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# Emotion Knowledge, Social Competence, and Behavior Problems in Childhood and Adolescence: A Meta-Analytic Review

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## Abstract

The present meta-analytic review examined the magnitude of the relation between discrete emotion knowledge and three of its most commonly studied correlates in childhood and adolescence: social competence, internalizing problems, and externalizing problems. Emotion knowledge demonstrated small to medium-sized relations with each correlate. Moderators of effect size were also examined and included multiple sample and methodological characteristics. Using random effects models, significant moderators of effect size for relations between emotion knowledge and externalizing problems included sample recruitment, sample age, and the source of externalizing problems ratings. Moderators of effect size were not found for emotion knowledge and social competence, and the effect sizes across samples for emotion knowledge and internalizing problems were homogeneous. Results highlight the relatively consistent yet modest relations between emotion knowledge and its correlates. Implications for applied research and new directions for research on emotion knowledge using innovative methods are discussed.

### Keywords

emotion knowledge; social competence; behavior problems; meta-analysis

Not long after theorists began cataloguing emotions, the development of the ability to understand emotions became a topic of interest for empirical research. The term *emotion knowledge* is often used to describe the capacity to understand emotion in facial expressions, behavioral cues, and social contexts. Basic features of emotion knowledge develop early in life and increase throughout childhood, bringing about later advances in emotion understanding and the ability to manage and adaptively utilize emotions (Izard, 1971). The term emotion knowledge and similar constructs (i.e. emotion understanding, nonverbal processing) can be used to describe a vast range of conceptions of emotion, assessment modalities, and levels of complexity. For example, relatively advanced emotion knowledge skills include display rule knowledge and the ability to understand mixed emotions. In addition, understanding dominant versus submissive affect (e.g., Russell, Stokes, Jones, Czogalik, & Rohleder, 1993) could be considered emotion knowledge even though the focus is not on discrete emotions.

The present meta-analytic review focused exclusively on the largest segment of emotion knowledge research: studies of *discrete emotion knowledge*. For purposes of the review, discrete emotion knowledge is defined as the ability to understand relatively unambiguous cues

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of discrete emotions expressed in traditional channels (facial expressions, vocalizations, gestures, social contexts; Izard, 2001). Multiple researchers have created reliable and valid measures that assess skills meeting our criterion for discrete emotion knowledge (e.g., Denham, 1986; Nowicki & Duke, 1994), and these measures have been utilized in numerous investigations of the socioemotional development of children and adolescents. Furthermore, our description of discrete emotion knowledge fits with Izard's (2001) discussion of emotion perception and labeling as the most basic facet of emotion knowledge. Izard asserted that emotion perception and labeling is a core aspect of the adaptive utilization of emotion and promotes the development of more complex aspects of emotion knowledge such as identifying causes for emotions in the self and others, understanding emotion dissimulation, or knowledge of ambivalent emotions. For purposes of the present review, discrete emotion knowledge is also limited to understanding emotion cues in others. Emotion understanding of the self is a separate, albeit important, aspect of the broader emotion knowledge construct (see Izard, 2001).

Elements of discrete emotion knowledge are contained in descriptions of a wide range of problems, competencies, and processes across childhood, adolescence, and adulthood. For example, emotion knowledge is a key facet of constructs such as emotional intelligence and emotional competence (Mayer & Salovey, 1997; Saarni, 1999). Poor emotion understanding is also among the deficits that are often associated with serious psychiatric disorders including autism and schizophrenia (e.g., Baron-Cohen, 2002; Brüne, 2005). Furthermore, emotion knowledge has numerous correlates, including associations between poor emotion knowledge and problems as diverse as learning and medical disabilities (Boni, Brown, Davis, Hsu, & Hopkins, 2001; Celani, Battacchi, & Arcidiancono, 1999). Training in emotion recognition skills is a central objective of numerous socio-emotional prevention programs for young children (e.g., Greenberg, Kusche, Cook, & Quamma, 1995; Izard et al., 2008), and similar training is also included in psychotherapeutic interventions for children and adolescents with psychiatric disorders (e.g., Kendall, Ashcenbrand, & Hudson, 2003).

With the widespread presence of emotion knowledge in the psychological literature, some might consider the validation and study of discrete emotion knowledge to have little room for further innovation. However, there is much to learn about discrete emotion knowledge and its correlates across childhood and adolescence. It is possible that studies showing the strongest correlations between discrete emotion knowledge and related constructs have received the most attention. When quantitatively examining the entire literature, relations that initially appeared robust based on a few studies may be attenuated. The present meta-analytic review of the literature on the relations between discrete emotion knowledge and its correlates was designed to uncover important moderators of effect size and guide future empirical research on emotion knowledge. A quantitative review may also have implications for the inclusion of emotion knowledge concepts within prevention and treatment research.

## Theoretical Perspectives and Research Review of Emotion Knowledge Correlates

Discrete emotion knowledge has been examined in relation to a wide array of behavioral, social, and cognitive outcomes, making inclusion of all previously studied correlates beyond the scope of the present meta-analysis. Therefore, we focused on emotion knowledge's most frequently studied correlates: social competence, internalizing problems, and externalizing problems. Numerous theoretical perspectives have been offered to explain the links between emotion knowledge and each of these correlates. Below, we provide an overview of key theoretical perspectives that address the relation between emotion knowledge and the correlates. In addition, we use examples from the published empirical literature on discrete emotion

knowledge to illustrate these theoretical perspectives and to develop hypotheses for the meta-analytic review.

## Social Competence

Developmental conceptualizations of socially competent behavior are generally grounded in a progression of skills and attainments (Howes, 1987; Rose-Krasnor, 1997; Waters & Sroufe, 1983). Theoretical discussions of emotion knowledge suggest that understanding emotions is an important predictor of the development of social competence (Denham, 1998). For example, Halberstadt, Denham, and Dunsmore (2001) asserted that receiving affective messages is one of three key components of affective social competence (ASC). Receiving emotional messages involves an awareness that a message was sent and the ability to identify the meaning of the message. Children who are better able to understand emotional cues in the social environment are purported to develop superior social skills and form positive interpersonal relationships. For example, a child who understands that a peer is feeling sad about being left out of the game will be in a better position to offer an empathic response to the child and attempt to include him. The child must also understand the message within its context and be able to manage multiple messages and filter the most important messages from less important ones (Halberstadt et al., 2001). Although the ASC model includes a broader array of skills than those encompassed in the assessment of discrete emotion knowledge, it highlights how basic understanding of emotion may translate into social competence.

In support of the ASC model, over three decades of research has demonstrated links between discrete emotion knowledge and indicators of social status, play skills, and social adjustment in preschool children (Goldman, Corsini, & DeUrioste, 1980; Krantz, 1982; Peery, 1979; Rubin & Maioni, 1975; Zuckerman & Przewuzman, 1979). Some early research on emotion knowledge and social competence found less consistent relations in samples of elementary school children (Gottman, Gonso, & Rasmussen, 1975; Vosk et al., 1983). In the decades following this early work, more research on discrete emotion knowledge and social competence has included school-age children and young adolescents (Custrini & Feldman, 1989; Mostow, Izard, Fine, & Trentacosta, 2002), with an increased focus on longitudinal studies (e.g., Denham et al., 2003) and low income and/or minority populations (e.g., Izard et al., 2001; Smith, 2001). Overall, relatively consistent support exists for relations between emotion knowledge and social competence in a wide range of samples and across time.

Although there is relatively robust support for relations between discrete emotion knowledge and social competence across childhood and adolescence, we examined potential age-related differences in the magnitude of this relation. Because knowledge of the basic discrete emotions such as happiness, sadness, anger, and fear develops early in childhood (Denham, 1998), we hypothesized that discrete emotion knowledge would be most robustly related to social competence during the preschool years. During later childhood and adolescence, more complex forms of emotion understanding, such as knowledge of display rules and mixed emotions, may be more salient for competence in interpersonal relationships.

## Internalizing Problems

There is not a single comprehensive model that completely accounts for relations between discrete emotion knowledge and internalizing problems in childhood and adolescence. However, a neuropsychological account of the relations between depression and children's emotion knowledge deficits focused on hemispheric lateralization (Lenti, Giacobbe, & Pegna, 2000). In this model, emotion knowledge deficits were theorized to co-vary with depression due to shared underlying dysfunction in the right hemisphere of the cerebral cortex. In discussing social anxiety, McClure and Nowicki (2001) suggested that the social skills deficits apparent in many socially anxious children (e.g., gaze aversion) may make it difficult to gather

emotional information from the social environment. Thus, children with social anxiety were presumed to develop deficits in their emotion understanding as a result of deficits in social interaction.

The theoretical perspectives offered by Lenti and colleagues (2000) and McClure and Nowicki (2001) are useful, particularly when examining emotion knowledge deficits in relation to specific internalizing problems. However, these accounts are relatively narrow in scope and do not provide a developmental description of how emotion understanding deficits predict the emergence and maintenance of internalizing problems. Extrapolating from the ASC model of Halberstadt and colleagues (2001) and related empirical research (e.g., Mostow et al., 2002), poor emotion knowledge in social situations may trigger inappropriate responses and, over time, the formation of maladaptive emotion-cognition relations. For example, a child who interprets a peer's display of sadness as anger may withdraw from the interaction, thus increasing her social isolation. If this child continues to make similar errors, she will associate negative emotion displays with her reticence. Over time, children with emotion knowledge deficits will experience increased social difficulties and may develop enduring patterns of negative emotions (Fine, Izard, Mostow, Trentacosta, & Ackerman, 2003). Because negative affect underlies numerous internalizing problems, a broad perspective on emotion knowledge and internalizing problems can be applied to risk for mood or anxiety disorders later in childhood or adolescence. Furthermore, this perspective complements McClure and Nowicki's theoretical account. Children with early social deficits, whether due to social anxiety, general social withdrawal, or lack of exposure to social situations, may have difficulty correctly identifying and understanding emotional cues. Over time, these emotion understanding deficits will exacerbate social deficits, increase the frequency and intensity of negative affect, and eventually lead to internalizing psychopathology.

Previous research examining discrete emotion knowledge and internalizing problems has included a mix of community and clinical samples. In early work on this topic, children diagnosed with anxiety or depressive disorders demonstrated poorer emotion understanding than normal controls (Walker, 1981). More recent studies with clinical samples provided inconsistent findings: Socially phobic children demonstrated poorer emotion understanding than controls (Simonian et al., 2001); depressed or dysthymic children demonstrated knowledge deficits for some emotions but not others (Lenti et al., 2000); and no relation existed between internalizing problems and emotion understanding in a sample of children at a residential treatment facility (Lancelot & Nowicki, 1997). In addition, children with anxiety disorders were *more* accurate in their identification of sadness in voices relative to clinical controls (Manassis & Young, 2000), although no differences were found for overall emotion knowledge. In community samples, social anxiety was associated with poorer understanding of vocal emotion cues (McClure & Nowicki, 2001), and emotion knowledge assessed in early elementary school predicted internalizing problems at age 11 (Fine et al., 2003; Schultz, Izard, Ackerman, & Youngstrom, 2001). Notably, most research has focused on internalizing problems in school-age children or adolescents.

For the meta-analysis, we hypothesized that lower levels of discrete emotion knowledge would be associated with more internalizing problems. However, compared to the relations between emotion knowledge and social competence, the relations with internalizing problems appear to be somewhat less direct. Two of the theoretical discussions described above involve social mediators (Fine et al., 2003; McClure & Nowicki, 2001), and the presence of social mediators may attenuate the magnitude of direct correlations with internalizing problems. As a result, we predicted that emotion knowledge would show relatively weak direct relations with internalizing problems.

### Externalizing Problems

Numerous theoretical perspectives support emotion knowledge as a correlate of externalizing problems. For example, Blair (1995) suggests deficient empathy in psychopaths because emergent psychopaths fail to recognize "distress" cues in fear and sadness expressions and do not develop the capacity to inhibit violence. Crick and Dodge's (1994) social information processing perspective is another theoretical perspective that has been applied to externalizing problems. The model includes multiple steps and feedback loops leading to aggression and other behavior problems. A full explanation of the SIP model is beyond the scope of the present review, but we highlight a few important insights based on this model:

First, Lemerise and Arsenio (2000) suggest that emotion processes may affect numerous SIP steps. Specifically, poor encoding of a peer's emotion cues may affect the child's intent attributions, possibly leading to hostile attributional biases and reactive aggression. From a developmental perspective, children who misread emotion cues may develop cognitive errors in intent attributions and response choices that cohere over time. Of greatest relevance to externalizing problems, a child who frequently infers anger in ambiguous contexts is more likely to attribute hostile intent and chose aggressive solutions to the problem (Schultz, Izard, & Ackerman, 2000). Secondly, poor emotion knowledge may predict the inability to manage and utilize emotions adaptively for prosocial outcomes. Thus, difficulty with emotion understanding, particularly when coupled with high levels of negative emotionality, may lead to dysregulated anger and frustration and acts of aggression in social situations.

A recent overview suggested that emotion knowledge is more consistently related to externalizing behavior in clinic samples than in community samples (Izard et al., 2001). While some community research has failed to find relations between emotion knowledge and externalizing problems (e.g., Izard et al., 2001), other work demonstrated some support for their association in a community sample (e.g., Denham, Caverly, et al., 2002). Previous research with clinical samples also provides support for emotion knowledge deficits in children with conduct problems (Cadesky, Mota, & Schachar, 2000; Speltz, DeKlyen, Calderon, Greenberg, & Fisher, 1999). However, not all clinical studies demonstrated discrete emotion knowledge deficits in children with externalizing problems. For example, a group of boys with severe emotional disturbance did not show emotion knowledge deficits relative to a control group (Cooley & Treimer, 2002), and children with comorbid conduct problems and ADHD had emotion knowledge scores that did not significantly differ from a comparison group (Cadesky et al., 2000).

Based on the theoretical perspectives presented above and the reviewed research, we hypothesized a negative association between discrete emotion knowledge and externalizing problems. However, the presence of non-significant findings in the published literature suggest that the overall relations may be small in magnitude. A relatively small effect size may exist because an emotion attribution bias toward inferring anger may more closely relate to aggression and other externalizing problems than broader emotion knowledge accuracy. Previous research on the topic suggests that anger biases predict aggression, even while controlling for general emotion knowledge (Barth & Bastiani, 1997; Fine, Trentacosta, Izard, Mostow, & Campbell, 2004; Schultz et al., 2000).

## Other Factors to Examine

Across these three correlates of emotion knowledge, there are a number of additional sample and methodological characteristics to consider in a quantitative review of the literature. Many recent studies have investigated lower income and ethnic minority samples and findings suggest that relations are similar to those found in middle class and ethnic majority samples. However, statistical comparisons across sample demographics are limited. Emotion knowledge

may be more important for social and behavioral adjustment in minority and lower socioeconomic status groups because these groups do not have the same level of social support to buffer poor emotion understanding. Alternately, poverty and cofactors including family stress and neighborhood violence may attenuate relations between a child's individual abilities and her attempts to establish successful social relationships and avoid problem behaviors. Longitudinal studies are another relatively recent innovation in the emotion knowledge literature, and concurrent investigations may show larger effects because time often brings a host of confounding factors that can attenuate effects. However, the effect of emotion knowledge may be best measured longitudinally because theory suggests that early emotion knowledge crystallizes into appropriate social interactions and behaviors with time (Izard, 2002). Other methodological moderators that we considered included the type of discrete emotion knowledge measure and the source of the outcome measure. For example, the most established measures of discrete emotion knowledge may be more reliable and robust predictors of social and behavioral outcomes. Also, discrete emotion knowledge may be more consistently related to social outcomes rated by peers because discrete emotion knowledge is especially relevant to the emergence of social competence in the peer domain (Hubbard & Dearing, 2004). Understanding the role of potential moderators of effect size may have important implications for the timing and targets for interventions that include a discrete emotion knowledge component.

## Method

### Study Selection

The goal of the meta-analysis was to include as many published and unpublished studies as possible that examined discrete emotion knowledge in relation to social competence and behavior problems in children and adolescence. Thus, we relied on a comprehensive, multi-step search for empirical research that would augment the literature overview presented above. The selection of studies to include in the meta-analysis proceeded with the following steps:

1. A PsycInfo search was conducted by trained undergraduate research assistants in the summer of 2004. The search combined emotion knowledge keyword search terms (emotion knowledge, emotion recognition, emotion labeling, emotion understanding, emotion perception, affective perspective taking, affective knowledge, emotion identification, nonverbal processing, emotion attribution, display rule knowledge, nonverbal behavior, emotional intelligence, emotional interpretation) with social competence and behavior problems keyword search terms (social competence, social skills, social preference, prosocial behavior, peer relations, behavior problems, externalizing, internalizing, aggression, depression, anxiety, social withdrawal, emotional competence, and emotion regulation). The search was intended to be exhaustive and combined each emotion knowledge keyword with each social competence/behavior problem keyword (e.g., "emotion recognition AND prosocial behavior").
2. The first author read abstracts from the PsycInfo search results to identify potentially relevant studies. Efforts were made to obtain these articles or dissertations through electronic resources, the University library, or Interlibrary loan.
3. Additional studies were solicited via requests to the SRCD Emotions Preconference e-mail list and the International Society for Research on Emotion listserv. Additional in press or unpublished studies were also solicited via personal e-mails to leaders in the field of emotional development with previous published research on emotion knowledge. The first author also scanned the Introduction of each included study to identify references to additional studies of emotion knowledge and social competence

or behavior problems. In addition, during 2005 and 2006 the first author conducted a Web of Science search to identify articles that referenced included studies.

4. The Method and Results sections of studies obtained through PsychInfo searches and studies obtained through solicitation were read to determine eligibility for the meta-analysis. Studies were included in the meta-analysis if they met the following criteria:[1]

    a. Participants were children or adolescents between the ages of 2 and 18 years.

    b. The sample was not primarily composed of children with mental retardation or pervasive developmental disorders (e.g., autism).

    c. The emotion knowledge measure met the criteria as an assessment of discrete emotion knowledge.

    d. The measure(s) of social competence and/or behavior problems fell into one of three categories: First, measures of social competence included observed or reported levels of social skills, social preference, peer status, prosocial behavior, or developmentally appropriate social play behavior (e.g., social pretend or cooperative play for preschoolers). Measures of developmentally appropriate social play behavior were determined by the first author based on theoretical descriptions of childhood social competence development (Howes, 1987; Rose-Krasnor, 1997; Waters & Sroufe, 1983). Given that the measures of emotion knowledge were structured performance tests, we did not include structured performance tests of social competence (i.e. social problem solving). Second, measures of externalizing behavior problems included observations or reports of aggression, oppositional behavior, or conduct problems, diagnoses of Oppositional Defiant Disorder or Conduct Disorder, or groups based primarily on externalizing behavior problem status (e.g., juvenile delinquents vs. nondelinquents).[2] Third, measures of internalizing behavior problems included observations or reports of depression, anxiety, or related problems, diagnoses of Depressive Disorders or Anxiety Disorders, or groups based primarily on internalizing problem status.

    e. The study was not an investigation of an intervention designed to increase emotion knowledge unless the study reported pre-intervention correlations between emotion knowledge and outcomes or the intervention was described as a pilot study with nonsignificant results.

    f. The results included either bivariate correlations between emotion knowledge and the outcome(s), t- or F-tests with the N in each group, or Ns, Means, and Standard Deviations for each group. Given the inconsistency of covariates across studies, bivariate correlations and group comparisons were restricted to analyses without covariates. An exception was made for studies that contained age as a sole covariate because the present meta-analysis also took age into account. In the event that relevant statistics were missing or reported simply as non-significant, the authors attempted to obtain the information from study's first author. In most cases, the information was

[1]Among studies deemed potentially relevant based on abstracts, the most common reasons for a study's exclusion from the meta-analysis were measures that did not assess discrete emotion knowledge, outcomes that were not social competence or behavior problems, samples consisting of adults or developmentally disabled populations, and missing statistics. Specific details about study exclusion are available from the first author.

[2]ADHD was not included with externalizing behavior problems for the present meta-analysis because many children with ADHD have the predominantly Inattentive type of the disorder without comorbid externalizing problems.

unavailable due to the time elapsed since the study took place or a lack of a reply from the author. In cases where a portion of the findings lacked statistics and were simply reported as non-significant, the study was included if at least 50% of statistics were reported. In these cases, non-significant findings without statistics were recorded as $r = .00$.

## Coding of Studies

Study characteristics were coded by the first author, and any ambiguity in coding decisions (e.g., classifying an outcome as social competence or externalizing problems) were resolved by discussion between the first and second authors. Two primary aspects of studies were coded: sample and method characteristics.

## Sample characteristics

1. Recruitment. Samples were classified either as primarily community samples or samples that included a clinical population.
2. Age. Samples were classified as containing primarily early childhood participants (ages 3-5), middle childhood participants (ages 6-11), or preadolescent/adolescent participants (ages 9-15). The latter two categories overlapped because samples in the 6-11 group often included elementary school children up to fifth and sixth grade whereas samples in the 9-15 group tended to include preadolescents and adolescents across a wide age range, with the mean age typically falling between 11 and 12.
3. Ethnicity. For studies that provided complete or partial ethnicity information, studies were coded as primarily ethnic majority (e.g., white, European American), primarily ethnic minority, or heterogeneous.
4. Socioeconomic status. Samples were classified as low income, middle/upper middle class, heterogeneous (lower middle/working and middle class), or unknown.

## Method characteristics

1. Discrete emotion knowledge measure classification. Because some discrete emotion knowledge measures are commonly used across the literature, emotion knowledge measures were classified as Denham's (1986) puppet measure, Nowicki & Duke's (1994; Rothman & Nowicki, 2004) DANVA or DANVA-2 measures, Izard's (1971; Mostow et al., 2002) measures, Ekman & Friesen's (1975) facial expressions, Borke's (1971) situational vignettes, other measures (e.g., Blair et al. 2005), or a combination of multiple measures.
2. Outcome source. The person/method that supplied the outcome information was coded as teacher, parent, peer, self, observer, DSM diagnosis, placement status (e.g., delinquent youths in a detention center), or a combination.
3. Length of study. The length of study was coded as concurrent or including a longitudinal component. Correlations between emotion knowledge measures and outcomes were only included if the emotion knowledge measure was completed at the same point or prior to the outcome assessment. Thus, in longitudinal studies, statistics representing social competence or behavior problems that occurred months prior to emotion knowledge assessments were not included.

## Data Reduction and Analysis Plan

Although studies often included multiple measures of emotion knowledge and outcomes, each study contributed only one statistic per outcome category. Multiple statistics were averaged to yield a single statistic per sample for each outcome meta-analysis. Thus, there were 63

independent sample statistics for the emotion knowledge and social competence meta-analysis, 19 sample statistics for the emotion knowledge and internalizing behavior problems meta-analysis, and 34 sample statistics for the emotion knowledge and externalizing behavior problems meta-analysis (see Table 1 for a list of included samples). Two sample size outliers and one effect size outlier (i.e. sample size or effect size > 3 SDs from the mean) were windsorized, meaning that they were reduced to the next largest sample size or effect size.

Meta-analyses were conducted with Lipsey & Wilson's (2001) SPSS macros. First, a meta-analytically derived mean effect size (*z*) was obtained for each outcome. The *z* statistic was converted back to *r* for presentation. Then, a homogeneity statistic (*Q*) was derived based on these effect sizes to determine if heterogeneity in effect sizes supported an examination of sample and method characteristics as moderators of effect size. The *Q* statistic has a chi-square distribution based on *k* - 1 degrees of freedom, with *k* representing the number of effect sizes in the analysis. A statistically significant homogeneity *Q* statistic supports a heterogeneous distribution. In cases of heterogeneity in effect sizes, random effects ANOVA models with maximum likelihood estimation were utilized to examine potential moderators. We relied on random effects models because this more conservative approach allows generalization beyond included samples (Rosenthal & DiMatteo, 2001). When effect size heterogeneity was examined, the $Q_{between}$ statistic was used to statistically test whether each moderator accounted for the effect size heterogeneity. A statistically significant $Q_{between}$ supported the variable as a moderator of effect size.

## Results

### Emotion Knowledge and Social Competence

Table 2 presents meta-analysis results for relations between emotion knowledge and social competence. Across 63 independent samples of relations between emotion knowledge and social competence, the mean effect size was *r* = .22. According to Cohen's (1992) standards, the magnitude of this effect size fell in the small to medium range. Furthermore, Orwin's (1983) *fail safe N* calculation indicated that an additional 76 studies with null findings would be necessary to reduce the mean effect size below *r* = .10 (Cohen's minimum *r* for a small effect size). The significant homogeneity *Q* statistic suggested that effect sizes were heterogeneous across the samples measuring the relation between emotion knowledge and social competence. Thus, we proceeded to examine sample and methodological characteristics as moderators of effect size.

In random effects models to examine moderators of variation in effect size, all $Q_{between}$ statistics were non-significant (all *p*s > .05). Thus, the method and sample characteristics examined in the present study were not supported as moderators of the heterogeneity in effect size for relations between emotion knowledge and social competence. Furthermore, the summary of subgroup effect sizes in Table 2 reflects the high level of consistency in effect sizes across sample and method characteristic subgroups. For example, the spread of effect size across samples that were characterized as either low income, mixed income, or primarily middle income was only *r* = .02. Similarly, the spread of effect sizes across samples of 3- to 5-year-olds, 6- to 11-year-olds, and 9- to 15-year-olds was *r* = .03.

### Emotion Knowledge and Internalizing Problems

Table 3 presents meta-analysis results for relations between emotion knowledge and internalizing problems. Across 19 independent samples of relations between emotion knowledge and internalizing problems, the mean effect size was *r* = −.17. Thus, the magnitude of relations between emotion knowledge and internalizing problems fell in the small to medium range. The *fail safe N* calculation indicated that an additional 13 studies with null findings

would be necessary to reduce the mean effect size below $r = -.10$. The non-significant homogeneity $Q$ statistic did not support heterogeneity in effect sizes for relations between emotion knowledge and internalizing problems. Therefore, sample and methodological characteristics were not statistically examined as moderators, but the subgroup effect sizes are provided in Table 3 for informational purposes. In cases where there was a reasonable number of samples for each subgroup (e.g., community vs. clinic samples), the effect sizes appear consistent across subgroups and support the homogeneity of emotion knowledge and internalizing problems effect sizes. It is also important to note that the relatively small number of independent samples assessing relations between emotion knowledge and internalizing problems led to 1 or 2 samples in many of the subgroups.

### Emotion Knowledge and Externalizing Problems

Table 4 presents the results of the meta-analysis of relations between emotion knowledge and externalizing problems. Across 34 independent samples of relations between emotion knowledge and externalizing problems, the mean effect size was $r = -.17$. Thus, the magnitude of relations between emotion knowledge and externalizing problems also fell in the small to medium range. The *fail safe N* calculation indicated that an additional 24 studies with null findings would be necessary to reduce the mean effect size below $r = -.10$. The significant homogeneity $Q$ statistic suggested that effect sizes were heterogeneous across the samples measuring the relation between emotion knowledge and externalizing problems. Thus, examination of sample and methodological characteristics as moderators was supported.

In random effects models to examine moderators of variation in effect size, $Q_{between}$ statistics were significant for three of the sample and methodological characteristics. First, the $Q_{between}$ statistic for the sample recruitment moderator was significant ($Q = 4.54$, $p < .05$). Specifically, in community samples ($r = -.13$) the mean effect size was small whereas the mean effect size in samples that included a clinic population ($r = -.26$) were in the medium range. Secondly, the $Q_{between}$ statistic for the participant age moderator was significant ($Q = 6.35$, $p < .05$). An examination of the magnitude of subgroup effect sizes showed that effect sizes in pre-adolescent/adolescent samples ($r = -.34$) were medium to large whereas effects sizes in early childhood ($r = -.15$) or middle childhood ($r = -.11$) were in the small range. Lastly, the $Q_{between}$ statistics for the moderator indexing source of externalizing problems ratings was significant ($Q = 16.44$, $p < .05$). When externalizing problems were determined by placement status ($r = -.37$), observer ($r = -.33$), or DSM diagnosis ($r = -.33$) effect sizes were in the medium to large range whereas effect sizes when externalizing problems were reported by parent ($r = -.05$), teacher ($r = -.14$), or a combination of sources ($r = -.10$) were in the small range. Only one study included ratings of externalizing problems based solely on peers' perspectives, and this effect size fell approximately midway between the larger and smaller effect sizes. Clinical samples, samples of preadolescents/adolescents, and samples based on placement or DSM diagnosis were somewhat overlapping. Not surprisingly, all five samples determined by either DSM diagnosis or placement status included a clinical population. Furthermore, all of the samples in the 9-15 age range included a clinical population, and, conversely, half of the clinical samples were in the 9-15 age range.

## Discussion

Results supported a statistically significant mean effect size for relations between emotion knowledge and three constructs that have received extensive attention as correlates of emotion knowledge. Although the non-independence of samples does not permit comparison of effect sizes across the social competence, externalizing, and internalizing meta-analyses, the mean effect sizes for emotion knowledge and externalizing and emotion knowledge and internalizing were nearly identical. In addition, mean effect sizes for all three of the meta-analyses fell into

the small to medium range based on established criteria for the magnitude of effect sizes (Cohen, 1992). Thus, this meta-analytic review suggests that emotion knowledge is a consistent correlate of multiple social and behavioral outcomes. Furthermore, the magnitude of these relations is similar to other meta-analyses of correlates of social competence and behavior problems. For example, the overall effect size for the association between hostile attribution of intent and aggressive behavior ($r$ = .17; Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002) was identical to the effect size reported for emotion knowledge and both dimensions of problem behavior in the present meta-analysis.

For emotion knowledge and social competence, heterogeneity of effect sizes was supported in the initial analysis of 63 samples; however, significant moderators of effect size were not found. Thus, it appears that the moderators included in the meta-analysis did not capture the variability in effect sizes. When samples were adequately distributed across subgroups, the subgroup effect sizes often demonstrated remarkable consistency. Therefore, based on the present set of moderators, findings support consistency in relations between emotion knowledge and social competence across moderator subgroups such as participant age range and the respondent for the social competence measure. It is possible that a more fine-grained approach to categorizing moderator variables, such as a breakdown of the age range into smaller segments, could have increased the likelihood of uncovering significant moderators. It is also important to note that we used more conservative random effects models to test for moderators, and a less conservative approach using fixed effects may have led to somewhat divergent conclusions. Future research should seek to uncover moderators that may account for the variation in effect sizes for the relation between emotion knowledge and social competence.

Results did not support heterogeneity in effect sizes for emotion knowledge and internalizing problems. Relative to social competence and externalizing problems, fewer samples included effect sizes for internalizing problems, and many moderator subgroups contained only a single sample. Therefore, additional studies of the relation between emotion knowledge and internalizing problems are needed that encompass a variety of emotion knowledge assessment methods and study designs. Possible directions for future research include comparisons of emotion knowledge across groups of children and adolescents with specific symptoms of anxiety and/or depression because difficulty with emotion understanding may be most relevant to specific internalizing problems. For example, lower levels of discrete emotion knowledge may be most robustly related to internalizing difficulties that are especially apparent in the interpersonal domain such as social anxiety or social withdrawal.

For emotion knowledge and externalizing problems, three characteristics were supported as moderators of variability in effect size: sample composition, age of participants, and the source for externalizing problem ratings. Samples that included clinical populations, pre-adolescents, and where externalizing problems were based on observer, DSM diagnosis, or placement status had effect sizes that fell into the medium to large range. Taken together, these findings suggest that older children with diagnosed or otherwise clinically-referred externalizing problems may demonstrate the most severe deficits in emotion knowledge. Caution in interpreting these findings is warranted because the clinical groups may fall at the extreme end of the continuum relative to comparison peers and may have other deficits (e.g., lower intelligence) that account for the magnitude of the relation between emotion knowledge and externalizing problems. With this caveat in mind, it is important to note that the majority of studies made efforts to match comparison groups to externalizing problem groups on important demographic characteristics. For example, Walker's (1981) classic study comparing normal, schizophrenic, anxious-depressed, and unsocialized-aggressive (the externalizing group used for the present meta-analysis) young adolescents showed no differences in education level or academic achievement between the clinical groups and the comparison group.

## Limitations

Although the current meta-analytic review was intended to be a comprehensive evaluation of the emotion knowledge literature in childhood and adolescence, a few important limitations exist. First, emotion knowledge is a broad construct, and we did not evaluate all that is encapsulated by this construct. We also did not focus on all potential correlates of emotion knowledge. Nonetheless, the definition of discrete emotion knowledge used for this review reflected the modal approach used in prior research, and the social and behavioral outcomes were the most frequently studied correlates of the discrete emotion knowledge construct.

Although our definition of discrete emotion knowledge was specific and helped to determine the studies to include in the meta-analytic review, the discrete emotion knowledge assessments were relatively heterogeneous. For example, some approaches assessed discrete emotion knowledge through facial expressions or vocal tones, others used social context, and yet others used a combination of emotion cues. Thus, the current meta-analytic review represents a broad cross-section of the literature on discrete emotion knowledge, but it does not answer some important questions regarding specific aspects of discrete emotion knowledge. We were able to break down the discrete emotion knowledge measure broadly, but the small number of studies that used a single channel to convey emotion cues (e.g., vocal tone, posture) did not permit an adequate examination of specific emotion cues as moderators of effect size.

Some potentially important moderators of effect size were not considered, and gender and language ability are two especially relevant moderators of effect size that were not included in the present meta-analysis. For future research, gender is a worthy moderator to consider because gender differences exist in aspects of discrete emotion knowledge (e.g., facial emotion processing; McClure, 2000) and social and behavioral adjustment (e.g., Keenan & Shaw, 1997). In order to consider gender differences in the present meta-analysis, the empirical research would have needed to include information on the *relationships between* emotion knowledge and outcomes presented *separately by gender* (e.g., separate correlation matrices for boys and for girls). Unfortunately, less than 10% of included samples provided this information. Language or cognitive ability would also be a worthy moderator to consider because the relations between emotion systems and cognitive processing play an important role in the development of emotion knowledge (Izard, 2001). Approximately 40% of samples included some information on language/cognitive ability. However, a majority of these samples did not include language/cognitive ability in analyses, or language/cognitive ability was solely examined within an analytic framework that included other covariates (e.g., multiple regression). As a result, we were unable to adequately isolate the portion of the effect size that was due to the overlap between emotion knowledge and language/cognitive ability. However, it is important to note that effect sizes would likely have been attenuated by some degree had language/cognitive ability been included.

## Moving Forward: Implications and New Directions for Emotion Knowledge Research

A number of implications and new directions for research are recommended based on the present meta-analytic findings. First, the findings have potential implications for prevention and intervention programs targeting youth. The robust and statistically significant effect sizes across a range of correlates provide support for instruction in core emotion knowledge skills as a component of prevention programs to promote social competence or prevent behavior problems. However, the relatively modest effect sizes suggest that a focus on emotion knowledge that also incorporates other important correlates of social competence and behavior problems may be especially beneficial. For example, programs targeting emotion knowledge along with other emotion-related competencies (e.g., emotion regulation) may prevent behavior problems and promote social competence (Izard et al., 2008). Also, discrete emotion knowledge could be included in conjunction with social problem-solving skills or other

cognitive-behavioral techniques as supported by prevention research with young children (e.g., Greenberg et al., 1995). Another important implication, based on the lack of moderation for sample ethnic or socioeconomic composition, is that emotion knowledge concepts in prevention and intervention may be equally helpful for socieconomically disadvantaged or impoverished groups relative to their more advantaged peers. Broader contextual factors such as the home environment or maltreatment are often the primary targets for intervention in these groups, but focusing on individual child factors including emotion knowledge may be a useful adjunct to contextually-based approaches. In terms of applied research with prevention and intervention programs, the findings also suggest that evaluating emotion knowledge as a mediator of change in social competence or behavior problems following intervention is a worthy goal. Emotion knowledge assessments have been included in evaluations of school-based prevention programs (e.g., Greenberg et al., 1995; Izard et al., 2008), and similar assessments may be relevant with psychotherapeutic interventions targeting conduct problems, anxiety, or depression (see Southam-Gerow & Kendall, 2002).

In terms of basic empirical research, there are a number of populations and subgroups that deserve greater attention. For example, the majority of studies included in the present meta-analytic review focused on early childhood samples. Because effect sizes are suggestive of emotion knowledge deficits that persist into adolescence and possibly become magnified for those with externalizing problems, more research is warranted with older children and adolescents. Another implication from the present findings is based on the combination of subgroups that have received relatively little investigation. A large percentage of the clinical samples focused on middle childhood or adolescence, and future research could investigate discrete emotion knowledge in clinical samples during early childhood. Such studies could help elucidate the mechanisms by which emotion knowledge deficits emerge or become magnified in groups of young children with behavior problems. The study by Speltz and colleagues (1999) of preschool boys with early-starting conduct problems is an example of the small amount of research with clinical samples of young children. Their study demonstrated a medium to large effect size for externalizing problems, and this finding complements much of the research with clinical samples of older children and adolescents. Additional research on discrete emotion knowledge with clinical samples of young children may take considerable effort because preschoolers with serious behavior problems often do not receive a psychiatric diagnosis until later in childhood or adolescence.

Newer, more fine-grained approaches to examining relations between emotion knowledge and its correlates are warranted. For example, Blair and colleagues (2005) demonstrated specific impairments in the understanding of fear in vocal affect among boys with symptoms of psychopathy. A recent meta-analysis of facial emotion recognition and antisocial behavior in samples of adolescents and adults also supported a selective impairment in fear recognition (Marsh & Blair, 2008). For the present meta-analysis, recognition of individual emotions was collapsed into a total emotion knowledge effect size, and this approach reflects the vast majority of previous research with children and adolescents. In future research, particularly in samples where specific deficits are likely, it will be helpful to present separate effect sizes for each discrete emotion cue. In addition, a few recent studies offer innovative directions that permit the examination of emotion understanding in a manner that more closely reflects the perception and recognition of cues in the natural environment. In an approach that used morphing to slowly present features of increasing intensity, children with psychopathic features required significantly more time to recognize sad expressions (Blair, Colledge, Murray, & Mitchell, 2001). Similar work exists with children who have experienced maltreatment and suggests that physically abused children are more sensitive to anger displays (Pollak & Sinha, 2002). These examples of innovative new methods used in clinical or at-risk populations also have important implications for more normative populations. For instance, sensitivity to cues of sadness or

fear using these innovative approaches may predict empathy and broader social competence among preschool children as suggested by the ASC model (Halberstadt et al., 2001).

Finally, future work could more closely apply the ASC model to the development of behavior problems. Little empirical research has simultaneously investigated emotion knowledge, social competence, *and* indicators of behavior problems to more comprehensively examine the interrelations among these constructs, particularly as they emerge over time. For example, poor emotion understanding may impair social skills in peer interactions and lead to decreased self confidence in social interactions and subsequent depression or social anxiety. While much previous research has examined a single path based on this example (e.g., the path from emotion knowledge to social skills; Mostow et al., 2002), social competence constructs could be examined as potential mediators or moderators of relations between emotion knowledge and internalizing or externalizing problem behaviors. Future longitudinal research using innovative approaches can shed light on the degree to which affective aspects of social competence, including discrete emotion knowledge, may lead to important social missteps that portend the development of clinically-elevated behavior problems.

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## Table 1

List of Included Samples with Sample Characteristics

| Study | | Outcome (Source) | Primary Age Range/Ethnicity/SES | EK Measure |
|---|---|---|---|---|
| Arsenio, Cooperman, & Lover (2000) | | SC (Combo) | 3-5/Mixed/Mixed | Denham |
| | | Ext (Combo) | | |
| Blair, Budhani, Colledge, & Scott (2005) | | Ext (Teacher) | 9-15/Majority/NR | Other |
| Blair, Granger, & Razza (2005) | | SC (Teacher) | 3-5/NR/Low | Other |
| | | Ext (Teacher) | | |
| Boyatzis & Satyaprasad (1994) | | SC (Teacher) | 3-5/Majority/Middle | Other |
| Cadesky, Mota, & Schachar (2000) | | Ext (DSM) | 6-11/NR/Mixed | Nowicki |
| Camras, Grow, & Ribordy (1983) | | SC (Teacher) | 3-5/NR/Low | Ekman |
| Carlo, Knight, Eisenberg, & Rotenberg (1991) | | SC (Observer) | 6-11/NR/Middle | Other |
| Cassidy, Parke, Butkovsky, & Braungart (1992) | | SC (Peer) | 6-11/ Majority/Middle | Other |
| Cassidy, Werner, Rourke, Zubernis, & Balaraman (2003) | | SC (Combo) | 3-5/ Majority/Mixed | Denham |
| Cole, Usher, & Cargo (1993) | | Ext (Combo) | 3-5/ Majority/Middle | Nowicki |
| Collins & Nowicki (2001) | | SC (Combo) | 6-11/Minority/Mixed | Nowicki |
| Cooley & Triemer (2002) | Clinical Group | SC (Teacher) | 6-11/Minority/NR | Nowicki |
| | | Ext (Teacher) | | |
| Cooley & Triemer (2002) | Normative Group | SC (Teacher) | 6-11/Minority/NR | Nowicki |
| | | Ext (Teacher) | | |
| Cortes (2002) | | SC (Combo) | 3-5/Minority/Low | Other |
| | | Ext (Combo) | | |
| Custrini & Feldman (1989) | | SC (Parent) | 6-11/NR/NR | Other |
| Denham (1986) | | SC (Observer) | 3-5/NR/Mixed | Denham |
| Denham et al. (2003) [a] | | SC (Combo) | 3-5/ Majority/Middle | Denham |
| | | Int (Teacher) | | |
| | | Ext (Combo) | | |
| Denham & Couchoud (1991) | | SC (Observer) | 3-5/NR/Mixed | Denham |
| Denham, McKinley, Couchoud, & Holt (1990) | | SC (Peer) | 3-5/NR/NR | Denham |
| Denham, Renwick-DeBardi, & Hewes (1994) | | SC (Observer) | 3-5/ Majority/Middle | Denham |
| Dodge, Laird, Lochman, Zelli, & CPPRG (2002) | | Ext (Combo) | 6-11/Mixed/Mixed | Other |
| Dunn & Cutting (1999) | | SC (Observer) | 3-5/ Majority/Mixed | Denham |
| Dunsmore & Karn (2004) | | SC (Combo) | 3-5/ Majority/Middle | Denham |
| Dunsmore, Noguchi, Casey, Cook, & Bhullar (2007) | | SC (Combo) | 3-5/ Majority/Middle | Denham |
| Ebanks (2002) | | SC (Teacher) | 3-5/ Majority/Mixed | Other |
| | | Ext (Teacher) | | |
| Edwards, Manstead, & MacDonald (1984) | | SC (Peer) | 6-11/NR/Mixed | Combo |
| Egan, Brown, Goonan, Goonan, & Celano (1998) | | Int (Parent) | 6-11/Minority/Low | Other |
| | | Ext (Parent) | | |
| Garner & Estep (2001) | | SC (Observer) | 3-5/ Majority/Middle | Other |
| | | Ext (Observer) | | |
| Garner, Jones, & Palmer (1994) | | SC (Observer) | 3-5/ Majority/Middle | Other |
| Garner & Lemerise (2007) | | SC (Teacher) | 3-5/Minority/Mixed | Other |

| Study | | Outcome (Source) | Primary Age Range/Ethnicity/SES | EK Measure |
|---|---|---|---|---|
| | | Int (Teacher) | | |
| | | Ext (Teacher) | | |
| Glanville & Nowicki (2002) | | SC (Peer) | 6-11/Mixed/Middle | Nowicki |
| Goldman, Corsini, & DeUrioste (1980) | | SC (Peer) | 3-5/NR/Middle | Ekman |
| Gottman, Gonso, & Rasmussen (1975) | | SC (Peer) | 6-11/NR/Mixed | Izard |
| Gouley, Brotman, et al. (2007) | | SC (Combo) | 3-5/Minority/Low | Combo |
| | | Int (Combo) | | |
| | | Ext (Combo) | | |
| Greener (1998) | | SC (Peer) | 6-11/ Majority/Mixed | Nowicki |
| Izard (1971) | Typical Preschool | SC (Teacher) | 3-5/NR/NR | Izard |
| Izard (1971) | Head Start | SC (Teacher) | 3-5/NR/Low | Izard |
| Izard (1971) | School-Age | SC (Teacher) | 6-11/NR/Mixed | Izard |
| Izard et al. (2001) [b] | | SC (Teacher) | 3-5/Minority/Low | Combo |
| | | Int (Combo) | | |
| | | Ext (Teacher) | | |
| Klemchuck (1985) | | Int (Parent) | 3-5/NR/Mixed | Combo |
| | | Ext (Parent) | | |
| Krantz (1982) | | SC (Combo) | 3-5/NR/Middle | Borke |
| Lenti, Giacobbe, & Pegna (2000) | | Int (DSM) | 12-18/NR/NR | Ekman |
| Leppanen & Hietanen (2001) | | SC (Combo) | 6-11/ Majority/Mixed | Combo |
| Lewis (1995) | | SC (Teacher) | 3-5/Minority/Mixed | Denham |
| Lindsey & Mize (2000) [c] | | SC (Combo) | 3-5/ Majority/Middle | Denham |
| Lupinetti (2000) | | SC (Combo) | 3-5/NR/Mixed | Denham |
| MacQuiddy, Maise, & Hamilton (1987) | | Ext (Parent) | 6-11/NR/Mixed | Other |
| Manassis & Young (2000) | | Int (DSM) | 6-11/NR/Middle | Nowicki |
| Manstead & Edwards (1992) | | SC (Peer) | 6-11/NR/NR | Combo |
| Martin, Armstrong, Boekamp, & Wheeler (2005) | | Int (Parent) | 3-5/ Majority/NR | Combo |
| | | Ext (Parent) | | |
| McClure & Nowicki (2001) | | Int (Self) | 6-11/ Majority/NR | Nowicki |
| McClure, Pope, Hoberman, Pine, & Liebenluft (2003) [d] | | Int (DSM) | 9-15/NR/NR | Nowicki |
| McCown, Johnson, & Austin (1986) | | Ext (Placement) | 12-18/Mixed/NR | Ekman |
| McElwain & Volling (2002) | | SC (Observer) | 3-5/ Majority/Middle | Denham |
| Miller et al. (2005) | | SC (Peer) | 6-11/Minority/Low | Other |
| Miller et al. (2006) [e] | | SC (Combo) | 3-5/Mixed/Low | Combo |
| | | Int (Teacher) | | |
| | | Ext (Teacher) | | |
| Miller, Seifer, Stroud, Sheinkopf, & Dickstein (2007) | | Int (Combo) | 3-5/ Majority/Low | Combo |
| | | Ext (Combo) | | |
| Mitchell (1995) | | SC (Peer) | 3-5/NR/NR | Nowicki |
| Mostow, Izard, Fine, & Trentacosta (2002) | | SC (Combo) | 6-11/ Majority/Mixed | Izard |
| Nowicki & Duke (1992) | | SC (Peer) | 6-11/ Majority/Mixed | Nowicki |
| Pears (1999) | | SC (Combo) | 3-5/ Majority/Mixed | Denham |

| Study | | Outcome (Source) | Primary Age Range/Ethnicity/SES | EK Measure |
|---|---|---|---|---|
| Peery (1979) | | SC (Combo) | 3-5/ Majority/Middle | Borke |
| Philippot & Feldman (1990) | | SC (Parent) | 3-5/NR/NR | Other |
| Rodemaker (1999) | | SC (Teacher) | 9-15/ Majority/NR | Nowicki |
| | | Int (Teacher) | | |
| | | Ext (Teacher) | | |
| Rothman & Nowicki (2004) | | SC (Teacher) | 6-11/NR/NR | Nowicki |
| Rubin & Maioni (1975) | | SC (Combo) | 3-5/ Majority/Mixed | Borke |
| Schmitt (1999) | | SC (Combo) | 3-5/Mixed/Mixed | Denham |
| | | Ext (Observer) | | |
| Schultz, Izard, & Bear (2004) [f] | | SC (Peer) | 6-11/ Majority/Middle | Izard |
| | | Ext (Teacher) | | |
| Simon (1999) | | SC (Teacher) | 3-5/ Majority/Low | Denham |
| | | Ext (Teacher) | | |
| Simonian, Beidel, Turner, Berkes, & Long (2001) | | Int (DSM) | 9-15/NR/NR | Ekman |
| Slomkowski & Dunn (1996) [g] | | SC (Observer) | 3-5/NR/Mixed | Denham |
| Smith (2001) | | SC (Combo) | 3-5/Minority/Mixed | Other |
| | | Int (Teacher) | | |
| | | Ext (Peer) | | |
| Smith & Walden (2001) | | Ext (Teacher) | 3-5/Minority/Mixed | Other |
| Speltz, DeKlyen, Calderon, Greenberg, & Fisher (1999) | | Ext (DSM) | 3-5/ Majority/Mixed | Other |
| Spence (1987) | | SC (Peer) | 3-5/ Majority/Middle | Combo |
| Stevens, Charman, & Blair (2001) | | Ext (Teacher) | 9-15/NR/NR | Nowicki |
| Trentacosta & Izard (2007) | | SC (Peer) | 6-11/Minority/Low | Izard |
| Vosk, Forehand, & Figueroa (1983) | | SC (Peer) | 6-11/NR/NR | Other |
| Walden & Field (1990) | | SC (Peer) | 3-5/NR/Middle | Other |
| Walker (1981) | | Int (DSM) | 9-15/NR/NR | Izard |
| | | Ext (DSM) | | |
| Zabel (1979) | | Ext (Placement) | 9-15/NR/NR | Ekman |
| Zuckerman & Przewuzman (1979) | Study 1 | SC (Teacher) | 3-5/NR/Middle | Other |
| Zuckerman & Przewuzman (1979) | Study 2 | SC (Teacher) | 3-5/NR/Middle | Combo |
| | | Int (Teacher) | | |
| | | Ext (Teacher) | | |

*Note*. SES = Socioeconomic Status; SC = Social Competence; Int = Internalizing Problems; Ext = Externalizing Problems; NR = Not Reported; Denham = Denham (1986) Puppet Interview; Ekman = Ekman & Friesen (1975) facial stimuli; Izard = measures based on Izard and colleagues' stimuli; Nowicki = DANVA or DANVA-2 measures; Borke = Borke's (1971) vignettes.

[a] Also includes the following reports using an overlapping sample: Denham, Caverly et al. (2002); Denham, Blair, Schmidt, & DeMulder (2002); and Sawyer et al. (2002).

[b] Also includes the following reports using an overlapping sample: Fine, Izard, Mostow, Trentacosta, & Ackerman (2003); Schultz, Izard, Ackerman, & Youngstrom (2001).

[c] Also includes the following reports using the same sample: Lindsey & Colwell (2003).

[d] Also includes the following reports using an overlapping sample: Easter et al. (2005).

[e] Also includes the following reports using an overlapping sample: Miller, Gouley, Dickstein, & Seifer (2007).

[f] Also includes the following reports using an overlapping sample: Schultz, Buckingham, Izard, & Bear (2007).

[g] Also includes the following reports using an overlapping sample: Maguire & Dunn (1997).

**Table 2**

Meta-Analysis of Associations Between Emotion Knowledge and Social Competence

| | k | N | r | 95% CI | Q |
|---|---|---|---|---|---|
| Total | 63 | 5135 | .22** | .19 to .26 | 88.70* |
| Sample | | | | | .01 |
| Community | 60 | 5025 | .22** | .19 to .26 | |
| Clinical | 3 | 110 | .23* | .02 to .43 | |
| Age | | | | | .76 |
| 3-5 | 42 | 2814 | .21** | .17 to .25 | |
| 6-11 | 20 | 2270 | .24** | .19 to .30 | |
| 9-15 | 1 | 51 | .23 | −.09 to .51 | |
| Ethnicity | | | | | .99 |
| Primarily majority | 23 | 2230 | .18** | .13 to .23 | |
| Primarily minority | 11 | 972 | .17** | .09 to .24 | |
| Heterogeneous | 4 | 284 | .25** | .11 to .37 | |
| SES | | | | | .12 |
| Low | 10 | 1318 | .21** | .14 to .28 | |
| Mixed | 22 | 2152 | .20** | .15 to .26 | |
| Middle | 20 | 1063 | .22** | .15 to .29 | |
| Emotion Knowledge Measure | | | | | 6.68 |
| Denham | 18 | 1140 | .17** | .11 to .24 | |
| Nowicki & Duke | 9 | 919 | .25** | .16 to .34 | |
| Izard | 7 | 1016 | .20** | .12 to .28 | |
| Ekman & Friesen | 2 | 72 | .42** | .18 to .61 | |
| Borke | 3 | 88 | .31** | .08 to .50 | |
| Other | 16 | 1114 | .23** | .16 to .29 | |
| Combination | 8 | 786 | .26** | .17 to .34 | |
| Social Competence Source | | | | | 7.17 |
| Teacher | 17 | 1307 | .22** | .16 to .29 | |
| Peer | 16 | 1825 | .27** | .21 to .33 | |
| Parent | 2 | 71 | .30* | .04 to .51 | |
| Observer | 9 | 512 | .12* | .02 to .22 | |

| | k | N | r | 95% CI | Q |
|---|---|---|---|---|---|
| Combination | 19 | 1420 | .20** | .14 to .26 | |
| Length | | | | | .79 |
| Concurrent | 52 | 4022 | .23** | .19 to .27 | |
| Longitudinal | 11 | 1113 | .19** | .11 to .27 | |

*Note*. CI = Confidence Interval; SES = Socioeconomic Status; Denham = Denham (1986) Puppet Interview; Ekman & Friesen = Ekman & Friesen (1975) facial stimuli; Izard = measures based on Izard and colleagues' stimuli; Nowicki & Duke = DANVA or DANVA-2 measures; Borke = Borke's (1971) vignettes.

**Table 3**

Meta-Analysis of Associations Between Emotion Knowledge and Internalizing Problems

| | k | N | r | 95% CI | Q |
|---|---|---|---|---|---|
| Total | 19 | 1243 | −.17** | −.24 to −.10 | 25.62 |
| Sample | | | | | .02 |
| Community | 11 | 955 | −.17** | −.25 to −.09 | |
| Clinical | 8 | 288 | −.16* | −.28 to −.03 | |
| Age | | | | | 4.19 |
| 3-5 | 11 | 924 | −.17** | −.24 to −.10 | |
| 6-11 | 3 | 151 | −.02 | −.20 to .15 | |
| 9-15 | 5 | 168 | −.27** | −.41 to −.11 | |
| Ethnicity | | | | | 1.18 |
| Primarily majority | 6 | 369 | −.10 | −.21 to .01 | |
| Primarily minority | 5 | 420 | −.14* | −.24 to −.03 | |
| Heterogeneous | 1 | 162 | −.22* | −.38 to −.04 | |
| SES | | | | | .89 |
| Low | 5 | 472 | −.12* | −.23 to −.01 | |
| Mixed | 4 | 289 | −.20** | −.33 to −.07 | |
| Middle | 3 | 221 | −.12 | −.28 to .04 | |
| Emotion Knowledge Measure | | | | | 7.66 |
| Denham | 2 | 205 | −.06 | −.20 to .08 | |
| Nowicki & Duke | 4 | 166 | −.13 | −.28 to .03 | |
| Izard | 1 | 30 | −.36 | −.64 to .00 | |
| Ekman & Friesen | 2 | 58 | −.39** | −.59 to −.13 | |
| Borke | 1 | 78 | −.27* | −.47 to −.05 | |
| Other | 3 | 195 | −.14 | −.28 to .01 | |
| Combination | 6 | 511 | −.17** | −.26 to −.08 | |
| Internalizing Problems Source | | | | | 3.23 |
| Teacher | 6 | 540 | −.19** | −.28 to −.09 | |
| Parent | 3 | 174 | −.11 | −.27 to .06 | |
| Self | 1 | 62 | −.14 | −.40 to .13 | |
| DSM | 5 | 141 | −.28** | −.44 to −.11 | |

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| | k | N | r | 95% CI | Q |
|---|---|---|---|---|---|
| Combination | 4 | 326 | −.11 | −.23 to .02 | |
| Length | | | | | .20 |
| Concurrent | 16 | 919 | −.18** | −.25 to −.10 | |
| Longitudinal | 3 | 324 | −.14* | −.27 to −.00 | |

*Note*. CI = Confidence Interval; SES = Socioeconomic Status; Denham = Denham (1986) Puppet Interview; Ekman & Friesen = Ekman & Friesen (1975) facial stimuli; Izard = measures based on Izard and colleagues' stimuli; Nowicki & Duke = DANVA or DANVA-2 measures; Borke = Borke's (1971) vignettes.

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**Table 4**

Meta-Analysis of Associations Between Emotion Knowledge and Externalizing Problems

| | k | N | r | 95% CI | Q |
|---|---|---|---|---|---|
| Total | 34 | 2851 | −.17** | −.23 to −.11 | 81.94** |
| Sample | | | | | 4.54* |
| Community | 22 | 2162 | −.13** | −.20 to −.06 | |
| Clinical | 12 | 689 | −.26** | −.36 to −.16 | |
| Age | | | | | 6.35* |
| 3-5 | 21 | 1836 | −.15** | −.22 to −.08 | |
| 6-11 | 7 | 702 | −.11 | −.23 to .03 | |
| 9-15 | 6 | 313 | −.34** | −.46 to −.19 | |
| Ethnicity | | | | | 2.52 |
| Primarily majority | 12 | 1043 | −.14** | −.24 to −.05 | |
| Primarily minority | 9 | 604 | −.07 | −.19 to .05 | |
| Heterogeneous | 5 | 650 | −.22** | −.35 to −.08 | |
| SES | | | | | 5.83 |
| Low | 8 | 862 | −.06 | −.16 to .05 | |
| Mixed | 12 | 1075 | −.22** | −.30 to −.13 | |
| Middle | 5 | 520 | −.12 | −.24 to .01 | |
| Emotion Knowledge Measure | | | | | 5.88 |
| Denham | 5 | 413 | −.15* | −.29 to −.01 | |
| Nowicki & Duke | 6 | 272 | −.24** | −.38 to −.08 | |
| Izard | 2 | 212 | −.18 | −.39 to .05 | |
| Ekman & Friesen | 2 | 171 | −.37** | −.55 to −.16 | |
| Borke | 1 | 78 | −.18 | −.47 to .14 | |
| Other | 12 | 1202 | −.15** | −.24 to −.06 | |
| Combination | 6 | 503 | −.09 | −.22 to .05 | |
| Externalizing Problems Source | | | | | 16.44* |
| Teacher | 14 | 1211 | −.14** | −.21 to −.06 | |
| Peer | 1 | 36 | −.22 | −.54 to .16 | |
| Parent | 4 | 198 | −.05 | −.22 to .12 | |
| Observer | 2 | 129 | −.33** | −.51 to −.13 | |

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| | k | N | r | 95% CI | Q |
|---|---|---|---|---|---|
| DSM | 3 | 261 | −.33** | −.47 to −.18 | |
| Placement | 2 | 171 | −.37** | −.53 to −.20 | |
| Combination | 8 | 845 | −.10* | −.19 to −.00 | |
| Length | | | | | 2.02 |
| Concurrent | 30 | 2246 | −.19** | −.25 to −.13 | |
| Longitudinal | 4 | 605 | −.07 | −.22 to .09 | |

*Note*. CI = Confidence Interval; SES = Socioeconomic Status; Denham = Denham (1986) Puppet Interview; Ekman & Friesen = Ekman & Friesen (1975) facial stimuli; Izard = measures based on Izard and colleagues' stimuli; Nowicki & Duke = DANVA or DANVA-2 measures; Borke = Borke's (1971) vignettes.