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A Three-factor Structure of Emotion Understanding in Third-grade Children

Vanessa L. Castro¹, Amy G. Halberstadt², and Patricia Garrett-Peters³

¹Northeastern University

²North Carolina State University

³University of North Carolina at Chapel Hill

Abstract

Theoretical conceptualizations of emotion understanding generally imply a two-factor structure comprised of recognition of emotional expressions and understanding emotion-eliciting situations. We tested this structure in middle childhood and then explored the unique predictive value of various facets of emotion understanding in explaining children's socioemotional competence. Participants were 201 third-grade children and their mothers. Children completed five different measures, which provided eight distinct indices of emotion understanding. Mothers completed two questionnaires assessing children's socioemotional skills and problems. Results indicated that: (a) emotion understanding in third-grade children was differentiated into three unique factors: Prototypical Emotion Recognition, Prototypical Emotion Knowledge, and Advanced Emotion Understanding, (b) skills within factors were modestly related, (c) factors varied in complexity, supporting theoretical and empirical models detailing developmental sequencing of skills, and (d) skills in Prototypical Emotion Knowledge were uniquely related to mothers' reports of third-grade children's socioemotional competence. Implications regarding elementary-school-age children's social cognitive development are discussed.

Keywords

emotion recognition; emotion knowledge; middle childhood; social competence

Introduction

Emotion understanding is an umbrella term used to capture the many skills associated with the recognition and attribution of emotions in the self and others (Castro, Cheng, Halberstadt, & Gruhn, 2015; Denham, 1986; Halberstadt, Denham, & Dunsmore, 2001). Emotion understanding is thought to predict important socioemotional competencies across childhood, including fewer parent- and teacher-reported behavior problems (see review by

Correspondence should be addressed to Vanessa L. Castro, Department of Psychology, Northeastern University, 125 NI, Boston, MA 02115, USA. v.castro@neu.edu.

Vanessa Castro, Department of Psychology, Northeastern University; Amy G. Halberstadt, Department of Psychology, North Carolina State University; Patricia Garrett-Peters, Frank Porter Graham Child Development Institute, University of North Carolina at Chapel Hill.

Trentacosta & Fine, 2010), greater prosocial adjustment and interpersonal success with peers (Heinze, Miller, Seifer, Dickstein, & Locke, 2015; Miller et al., 2005; Ornaghi, Grazzani, Cherubin, Conte, & Piralli, 2015), and various indicators of academic achievement (Denham, Bassett, Brown, Way, & Steed, 2013; Denham et al., 2012).

Despite the importance of emotion understanding as a developmental competency, we know little about its structure for elementary-school-age children. Knowing more about this structure is important for two reasons. Pragmatically, no one has examined to what extent the multiple measures of emotion understanding assess similar or divergent skill sets, challenging our ability to compare across studies. Additionally, once we know the structure of emotion understanding, we can then test developmental trajectories of these skills; that is, different skills may cohere differently at different ages, and different skills may be uniquely related to other competencies at different ages. Thus, the current study has two objectives: to test the structure of emotion understanding in third-grade children and to examine the structure in relation to children's other socioemotional competencies. Below, we define emotion understanding and describe how different components may relate to the developmental competencies important for children's socioemotional adjustment during middle childhood broadly, and third grade specifically.

Theoretical Conceptualizations of Children's Emotion Understanding

Children's emotion understanding is thought to be multidimensional, with at least two broad skill sets: *emotion recognition*, the perceptual recognition and labeling of emotional expressions in the self and others, and *emotion knowledge*, the attribution of emotions in the self and others using general emotional scripts as well as culturally embedded scripts about emotion-eliciting situations (e.g., Castro, Cheng et al., 2015; Denham, 1986; Halberstadt et al., 2001; Pons, Harris, & de Rosnay, 2004; Widen, 2013). The development of children's emotion understanding is thought to be sequential, with skills becoming increasingly complex in both level and quality throughout childhood. For example, basic skills, such as labeling prototypical emotional expressions and knowing about external causes of emotions, emerge in early childhood (ages 3–5), whereas more complex skills, such as recognizing mixed emotional expressions, understanding social and moral emotions, and knowing how to manage emotions effectively, develop around the age of eight (e.g., Harris, 1989; Pons et al., 2004; Saarni, 2000).

It is likely that emotion understanding skills continue to differentiate during middle childhood (ages 7–11), as children's growing cognitive skills facilitate their abilities to analyze, interpret, and integrate multiple, mixed, and fragmented emotion-related messages (Eccles, 1999; Halberstadt, Parker, & Castro, 2013). Children in middle childhood are also increasingly expected to understand others' emotions in contexts that include multiple, rapidly changing, and fragmented emotion expressions and experiences (Halberstadt et al., 2013; Pons et al., 2004). Together, children's developing skills and the contextual demands they face may spawn more complex and differentiated skills, such as the interpersonal recognition of emotion in familiar others (e.g., Castro, Halberstadt, Lozada, & Craig, 2015; Ickes, 2011) and knowledge of mixed and moral emotions (e.g., Brown & Dunn, 1996; Pons et al.). Further, children's skills in knowing which emotion regulatory responses to select

and apply in social situations, as well as self-awareness about their own skill, may become increasingly sophisticated and differentiated as children learn how to effectively manage their emotions (Eisenberg & Morris, 2002). Thus, testing the multidimensionality of emotion understanding during middle childhood may reveal a differentiated pattern of development, adding clarity to our understanding of the development of different emotion understanding skills.

The three studies testing the structure of children's emotion understanding all report a two-factor structure distinguishing emotion recognition and emotion knowledge, using prototypical measures which are appropriate for three-to-five-year-old children (Barbosa-Leiker, Strand, Mamey, & Downs, 2014; Bassett, Denham, Mincic, & Graling, 2012; Sette, Bassett, Baumgartner, & Denham, 2015). Our study expands on these in two ways. First, we extend knowledge about emotion understanding structure to an older population—third-grade children. Parents expect children to demonstrate more emotionally competent behavior after second grade (Cassano, Perry-Parrish, & Zeman, 2007). Indeed, third grade is 'an important pivot point' (Hernandez, 2015, p. 5) in school as well, as classroom demands change significantly with increasing teacher expectations that children function more autonomously, have greater self-regulation skills, and demonstrate better social and emotional competencies overall. Second, our study includes multiple emotion understanding measures that collectively assess a diverse skill set. We included prototypical measures in the classic tradition, because they assess understanding with the most complete, unmasked, and pure exemplars of emotion, and thus assess skill under optimal conditions. However, emotion communication in 'real life' is 'messy', and often involves quick and truncated expressions, and mixed, masked, and sometimes irrelevant communications, which need to be sorted out (App, McIntosh, Reed, & Hertenstein, 2011; Halberstadt et al., 2013). Thus, to assess the increasingly sophisticated skills of third-grade children in contexts more representative of the settings in which emotion understanding actually occurs, we included both a measure of children's accuracy in recognizing parents' emotions during an actual dyadic interaction, and a contextualized measure of children's abilities to differentiate emotion labels and regulation strategies in the context of meaningful relationships and events.

Emotion Understanding and Socioemotional Competence in Middle Childhood

The linkage between emotion understanding and socioemotional competence is well-established in early childhood (e.g., Heinze et al., 2015; Miller et al., 2005; Ornaghi et al., 2015), but is less studied in the middle childhood years. In addition, most studies use global measures that fail to differentiate skill sets (for notable exceptions with early childhood samples, see Bassett et al., 2012; Garner & Waajid, 2012; Heinze et al.; Miller et al.). Thus, the degree to which specific emotion understanding skills are relevant for third-grade children's social and emotional adjustment, over and above other skills, remains unknown.

Intuitively, it makes sense that all emotion understanding skills would relate to positive and harmonious relationships and be similarly influential for other skills; leading to the prediction of positive associations with all socioemotional skills and negative associations with all socioemotional problems throughout childhood. However, different emotion

understanding skills may be recruited for new interpersonal demands as children age, and others may become costly. For example, at least some advanced emotion understanding skills in second and third grade may result in over-attunement to peer relationship problems, and may contribute to socioemotional *maladjustment* over time (Hoglund, Lalonde, & Leadbeater, 2008); further, by the middle school years, social perspective taking may become a tradeoff, contributing to both friendship quality *and* interpersonal distress (Smith & Rose, 2011). Thus, children's socioemotional competence may be uniquely predicted by particular subsets of emotion understanding skill (such as prototypical emotion knowledge) over the course of development. Given that no studies have examined the unique predictive value of various emotion understanding skills on children's socioemotional competence, we explored the opportunity to further assess these associations.

The Present Study

To test the factor structure of emotion understanding in third grade, we utilized multiple, mixed-method measures appropriate for children who were between seven- to nine-years old. We hypothesized that emotion understanding would demonstrate multidimensionality in third grade. Specifically, we tested the two-factor structure identified in early childhood, and included a third factor related to advanced understanding skills, and a fourth factor related to regulation knowledge skills (Castro, Cheng, et al., 2015; Eisenberg & Morris, 2002; Pons et al., 2004). We also tested model fit between one-, two-, three-, and four-factor structures to determine the best fitting model for the data. We then explored the unique predictive value of the resulting factors on mothers' reports of children's socioemotional skills and problems. No *a priori* hypotheses were made, given the scarcity of studies in this area.

Method

Participants

Participants were 201 third-grade children (116 African-American, 81 European American, 4 Biracial; 48.8 percent female; $M_{\text{age}} = 8.75$ years, $SD_{\text{age}} = .34$) and their mothers who were part of and supplemental to families recruited by the Durham Child Health and Development Study, which included approximately equal numbers of African-American and European American families from both lower and higher income groups. Families represented a broad spectrum in total household income (ranging from \$800 to \$420 000; *Median* = \$75 000), and maternal education level (ranging from ninth grade to college graduate; *Median* = 14.00 years, some college education).

Measures

Children's Emotion Understanding—Children completed five tasks, which provided eight indices of emotion understanding (indices indicated in parentheses): Two tasks assessed children's accuracy in recognizing prototypical emotional expressions as posed by children (*child recognition*) and adults (*adult recognition*). A third task assessed children's accuracy in recognizing mothers' emotions during a mother-child discussion of conflict (*interpersonal recognition*). A fourth task assessed children's prototypical emotion situation knowledge and distinguished between knowledge about basic mental states (*mental knowledge*), emotion regulation (*regulation knowledge*), and complex emotional states

(*complex knowledge*). A fifth task assessed children's abilities to differentiate emotion labels (*differentiation knowledge*) and regulation strategies (*change knowledge*) in the context of meaningful relationships and events. Please see Table 1 for descriptive statistics.

Prototypical emotion recognition—The Child and Adolescent Recognition of Emotion (CARE) task (Parker, Mathis, & Kupersmidt, 2013) is a web-based measure assessing young children's recognition of other children's facial and bodily expressions of emotion. The measure includes high quality photographs of boys and girls of four different ethnicities depicting prototypical happy, sad, mad, scared, surprise, disgust, and neutral faces, and full body postures with facial expressions blurred. The stimuli were validated by Facial Action Coding System coding for faces, and adult observer ratings for face and body expressions. Children select the description best characterizing the emotion for each of 54 expressions across two answer-choice formats: forced-choice between two labels for 36 items, and free labels for 18 items, which were later scored by two coders ($\kappa = .98$). As consistent with this type of emotion recognition task (e.g., Nowicki & Duke, 1994), item presentation was held constant across children.

The CARE is scored using a traditional accuracy paradigm, in which responses that match the target criterion receive a value of 1, and incorrect responses not matching criterion receive a value of 0. Responses are averaged across all 54 items to create a mean *child recognition* accuracy score ranging from 0 to 1; higher scores indicate greater accuracy. Evidence of construct validity is supported by associations with teacher-reported social skills (Parker et al., 2013). Reliability in our sample was low ($\alpha = .41$), but consistent with the literature (Parker et al.) (for a discussion regarding why non-verbal measures of emotion recognition often have low reliability, see Hall & Bernieri, 2001).

The Increasingly Clear Emotions (ICE) task (Halberstadt, Lozada, Leary, Sibley, & Garrett-Peters, 2010) is a computer-based task that assesses recognition of adults' dynamic facial expressions of emotion in multiple rounds in which the expressions unfold from the very initial forming of the expression (first round) to the full facial expression (final round). Each round includes more information about each facial expression. Expressions were drawn from video-recordings of 20 different adults balanced by ethnicity (African-American and European American) and gender (male and female). Twelve of these were chosen from the Extended Cohn-Kanade AU-Coded Facial Expression Database (Lucey et al., 2010) and eight were additionally recorded. Five emotions (anger, fear, happiness, sadness, surprise) are fully represented within gender and ethnicity. To establish prototypicality of the expressions, the beginning (neutral face) and final (prototypical) segments of all 20 facial expressions were correctly identified by at least 80 percent of a sample of 20 adult raters (10 African-Americans, 10 European Americans, balanced across gender). The video-recordings for each expression were divided into sixths to create six rounds of stimuli, with the first round including the least amount of emotional information and the sixth round including the most (fully prototypical). All 20 facial expressions were presented in each round. Children viewed four rounds: these began with early stages of facial expressions and continued to levels of moderate intensity. Each video segment was preceded by a bright traffic light shifting from green to yellow to red, alerting the child to pay attention; children had 4 s after the video display to choose from the five emotion labels. Accuracy was calculated for each

expression within each round; scores were then averaged across rounds to create a total *adult recognition* accuracy score; higher scores indicate greater accuracy. Reliability for the ICE task (Cronbach's $\alpha = .65$), was relatively high compared to other measures of non-verbal emotion recognition (Hall & Bernieri, 2001).

Interpersonal emotion recognition—Mother-child dyads talked for 7 min about an issue involving conflict between them (e.g., homework, bedtime, as per Gunlicks-Stoessel & Powers 2008; Welsh & Dickson, 2005). Facial and upper-body images of each participant were video-recorded. Fifteen 10-s videoclips taken from the beginning of the discussion were then presented to participants. Children and mothers independently identified their own feelings during each videoclip, and then independently reviewed the videoclips again to identify what the other was feeling. Answer choices were Happy, Curious, Anxious, Irritated, Sad, and Disgust, each of which included three descriptors (e.g., for *Happy*, pleased, proud, and happy were included; for *Anxious*, worried, afraid, and anxious were included) or No Emotion. Participants could also write in an emotion that was not included; no participant included a term that indicated a distinct, separate emotion.

Interpersonal recognition accuracy was based on agreement between the self-reported experience of the mother and the child's judgment as to what the mother was feeling. Items received 1 point for complete agreement (e.g., mother reported feeling 'happy' and child said mother was feeling 'happy'), no points for complete disagreement (e.g., mother reported feeling 'happy' and child said mother was feeling 'sad'), and .5 points for mismatched responses of the same valence (e.g., mother reported feeling 'irritated' and child said mother was feeling 'anxious'). Points were averaged across all items for each child to create a total *interpersonal recognition* score. Evidence of construct validity for this type of paradigm in elementary-school-age children is provided by two studies (Castro, Halberstadt, et al., 2015; Dunsmore, Her, Halberstadt, & Perez-Rivera, 2009).

Prototypical emotion knowledge—Children completed the Test of Emotion Comprehension (TEC) (Pons et al., 2004), which assesses prototypical emotion situation knowledge. Children are asked to identify emotional outcomes of schematically depicted characters in nine vignettes that require increasingly sophisticated emotion knowledge. For each vignette, children choose the best answer from four emotion-related choices. Because third-graders' skill is typically representative of the end-range of TEC assessment, we created three indices of increasing complexity from those vignettes: *Mental Knowledge* (2-item composite of desires and beliefs vignettes: knowing that different people sometimes have different feelings about the same thing, and understanding that people may hold false beliefs), *Regulation Knowledge* (2-item composite of masking and regulation vignettes: understanding that discrepancies may exist between what someone feels and shows, and knowing that there are various strategies of emotional control), and *Complex Knowledge* (3-item composite of mixed and moral emotion awareness vignettes: knowing that people sometimes have multiple or even contradictory emotions, and that emotions emerge from evaluated action). Items were scored for accuracy and summed within each index. Although reliability is not assessed due to few items per knowledge component, there is good evidence

supporting construct validity (e.g., Pons & Harris, 2005; Pons et al.; von Salisch, Haenel, & Freund, 2013).

Contextual emotion knowledge—To assess more contextually relevant aspects of emotion knowledge, children discussed three vignettes designed to elicit emotional responses (Halberstadt, MacCormack, & Shull, 2012; adapted from Bajgar, Ciarrochi, Lane, & Deane, 2005; Cunningham, Kliewer, & Garner, 2009). Vignettes include being in a restaurant with one's mother while black smoke comes out of the kitchen, forgetting to bring one's lunch to school and getting caught taking someone else's, and being tripped in an athletic competition which was won by one's friend. Children reported what they and the other person would feel in the situation, and, if they wanted to change their own feelings, what they could do. Interviewers prompted children until no new information was provided. Responses were video-recorded, transcribed, and coded for complexity of understanding by a mixed-ethnicity team of coders.

Specifically, coders rated on 6- and 5-point Likert scales ($kappas > .90$) the children's ability to identify and differentiate emotions in themselves and others (*Differentiation Knowledge*; 0 = no emotion to 5 = four or more emotion words across four or more emotion families, e.g., 'I'd feel sad, regretful a little worried and uh, probably a little shocked I did it'), and to identify a variety of strategies that might be used to change or control emotions (*Change Knowledge*; 0 = no strategy or magical thinking, e.g., 'I would fly away like a bird' to 4 = four or more strategies which also cross strategy domains (Gross, 2007), e.g., situational modification, 'I would sign up for another race'; attentional deployment, 'I would think about my friend's victory'; cognitive reappraisal, 'I would remember that I had fun running'; and response modulation, 'I would try to walk like my foot did not hurt'). Differentiation knowledge and change knowledge were independently rated for each vignette; ratings were then averaged across vignettes.

Children's Socioemotional Competence—Mothers completed two questionnaires measuring children's social and emotional skills and problems. See Table 2 for descriptive statistics.

The Social Skills Rating System (parent version; Gresham & Elliot, 1990) was used to assess children's social skills and problems. Mothers reported on four domains of social skills and three domains of social problems, using 3-point Likert scales (0 = never, 1 = sometimes, 2 = very often). The social skill domains are: *Cooperation* (10 items; 'How often child volunteers to help family members with tasks'; $\alpha = .77$), *Assertion* (10 items; 'How often child joins group activities without being told to'; $\alpha = .75$), *Self-control* (11 items; 'How often child responds appropriately when hit or pushed by other children'; $\alpha = .84$), and *Responsibility* (10 items; 'How often child appropriately questions household rules that may be unfair'; $\alpha = .64$). The social problem domains are: *Internalizing* (six items; 'How often child appears lonely'; $\alpha = .70$), *Externalizing* (six items; 'How often child threatens or bullies others'; $\alpha = .80$), and *Hyperactivity* (six items; 'How often child fidgets or moves excessively'; $\alpha = .79$). Responses were averaged for each domain. The social skills rating system has demonstrated an extensive web of construct validity (e.g., Burchinal, Roberts, Zeisel, & Rowley, 2008; Gresham & Elliott).

The Emotion Regulation Checklist (Shields & Cicchetti, 1997) was used to assess children's emotional skills and problems. Using 4-point Likert scales from 1 = Never to 4 = Almost Always, mothers reported on children's *Emotion Regulation* (8 items; 'Responds positively to neutral or friendly overtures by peers'; $\alpha = .68$), and *Emotional Lability* (15 items; 'Exhibits wide mood swings', $\alpha = .86$). Responses were averaged within each domain to create two composite scores corresponding to socioemotional skill (Regulation) and problems (Lability). The emotion regulation checklist has demonstrated strong convergence with other social competence measures (Kim & Cicchetti, 2010; Shields & Cicchetti).

Procedure

Maternal consent and child assent were obtained for each family. Mothers were mailed the socioemotional competence questionnaires and completed them before coming to the lab. At the lab visit, children completed the TEC with a research assistant, participated in a dyadic task with their mothers (not relevant to this study) and completed the CARE and ICE tasks. Following a snack, children participated in the contextualized knowledge interview and then joined their mothers for the conflict discussion and subsequent interpersonal recognition task.

Results

All variables demonstrated univariate and bivariate normality. Bivariate correlations, shown in Table 3, indicated that the emotion understanding measures reflected relatively distinct skill sets, as not all indices were significantly correlated, and that similar skills demonstrated greater coherence (e.g., prototypical emotion recognition of child and adult expressions) than theoretically divergent skills (e.g., emotion differentiation knowledge and interpersonal emotion recognition).

Emotion Understanding Structural Analyses

We tested four factor structures using latent variable modeling (see Figure 1). All models were estimated using AMOS 22.0. Latent variable variances were constrained so that path estimates for all indicators could be estimated. Missing data occurred an average of 4.62 percent across measures, and resulted from random data collection issues (i.e., audiovisual equipment failure, particularly for the interpersonal recognition task; research assistant errors and early changes to the procedure for the interview task) and non-random problems observed during the laboratory visit (i.e., children's inattention or non-response during emotion understanding tasks, particularly for the interpersonal recognition and interview tasks). Missing data were addressed by maximum likelihood imputation. Model fit was determined using chi-square statistic (χ^2), Comparative Fit Index (CFI), Tucker–Lewin Index (TLI), Root Mean Square Error of Approximation (RMSEA), and 90 percent confidence interval around RMSEA (90 percent CI). A non-significant χ^2 value, CFI .95, TLI .90, and RMSEA .08 indicate good model fit to the data (Hu & Bentler, 1999; Schreiber, Nora, Stage, Barlow, & King, 2006). Models were nested by constraining covariances among factors, and thus statistically compared using χ^2 difference test. Model fit and comparison statistics are presented in Table 4.

We first tested whether a two-factor structure reported with young children (Barbosa-Leiker et al., 2014; Bassett et al., 2012; Sette et al., 2015) fit the data. This structure failed to demonstrate adequate model fit, as did the one-factor structure. Instead, the three-factor model demonstrated good fit to the data, as did the four-factor model structure. Next, we compared the least constrained four-factor model against the more constrained but parsimonious one-, two-, and three-factor models by examining the χ^2 difference between the unconstrained (four-factor) model and alternative models. The comparison between the four-factor model and the one- and two-factor models revealed significant differences in χ^2 , indicating that the one- and two-factor models had significantly worse fit to the data than the four-factor model. Similarly, comparisons between the three-factor model and the two- and one-factor models revealed that the more constrained models (two- and one-factor models) demonstrated significantly worse fit to the data than the three-factor model. The comparison between the one- and two-factor models indicated that the one-factor model had significantly worse fit to the data. The comparison between the four-factor model and the three-factor model revealed no significant difference in χ^2 ; thus, we interpreted the more parsimonious three-factor model as the best fitting model (Byrne, 2010). Altogether, these results indicated that the three-factor model structure was the more parsimonious best-fitting model to explain third-grade children's emotion understanding as measured by our variety of tasks.

Table 5 presents the standardized regression coefficients for each manifest variable in the one-, two-, three-, and four-factor models. In the three-factor model, the covariance between the Prototypical Emotion Recognition and Advanced Emotion Understanding latent factors was moderate, $r = .40$, $p = .025$. However, the covariance between Prototypical Emotion Recognition and Prototypical Emotion Knowledge latent factors was not significant, $r = .21$, $p = .106$, and the covariance between Prototypical Emotion Knowledge and Advanced Emotion Understanding latent factors was also not significant, $r = .24$, $p = .153$. These results suggested that third-grade children's emotion understanding was well represented by three distinct factors.

Exploratory Associations with Maternal Reports of Socioemotional Competence

Bivariate correlations between the socioemotional competence scales were first conducted to determine the existence of potential latent variables as assessed by mothers' responses on the Social Skills Rating Scale and Emotion Regulation Checklist. Overall, scales relating to socioemotional skills were moderately associated ($M = .52$, $ps < .01$), as were scales relating to socioemotional problems ($M = .57$, $ps < .001$). Inter-correlations between skills and problems were lower ($M = -.35$, $ps < .05$). Thus, we continued with analyses modeling socioemotional skills and problems as two independent latent factors.

Structural equation modeling was used to explore the unique predictive value of children's emotion understanding factors on children's socioemotional skills and problems (see Figure 2). We examined the structural path coefficients from each of the three emotion understanding factors to the socioemotional skills and problems latent variables using AMOS 22.0. Models were run separately for skills and problems. Missing data ($M = 4.62$ percent) were again estimated using maximum likelihood imputation.

Both models fit the data adequately (Byrne, 2010), and all manifest variables loaded significantly onto respective latent variables ($ps < .01$). As shown in Figure 2, children's Prototypical Emotion Knowledge was both a significant positive predictor of socioemotional skills and significant negative predictor of socioemotional problems. However, children's Prototypical Emotion Recognition was unrelated to children's socioemotional skills ($\beta = .01, p = .942$) and problems ($\beta = -.23, p = .159$), as was children's Advanced Emotion Understanding unrelated to children's socioemotional skills ($\beta = .02, p = .915$) and problems ($\beta = .21, p = .234$). These patterns persisted even when modeling child age, total family income, and maternal education as covariates, indicating that third-grade children's prototypical emotion knowledge skills were uniquely associated with children's socioemotional competence, over and above the effects of children's prototypical emotion recognition, advanced emotion understanding skills, child age, and family socioeconomic factors.

Discussion

This study was the first empirical test of the structure of emotion understanding skills in middle childhood, and included a greater diversity of measures, assessing a wider variety of skills, than found previously in the literature. Results showed that the two-factor structure of emotion understanding identified in early childhood (Barbosa-Leiker et al., 2014; Bassett et al., 2012; Sette et al., 2015) was insufficient for third-grade children. Instead, the three- and four-factor structures of emotion understanding provided significantly better model fit for the data compared to alternative two- and one-factor structures, supporting theoretical postulations regarding seven-to-nine-year-old children's increasingly complex and differentiated understanding of emotions (e.g., Harris, 1989; Pons et al., 2004; Saarni, 2000). As there were no significant differences between the three- and four-factor models, we interpreted the more parsimonious three-factor model as the best fitting model for the data (Byrne, 2010).

Multiple Dimensions of Emotion Understanding in Third Grade

Although we observed coherence among similar emotion understanding skills that were measured using similar methods (e.g., labeling of prototypical emotional expressions as posed by children and adults), little coherence was observed among the more differentiated, contextualized skills (e.g., interpersonal emotion recognition and emotion differentiation knowledge). These results suggest that emotion understanding skills may involve a more complex organization of skills than previously considered, and certainly highlight the need for future research to include a greater variety of emotion understanding measures that collectively assess the broad construct of emotion understanding, particularly with children between seven and nine years of age.

Three Factors of Emotion Understanding—We found support for three distinct factors of emotion understanding in third-grade children. The first factor, Prototypical Emotion Recognition, included children's skills in recognizing child and adult prototypical expressions of emotions as displayed by the face and body. Such skills are thought to develop during early childhood (Denham, 1986; Harris, 1989; Pons et al., 2004), and recent

theoretical frameworks distinguish the recognition of prototypical emotional expressions from the more advanced skill of recognizing non-prototypical emotional expressions (Castro, Cheng, et al., 2015).

The second factor, Prototypical Emotion Knowledge, consisted of knowledge regarding others' mental states, including the ability to differentiate emotional states across and within situations and to use beliefs and desires to attribute emotions during prototypical emotion-eliciting situations; and knowledge regarding the management of emotions, including the ability to differentiate and select appropriate strategies for a given emotion-eliciting situation. Notably, this factor included skills sampled from two methods using two very different techniques to assess children's prototypical and contextualized emotion knowledge, further supporting the structural coherence underlying these types of knowledge. These skills typically emerge during early childhood, and become increasingly more sophisticated as children move through elementary school (Harris, 1989; Pons et al., 2004; Saarni, 2000). The distinction of these skills from emotion recognition in our sample of third-grade children replicated findings with younger children (Barbosa-Leiker et al., 2014; Bassett et al., 2012; Sette et al., 2015). That the covariance between factors in our sample was reduced also suggests increased differentiation of these skills with age.

The third factor, Advanced Emotion Understanding, arguably consisted of the most complex and integrated skills assessed in the present study. This factor included children's skills in recognizing their parents' emotions during an ongoing interpersonal discussion of conflict and the identification of mixed and moral emotions in emotional situations. Both skill sets are highly relevant for third-grade children (Castro, Halberstadt, et al., 2015; Halberstadt et al., 2013; Harris, 1989; Pons et al., 2004). These skills may also be the most difficult to measure, as they likely consist of a complex amalgamation of recognition and knowledge; in order to accurately recognize expressions in a familiar other (such as a parent, peer, or teacher) one relies on perceptual skills (emotion recognition) *and* accumulated knowledge regarding how and why this known person typically experiences emotions in a given situation (emotion knowledge). Thus, these skills are not just general knowledge forms but knowledge embedded in and tailored to unique relationships. For example, to understand that one's behaviors may disappoint another person (such as in the case of stealing a cookie from the cookie jar prior to eating dinner, despite parental rules), a child must predict how the other person will feel and react by differentiating his/her emotions from the emotions of the other person as well as using knowledge about the situation to attribute emotion. Both of these processes are interpersonally relevant; for example, a child must care about the parent's appraisals in order to correctly differentiate and attribute emotion in the cookie jar context.

Moving Beyond Two Factors—Our study demonstrated that skills in recognizing prototypical emotional expressions and more sophisticated understanding skills, including prototypical emotion knowledge, were differentiated at least in third grade, although we cannot yet ascertain at what point during the transition from early to middle childhood this differentiation occurs. To disentangle effects relating to emergence and differentiation of skills, longitudinal work is needed.

Given that the four-factor structure did not differ significantly from the three-factor structure, it is possible that emotion understanding will continue to differentiate beyond three factors as children become older. For example, emotion regulation knowledge may differentiate into a fourth factor during adolescence. Knowledge regarding the management of emotions, including appropriate strategies for a given situation and relative benefits and costs for engaging in different strategies, may allow adolescents to successfully transition from a period marked by emotional ‘storm and stress’ (Arnett, 1999) to a period of emotional stability. We are especially excited by this possibility, and believe this is a promising area for social development research.

Prototypical Emotion Knowledge as a Unique Predictor of Socioemotional Competence

Our exploratory analyses relating the three emotion understanding factors with maternal reports of children’s socioemotional skills and problems suggested that prototypical knowledge may be more relevant for children’s socioemotional skills and problems than either prototypical emotion recognition or advanced understanding skills. This may reflect a match between prototypical emotion knowledge and the socioemotional demands placed on third-grade children. As children get older, they may place more emphasis on successfully navigating the many different types of social interactions they encounter (Klimes-Dougan & Zeman, 2007). Being able to differentiate various emotions another child feels, understand how beliefs and desires contribute to emotions, and identify various regulatory strategies may very well be integral to successfully interacting with others at this age. Parents and other family members may also expect greater independence and levels of competence in their children, and children with the above-mentioned forms of emotion knowledge may succeed in maintaining cooperative and harmonious relationships in which they also achieve having their own needs met.

It is unclear why prototypical emotion recognition and advanced emotion understanding failed to predict third-grade children’s socioemotional competence. One possibility is that these skills contribute shared predictive variance rather than unique effects. Indeed, our study is one of the first to consider the unique contributions of different emotion understanding skills within a single statistical model. Future research should aim to replicate this model to disentangle collective and unique effects. A second possibility concerns the developmental-relevance of different skills. Third-grade children may rely less on prototypical emotion recognition skills, as such expressions are increasingly less frequent than non-prototypical expressions across childhood (Camras, Castro, Halberstadt, & Shuster, in press). Moreover, advanced emotion understanding skills may confer some disadvantages at this age; knowing too much about what others are feeling or being over-sensitive to emotional cues may interfere with children’s abilities to behave appropriately and establish harmonious relationships (Hoglund et al., 2008; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979). More work is needed to explore the ages and contexts in which the advantages and disadvantages of advanced emotion understanding are balanced.

Limitations and Strengths

As with any study, we note some limitations. The interpersonal recognition measure, although similar to methods used widely in the marital literature (e.g., Gottman &

Porterfield, 1981), has been used only recently with children and their families (e.g., Castro, Halberstadt, et al., 2015; Dunsmore et al., 2009). The dynamic emotion recognition measure with adults' increasingly clear emotions is similar to methods used with children (e.g., Pollak, Messner, Kistler, & Cohn, 2009), but it, along with the contextualized emotion knowledge measure, will require further validation. The new measures are also a notable strength, providing depth and novelty within a field that is saturated by methodological commonalities.

Our study included mothers' reports of children's competencies. Additional perspectives, including teacher and peer reports, could add important insights regarding the predictive utility associated with different emotion understanding factors. This may be particularly important when considering age-related changes in emotion understanding alongside changing classroom demands. However, mothers (and care-givers more broadly) may assess children's socioemotional competencies across a variety of contexts; that is, mothers see their children at home, at school, and in other peer-related settings. Thus, mothers' ratings likely represent a perspective that intersects children's socioemotional competencies in a range of situations.

Another limitation concerns issues of reliability, as some emotion understanding measures demonstrated low reliability (i.e., CARE; prototypical emotion recognition), whereas other methodologies precluded the calculation of reliability estimates altogether (i.e., TEC; interpersonal emotion recognition). It is important to note, however, that the field of emotion understanding has long dealt with issues of reliability, perhaps because emotions are abstract entities and thus the measures only approximate this abstractness. In fact, it has been argued that hundreds of items must be included within a given measure to achieve adequate reliability in this domain (Hall & Bernieri, 2001). To do so would not be reasonable for research with children, whose cognitive and social capacities preclude such lengthy inventories. It is also important to note that three of the five emotion understanding measures used in the present study have demonstrated good construct validity in predicting other social and emotional processes (e.g., Castro, Halberstadt, et al. 2015; Parker et al., 2013; von Salisch et al., 2013). We note that issues of reliability should always be discussed alongside assessments of validity; only then may a balanced picture regarding the utility of a given measure be observed.

In addition, estimates from latent variable and structural equation modeling are sample-specific, and, thus, limit generalizability to other samples using other measures of emotion understanding. Given that our study included only third-grade children, it is unclear whether our results reflected associations that are unique to third-graders or generalizable to middle childhood. To the extent that age is a proxy for underlying process (Cairns, Elder, & Costello, 1996), it is likely that our results generalize to other ages within the same developmental period of middle childhood, but this possibility should be confirmed in future research.

Our study also demonstrates distinct strengths. First, our study comprehensively assessed emotion understanding, including both prototypical and innovative, contextualized measures of emotion understanding. Collectively these measures provided information regarding

children's abilities to identify and label prototypical facial and body expressions of emotion in children and adults; identify prototypical emotional causes, consequences, and regulation strategies; identify and label emotions in familiar others during a real-life interaction; and identify a variety of emotions and regulation strategies that may be experienced by the self (or a known other) in meaningful interpersonal contexts. The latter two abilities are particularly important contributions to the field, as these likely mirror the ways in which emotions are understood by elementary-school-age children in 'real life', thus answering recent calls for greater consideration of context and interpersonal dynamics in the study of emotion (Boiger & Mesquita, 2012; Halberstadt et al., 2013).

Second, by extending research with younger children to an older population, we found that children's skills in third grade may not be simply 'more of the same, just better', but may reflect developmentally appropriate differentiation and integration of various skills which are utilized more efficiently and in response to changing interpersonal demands. These results further imply that the structure of emotion understanding is dynamic; skills may become more differentiated with age, contributing to potential lifespan changes in the structure of this construct. Thus, consideration of the emotion understanding structure at later points in the lifespan would be a fruitful avenue for future research.

Third, as noted above, our study is the first to examine the unique predictive value of different facets of emotion understanding on children's socioemotional competencies in middle childhood. By doing so, we found that children's prototypical emotion knowledge had specific advantages for their social and emotional competencies in third grade. We encourage future studies to further explore how various facets of emotion understanding impact children's and adolescents' affective social competence.

In sum, emotion understanding, at least in third grade, appears to be a multidimensional construct. Our results support theories that propose multiple, developmentally oriented components of understanding (e.g., Harris, 1989; Pons et al., 2004). Moreover, our results extend empirical considerations to include the degree of coherence among different skill sets as well as potential discontinuity in development of emotion understanding skills. We hope that these findings will facilitate greater exploration of the latent construct of emotion understanding across the lifespan.

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Figure 1.
Tested Factor Structures of Children's Emotion Understanding Latent variable modeling of children's emotion understanding as (a) one, (b) two, (c), three, and (d) four factors.

Figure 2.

Children's Emotion Understanding Factors as Predictors of Children's Socioemotional Competence Structural equation models of children's emotion understanding predicting mothers' reports of children's socioemotional skills ($\chi^2 = 66.58$, $p = .232$, CFI = .98, TLI = .97, RMSEA = .03, 90 percent CI: .00–.05), and problems ($\chi^2 = 56.97$, $p = .176$, CFI = .98, TLI = .96, RMSEA = .03, 90 percent CI: .00–.06). Skills and problems were tested separately, but illustrated together to reduce redundancies. To simplify presentation, indicators for latent variables and residuals are omitted here, as are covariances between emotion understanding factors. Dashed lines indicate non-significant paths. Solid lines indicate significant paths, and include the standardized regression coefficient. Findings remained the same when controlling for the effects of child age, family income, and maternal education on socioemotional skills and problems.

* $p < .05$, ** $p < .01$.

Table 1

Descriptive Statistics for Children's Emotion Understanding Indices

Index	N	Range	<i>M</i>	<i>SD</i>
Child recognition (CARE)	200	.42–.90	.69	.09
Adult recognition (ICE)	197	.33–.76	.58	.07
Interpersonal recognition (Dyadic Interaction)	184	.00–.70	.27	.14
Mental knowledge (TEC)	201	.00–2.00	1.64	.53
Regulation knowledge (TEC)	201	.00–2.00	1.62	.54
Complex knowledge (TEC)	201	.00–3.00	1.99	.88
Differentiation knowledge (Interview)	170	.00–4.17	1.33	.79
Change knowledge (Interview)	185	.00–2.50	1.16	.53

Note: Measures for each index noted in parentheses. CARE = The Child and Adolescent Recognition of Emotion Task; ICE = The Increasingly Clear Emotions Task; TEC = The Test of Emotion Comprehension.

Table 2

Descriptive Statistics for Children's Socioemotional Competence Scales

Measure	N	Range	<i>M</i>	<i>SD</i>
Social Skills Rating System (SSRS)				
Cooperation ^a	191	.30–2.00	1.24	.32
Assertion ^a	191	.60–2.00	1.59	.30
Self-control ^a	191	.27–2.00	1.35	.34
Responsibility ^a	191	.50–2.00	1.36	.29
Internalizing ^b	190	.00–1.67	.52	.36
Externalizing ^b	190	.00–2.00	.54	.40
Hyperactivity ^b	190	.00–2.00	.63	.44
Emotion Regulation Checklist (ERC)				
Emotion Regulation ^a	193	2.13–4.00	3.33	.39
Emotional Lability ^b	193	1.00–3.20	1.67	.39

^aSocioemotional skill.^bSocioemotional problem.

Table 3

Inter-correlations between Children's Emotion Understanding Indices

Measure	Prototypical emotion recognition			Interpersonal emotion recognition		Prototypical emotion knowledge		Contextualized emotion knowledge	
	Child (CARE)	Adult (ICE)	Interper (Interaction)	Mental (TEC)	Regulation (TEC)	Complex (TEC)	Differ (Interview)	Change (Interview)	
Child recognition (CARE)	—	.30***	.09	.10	.02	.05	.05	.09	
Adult recognition (ICE)		—	.15*	.25***	.10	.12 [†]	.02	.07	
Interpersonal recognition (Dyadic interaction)			—	.08	.08	.19*	-.06	.05	
Mental knowledge (TEC)				—	.12 [†]	.05	.10	.16*	
Regulation knowledge (TEC)					—	.07	.01	.19*	
Complex knowledge (TEC)						—	.07	.10	
Differentiation knowledge (Interview)							—	.37***	
Change knowledge (Interview)								—	

Note: CARE = The Child and Adolescent Recognition of Emotion Task; ICE = The Increasingly Clear Emotions Task; TEC = The Test of Emotion Comprehension; Interper = interpersonal; Differ = differentiation.

[†] $p < .10$,

* $p < .05$,

*** $p < .001$.

Table 4
Comparing Model Fit: Different Factor Structures for Children’s Emotion Understanding

Model	Fit indices				Model comparison			
	df	χ^2	CFI	TLI	RMSEA	90 percent CI	χ^2	df Comparison
1-factor	20	38.36 [†]	.64	.35	.07	.03–.10	10.08 ^{**}	1 2 vs. 1
2-factor	19	28.28 [†]	.82	.66	.05	.00–.09	9.80 ^{**}	2 3 vs. 2
3-factor	17	18.48	.97	.94	.02	.00–.07	19.88 ^{***}	3 3 vs. 1
4-factor	14	16.29	.96	.88	.03	.00–.08	2.19 [*]	3 4 vs. 3
							11.99 [*]	5 4 vs. 2
							22.08 ^{**}	6 4 vs. 1

[†] $p < .10$,

^{*} $p < .05$,

^{**} $p < .01$,

^{***} $p < .001$.

Standardized Factors Loadings for the Emotion Understanding Tasks in the 1-, 2-, 3-, and 4-Factor Models

Table 5

Model	Emotion understanding indicators						
	CARE	ICE	Mental	Differ	Regulation	Change	Interper
1-factor	.36***	.52***	.43***	.20 [†]	.24*	.33***	.27*
2-factor	.45*** ^a	.65*** ^a	.32*** ^b	.45*** ^b	.25*** ^b	.67*** ^b	.14 ^b
3-factor	.43***^a	.68***^a	.27***^b	.44***^b	.23***^b	.77***^b	.47***^c
4-factor	.42*** ^a	.70*** ^a	.30*** ^b	.37*** ^b	.22*** ^c	.83*** ^c	.48*** ^d

Note: Indices grouped within factors carry the same superscripts within rows. Best fitting model for the data noted in bold. CARE = The Child and Adolescent Recognition of Emotion Task; ICE = The Increasingly Clear Emotions Task; Interper = interpersonal; Differ = differentiation.

[†] $p < .10$,
* $p < .05$,
** $p < .01$,
*** $p < .001$.