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# Antecedents of emotion knowledge: Predictors of individual differences in young children

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## Abstract

Individual differences in emotion knowledge were examined among 188 4-year-old, predominantly African American children. Cognitive ability and negative emotionality, maternal characteristics (parenting, verbal intelligence, and depressive symptoms), environmental risk, and child sex were examined as predictors of emotion knowledge. Regression analyses indicated that cognitively skilled children who resided in relatively low risk environments with verbally intelligent mothers possessed greater emotion knowledge. Proximal (4-year) child cognitive ability was a stronger predictor than distal (2-year) cognitive ability. Positive parenting at 4 years was correlated with child emotion knowledge, but this relation disappeared when parenting was examined in the context of other predictors. These findings highlight the potential role of child cognitive ability, along with environmental risk and maternal verbal intelligence, in children's emotion knowledge and demonstrate the importance of examining a variety of predictors for their unique contribution to emotion knowledge.

Emotional intelligence includes the ability to accurately perceive emotional messages and to understand their meaning (Salovey, Bedell, Detweiler, & Mayer, 2000). Such emotion knowledge increases during early childhood, as preschool-age children gradually develop competency in identifying emotions, recognising the meaning of facial expressions, and understanding how situational cues may affect others' emotions (Denham & Couchoud, 1990; Gross & Ballif, 1991; Michalson & Lewis, 1985). Such emotion knowledge may help children anticipate other's feelings and behavior, communicate their own feelings, and to subsequently act in an appropriate manner (Denham, McKinley, Couchoud, & Holt, 1990; Lewis & Michalson, 1983).

Interest in individual differences in emotion knowledge has recently grown as children who are more competent at such skills tend to have better social adjustment (Boyatzis & Satyaprasad, 1994; Garner, Jones, & Miner, 1994; Nowicki & Duke, 1992; Schultz, Izard, Ackerman, & Youngstrom, 2001) and fewer emotional and behavioural problems (Blair & Coles, 2000; Shields et al., 2001; Zabel, 1979). Emotion knowledge is not merely a concurrent correlate of adjustment as it also predicts future social and emotional functioning (Denham et al., 2003; Dodge, Laird, Lochman, Zelli, & Conduct Problems Prevention Research Group, 2002; Izard et al., 2001). Hence, the identification of factors contributing to individual differences in emotion knowledge is an important goal, albeit one that has received little study

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(Scharfe, 2000). Bioecological models suggest that individual differences in emotion knowledge will stem from multiple factors, including individual characteristics (e.g., cognitive ability, negative emotionality), family processes (e.g., parenting), and the broader environmental context of the child (Bronfenbrenner & Morris, 1998). We sought to examine each of these factors as predictors of young children's emotion knowledge.

Emotion knowledge is believed to reflect one's basic information-processing skills using emotional information as the relevant data (Salovey et al., 2000). Thus, emotion knowledge and general cognitive ability may be closely related. Broad measures of cognitive ability such as intelligence tests are positively related to emotion knowledge in young children (Field & Walden, 1982; Izard, Schultz, Fine, Youngstrom, & Ackerman, 2000), as are measures of children's verbal skills (Cutting & Dunn, 1999; Greig & Howe, 2001; Pons, Lawson, Harris, & De Rosnay, 2003; Schultz et al, 2001; Smith & Walden, 1998). Yet, the correlations between emotion knowledge and cognitive ability are generally moderate at best, suggesting that factors other than cognitive ability play a role in explaining individual differences in children's emotion knowledge.

Negative emotionality, for example, may affect children's ability to acquire emotion knowledge. Children who frequently experience negative emotions may be likely to focus on their own experience rather than on that of others (Eisenberg et al, 1998). Such an internal focus may make children less able to process information, including emotional information (Izard, 2001). Support for this hypothesis comes from research showing that anger and emotion knowledge are negatively correlated in young children (Denham, 1986). In addition, child sex needs to be considered as some studies indicate that girls exhibit greater emotion knowledge (e.g., Borke, 1973; Brown & Dunn, 1996; but see Camras et al, 1990; Dunn & Cutting, 1999; Stifter & Fox, 1987, for exceptions).

At the family level, parenting has been related to children's emotion knowledge. Preschool-age children whose parents are responsive, emotionally expressive, and who exhibit low rates of anger and sadness have greater emotion knowledge (Camras et al., 1990; Denham, Zoller, & Couchoud, 1994; Garner et al., 1994; Halberstadt, Crisp, & Eaton, 1999). In contrast, frequent and intense parental expression of negative affect may cause increased child distress and dysregulation, which may inhibit emotional learning (Denham, 1998). At the extreme end of negative parenting, children who were physically abused or neglected performed worse on emotion recognition and understanding (Camras et al, 1990; Rogosch, Cicchetti, & Aber, 1995; Shipman & Zeman, 1999). Maternal depressive symptomatology, while not a measure of parenting per se, is also related to lower child emotion knowledge scores (Greig & Howe, 2001). Given that parenting dimensions are related to maternal depression and intelligence (Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Whiteside, Mansell, Pope, & Bradley, 1996), parenting may mediate any relationship between these maternal characteristics and child emotion knowledge. Research has yet to examine whether the relation between maternal depressive symptoms or intelligence and children's emotion knowledge exists after controlling for parenting dimensions.

More broadly, environmental factors such as higher parental education and the presence of two parents in the home have been positively related to children's emotion knowledge, although variance attributed to such factors may become nonsignificant when other factors are considered (Cutting & Dunn, 1999; Dunn & Brown, 1994). It is unclear from the limited research whether such environmental risk factors are uniquely related to children's emotion knowledge or are merely markers for other variables.

Finally, predictors of emotion knowledge have rarely been examined in a predominantly African American sample. Although parenting styles of African, European, Hispanic, and

Asian Americans are more similar than different (Julian, McKenry, & McKelvey, 1994; Whiteside-Mansell, Bradley, Tresch Owen, Randolph, & Cauce, 2003), the use of harsh, restrictive discipline has been related to negative outcomes for European but not for African American children (Baumrind, 1993; Deater-Deckard, Dodge, Bates, & Pettit, 1996). Furthermore, broad environmental risk factors may affect African and European American children differently (Chase-Lansdale & Gordon, 1996; Thompson, Catlett, Oehler, Gustafson, & Goldstein, 1998). Thus, an important question is whether factors related to emotion knowledge in predominantly European American samples are also found among African American children. Although there is no compelling theory to suggest that the relations between risk factors and emotion knowledge differ across racial groups, verification of these relations is needed among African American children, who have been under-represented in developmental research (Garcia Coll et al, 1996).

The purpose of the present study was to examine the relative contributions of individual characteristics (child cognitive ability, negative emotionality, and sex), family process variables (maternal positive and negative parenting), maternal characteristics (depressive symptoms and verbal intelligence), and environmental risk on children's emotion knowledge in a predominantly African American sample. We hypothesised that: (a) child cognitive ability, positive parenting, and maternal verbal intelligence would be associated with greater child emotion knowledge; (b) child negative emotionality, negative parenting, maternal depressive symptoms, and environmental risk would be associated with lower emotion knowledge; and (c) the relation between maternal characteristics (i.e., verbal intelligence and depressive symptoms) and emotion knowledge would become nonsignificant once parenting dimensions were controlled. Furthermore, we examined several predictors (child cognitive ability, negative emotionality, parenting dimensions, and environmental risk) at both ages 2 and 4 years for their relation with emotion knowledge at age 4. Given that factors in children's current or recent environments tend to be better predictors of adjustment than more distal factors (Lewis, 1997), we hypothesised that the 2-year measures would add little if any significant variance to the more proximal 4-year measures of the same constructs.

Emotion knowledge was assessed using three important components: labelling of expressions, recognition of expressions, and situational knowledge. Labelling refers to the ability to verbally identify other people's facial expressions. In contrast, recognition relies more on receptive than expressive verbal skills as it assesses the ability to identify a facial expression when given the verbal label. Situational knowledge is the understanding of the normative reactions to emotion-eliciting situations (Michalson & Lewis, 1985).

## METHOD

### Subjects

The sample of 188 children (94 boys, 94 girls) and their mothers was recruited for a longitudinal study on emotional development and included children of low socioeconomic (SES), some of whom had minor medical problems (e.g., below average birth weight; respiratory complications; anemia) and/or prenatal substance exposure (see Bendersky & Lewis, 1998; Bennett, Bendersky, & Lewis, 2002). Pregnant women attending participating hospital-based prenatal clinics, or newly delivered women in the three hospitals in Trenton, New Jersey, and at the Medical College of Pennsylvania Hospital in Philadelphia were approached. Of these, 82% agreed to participate in the study. Informed consent was obtained at this time. Infants were excluded from the study if they were born prior to 32 weeks of gestation, required special care or oxygen therapy for more than 24 hours, exhibited congenital anomalies, were exposed to opiates or PCP in utero, or if their mothers were infected with HIV. Mothers were predominantly African American (87%), with 9% European American and 3% Hispanic. Mothers' median education level was 11th grade ($SD$ = 1.6 years), and 63% of families received

Aid for Dependent Children. Mothers ranged in age from 13.7 to 43.6 years ($M$ = 25.6; $SD$ = 6.1). Participation was voluntary, and incentives were provided in the form of vouchers for use at local stores.

## Procedure

Children and mothers were seen in a lab setting for two visits at age 2 years, and two visits at age 4 years. Except where noted, mothers were not present in the testing room while the examiner worked with the child. Emotion knowledge was assessed at the second 4-year visit. Table 1 provides a summary list of all measures.

## Predictor measures

**Cognitive ability—**At 2 years, the Bayley Scales of Infant Development-II (Bayley, 1993) were administered. At 4 years, the Stanford-Binet Intelligence Scale, Fourth edition (SB-IV; Thorndike, Hagen, & Sattler, 1986) was administered. Both measures have extensive standardisation data and satisfactory reliability, including with African American children (Bayley, 1993; Krohn & Lamp, 1999; Thorndike et al., 1986).

**Negative emotionality—**A negative emotionality composite score was derived at 2 years from the sum of the standardised scores from the following seven developmentally appropriate tasks indicated in Table 1. In the modified strange situation Separation-Reunion procedure (see Lewis, Feiring, & Rosenthal, 2000), the following duration scores were standardised and summed for each child: negative affect during free play; crying during separation; other negative behaviour during separation; and negative affect during reunion (mean intraclass correlation coefficient, ICC, across codes = 0.94).

In the Plexiglass Puzzle, children were given 4 minutes to push down on a lever to bring a cookie up through an opening in a large plexiglass box. A factor score derived from the standardised sum of the intensity of children's negative vocalisations (ICC = 1.00) and the latency to their first negative vocalisation served as the negative emotionality score.[1]

In the Pulley Puzzle, children were given 4 minutes to get food from a basket that was attached to a rope and pulley and hung from the ceiling out of the child's reach. A factor score derived from the standardised sum of the intensity of negative vocalisations (ICC = 0.87), the number of complaints (ICC = 0.91), and the number of demands the child made (ICC = 0.47) served as the negative emotionality score.

In the Tickle procedure, the examiner tickled the child for 20 seconds. Tickling has previously been shown to elicit negative affect in a substantial minority of children (Bendersky, Alessandri, & Lewis, 1996). A factor score derived from the standardised sum of the frequency of negative vocalisations (e.g., complains; whines; cries; ICC = 0.94) and negative facial expressions (e.g., frowns; sad or angry facial expression; ICC = 0.78) served as the negative emotionality score.

In the Balloon Pop procedure, a balloon was covertly popped near the child. Facial expressions were coded for joy, surprise, anger, disgust, fear, sadness, interest, and neutral expressions for 10 seconds after the balloon pop using the Maximally Discriminative Facial Movement Coding System (MAX; Izard, 1995). A factor score derived from the standardised sum of the fear, sadness, anger, interest, and joy (reverse coded; kappa for this composite score = 0.69) expressions served as the negative emotionality score.

[1]Details of all factor analyses are available from the authors.

Interruption of Free Play involved subjects playing with toys for 2½ minutes (Sullivan & Lewis, 2003). The mother then asked the child to sit in her lap and if the child did not comply after three requests, brought the child over to her lap. After sitting on the mother's lap for 1 minute, the child was released to play for 1 minute. A factor score derived from the standardised sum of frustration ratings (0 = no signs of frustration; 5 = child definitely frustrated, struggles or cries/screams throughout the minute, and is also aggressive; ICC = 0.96), the latency for the child to become calm for 30 consecutive seconds after release, and the latency from the time the mother called the child to the child's first negative vocalisation (reverse scored) served as the negative emotionality score.

Finally, children's response to a Toy Prohibition was examined, as such tasks have been found to elicit negative affect and vocalisations among young children (Longo, Harvey, Wilson, & Deni, 1982). The examiner entered the playroom with a remote controlled car, placed the car a few feet from the child, and played with the car for 2 minutes. A factor score derived from the standardised sum of the frequency of children's anger/annoyance expressions, sadness expressions, and demands (e.g., "Give it to me!") (ICC = 0.78) served as the negative emotionality score.

A negative emotionality composite score was derived at 4 years from the sum of the standardised scores from the following three tasks. First, a reaction to Success and Failure task was administered, which previously has been found to elicit negative affect among preschool-age children (e.g., Lewis, Alessandri, & Sullivan, 1992). Children were given four puzzles, with the examiner manipulating a timer so that children failed two of the puzzles (for additional details, see Sullivan, Bennett, & Lewis, 2003). Children's responses to success and failure were coded from videotape for embarrassment and shame during the 20 second period after the timer went off for each puzzle. The negative emotionality score consisted of the standardised sum of the shame (ICC = 0.71) and embarrassment (ICC = 0.71) scores (see Lewis & Ramsay, 2002; Lewis, Sullivan, Stanger, & Weiss, 1989; Lewis et al., 1992, for additional coding information).

Second, a modification of the Pulley Puzzle task administered at age 2 was presented for 3 minutes. A factor score derived from the standardized sum of the intensity of negative vocalisations (0 = no negative vocalisation; 4 = cries/screams most of the time; ICC = 0.90), latency to first evidence of frustration (reverse scored; ICC = 0.98), and frequency of complaints (ICC = 0.98) served as the negative emotionality score for the Pulley Puzzle.

Finally, children's response to a brief but loud and unexpected foghorn blast was videotaped and coded for negative affect (0 = neutral, no negative affect; 4 = strong negative facial expression and intense cry; ICC = 0.78) for the period immediately following the blast.

**Negative Parenting—**At 2 years, the number of seconds that mothers exhibited negative affect while interacting with their child during the free play and reunion phases of the Separation-Reunion task (see above) was coded. Scores were standardised across the free play and reunion phases and summed to create the negative parenting composite.

At 4 years, mothers completed the 22-item Parent-Child Conflict Tactics Scale (PCCTS; Straus, 1995). The physical assault and psychological aggression subscales were summed to form a negative parenting composite. These subscales have adequate reliability and validity and have been previously used with African American families (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998).

**Positive parenting—**At 2 years, the number of seconds that maternal warmth ("mother shows enjoyment of the interaction with her child, e.g., smiling, caressing, kissing, snuggling")

was observed during the free play and reunion phases of the Separation-Reunion task was coded. In addition, a positive maternal parenting factor consisting of the following dichotomous variables emerged from the Interruption of Free Play task: mother comforts child; mother talks/sings to child; mother warmly asks child to come to her; and mother ignores child (reverse scored). These two scores were standardised and summed to create the positive parenting composite for age 2.

At 4 years, the 7-item Warmth and Acceptance subscale from the Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984) was obtained by examiner interview and observation of the mother. The HOME has been used extensively with African Americans (e.g., Bradley, Mundfrom, Whiteside, Casey, & Barrett, 1994). In addition, the Pediatric Review of Children's Environmental Support and Stimulation (PROCESS; Casey, Bradley, Nelson, & Whaley, 1988), which assesses mothers' responsivity to their young children, was completed by the examiner. The HOME Inventory Warmth and Acceptance score and the PROCESS total score, which were significantly correlated ($r = .62$, $p < .01$), were standardised and summed to create the positive parenting composite.

**Environmental risk—**At both 2 years and 4 years, risk factors were assessed by maternal interview. The variables were converted to *z*-scores, reverse scored if necessary so that the higher the value the greater the risk, and summed to produce the environmental risk score (see Bendersky & Lewis, 1998). The score included maternal life stress, based on the Social Environment Inventory (Orr, James, & Casper, 1992). This interview assesses stressful events during the past 6 months (e.g., "you lost your job"). Maternal social support (i.e., the number of important or significant people in the mother's network, reverse scored) was based on the Norbeck Social Support Questionnaire (Norbeck, Lindsey, & Carrieri, 1981). The number of regular child caregivers (greater number = higher risk), the irregularity of the child's schedule (15 items rated on a 4-point scale that assessed the variability of when the child woke up, ate, went to sleep, etc., during the past week), and the instability of the child's surroundings (9 items assessing the number of changes in the room the child sleeps in, who lives in the house, etc., during the past 6 months) were assessed from the Family Chaos Scale (A. Sameroff, personal communication, September, 1993). In addition, single parenthood (living alone with children = higher risk), maternal race (non-European American = higher risk), maternal education (years schooling completed, reverse scored), and public assistance status (public assistance as main source of income = higher risk) were included in the environmental risk composite.

**Maternal depressive symptoms—**At 4 years, the 21-item Beck Depression Inventory (BDI; Beck, 1978) was completed by mothers. The BDI has been used extensively with African Americans (Beck, Steer, & Garbin, 1988; Munford, 1994).

**Maternal verbal IQ—**At 4 years, the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) was administered to mothers to provide an estimate of verbal IQ. The PPVT-R correlates highly with the verbal IQ scale of the Wechsler Adult Intelligence Scale (median $r = .71$; Dunn & Dunn, 1981), has been used with African American adults, and has been found to be a valid predictor of IQ for both African and European Americans (Dunn & Dunn, 1981; Halpin, Simpson, & Martin, 1990).

## Outcome measures: Emotion knowledge

**Labelling of expressions—**Emotion knowledge was assessed using procedures described by Michalson and Lewis (1985). Children were first shown photographs and asked to verbally label the expression of the child model (i.e., happy, sad, mad, afraid, surprise, or disgust). Faces labelled in terms of a behaviour (e.g., "smiling" for the happy expression) were prompted

("Yes, Felicia is smiling, but how does she feel?") and were not scored as correct unless the child subsequently gave a correct label. The only synonyms accepted as correct were "angry" for the mad face, "scared" for the afraid face, "shocked" for the surprise face, and "yucky" and "nasty" for the disgust face. The internal consistency (Kuder-Richardson 20; KR-20) coefficient was 0.56.

**Recognition of expressions—**To assess children's recognition of facial expressions, the Examiner next presented all six photographs and asked children in a neutral tone to "point to the … (happy/mad/sad/scared/surprised/yucky) face". The photographs were then shuffled and the child was asked to identify each expression a second time. The internal consistency (KR-20) coefficient was .68.

**Situational knowledge—**To assess children's knowledge of facial expressions in their situational contexts, children were presented with 10 brief stories (including 6 from Michalson & Lewis, 1985; e.g., peer takes the child's ball). Each story was illustrated with a line drawing, with the characters' faces left blank. Using the same 6 photographs from the expression labelling and recognition tasks, children were asked "to point to the face that Felicia would make" in each story. The internal consistency (KR-20) coefficient was .58. A composite emotion knowledge score was created by summing the standardised labelling, recognition, and situational knowledge scores (alpha = .63).

## RESULTS

Table 2 presents means and standard deviations for predictor and outcome variables while Table 3 presents correlations between each predictor and outcome variable. Emotion knowledge was positively correlated with distal and proximal measures of child cognitive ability, and with maternal verbal intelligence and the proximal measure of positive parenting. Emotion knowledge was negatively correlated with both distal and proximal environmental risk scores. As expected, the proximal measure of cognitive ability was more highly correlated with emotion knowledge than was the distal measure (Fisher $r$ to $z$ transformation, $z = 1.96$, $p < .05$). No significant differences, however, were found between proximal and distal measures of child emotionality, environmental risk, and parenting in predicting emotion knowledge.

Hierarchical regressions were conducted next to predict child emotion knowledge. In Step 1, we entered predictors from 4 years, followed by those from 2 years in Step 2. Maternal characteristics were entered in Step 3, and child sex in Step 4. Four-year predictors were entered before two-year predictors to examine whether the more distal predictors added any unique variance to the prediction of emotion knowledge. The maternal characteristics of depressive symptoms and verbal intelligence were entered next because we hypothesised that any effects of these variables on emotion knowledge would be mediated through maternal parenting, already entered in the first two steps. Finally, given that girls have been found to exhibit greater emotion knowledge in some studies, we entered child sex last to see if a sex difference was present, controlling for the effects of the other predictors.[2]

### Predictors of children's emotion knowledge

Table 4 presents the standardised regression coefficients (β) at time of entry and for the final equation, the change in $R^2$ for each block, and the total model $R^2$ for the prediction of the composite and for each emotion knowledge domain. The overall equation for the emotion

[2]Existing research (e.g., Kaugars, Russ, & Singer, 2001) does not provide any reason to examine neonatal health or cocaine exposure as predictors of emotion knowledge, and when added to the hierarchical regressions no effects were found.

knowledge composite, a standardized sum of the three separate outcomes, explained 35% of the variance ($p < .001$). Child cognitive ability at 4 years explained the greatest variance ($\beta = .47$, $p < .001$) as children with higher IQ scores tended to have higher emotion knowledge scores. Child cognitive ability at 2 years added significant variance to emotion knowledge scores ($\beta = .15$, $p < .05$), even after entering 4-year cognitive ability. Maternal verbal intelligence also was a positive predictor of children's emotion knowledge, even after entering children's cognitive ability ($\beta = .15$, $p < .05$). Finally, high environmental risk, assessed both at 4 and 2 years ($\beta = -.14$, $p < .05$; $\beta = -.16$, $p < .05$, respectively), predicted lower emotion knowledge scores. Child negative emotionality, parenting, maternal depressive symptoms, and sex failed to predict the emotion knowledge composite.

Examining each emotion knowledge domain, patterns of prediction similar to that for the composite were found with a few exceptions. Whereas child cognitive ability at 4 years predicted each of the three domains, cognitive ability at 2 years predicted only the situational knowledge domain ($\beta = .17$, $p < .05$). Nonsignificant trends were found for maternal verbal intelligence to predict greater expression labelling and recognition scores ($\beta = .14$, $p < .10$), but not situational knowledge scores. Environmental risk at 2 years was significant only for the prediction of expression recognition ($\beta = -.17$, $p < .05$), and environmental risk at 4 years was significant only for the prediction of situational knowledge ($\beta = -.15$, $p < .05$). A trend was found for negative parenting at 2 years to also predict lower situational knowledge ($\beta = -.12$, $p < .10$). Finally, a trend also was found in the final equation for negative emotionality to predict lower situational knowledge ($\beta = -.13$, $p < .10$). Positive parenting, maternal depressive symptoms, and child sex were unrelated to each emotion knowledge domain.

## DISCUSSION

Young children's cognitive ability is a strong predictor of their emotion knowledge. Most prior studies have found a positive relation between children's cognitive ability and their emotion knowledge (e.g., Brown & Dunn, 1996; Denham et al., 1994; Fine, Izard, Mostow, Tretacosta, & Ackerman, 2003; Greig & Howe, 2001; Schultz et al., 2001; cf. Shields et al., 2001; Zabel, 1979). Earlier studies, however, have not always compared cognitive ability to a broad range of potential predictors of emotion knowledge. Furthermore, prior studies have generally used either a few subtests from an IQ test (Cook, Greenberg, & Kusche, 1994; Izard et al., 2000), a receptive language scale (Fine et al., 2003; Greig & Howe, 2001; Schultz et al., 2001; Shields et al., 2001; Smith & Walden, 1998; Zabel, 1979), or a measure of observed expressive language ability (Brown & Dunn, 1996; Denham et al., 1994) to estimate cognitive ability rather than the more comprehensive cognitive batteries used in the present study. Although the proximal measure of cognitive ability was found to be a stronger predictor, the distal measure did add unique variance as children with relatively high cognitive ability at 2 years had greater emotion knowledge at 4 years even after controlling for cognitive ability at 4 years. Maternal verbal intelligence and environmental risk also predicted emotion knowledge. However, children's negative emotionality, sex, parenting, and maternal depressive symptoms were unrelated to emotion knowledge.

Children with either poor emotion knowledge or poor cognitive abilities exhibit increased rates of emotional-behavioural problems (Cook et al., 1994; Fine et al., 2003; Kusche, Cook, & Greenberg, 1993). What remains unclear is whether emotion knowledge and cognitive ability each add unique variance to the prediction of emotional-behavioural problems, as they may for social adjustment (Izard et al., 2000). It has been suggested that the development of emotion knowledge involves both the cognitive and emotion systems, and that emotion knowledge is related to but independent from cognitive ability (Izard, 1991; Schultz et al., 2001). Although the processes are not well understood, emotion knowledge deficits may lead to social problems and peer rejection, which in turn may lead to emotional-behavioural problems (Dodge et al.,

2002; Fine et al., 2003; Laird, Jordan, Dodge, Pettit, & Bates, 2001; Parker & Asher, 1987; Rogosch et al., 1995). Similarly, poor cognitive ability is a risk factor for learning problems, stigmatisation, shame, and peer rejection, which also may lead to emotional-behavioural problems (Laird et al., 2001; Lewis, 1995; Parker & Asher, 1987; Prior, Smart, Sanson, & Oberklaid, 1999). Alternatively, perhaps emotion knowledge mediates the relation between cognitive ability and emotional-behavioral problems, as children with low cognitive ability may have greater difficulty learning about emotions. Izard et al. (2000), for example, found that emotional recognition skills mediate the relation between cognitive ability and social adjustment.

Maternal verbal intelligence also predicted emotion knowledge, even after controlling for children's cognitive ability. Perhaps verbally intelligent mothers are better able to articulate emotion lessons to their child, thus providing greater emotion learning opportunities. More broadly, given that maternal intelligence has been associated with affectionate, responsive parenting (Bornstein et al., 1996; Whiteside-Mansell et al., 1996), maternal verbal intelligence may be a causal factor, or at least a marker, for effective parenting. In the present sample, maternal verbal intelligence was correlated with positive parenting at 4 years, and both of these maternal characteristics were positively correlated with children's emotion knowledge. Yet, maternal verbal intelligence predicted emotion knowledge after positive parenting was already controlled for in the regressions, indicating that maternal intelligence added unique variance and is not merely a marker for positive parenting.

Environmental risk also predicted emotion knowledge. This is consistent with prior findings showing that parental education, occupation, and the presence of two parents in the home are positively related to children's emotion knowledge (Cutting & Dunn, 1999; Dunn & Brown, 1994; Smith & Walden, 1998). Several other variables reflective of children's environment, however, failed to predict emotion knowledge when examined in the context of other predictors. Maternal depressive symptoms were unrelated to emotion knowledge. Greig and Howe (2001) found maternal depressive symptoms to be negatively related to children's emotion knowledge, but the relation became nonsignificant after controlling for other variables. Combined with the present findings, maternal depressive symptoms do not appear to be a robust predictor of children's emotion knowledge. Similarly, positive parenting was correlated with emotion knowledge, but became a nonsignificant predictor when examined in the regressions. Negative parenting also was unrelated to emotion knowledge. Given that some research has found an association between parenting and children's emotion knowledge, at least two potential explanations exist. First, most prior studies examining parenting effects on children's emotion knowledge had fewer than 50 subjects (Camras et al, 1988, 1990; Daly, Abramovitch, & Pliner, 1980; Denham et al., 1994; Field & Walden, 1982; Garner et al., 1994; Shipman & Zeman, 1999). Such samples limit the ability to examine the unique variance of parenting effects in the context of other potential predictors, such as cognitive ability and environmental risk. Second, our parenting measures assessed maternal affect, warmth, and the use of harsh discipline. While our parenting assessments were relatively comprehensive, it is possible that more specific measures focusing on maternal expressivity (Halberstadt et al., 1999) or the use of emotional language (Denham et al., 1994) are more likely to show parenting effects on emotion knowledge.

Negative emotionality also was unrelated to children's emotion knowledge. Before negative emotionality is dismissed as a predictor of emotion knowledge, it should be noted that we assessed negative emotionality during interactions in which either the examiner or mother was present. Such contextual factors are important, as young children may be less apt to exhibit negative emotions when an adult is present (Garner, 1995; Zeman, Penza, Shipman, & Young, 1997). In addition, our measures of negative emotionality at 2 and 4 years, though developmentally appropriate, were not parallel. For example, the strange situation is typically

administered within the first two years of life, whereas assessment of self-conscious emotions such as shame would be inappropriate at age 2 as such emotions emerge during the third year (Lewis, 1993).

The findings for our predominantly African American, low SES sample are consistent with those from predominantly European American samples. We used more comprehensive measures of cognitive ability, but our findings were consistent with studies finding children's language ability to be positively related to emotion knowledge among both African American (Schultz et al., 2001; Smith & Walden, 1998) and European American samples (Brown & Dunn, 1996; Greig & Howe, 2001). Regarding maternal depression, Greig and Howe (2001) found a negative relation between maternal depressive symptoms and children's emotion knowledge in their predominantly white, working class sample of Scottish preschoolers (Greig & Howe, 2001). Similarly, we found a trend for maternal depressive symptoms to be negatively related to children's recognition of expressions, though not to their labelling of expressions or situational knowledge. In both studies, however, the relation between maternal depressive symptoms and children's emotion knowledge decreased and became nonsignificant once other variables, including children's cognitive ability, were entered into regressions. For other predictors, there is insufficient research to compare the generalisability of findings across racial groups. For example, we know of no prior study to examine negative emotionality as a predictor of emotion knowledge among African American or European American children.

We assessed several important dimensions of emotion knowledge. Emotion knowledge, however, is a broad construct that may include additional skills (e.g., the perception of emotion signals in vocal expressions and behaviours; the identification of causes of emotions; the ability to recognise and label one's own emotions; Izard, 2001). Although such skills may be interrelated, our findings do not necessarily generalise to other dimensions of emotion knowledge. Similarly, our findings are based on measures that utilise posed photographs and hypothetical vignettes, and thus may not generalise to children's actual behaviour in social situations that require consideration of nonfacial cues and one's personal history with an interactant (Saarni, 1999). Furthermore, as some basic dimensions of emotion knowledge do not develop until after age 24 months (e.g., emotion situation knowledge; Fine et al., 2003), we did not assess emotion knowledge at 2 years, prohibiting us from examining correlates of change in emotion knowledge from age 2 to 4.

In summary, relatively little is known about the characteristics of children and their environments that may enhance or hinder their acquisition of emotion knowledge (Schultz et al., 2001). The present study compared theoretically important predictors for their relation to young children's emotion knowledge. The findings indicate that cognitively skilled children who come from low risk environments and who have verbally intelligent mothers possess greater emotion knowledge in early childhood than their peers.

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## TABLE 1

Constructs and their measures

*Cognitive ability*
Two years: Bayley Scales of Infant Development-II, Mental Development Index
Four years: Stanford-Binet Intelligence Scale-IV, IQ score (composite based upon abstract/visual reasoning, quantitative reasoning, short-term memory, and verbal reasoning subscales)

*Negative emotionality*
Two years:

1. Strange Situation: negative affect + crying + other negative behaviour
2. Plexiglass Puzzle: intensity and latency (reverse scored) of negative vocalisations
3. Pulley Puzzle: negative vocalisations + complaints + demands
4. Tickle: negative vocalisations + negative facial expressions
5. Balloon Pop: negative affect
6. Free Play Interruption: frustration + latency to calm + negative vocalisation
7. Toy Prohibition: anger + sadness + demands

Four years:

1. Success and Failure tasks: shame + evaluative embarrassment
2. Pulley Puzzle: negative vocalisations + frustration + complaints
3. Foghorn blast: negative affect

*Negative parenting*
Two years:

1. Free Play: negative affect
2. Strange Situation (free play and reunion phases): negative affect

Four years: Parent-Child Conflict Tactics Scale: physical assault + psychological aggression scale scores

*Positive parenting*
Two years:

1. Free Play Interruption: comforts + talks/sings + warmly directs + ignores (reverse scored)
2. Strange Situation (free play and reunion phases): maternal warmth

Four years:

1. Home Observation for Measurement of the Environment: warmth and acceptance subscale
2. Pediatric Review of Children's Environmental Support and Stimulation: total score

*Environmental risk*
Two and four years:
Social Environment Inventory (maternal life stress) + Norbeck Social Support Questionnaire (maternal social support; reverse scored) + number of caregivers + irregularity of child's schedule + instability of child's surroundings + single parent household + maternal race (minority status) + maternal education (reverse scored) + receives public assistance

*Maternal depressive symptoms*
Four years:
Beck Depression Inventory

*Maternal verbal IQ*
Four years:
Peabody Picture Vocabulary Test-Revised

*Emotion knowledge*
Four years:

1. Labelling of expressions
2. Recognition of expressions
3. Situational knowledge

## TABLE 2

Means (and standard deviations) of predictor and outcome variables

| | *Mean (SD)* | *n* |
|---|---|---|
| *Predictor variables* | | |
| Child cognitive ability | | |
| Two years | 83.1 (10.1) | 178 |
| Four years | 84.7 (11.4) | 175 |
| Maternal characteristics | | |
| Depressive symptoms | 5.9 (6.5) | 174 |
| Verbal intelligence | 72.3 (14.6) | 170 |
| *Outcome variables* | | |
| Expression labelling | 1.6 (1.4) | 188 |
| Expression recognition | 5.6 (2.7) | 188 |
| Situational knowledge | 6.8 (2.7) | 188 |

*Note:* Means and standard deviations for the child negative emotionality ($n$ = 179 at 2 years, $n$ = 182 at 4 years), environmental risk ($n$ = 178, $n$ = 166), negative parenting ($n$ = 111, $n$ = 174), positive parenting ($n$ = 177, $n$ = 188), and the emotion knowledge composite ($n$ = 188) are not listed as they were based on standardised ($z$) scores.

**TABLE 3**

Correlations among predictor and outcome variables

| | *Distal Predictors (2 years)* | | | | | *Proximal Predictors (4 years)* | | | | | | | *Emotion knowledge* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Cog*** | ***Emot*** | ***Env*** | ***NegP*** | ***PosP*** | ***Cog*** | ***Emot*** | ***Env*** | ***NegP*** | ***PosP*** | ***Dep*** | ***VIQ*** | ***Sex*** | ***Label*** | ***Rec*** | ***Sit*** | ***Comp*** |
| *Distal predictor variables (2 years)* | | | | | | | | | | | | | | | | | |
| Child cognitive ability | — | | | | | | | | | | | | | | | | |
| Child negative emotionality | −.02 | — | | | | | | | | | | | | | | | |
| Environmental risk | −.22** | .06 | — | | | | | | | | | | | | | | |
| Negative parenting | −.06 | .22* | .00 | — | | | | | | | | | | | | | |
| Positive parenting | .05 | −.09 | .07 | .06 | — | | | | | | | | | | | | |
| *Proximal predictor variables (4 years)* | | | | | | | | | | | | | | | | | |
| Child cognitive ability | .52*** | .03 | −.15# | −.08 | .11 | — | | | | | | | | | | | |
| Child negative emotionality | .04 | −.05 | .01 | .19# | .12 | .09 | — | | | | | | | | | | |
| Environmental risk | −.17* | .05 | .47*** | .08 | −.02 | −.23** | .10 | — | | | | | | | | | |
| Negative parenting | −.04 | .03 | .14# | .08 | −.02 | −.12 | −.01 | .15* | — | | | | | | | | |
| Positive parenting | .19** | .01 | −.26*** | −.19* | −.12 | .24*** | −.04 | −.34*** | −.04 | — | | | | | | | |
| Maternal depressive symptoms | −.04 | .06 | .26*** | .13 | .01 | −.06 | −.08 | .28*** | .28*** | −.30*** | — | | | | | | |
| Maternal verbal intelligence | .22** | .16* | −.21** | −18# | .03 | .40*** | −.02 | −.27*** | −.04 | .36*** | −.02 | — | | | | | |
| Child sex | .16* | −.13 | −.01 | −.07 | .07 | .07 | −.01 | .10 | .03 | −.16* | .03 | −.06 | — | | | | |
| *Emotion knowledge variables* | | | | | | | | | | | | | | | | | |
| Labelling of expressions | .32*** | .05 | −.22** | −.11 | .02 | .50*** | −.01 | −.23** | .01 | .23** | −.10 | .35*** | −.03 | — | | | |
| Recognition of expressions | .31*** | −.07 | −.28*** | −.08 | −.03 | .38*** | .00 | −.22** | −.03 | .19** | −.14# | .30*** | .10 | .56*** | — | | |
| Situational knowledge | .31*** | .06 | −.19* | −17# | .01 | .35*** | −15# | −.20* | .02 | .07 | .02 | .25*** | .09 | .38*** | .34*** | — | |
| Composite | .40*** | .02 | −.29*** | −.16 | .00 | .52*** | −.07 | −.27*** | .00 | .21** | −.09 | .38*** | .08 | .82*** | .80*** | .73*** | — |

*Note:* Correlations between child sex and other variables are based on Spearman's rho; all other coefficients are based on Pearson correlations. Sex was coded such that 1 = boys, 2 = girls.

* $p \leq .05$, two-tailed;

** $p \leq .01$;

*** $p \leq .001$.

Cog = child cognitive ability; Emot = child negative emotionality; Env = environmental risk; NegP = negative parenting; PosP = positive parenting; Dep = maternal depressive symptoms; VIQ = maternal verbal intelligence; Sex = child sex; Label = expression labelling; Rec = expression recognition; Sit = situational knowledge; Comp = emotion knowledge composite (i.e., label + rec + sit).

**TABLE 4**

Hierarchical regressions predicting children's emotion knowledge at 4.5 years

| *Predictor* | *Emotion knowledge composite* | | | *Labelling of expressions* | | | *Recognition of expressions* | | | *Situational knowledge* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Entry* β | *Final* β | $R^2$*change* | *Entry* β | *Final* β | $R^2$*change* | *Entry* β | *Final* β | $R^2$*change* | *Entry* β | *Final* β | $R^2$*change* |
| *1. Proximal (4 years)* | | | .29*** | | | .26*** | | | .16*** | | | .15*** |
| Child cognitive ability | .47*** | .36*** | | .45*** | .38*** | | .33*** | .25** | | .33*** | .22* | |
| Child negative emotionality | −.08 | −.06 | | −.03 | −.02 | | .00 | .00 | | −.12 | −13# | |
| Environmental risk | −.14* | −.06 | | −.10 | −.03 | | −.12 | −.02 | | −.15* | −.08 | |
| Negative parenting | .08 | .09 | | .08 | .10 | | .03 | .06 | | .07 | .06 | |
| Positive parenting | .05 | −.03 | | .09 | .02 | | .08 | .01 | | −.06 | −.09 | |
| *2. Distal (2 years)* | | | .05* | | | .02 | | | .04# | | | .05# |
| Child cognitive ability | .15* | .14* | | .06 | .07 | | .11 | .10 | | .17* | .17* | |
| Child negative emotionality | .03 | .01 | | .05 | .02 | | −.06 | −.07 | | .08 | .07 | |
| Environmental risk | −.16* | −.15* | | −.11 | −.09 | | −.17* | −.15# | | −.11 | −.10 | |
| Negative parenting | −.08 | −.06 | | −.05 | −.04 | | −.02 | .01 | | −.12# | −.11 | |
| Positive parenting | −.02 | −.03 | | .00 | −.01 | | −.05 | −.06 | | .00 | −.01 | |
| *3. Maternal characteristics:* | | | .02 | | | .01 | | | .02 | | | .01 |
| Depressive symptoms | −.04 | −.04 | | −.06 | −.06 | | −.08 | −.08 | | .04 | .04 | |
| Verbal intelligence | .15* | .15* | | .14# | .14# | | .14# | .14# | | .08 | .08 | |
| *4. Child sex* | .03 | .03 | .00 | −.04 | −.04 | .00 | .08 | .08 | .01 | .03 | .03 | .00 |
| Total model $R^2$ | | | .35*** | | | 29*** | | | .23*** | | | 21*** |

*Note:* Asterisks under $R^2$ column indicate significance of change in $R^2$ for each block. Sex was coded such that 1 = boys, 2 = girls.

* $p \leq .05$;

** $p \leq .01$;

*** $p \leq .001$;

\# $p \leq .10$.