Inferring Emotional Reactions in Social Situations: Differences in Children With Language Impairment

Anticipating and responding to a partner’s emotional reactions are key components in the comprehension of daily social discourse. Kindergarten children with language impairment (LI) and age-matched controls (CA) were asked to label facial expressions depicting 1 of 4 emotions (happy, surprised, sad, mad) and to identify those expressions when given a verbal label. Children then chose among these facial expressions when asked to infer emotional reactions from stories (3-sentence scenarios) presented in 1 of 3 modalities: verbal, visual, and combined. Although all children were able to identify and label the facial expressions, children with LI had difficulty integrating emotion knowledge with event context in order to infer a character’s feelings. When these inferencing errors occurred, children in the LI group were more likely to provide emotions of a different valence (e.g., substituting happy for mad) than were children in the CA group. Inferencing ability was related to language comprehension performance on a standardized test. The findings suggest that inferencing errors made by children with LI occur during the early stages of social processing and may contribute to social difficulties often experienced by this group of children.

KEY WORDS: comprehension, language impairment, emotion, inferences, children

Comprehension deficits experienced by children with language impairment (LI) are generally accounted for by assessing literal knowledge of semantics, morphology, and syntax. However, research has demonstrated that impairments in making inferences contribute to discourse comprehension difficulties experienced by this group of children (Bishop & Adams, 1992; Crais & Chapman, 1987; Ellis Weismer, 1985). A key component in comprehension of daily social discourse is the listener’s ability to infer a partner’s emotional reactions, which is the focus of the present study.

It has been suggested (Weaver & Kintsch, 1991) that up to 15 inferences must be made for successful comprehension of every statement that we hear. In order to successfully understand discourse, children must tie utterances together in some coherent fashion, and must also elaborate on this information, given their world knowledge. These basic inferencing processes allow individuals to develop a representation that can then be modified as more incoming information is received (e.g., Yuill & Oakhill, 1991).
There are many different types of inferences that must be made in order to develop this representation (see Nicholas & Trabasso, 1980, for a complete taxonomy). Of these different types, causal inferences (how one event enables another event or affects an individual’s mental state) have received particular attention, especially in research regarding narrative development and comprehension. Causal connections affect what a comprehender judges as important in narrative text (Trabasso & Sperry, 1985). Children’s ability to retell stories is related to the cohesiveness of the causal events that occur within the story (Trabasso, Secco, & van den Broek, 1984). That is, causal connections are most readily remembered in narrative retell tasks; they are a basic building block for the mental representations necessary in the comprehension process.

Given that causal inferences may be based on physical events (e.g., inferring that wet clothes were caused by rain) or mental states (e.g., inferring that forgetting an umbrella might cause someone to become angry), how might these task demands differ? Physical events are observable; a child sees someone get wet in the rain, allowing the child to easily make the link between rain and wet clothes in the future. On the other hand, mental states are not observable; therefore, it may be more difficult for the child to link events with mental states. Even when a person directly expresses how he or she feels, successful comprehension may require the listener to infer an alternate mental state (e.g., a friend may state that she is happy to do a favor, but the listener may need to infer that she feels otherwise). It is not surprising that there is evidence to indicate that the ability to make causal inferences based on (unobservable) mental states might be more difficult than those based on (observable) physical events (Miller & Aloise, 1989).

The presence of a facial expression may facilitate the ability to infer another’s mental state (Wiggers & van Lieshout, 1985). Facial expressions are an observable window into the mental states of others, and reading emotions in faces is a basic task involved in the perception of people (Walden & Field, 1982). Long before children are able to verbally label emotions, they are responsive to expressions around them.

Infants as young as 2 months of age can respond to facial expressions of surprise and happiness by returning smiles and participating in vocal play (Flin & Dziurawiec, 1989). By the end of the first year, children rely on facial expressions to assist in determining appropriate responses (e.g., Klinnert, Emde, Butterfield, & Campos, 1986). Children as young as 2 are able to identify some facial expressions (sad, happy) through a verbal labeling task (Bretherton, McNew, & Beeghly-Smith, 1981). Preschool children are able to use facial expressions to make inferences regarding basic emotions (Denham & Couchoud, 1990). When given an event scenario, they also are able to predict a character’s emotional response by choosing the appropriate facial expression (Denham, 1986).

However, some facial expressions are easier to interpret than others. Facial expressions that depict bipolar emotions (e.g., happy/sad) may be easier to discriminate than those that share common features (e.g., sad/mad are both considered unpleasant). Additionally, whether emotions refer to an individual’s beliefs or desires may contribute to correct interpretation (Wellman & Banerjee, 1991). Emotions such as “happy, sad, and mad” describe a relation between desire and reality. If someone wants something (desire) and gets it (reality), that person is happy; if not, the person is sad or mad. The emotion “surprise” describes a relation between a person’s belief or expectation about a situation and the reality of that situation. For example, a person who lives alone, arriving home in the evening, would typically expect no one to be there (belief). If someone is in the house (reality), the homeowner is surprised (mismatch between belief and reality). There is evidence that understanding another's expectations, and violations of expectations, may be more difficult than understanding another's desires (Hadwin & Perner, 1991). These factors may account for the consistent findings (e.g., Denham, 1986; Field & Walden, 1982) that when children are asked to make inferences regarding the emotions “happy, sad, mad,” they can infer “happy” emotions by age 3, but “sad” versus “mad” and “surprised” cannot be consistently inferred until after 5 years of age (Hadwin & Perner, 1991).

Despite the difficulties that one may encounter when interpreting facial expressions to make a social inference, most comprehenders seem to accomplish this task with little or no conscious effort. According to Crick and Dodge’s (1994) social processing model, individuals come into a situation with both biologically predetermined abilities and previous experiences (world knowledge). These predetermined and experientially based skills allow an individual to complete a series of at least six interrelated mental steps in order to make a social inference. The first step involves perceiving social cues and recognizing which cues are relevant (i.e., attending to those cues that are appropriate). Secondly, these cues are integrated with prior knowledge in order to make an inference. Third, possible responses are considered and (fourth) constructed. During the fifth step, a response selection is made, and finally (sixth step), the response is executed. Efficient processing requires completing these steps in a timely manner.

Research has suggested that children with LI may have difficulty making inferences based on physical events (Bishop & Adams, 1992; Crais & Chapman, 1987; Ellis Weismer, 1985), as well as those based on mental
The ability to readily infer other people’s feelings (mental state) may be a critical link between language comprehension difficulties (specifically, making inferences) and the social difficulties experienced by children with LI (e.g., Bryan, 1977).

The negative social consequences based on LI become apparent during the early preschool years. Children as young as 3 tend to avoid conversing with their language-impaired peers (Rice, Sell, & Hadley, 1991). By 4 years of age, children with language comprehension deficits are chosen as least liked by their typical peers (Gertner, Rice, & Hadley, 1994). These trends continue throughout the school years, when children with language-based learning disabilities continue to be less popular than typical peers (e.g., Horowitz, 1981). One potential source of these social difficulties may be related to the ability to infer another person’s mental state based on linguistic and/or nonlinguistic cues, and to then make an appropriate response.

According to Crick and Dodge’s (1994) model, the first step in making an inference regarding an emotional state involves a child’s attention to a facial expression, among other relevant cues. As mentioned previously, typically developing children acquire this ability during the preschool years. Research has suggested that children with LI may have difficulty quickly and accurately identifying emotions depicted by facial expressions. Dimitrovsky et al. (1998) and Holder and Kirkpatrick (1991) presented children with facial expressions depicting six emotions (anger, fear, sadness, surprise, happiness, and disgust) and found that children with language/learning impairments (age ranges of 9–12 years and 8–15 years, respectively) were less accurate than their age-matched peers at labeling various emotions. In contrast, Trauner, Ballantyne, Chase, and Tallal (1993) found no differences in abilities of children with LI (9–14 years of age) and their age-matched peers to identify facial expressions. However, they asked children to identify only three expressions (happy, sad, angry) in a forced-choice situation and, as a result, a ceiling effect was obtained for all emotions.

In addition to identifying a facial expression, a child must also attend to and use contextual information, available either verbally or visually, to predict someone’s emotional response to a series of events. Thus, even if children with LI are able to identify facial expressions, they may not be able to use contextual information in a linguistically demanding task to make an inference (Worling, Humphries, & Tannock, 1999). The time requirements for making a successful inference, in addition to the linguistic demands, may result in what Dodge (1986) described as process overload.

The first two steps of Crick and Dodge’s (1994) social inferencing model were investigated in the present study. Specifically, this study was designed to address the following three questions: (1) Do children with LI have difficulty identifying facial expressions? (2) Can they integrate facial expression knowledge with other verbally and/or visually presented information in order to make a social inference? (3) Are inferencing difficulties modality-specific? That is, do children with LI have difficulty when presented with verbal information only, do these difficulties extend to visually presented information, and/or are the difficulties prevalent when visual and verbal information is combined?

**Method**

**Participants**

Two groups of children (N = 24) attending kindergarten in the central New York area served as participants in this study: 12 children with LI (LI group: mean age = 5;9 [years;months], SD = 4.7, range = 5;4–6;4) and 12 typically developing children (CA group: mean age = 5;8, SD = 3.9, range = 5;4–6;2). Three children in the CA group and 4 children in the LI group were from low-income, inner-city schools. The remaining children attended suburban schools in middle-income neighborhoods. There were 6 boys and 6 girls in each group. There was 1 child originally identified as typically developing who was disqualified from participation because of a nonverbal IQ score below the cut off (below 85). The next typically developing child who volunteered was included. All children were monolingual native English speakers. A group of children matched on language ability was not included because of the conceptual concerns that arise when comparing children with LI to younger peers (Plante, Swisher, Kiernan, & Restrepo, 1993).

**Materials**

Four picture cards were drawn of facial expressions depicting four emotions: happy, surprised, mad, and sad. Nine stories were generated for each of the four emotions. Each story consisted of two actions and an emotional response stem. Within the nine stories for each emotion, three general types of stories were constructed. For example, in the happy condition, the three types of stories included receiving a gift, going on an outing, and receiving recognition (e.g., applause, hug). For each of the three story types, three different versions were constructed. For example, the three versions for the outing type of story included going swimming, going to the park, and going to a carnival. Thus, there were three types of stories with three versions of each story, yielding a total
of nine stories per emotion, and a total of 36 stories. Stories were constructed in this manner to ensure equivalence of story topics across modalities, as modality was a within-subjects factor. Therefore one child might receive the swimming version of the outing story in the visual modality, the park version in the verbal modality, and the carnival version in the visual/verbal concurrent modality.

Each story was depicted in three modalities: visual only, verbal only, and visual/verbal concurrently. The visual stimuli consisted of a sequence of three black and white line drawings on 6.5 × 9.5 in. cards. The first two cards illustrated a common situation (e.g., a cartoon character gradually opening a present), and the third showed a conclusion (e.g., the character holding the new teddy bear). The first two drawings showed only profile or back views of the cartoon character, and the last drawing showed the full front view of the character, with the face missing. The facial expression picture cards allowed children to choose and attach an expression to complete the story. A cartoon character (Twinky) was used in all stories to minimize cultural identity and gender as confounding variables. Verbal stimuli, three-sentence stories that corresponded to the visual stimuli, were recorded. Thus, for the visual/verbal concurrent condition, stories were played on an audiotape player while the examiner simultaneously presented picture cards. There were two to three communication units (Loban, 1976) per story in the verbal condition, with the mean number of communication units equivalent across emotion conditions. There were no complex sentences, and all communication units contained three to four clausal elements (Crystal, 1988). A story example is illustrated in the Appendix. For the visual versions, the character’s visual appearance and gender neutral name allowed each individual participant to assume Twinky’s gender. For the verbal stimuli, two sets of tapes were recorded, varying pronouns that determined Twinky’s gender. This allowed gender to be matched for each participant.

Selection of Stimuli

In order to ensure the recognizibility of the facial expressions used in the present study, 38 adults (graduate students in speech-language pathology) were asked to label four emotion cards. All adults labeled the sad facial expression correctly 100% of the time, and the remaining three expressions (mad, happy, surprised) were labeled correctly 97% of the time.

Prior to determining the 36 situational stories (9 stories × 4 emotions) used in the study, 90 adults read written versions of the stories and were asked to write in the resulting emotion (e.g., Twinky wanted a teddy bear for his/her birthday. S/he opened a present with a big fluffy teddy bear. Twinky was ____). All stories selected were completed with the predicted emotion an average of 94% of the time (range = 86–100%). On the basis of this information, three master lists of the 36 stories were then constructed, varying by mode of presentation for each story (e.g., one list contained the teddy bear gift story through the verbal mode, the second contained the same story through the visual mode, and the third contained the story with visual/verbal concurrent presentation). To avoid possible ordering effects, story order was then randomized for each list.

Procedure

Children were seen individually in a quiet room. To determine eligibility for inclusion in the study, two standardized tests were administered. The Clinical Evaluation of Language Fundamentals–Preschool (CELF-P; Wiig, Secord, & Semel, 1992) was administered to assess language ability, and the nonverbal subtests of the Kaufman Assessment Battery for Children (KABC; Kaufman & Kaufman, 1983) were administered to assess cognitive ability. Children in both groups received a performance composite score of at least 85 on the nonverbal subtests of KABC. Children in the CA group received a standard score of at least 90 on the comprehension subtests of the CELF-P. Children in the LI group scored more than 1 SD below the mean (below 85) on the comprehension subtests of the CELF-P. In addition, children in the LI group had been previously diagnosed by speech-language pathologists and were receiving language intervention services in their school districts. Mean scores for the two groups are presented in Table 1.

Children were then asked to perform three experimental tasks: production of emotions depicted by facial expressions, comprehension of emotion terms, and inferencing.

In the production task, the four facial expressions were presented to each child one at a time (in random order). After presenting each picture, the examiner asked, “How does this child feel?” Responses were transcribed and audio recorded. The production task was

Table 1. Language and cognitive standardized test scores.

<table>
<thead>
<tr>
<th></th>
<th>LI group</th>
<th>CA group</th>
</tr>
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<tbody>
<tr>
<td>CELF-P (Receptive)</td>
<td>81.5</td>
<td>103.4</td>
</tr>
<tr>
<td>(6.9)</td>
<td>(8.0)</td>
<td></td>
</tr>
<tr>
<td>KABC (Nonverbal)</td>
<td>98.1</td>
<td>113.1</td>
</tr>
<tr>
<td>(10.4)</td>
<td>(10.1)</td>
<td></td>
</tr>
</tbody>
</table>

Note. LI group = children with language impairment; CA = age-matched controls; CELF-P = Clinical Evaluation of Language Fundamentals–Preschool; KABC = Kaufman Assessment Battery for Children.
always administered first to determine the labels children associated with the different expressions.

The purpose of the comprehension tasks was to determine understanding of the emotion labels used during the inferencing task (story). Children were shown the same four drawings of the facial expressions used in the production task, and asked, “point to happy (sad, etc.).” After each trial, the drawings were removed and shuffled in order to prevent a response set.

In the inferencing task, the examiner sat next to the child in order to minimize unintentional facial cues. The examiner verbally stated the following instructions: “We are going to listen and look at some stories about my friend Twinky. Things happen to Twinky that make him (or her) mad, happy, sad or surprised. Listen and watch carefully, because for each story, I want you to show or tell me how Twinky feels. Put the right face on Twinky to finish the story. Let’s try one.” Children were then given one practice story (concurrently presented) to familiarize them with the task. All children completed the practice story without difficulty.

**Data Collection**

For all experimental tasks, responses to each trial were audio recorded, and a dichotomous correct/incorrect score was given. When a child selected a visual picture (without a verbal label), the examiner provided a label (e.g., “you chose happy”) for purposes of obtaining interrater agreement. To determine interrater agreement, one response from each child was randomly selected from the audiotapes for independent coding by a naïve judge. Point by point agreement was 100%.

**Results**

**Production of Emotions**

In the first experimental task, children were shown pictures of the emotional expressions (one at a time) and asked to verbally label the expression. Children in both groups (LI, CA) were able to spontaneously label happy, sad, and mad with 100% accuracy.

Children’s initial responses to the surprised expression were slightly more varied. Within the CA group, 10 of 12 children spontaneously labeled surprised (of the remaining 2, 1 child initially labeled this expression as “really happy” and 1 as “excited”). Within the LI group, 8 of 12 children spontaneously reported surprised. Of the 4 who provided different labels, 2 stated “happy”, 1 “oh my!” and 1 as “open.” In these cases, the child’s initial response was acknowledged but the child was then told “today we will call this surprised.” The production task was then repeated, and all children used the label “surprised” on the second trial.

**Comprehension of Emotions**

The second experimental task was a picture pointing task to verify comprehension of all four emotions. Children in both groups (LI, CA) pointed to the correct facial expression upon request with 100% accuracy.

**Inferencing Task**

Because there were no significant list effects, F(2, 23) = 0.19, p = .83, data for the inferencing tasks were combined across lists for analyses. Additionally, results from the Mauchly (1940) test revealed that the homogeneity of variance assumption had not been violated, χ²(2, N = 24) = 1.840, p = .3985. An alpha level of .05 was used for all statistical tests. The size of effect for all significant results was measured using the standardized mean difference, d (Cohen, 1988).

Means and standard deviations of performance on the inferencing tasks are presented in Table 2. Children’s scores on the inferencing task were analyzed with a 2 (Group) × 3 (Modality) × 4 (Emotion) analysis of variance (ANOVA) with repeated measures for the last two factors. The analysis revealed three significant main effects. First, as predicted, children with LI were not as proficient at inferring emotional reactions, compared to their CA matched peers, F(1, 22) = 26.17, p < .0001, d = .88 (large effect). Second, there was a main effect due to modality, F(2, 44) = 7.10, p = .0021. Post hoc comparisons using Tukey’s HSD procedure showed that the visual/verbal concurrent presentation resulted in more correct inferences than the visual only presentation, Tukey a, p < .05, d = .36 (modest effect) in both groups, with no statistically significant difference between auditory only and visual only presentations. There was no statistically significant interaction between group and modality, F(2, 44) = 0.14, p = .24. Children with LI had more difficulty than their CA matched peers, regardless of modality of presentation.

The third main effect was type of emotion to be inferred, F(3, 66) = 13.65, p < .0001. Tukey HSD post hoc analyses revealed statistically significant differences between happy and sad, Tukey a, p < .05, d = 1.03 (large effect), as well as differences between happy and surprised, Tukey a, p < .05, d = 1.06 (large effect). There was no statistically significant interaction between modality and emotion, F(6, 132) = 1.27, p = .27, and no three-way interaction, F(6, 132) = 1.43, p = .21. Thus, children in the LI group had more difficulty making appropriate inferences, regardless of emotion or mode of presentation.

**Error Analysis**

When children did make an error (i.e., chose an emotion different from the one anticipated), we noted the
specific emotion selected. Were errors typically of the same valence (e.g., happy/surprised, mad/sad) or different valence (e.g., happy/mad)? Errors that were of a different valence were analyzed with a 2 (Group) × 4 (Emotion) ANOVA with repeated measures for emotion. Children with LI were more likely to infer emotions of a different valence, compared to their CA matched peers, \( F(1, 22) = 37.08, p < .0001, \ d = 1.5 \) (large effect). There was no significant main effect due to emotion, \( F(3, 66) = 1.62, \ p = .19 \), and no significant interaction, \( F(3, 66) = 0.42, \ p = .74 \). Table 3 provides an analysis of the errors by valence, demonstrating that 53% of the LI group’s errors were of the wrong valence, compared to only 19% in the CA group. Three children in the typical group produced no errors of valence, with the remaining 9 producing between 1 and 5 confusions of valence. In contrast, every child in the LI group produced valence errors, with 3 children producing between 2 and 5 errors, 3 producing between 6 and 10 errors, and 6 producing 11–15 errors. The confusion matrix presented in Figure 1 provides information about which specific emotions were chosen for each targeted emotion.

### Factors Influencing Inferencing Ability

As anticipated, the two groups (LI, CA) differed significantly on language ability as assessed by the comprehension subtests of the CELF-P (\( M = 81 \) for LI; \( M = 104 \) for CA), \( t(22) = 8.47, p < .0001 \). Although all participants achieved a score within normal limits (>85) on the measure of nonverbal intelligence as measured by the nonverbal subtests of the KABC, there were significant differences between the two groups (\( M = 98 \) for LI; \( M = 113 \) for CA), \( t(22) = 3.58, p = .0017 \). In addition, there was a moderate correlation of KABC and language scores (\( r = .70 \)).

In order to investigate the extent to which language and/or nonverbal cognition influenced performance on the visual (nonverbal) condition of the inferencing tasks, regression analyses were performed. The effect of KABC score on visual condition performance and the effect of language score on visual condition performance initially were tested separately. Both KABC score, \( F(1, 22) = 5.83, p = .0245 \), and language score, \( F(1, 22) = 18.54, p = .0003 \), were found to significantly influence inferencing in the visual condition. KABC score accounted for 21% of the
variance ($R^2 = .21$) in visual condition performance, and language score accounted for 46% of the variance ($R^2 = .46$) on this measure. In order to determine if these two independent variables accounted for more of the variance than either variable alone, language and KABC scores were then entered simultaneously. Results of the test of the simultaneous model were significant, $F(2, 21) = 8.87$, $p = .0016$. The model continued to account for approximately 46% of the variance in inferencing ability, $R^2 = .46$, indicating no additional variance accounted for when KABC and language were examined together in contrast with language scores alone. Consistent with this, the regression slope significantly differed from zero for language ability when cognition was held constant, $t(21) = 3.104$, $p = .005$, suggesting that language ability played a major role in children’s ability to make inferences, even when stimuli were only presented visually. The regression slope did not significantly differ from zero for nonverbal intelligence measures when language was held constant, $t(21) = -0.160$, $p = .874$.

### Table 3. Number (and proportion) of errors by emotion and valence.

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Total errors</th>
<th>Errors of same valence</th>
<th>Errors of different valence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CA group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Happy</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Surprised</td>
<td>42</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>Mad</td>
<td>44</td>
<td>41</td>
<td>3</td>
</tr>
<tr>
<td>Sad</td>
<td>15</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td>88</td>
<td>21</td>
</tr>
<tr>
<td><strong>LI group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Happy</td>
<td>36</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Surprised</td>
<td>79</td>
<td>42</td>
<td>37</td>
</tr>
<tr>
<td>Mad</td>
<td>63</td>
<td>37</td>
<td>26</td>
</tr>
<tr>
<td>Sad</td>
<td>58</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>236</td>
<td>111</td>
<td>125</td>
</tr>
</tbody>
</table>

Note. CA group = age-matched controls; LI group = children with language impairment. Denominator for proportions is total number of errors per group.

### Discussion

The current study suggests that children with LI do differ from their typically developing peers in processing social information. Children in both groups (LI and CA) demonstrated the ability to identify (through comprehension and production tasks) the four emotions depicted in line-drawn facial expressions. However, children with LI were less proficient at integrating this emotion knowledge with event context, in order to make an accurate social inference regarding a character’s feelings. When inferencing errors were made, children in the LI group were likely to provide emotions of a different valence (e.g., substituting happy for mad), whereas children in the CA group tended to provide emotions of a similar valence (e.g., substituting mad for sad).

The finding that all children were able to identify and produce the lexical labels for the facial expressions is not necessarily inconsistent with prior research, if one considers methodological differences. Children in the Dimitrovsky et al. (1998), Holder and Kirkpatrick (1991), and Trauner et al. (1993) studies all easily identified happiness. Although children in those studies did not identify sadness, anger (madness), or surprise as successfully as our children did, we attribute this to the use of four line drawings rather than to the more complicated multiple photographic examples of adult facial expressions. Limited information was provided in the prior studies, but it is unlikely that language differences accounted for better performance of children in the
present study, as children in the prior studies were all several years older.

During the initial steps of social information processing proposed by Crick and Dodge (1994), individuals must encode and interpret social cues (based on world knowledge) in order to make an inference. Findings from the current study offer some insight into possible sources of difficulty children with LI experienced. The 5-year-old children in this study possessed the skills necessary to recognize four facial expressions and to semantically map those emotions (Crick & Dodge’s step one). The difficulty arose during information processing (Crick & Dodge’s step two), when this facial expression/emotion knowledge needed to be integrated with current context in order to arrive at an appropriate inference. Children with LI had significantly more difficulty than their CA peers in choosing the appropriate emotional expression, suggesting difficulty with information processing (Crick & Dodge’s step two).

Children in both groups made significantly more correct inferences in the happy condition than in the mad or surprised conditions. The ease of inferring happiness is consistent across several studies (e.g., Denham, 1986; Field & Walden, 1982), as is the greater difficulty with mad and surprised (Denham & Couchoud, 1990). Denham and Couchoud cited research demonstrating that adults show happy expressions most often, and they suggested that the emotions adults talk about most frequently may be learned at earlier ages. In addition, Denham (1986) indicated that facial expressions of happiness are likely to result in reciprocal positive reactions (one is likely to react to a smile with a smile).

When we examined the valence of errors children made, we found striking differences between the LI and CA groups. The children in the LI group made significantly more errors that confused positive and negative emotions than did children in the CA group. During a social interaction, the consequence of predicting that a person may be sad instead of mad (inference of same valence) may or may not have a negative impact on the interaction. In fact, these slight inference confusions may occur frequently in day to day interactions, because the person experiencing the event may actually feel more than one emotion (e.g., losing a pet may cause someone to feel sad and mad concurrently). However, the consequences of misreading the loss of a pet as making someone feel happy could have devastating social consequences. In other words, failure to correctly complete Crick and Dodge’s step two will result in errors in step three (choosing an appropriate response to the situation). Further explorations of polarity confusions in emotional interpretation may provide greater insight into the social difficulties experienced by children with LI (e.g., Gertner et al., 1994; Horowitz, 1981; Rice et al., 1991).

Another question addressed in this study was whether the modality of presentation would affect inferencing ability in children with LI. Across groups, children performed more accurately during concurrent presentation of the material than when presented with pictures only (visual condition). Both conditions utilized the same pictures, with the concurrent condition also providing verbally encoded redundant information. Although the concurrent condition did not significantly differ from the auditory-only condition, the addition of language to the visually presented material (concurrent condition) did improve children’s ability to make an emotional inference.

Further evidence of the role of language in these emotional inferences is provided by the results of the regression analyses. Children in the LI and CA groups differed on performance on the KABC. However, when we looked specifically at performance on the pictorially presented stimuli (visual condition), we found that inferencing ability was related to language ability when cognitive abilities were held constant, suggesting that children in both groups were verbally mediating visually presented material. We often observed children (in both groups) performing verbal mediation as they told themselves the experimental story aloud during the visual condition. The moderate correlation between KABC score and language score, coupled with the fact that addition of KABC score to language score did not increase the amount of explained variance, suggests that the nonverbal tasks on the KABC may also be verbally mediated. This is consistent with evidence of language-based encoding of visually presented stimuli on memory tasks, for example (Gillam, Cowan, & Marler, 1998; Penney, 1989). Determining the influence of language versus other cognitive abilities on targeted tasks continues to present challenges to researchers and clinicians.

In a typical social interaction, the number, type, and modality of cues to be identified (step one) and integrated (step two) will vary from situation to situation. Children with LI were able to identify facial expressions (step one in the social processing model) but had difficulty inferring the appropriate emotion and choosing the corresponding facial expression when given an event context. The speaker’s personal history, current motives, and varying facial expressions throughout the exchange are examples of information that may need to be identified and integrated concurrently in order to make an appropriate inference. We recognize that these types of information were not considered in the design of the current study. Future studies may consider these possible sources of information in more contextually rich situations to determine if, with additional cues, children with LI can accurately and efficiently identify and integrate those cues that are appropriate (based on their world knowledge). Measures that are more reflective of
moment-to-moment processing (e.g., response time measures) may also help to validate the existence of stages of processing.

Given that the ability to anticipate and respond to a partner’s emotional reactions are integral components in the comprehension of social discourse, our study offers some insight into the possible sources of difficulty children with LI may experience. The current study also suggests that at least some social inferencing difficulties are language based, indicating that it is appropriate for clinicians to address social inferencing in their assessment and therapy of young children. Concurrent presentation (verbal and visual) of information should assist comprehension in social situations. The findings further suggest that it may be necessary to extend treatment beyond the identification of facial expressions to include use of those facial expressions in making inferences about a speaker’s or character’s emotional state. Clearly the current study has demonstrated the value of further clinical and experimental exploration of this critical component of social processing in children with LI.

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References


