of the level of development of other aspects of the emotion script. On this view, the face should be the strongest cue to each emotion we studied. In addition, this account does not predict a pattern of differentiation in children's responses. Instead, on a labelling task, children's 'erroneous' responses should be random because they do not yet associate the correct label with

that emotion, and then upon learning its label, responses should hereafter be correct. This all-or-nothing pattern was not observed.

The pattern of differentiation observed in the current study better supports the second account in which children assimilated events that adults label disgust, embarrassment, or shame to their earlier-emerging emotion categories (e.g., anger, sadness). Then, children gradually differentiated the later-emerging categories from these through observation of emotions' causes, consequences, arousal levels, etc. but less so from observations of the facial expressions. For example, Kindergarten and Grade 1s differentiated sadness from shame (something preschoolers did not do), but only when the emotion was presented as a story, not as a face. In the face mode, this differentiation occurred in Grades 2 and 3s. Other aspects of differentiation that occurred in the story mode had not yet occurred in Grade 2 and 3 in the face mode.

The finding that differentiation occurred earlier in the story mode than in the face mode raises questions about the specific version of the differentiation model of children's understanding of emotion, especially the proposed specific ages for the splitting of specific categories (Widen & Russell, 2003). That version was based on facial expressions of basic-level emotions. The difficulty is that children's differentiation of facial expressions may be limited to a small subset of basic-level facial expressions – those that were originally tested – and differentiation may occur more rapidly when non-facial cues are examined. In the current study, the facial expressions tested in the original studies (anger, fear, surprise, disgust) were differentiated, with the exception of disgust which was still assimilated to anger even for the oldest age group, but only one facial expression for a later-emerging social emotion differentiated from an earlier-emerging category (shame from sadness). The initial version might more accurately describe the development of children's understanding of emotion if it were based on their understanding of other aspects of the emotion script, such as the causes and consequences of emotions. In the story mode, children differentiated more of the later-emerging emotion categories from the early emerging ones at earlier ages and the oldest age group had differentiated all but one category (contempt from anger).

It is possible to argue that the faces that were used in the current study were weaker than the stories because they were not clear, prototypical facial expressions of the emotions. This possibility is a particular hazard for the social emotions, the proposed facial expression for which have been less tested. It is also possible that clearer examples of facial expressions of social emotions would provide stronger cues to these emotions than stories. However, the facial expressions for the social emotions used in the current study were carefully developed and have been tested: the embarrassed and ashamed faces were based on a study in which participants experienced the target emotions, and then other participants identified the emotions from the facial expressions (Keltner, 1995). The compassion face was based on criteria set in an observational study by Eisenberg *et al.* (1989). The full set of faces was then tested cross-culturally in the USA and India (Haidt & Keltner, 1999): *happiness*, *anger*, *fear*, *surprise*, and *disgust*, and *embarrassment* were each the modal response for the corresponding faces in both cultures; *shame* was the modal response for ashamed in the USA (*sadness* was modal, *guilt* was second, and *shame* was third in India); and *contempt* was the modal response for contemptuous in India (*disgust* was modal, *contempt* was second in the USA). Only for the compassion face was *compassion* not the modal response in either culture, but it was the second most frequent response for both (*sadness* was modal in the USA, *awe* in India). Of course, the possibility remains that more recognizable facial expressions for

compassion, shame, and embarrassment will one day be found and published. Still, the theory that these emotions are innately and universally expressed in the face does suggest that the most recognizable expressions should have been easily found long ago.

One might argue that inferring emotion from its facial expression is a more difficult task than doing so from a story. Faces were presented visually, for example, whereas the story was verbal as was the response mode. In a sense, this argument is simply a restatement of our results: for most emotions, stories were the better cue. The argument is inconsistent with the emotion signalling account in which recognition of specific emotions from facial signals should be easy.

Our results are consistent with the idea that a child's understanding of emotion is embedded in a narrative structure (what we called scripts and operationalized as stories). Thus, the stories have an advantage here because they evoke in the child that narrative structure. Viewing a facial expression provides no such structure. Our results point to a perspective different from that commonly taken in emotion research. From our perspective, the study of emotion understanding must examine the role of language and cognition. For example, language development and emotion understanding are related. Children's level of language development was not measured in the current study, but others have demonstrated this relationship (e.g., Pons, Lawson, Harris, de Rosnay, 2003; Ruffman, Slade, Rowlandson, Rumsey, & Garnham, 2003). Pons *et al.* showed that children's (4–11 years) receptive grammar abilities was correlated with their level of emotion understanding. Ruffman *et al.* showed that children's (3–5 years) receptive syntax and semantic understanding was correlated with their recognition of facial expressions.

This study investigated which aspect of children's emotion scripts better tapped their understanding of basic-level and social emotions: facial expression or cause-and-consequence stories. Overall, cause-and-consequence stories were the stronger cue, especially for fear, disgust, and social emotions. Faces were the stronger cue only for surprise. When all of children's responses (both 'correct' and 'incorrect') were considered, younger children assimilated social emotions into basic-level emotion categories; older children differentiated them. This pattern of differentiation, which occurred earlier for the stories than for the faces, is contrary to the predictions of the discrete categories account.

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References

- Balconi, M., & Carrera, A. (2007). Emotional representation in facial expression and script: A comparison between normal and autistic children. *Research in Developmental Disabilities*, 28, 409–422.
- Barrett, L. F., & Salovey, P. (2002). *The wisdom in feeling: Psychological processes in emotional intelligence*. New York: Guilford Press.

- Beaupré, M. G., Cheung, N., & Hess, U. (2000). *The Montreal Set of Facial Displays of Emotion [CD]*. Montreal, QC: Department of Psychology, University of Quebec.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111-127.
- Bretherton, I., & Beeghly, M. (1982). Talking about internal states: The acquisition of an explicit theory of mind. *Developmental Psychology, 18*, 906-921.
- Bridges, K. M. B. (1930). A genetic theory of the emotions. *Journal of Genetic Psychology, 37*, 514-527.
- Brody, L. R., & Harrison, R. H. (1987). Developmental changes in children's abilities to match and label emotionally laden situations. *Motivation and Emotion, 11*, 347-365.
- Brown, J. R., & Dunn, J. (1996). Continuities in emotion understanding from three to six years. *Child Development, 67*, 789-802.
- Camras, L. A., & Allison, K. (1985). Children's understanding of emotional facial expressions and verbal labels. *Journal of Nonverbal Behavior, 9*, 84-94.
- Denham, S. A. (1998). *Emotional development in young children*. New York: Guilford Press.
- Denham, S. A., & Couchoud, E. A. (1990). Young preschoolers' ability to identify emotions in equivocal situations. *Child Study Journal, 20*, 153-169.
- Eisenberg, N., Fabes, R. A., Miller, P. A., Fultz, J., Shell, R., Mathy, R. M., et al. (1989). Relation of sympathy and distress to prosocial behavior: A multimethod study. *Journal of Personality and Social Psychology, 57*, 55-66.
- Ekman, P. (1994). Strong evidence for universals in facial expressions: A reply to Russell's mistaken critique. *Psychological Bulletin, 115*, 268-287.
- Ekman, P., & Friesen, W. V. (1976). *Pictures of facial affect*. Palo Alto, CA: Consulting Psychologists Press.
- Fehr, B., & Russell, J. A. (1984). Concept of emotion viewed from a prototype perspective. *Journal of Experimental Psychology: General, 113*, 464-486.
- Fischer, K. W. (1980). A theory of cognitive development: The control and construction of hierarchies of skills. *Psychological Review, 87*, 477-531.
- Garner, P. W., & Waajid, B. (2008). The associations of emotion knowledge and teacher-child relationships to preschool children's school-related developmental competence. *Journal of Applied Developmental Psychology, 29*, 89-100.
- Goeleven, E., de Raedt, R., Leyman, L., & Verschuere, B. (2008). The Karolinska directed emotional faces: A validation study. *Cognition and Emotion, 22*, 1094-1118.
- Haidt, J., & Keltner, D. (1999). Culture and facial expression: Open-ended methods find more expressions and a gradient of recognition. *Cognition and Emotion, 13*, 225-266.
- Harrigan, J. A. (1984). The effect of task order on children's identification of facial expressions. *Motivation and Emotion, 8*, 157-169.
- Harris, P. L. (1989). *Children and emotion: The development of psychological understanding*. Oxford: Basil Blackwell.
- Harris, P. L., Olthof, T., Meerum Terwogt, M., & Hardman, C. E. (1987). Children's knowledge of the situations that provoke emotion. *International Journal of Behavioral Development, 10*, 319-343.
- Heerey, E. A., Keltner, D., & Capps, L. M. (2003). Making sense of self-conscious emotion: Linking theory of mind and emotion in children with autism. *Emotion, 3*, 394-400.
- Hollingshead, A. B. B., & Redlich, F. C. (1958). *Social class and mental illness: Community study*. Hoboken, NJ: John Wiley & Sons.
- Hornik, R., Risenhoover, N., & Gunnar, M. (1987). The effects of maternal positive, neutral, and negative affective communications on infant responses to new toys. *Child Development, 58*, 937-944.
- Izard, C. E. (1971). *The face of emotion*. New York: Appleton Century Crofts.
- Izard, C. E. (1994). Innate and universal facial expressions: Evidence from developmental and cross-cultural research. *Psychological Bulletin, 2*, 288-299.

- Keltner, D. (1995). Signs of appeasement: Evidence for the distinct displays of embarrassment, amusement, and shame. *Journal of Personality and Social Psychology*, *68*, 441-454.
- Kestenbaum, R., & Nelson, C. A. (1992). Neural and behavioral correlates of emotion recognition in children and adults. *Journal of Experimental Child Psychology*, *54*, 1-18.
- Lenti, C., Giacobbe, A., & Pegna, C. (1997). A neuropsychological approach to depression in children and adolescents: The discrimination of emotional facial expressions. *Italian Journal of Psychiatry and Behavioral Sciences*, *7*, 121-127.
- Lenti-Boero, D. (1994). Oltre le parole: La comunicazione umana non verbal come comunicazione universal. *Teoria Sociologica*, *2/3*, 94-122.
- Markham, R., & Adams, K. (1992). The effect of type of task on children's identification of facial expressions. *Journal of Nonverbal Behavior*, *16*, 21-39.
- Matsumoto, D., & Ekman, P. (1988). Japanese and Caucasian facial expressions of emotion and neutral faces (JACFEE): 56 jpeg photos of facial expressions [CD]. San Francisco: Intercultural and Emotional Research Laboratory.
- Miller, A. L., Fine, S. E., Gouley, K. K., Seifer, R., Dickstein, S., & Shields, A. (2006). Showing and telling about emotions: Interrelations between facets of emotional competence and associations with classroom adjustment in Head Start preschoolers. *Cognition and Emotion*, *20*, 1170-1192.
- Norton, A., Winner, E., Cronin, K., Overy, K., Lee, D. J., & Schlaug, G. (2005). Are there pre-existing neural, cognitive, or motoric markers for music ability? *Brain and Cognition*, *59*, 124-134.
- Pell, M. D. (2005). Nonverbal emotion priming: Evidence from the 'facial affect decision task'. *Journal of Nonverbal Behavior*, *29*, 45-73.
- Pons, F., Harris, P. L., & de Rosnay, M. (2004). Emotion comprehension between 3 and 11 years: Developmental periods and hierarchical organization. *European Journal of Developmental Psychology*, *1*, 127-152.
- Pons, F., Lawson, J., Harris, P. L., & de Rosnay, M. (2003). Individual differences in children's emotion understanding: Effects of age and language. *Scandinavian Journal of Psychology*, *44*, 347-353.
- Raver, C. C., Garner, P., & Smith-Donald, R. (2007). The roles of emotion regulation and emotion knowledge for children's academic readiness: Are the links causal? In R. C. Pianta, M. J. Cox, & K. L. Snow (Eds.), *School readiness and the transition to kindergarten in the era of accountability* (pp. 121-147). Baltimore, MD: Paul H. Brookes Publishing.
- Reichenbach, L., & Masters, J. C. (1983). Children's use of expressive and contextual cues in judgements of emotion. *Child Development*, *54*, 993-1004.
- Repacholi, B. M. (1998). Infants' use of attentional cues to identify the referent of another person's emotional expression. *Developmental Psychology*, *34*, 1017-1025.
- Repacholi, B. M., & Gopnik, A. (1997). Early reasoning about desires: Evidence from 14- and 18-month-olds. *Developmental Psychology*, *33*, 12-21.
- Rieffe, C., Meerum Terwogt, M., & Jellesma, F. C. (2008). Emotional competence and health in children. In A. Vingerhoets, I. Nyklíček, & J. Denollet (Eds.), *Emotion regulation: Conceptual and clinical issues* (pp. 184-201). New York: Springer Science + Business Media.
- Rinn, W. E. (1991). Neuropsychology of facial expression. In R. S. Feldman & B. Rimé (Eds.), *Fundamentals of nonverbal behavior: Studies in emotion and social interaction* (pp. 3-30). New York: Cambridge University Press.
- Ruffman, T., Slade, L., Rowlandson, K., Rumsey, C., & Garnham, A. (2003). How language relates to belief, desire, and emotion understanding. *Cognitive Development*, *18*, 139-158.
- Russell, J. A. (1990). The preschooler's understanding of the causes and consequences of emotion. *Child Development*, *61*, 1872-1881.
- Russell, J. A., & Widen, S. C. (2002). Words versus faces in evoking children's knowledge of the causes of emotions. *International Journal of Behavioral Development*, *26*, 97-103.
- Saarni, C. (1999). *The development of emotional competence*. New York: Guilford Press.

- Seidner, L. B., Stipek, D. J., & Feshbach, N. D. (1988). A developmental analysis of elementary school-aged children's concepts of pride and embarrassment. *Child Development, 59*, 367-377.
- Shamay-Tsoory, S. G., Lavidor, M., & Aharon-Peretz, J. (2008). Social learning modulates the lateralization of emotional valence. *Brain and Cognition, 67*, 280-291.
- Smith, M., & Walden, T. (1999). Understanding feelings and coping with emotional situations: A comparison of maltreated and nonmaltreated preschoolers. *Social Development, 8*, 93-116.
- Susskind, J. M., Littlewort, G., Bartlett, M. S., Movellan, J., & Anderson, A. K. (2007). Human and computer recognition of facial expressions of emotion. *Neuropsychologia, 45*, 152-162.
- Tomkins, S. S. (1962). *Affect, imagery, consciousness: Vol. I. The positive affects*. New York: Springer Publishing.
- Tottenham, N., Tanaka, J., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A., et al. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research, 168*(3), 242-249.
- Trentacosta, C. J., & Izard, C. E. (2007). Kindergarten children's emotion competence as a predictor of their academic competence in first grade. *Emotion, 7*, 77-88.
- Walker-Andrews, A. S. (1997). Infants' perception of expressive behaviors: Differentiation of multimodal information. *Psychological Bulletin, 121*, 437-456.
- Widen, S. C., & Russell, J. A. (2002). Gender and preschoolers' perception of emotion. *Merrill-Palmer Quarterly, 48*, 248-262.
- Widen, S. C., & Russell, J. A. (2003). A closer look at preschoolers' freely produced labels for facial expressions. *Developmental Psychology, 39*, 114-128.
- Widen, S. C., & Russell, J. A. (2004). The relative power of an emotion's facial expression, label, and behavioral consequences to evoke preschoolers' knowledge of its cause. *Cognitive Development, 19*, 111-125.
- Widen, S. C., & Russell, J. A. (2008). Young children's understanding of other's emotions. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (3rd ed., pp. 348-363). New York: Guilford Press.
- Widen, S. C., & Russell, J. A. (in press). Differentiation in preschooler's categories for emotion. *Emotion*.
- Wiggers, M., & van Lieshout, C. F. M. (1985). Development of recognition of emotions: Children's reliance on situational and facial expressive cues. *Developmental Psychology, 21*, 338-349.
- Zeidner, M., Matthews, G., Roberts, R. D., & MacCann, C. (2003). Development of emotional intelligence: Towards a multi-level investment model. *Human Development, 46*, 69-96.

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