Recognition of Facial Expressions of Six Emotions by Children with Specific Language Impairment

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RECOGNITION OF FACIAL EXPRESSIONS OF SIX EMOTIONS BY CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT

By

Kristen D. Atwood

A thesis submitted to the faculty of Brigham Young University in partial fulfillment of the requirements for the degree of Master of Science

Department of Communication Disorders
Brigham Young University
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BRIGHAM YOUNG UNIVERSITY

GRADUATE COMMITTEE APPROVAL

of a thesis submitted by

Kristen Atwood

This thesis has been read by each member of the following graduate committee and by majority vote has been found to be satisfactory.

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As chair of the candidate’s graduate committee, I have read the thesis of Kristen Atwood in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill the university and department style requirements; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

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Over the past several years, research has shown that children with language impairment often have increased social difficulties. The purpose of this study was to take a closer look at the relationship between language ability and emotion understanding by examining the recognition of facial expressions in children with specific language impairment (SLI) and their typically developing peers. As such, this study is a follow-up investigation of the work done by Spackman, Fujiki, Brinton, Nelson, & Allen (2006). Children with SLI and their age- and gender-matched peers were asked to identify the following six facial expressions of emotion in a language-minimal manner: happiness, anger, fear, surprise, sadness, and disgust. Group performance was then compared for each of the emotions examined.

This study found significant differences between the groups (SLI vs. typical), with
the children without language impairment performing better than those with SLI. There was also a significant difference found for emotion, indicating that some emotions were identified more correctly than others. No significant effects were found for gender, nor were any interaction effects between variables found.
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I would like to express deep gratitude to my family. Their constant support and encouragement have helped me to complete this project. I am grateful to my parents for teaching me the value of a good education. I am grateful to my sister, Keri, for her enthusiasm and support in the final stages of this project. I am most grateful to my husband, Jeff, and daughter, Emily, who have helped me keep going with this project. Jeff’s encouragement, patience, sense of humor, and eternal perspective have been invaluable to me. I am sincerely grateful to my dear family for their love and support throughout the past few years.
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Introduction

Over the past ten years, research has found that children with specific language impairment (SLI) often have more social problems than their typically developing peers. These social problems can be far reaching and have serious consequences for children with SLI. For instance, these children have been found to be more socially withdrawn (Brinton & Fujiki, 1999; Fujiki, Brinton, Morgan, & Hart, 1999; Redmond & Rice, 1998), have limited social interactions (Brinton, Fujiki, Spencer, & Robinson, 1997), and have poorer quality interactions (Craig, 1993) than typically developing children. Children with SLI have also been found to interact with fewer peers in social activities (i.e., eating lunch, board games, sports), and report being less satisfied with their social interactions than their age-matched peers (Fujiki, Brinton, & Todd, 1996). Also, these children have been reported to be less likely to be chosen as playmates (Gertner, Rice, & Hadley, 1994) and are more likely to be rated by teachers as having behavior problems (Fujiki et al., 1996). In addition, where typically developing children use explanation, persuasion, and questioning in conflict resolution, children with SLI have been found to use less verbal persuasion, fewer requests, more threats, and more physical actions to resolve conflicts (Craig, 1993; Stevens & Bliss, 1995).

Social interactions are greatly influenced by language ability. In order to have successful social interactions, one must be able to communicate effectively. It seems logical then, that communication impairments such as SLI would lead to social problems. However, recent research has questioned whether the social problems of children with SLI are entirely the result of poor language skills or whether the problems are indicative
of the influence of other deficits, such as problems in social cognition (Craig, 1993; Gertner et al., 1994).

It may be expected that if social problems were a direct result of language impairment, all children with language impairment would experience social difficulty. However, studies have shown varying results regarding social difficulty in the population with SLI. For instance, Fujiki, Brinton, Morgan et al. (1999) found that not all children with SLI have problematic social interactions. Although 80% of children with SLI in this study were rated as having social and behavioral problems, 20% of these children had similar ratings to their typically developing peers. This study also explored the extent to which the severity of social difficulty was affected by the severity of language impairment. If social problems are the result of language impairment, we would expect that the correlation between the degree of language impairment and the degree of social problems would be high. However, the authors found that the relationship between the two was not consistent; those with more severe language impairment did not necessarily have greater social difficulty.

Fujiki, Brinton, Hart, and Fitzgerald (1999) also studied peer acceptance in the classroom. In this study, children in the same classroom as a child with SLI were asked to rank their peers into the following three groups: children they liked to play with “a lot,” children they “kinda” liked to play with, and children they “didn’t like” to play with. As expected, most of the children with SLI were placed in the “don’t like to play with” group. However, one child with SLI was very popular in the classroom. The variability found in these two studies suggests that language ability may not be the only factor contributing to the social difficulty faced by children with SLI.
As suggested by Spackman et al. (2006), one factor that could influence the social problems of children with SLI is emotional competence. Saarni (1990) states that emotional competence involves being successful in “emotion eliciting social transactions” (p. 116), and indicates that this competence is essential in forming relationships and interacting with others.

Emotion understanding, or the ability to appropriately interpret the emotions of others, is an important aspect of emotional competence. The purpose of this study was to take a closer look at the relationship between language ability and emotion understanding by examining a specific aspect of emotion understanding, the recognition of facial expressions, in children with SLI and their typically developing peers. As such, this study is a follow-up investigation of the work done by Spackman et al. (2006). Children with SLI and their age- and gender-matched peers were asked to identify the following six facial expressions of emotion in a language-minimal manner: happiness, anger, fear, surprise, sadness, and disgust. Group performance was then compared for each of the emotions examined.
Review of Literature

Emotional Competence

Emotional competence has been defined by Saarni (1990) as the “demonstration of self-efficacy in the context of emotion-eliciting social transactions” (p.116). More specifically, this definition embodies the idea that people “respond emotionally, yet simultaneously and strategically apply their knowledge about emotions and their expression to relationships with others so that they can negotiate interpersonal exchanges and regulate their emotional experiences” (p. 116). Saarni outlines the following 11 components and skills of emotional competence:

1. Awareness of one’s emotional state.
2. Ability to discern others’ emotions.
3. Ability to use the vocabulary of emotion and expression.
4. Capacity for empathic involvement in others’ emotional experiences.
5. Ability to realize that inner emotional state need not correspond to outer expression.
6. Awareness of cultural display rules.
7. Ability to take into account unique personal information about individuals and apply it when inferring their emotional state.
8. Ability to understand that one’s emotional-expressive behavior may affect another.
9. Capacity for coping adaptively with aversive or distressing emotions by using self-regulatory strategies.
10. Awareness that the structure or nature of relationships is in part defined
by both the emotional immediacy or genuineness of expressive display.


Indeed, emotional competence is complex. However, it can be broken down into the following three general components: the experiencing of emotion, the expressing of emotion, and the understanding of emotion. Denham et al. (1998) presented these three interdependent areas, and further proposed that emotion understanding is at the heart of emotional competence. The purpose of this study is to focus on a specific and basic aspect of emotion understanding, the ability to interpret the emotion expressed on a face.

*Emotion Understanding*

As stated above, in order to be emotionally competent, one must be able to understand emotions. According to Denham (1998), emotion understanding is knowledge of the causes and consequences of emotions. This understanding has many important implications. For instance, research has found that emotion understanding aids in self-control, as well as in the development of a child’s theory of mind (Dunn & Cutting, 1999; Saarni & Harris, 1989). The understanding of emotion allows children to tie situations, subjective emotional states, and expressive signals together into coherent emotional experiences (Denham, 1998).

The understanding of emotion involves the following aspects described by Denham (1998):

1. Labeling emotional expressions.
2. Identifying emotion-eliciting situations.
3. Inferring the causes and consequences of emotion-eliciting situations.
4. Using emotion language to describe their own emotional experiences and
clarify those of others.

5. Recognizing that their own emotional experiences can differ from others’ emotional experiences.

6. Awareness of emotion regulation strategies.


8. Knowledge that more than one emotion can be felt at the same time, even if they conflict.

9. Understanding of complex social and self-conscious emotions such as guilt.

This study focuses on the first of Denham’s nine areas, the labeling of expressions of emotion. In order to label expressions of emotion, one must recognize that an emotional signal is being sent and accurately interpret that message. Saarni and Harris (1989) suggest that a human’s first recognitions of emotion are based on facial expressions. Thus, recognizing facial expressions of emotion provides a foundation on which to build greater understanding of emotions (Denham, 1998).

Gnepp (1989) noted that children face a complex developmental task in learning to understand emotions. The ability to gather information about another’s emotional state requires knowledge about a person’s background, personality, and situation. One must also be sophisticated enough to realize when more information is needed, how to integrate multiple sources of information, and how to differentiate between relevant and irrelevant messages (Gnepp, 1989). The remainder of this section will provide a brief description of the development of emotion understanding, and will discuss certain relationships that are influential in this development.
From about the 3-5 years of age, children are able to recognize both live facial expressions (Felleman, Barden, Carlson, Rosenberg, & Masters, 1993) and facial expressions presented pictorially (Camras & Allison, 1985; Field & Walden, 1982). Also at this age, children are able to infer basic emotions from situations that are simple and familiar (Gnepp, 1989).

The understanding of emotion develops further as children begin school. Between the ages of 5-8, children begin to have a greater awareness of how personal information, such as age or gender, affects emotion. They are also able to understand that different people can feel different ways in unclear emotional situations. However, they have difficulty comprehending that one person might feel either of two ways about an unclear situation. Additionally at this age, children are able to make assumptions about another persons’ judgment of an emotional situation based on that persons’ past reactions, but they have difficulty using that knowledge to predict emotional reactions to later events (Gnepp, 1989).

From the ages of 8-12 years, a child’s understanding of complex emotions and situations increases. When facial and situational cues differ, children are now more reliant on situational cues, and are better able to reconcile the conflicting signals. These children also continue to develop their understanding of how and why an individual may feel a certain way, and why a person may feel more than one emotion at the same time. (Gnepp, 1989).

Children’s understanding of emotion is developed and enhanced as they interact with their family members and in their peer groups. These social interactions and negotiations help them to establish understanding that will be transformed into the
knowledge and skills that will allow them to participate effectively as adults.

A child’s earliest experiences with emotion most often occur in the family setting. Consequently, the family plays an influential role in the development of emotion understanding. For example, it has been found that the quality of interactions between parents and children influences the development of emotion understanding. Children who possess secure attachments to their parents show greater understanding of emotion than those children who do not possess secure attachments (Laible & Thompson, 1998).

Denham, Zoller, and Couchoud (1994) examined family relationships and discourse about emotions. It was found that maternal emotion discourse is especially salient in a child’s development of emotion understanding. Mothers who explain their emotions have children who are more proficient in understanding emotion. Furthermore, children who are exposed to negative maternal emotions, such as anger, appear to be at a disadvantage in understanding emotion.

Peers also have a great influence on children’s emotional development. As children interact with their peers, they create peer cultures in which they carry out the complex processes of making friends, gaining access to play groups, and maintaining joint action (Cosaro & Eder, 1990). Because of the intimate nature of friendship, emotional competence is attained as peers share their emotions with one another (Denham et al., 1994). Additionally, peers often share roles and face the same transitions and life events, so they are in a better position to understand one another’s emotional lives more than parents or other age groups.

Recent research supports the concept that peer interactions are essential in developing emotional competence. For example, Dunn and Cutting (1999) found that
four-year-olds who show understanding of emotions had more positive interaction with their friends, including cooperative shared pretend play, low frequency of conflict, and successful communication. Another recent study found that friends who engage in conversation about emotion with each other also have more cooperative interactions (Brown, Donelan-McCall, & Dunn, 1996). On the other hand, children who miss important emotional messages or misinterpret them are at a disadvantage in social situations. This leads to disrupted social interactions, negative social relationships, and possibly inappropriate behavior (Holder & Kirkpatrick, 1991).

**Recognition of Facial Expression**

As noted above, the ability to recognize facial expressions is a basic aspect of emotion understanding. Two theories have been proposed regarding the nature of the recognition of facial expressions. One theory, supported by Universalists, proposes that facial expressions are innate and universal. Specifically, Universalists believe that the same muscular movements are associated with the same emotion in all people (Ekman, 1972, 1994; Izard, 1994). Relativists, on the other hand, support the theory that facial expressions are linked to language, are learned, and are specific to culture (Russell, 1994). Ekman (1973) and Izard (1994) support the Universalist position and propose that there are a primary set of emotions that can be easily conveyed facially. However, conflicting findings have led researchers to question which emotions are primary. Turner (2000) reviewed several different studies from many disciplines and found that for the emotions *happiness, sadness, fear,* and *anger,* there was almost complete consensus that these are primary emotions. Furthermore, Turner notes that in most studies reviewed, *surprise* and *disgust* were also viewed as primary emotions.
In a discussion of the universal nature of the recognition of emotion, Harris and Saarni (1989) suggest that a child’s early recognition of emotion may be based on facial expressions. In fact, recent research documents that infants are able to both produce and recognize emotional expressions (Campos, Barrett, Lamb, Goldsmith, & Stenberg, 1983; Izard & Malatesta, 1987, Nelson, 1987). Some researchers suggest that these earliest recognitions may begin with infants recognizing the difference between positive and negative affective tones (Camras & Allison, 1985). It is important to note that although the recognition of facial expression develops at an early age, the meaning and significance of these facial expressions develops as the infant grows (Harris & Saarni, 1989).

Camras and Allison (1985) examined young children’s abilities to recognize facial expressions of emotion. They found that children from preschool to second grade were accurate in the recognition of happiness, surprise, anger, sadness, fear, and disgust in adults. They also found differences between the emotions. For instance, happiness and sadness were recognized more easily than the other emotions; anger was easier to discern than scared; and disgust was the most difficult of the emotions to recognize. In addition, Felleman et al. (1983) found that children have a more difficult time discerning between anger and sadness than the other primary emotions. Despite the difference between the emotions, the overall accuracy of identification observed in these studies was high.

**Emotion Understanding (Recognition of Facial Expressions) in Populations with Impairments**

The understanding of emotion plays an important role in the development and maintenance of social relationships. By accurately interpreting another’s emotions, one
can obtain valuable information about social situations. Facial expressions offer
important clues to the meaning of social conversations, and those who are able to
accurately interpret facial expressions benefit from the information given (Denham,
1998). For instance, children who are able to accurately discriminate facial expressions
have been found to be more affectively positive, more extroverted, and more popular
(Field and Walden, 1982). The accurate interpretation of emotion is also an indicator of
overall social competence (Gnepp, 1989).

Although the relationship between emotion understanding and social functioning
is well established, and the correlation between social competence and language ability is
clear, there is little research examining the relationship between language ability and
emotion understanding. However, the understanding of emotion, specifically facial
expression recognition, has been studied in populations who have communication
deficits, such as children with autism, mental retardation, and learning disabilities. The
following sections will review the research regarding children with these disabilities and
their ability to recognize facial expressions of emotion.

**Learning Disabilities (LD).** Holder and Kirkpatrick (1991) examined the ability of
48 children with LD to identify facial expressions of fear, sadness, surprise, anger,
happiness, and disgust. Children with LD were characterized as having “average to above
average range of intellectual functioning, lower levels than those commensurate with age
and ability level, and a discrepancy between intellectual ability and achievement level”
(p. 171). These children were matched with a control group of 48 children without LD.
All of the participants were given an interpretive task involving a modified version of
Ekman and Friesen’s Pictures of Facial Affect. The authors found significant differences
between the children with LD and their typical peers. Overall, children with LD were less accurate in interpreting the facial expressions of emotion than children without LD. The children with LD had the most difficulty in the interpretation of the later developing emotions of *surprise* and *disgust*. An additional finding was that as a whole, both groups of children were most proficient in labeling *happiness*, followed by *anger*, *surprise*, and *sadness*. The total sample was least accurate in labeling *fear* and *disgust*.

In a similar study, Dimitrovsky, Spector, Levy-Shiff, and Vakil (1998) examined the ability of 76 children with LD to identify the same six facial expressions of emotion (*happiness, sadness, anger, surprise, fear* and *disgust*). In this study, however, children with LD were divided into the following three subgroups: those with nonverbal deficits, those with verbal deficits, and those with both nonverbal and verbal deficits. These children, as well as 48 non-disabled children, were given a shortened version of Ekman and Freisen’s Pictures of Facial Affect. It was found that the disabled group interpreted the facial expressions less accurately than the non-disabled group, and the children with verbal deficits were more accurate than the nonverbal deficit and verbal deficit groups. The authors concluded that children with LD, and particularly children with nonverbal LD, may be at risk for social problems because of these difficulties.

In support of the previous studies regarding children with LD and social skill deficits is work done by Petti, Voelker, Shore, and Sayman-Abello (2003). This study examined 33 children, 22 with LD and 11 without LD. The children with LD were divided into two groups, those with verbal LD and those with nonverbal LD. To examine the social perception abilities of the children in this study, the Diagnostic Analysis of Nonverbal Accuracy was used. This test was developed to measure children’s ability to
send and interpret nonverbal cues for the emotions happy, sad, angry, and fearful. Of relevance to this study was the subtest that measured ability to recognize facial expressions of these emotions. This subtest consisted of 48 slides of faces, half posed by adult models and half posed by child models, with male and female models equally represented. For this subtest, a significant effect was found for group, meaning, the children with nonverbal LD were significantly less accurate in identifying the facial expressions of emotion posed by the adult models than were the children with verbal LD or the control group. The information obtained from this study is further evidence that children with LD, particularly those with nonverbal LD, have social perception deficits.

*Autism Spectrum Disorder (ASD).* Another population whose ability to interpret facial expressions of emotion is impaired are those with Autism Spectrum Disorders (ASD). It is generally recognized that a central feature of ASD is a lack of shared social and communication skills (Downs & Smith, 2004). As Downs and Smith note, children with ASD communicate primarily to indicate needs or to deliver monologues, and rarely respond to the social overtures made by others. The social deficits of children with ASD are also heightened as a result of their lack of empathy and by the fact that they don’t seek opportunities to share enjoyment of activities with others (Downs & Smith, 2004).

Because of these social deficits, researchers have taken interest in the emotion understanding abilities of children with ASD. Numerous authors have examined children with ASD and their abilities to understand emotion. The following studies are only a small sample of the available research in this area.

Ozonoff, Pennington, and Rogers (1990), for example, examined emotion perception in children with autism (mean chronological age [CA] = 6.24 years) and their
mental age-matched peers (mean CA = 4.14 years) using an emotion/identity sort task. For this task, the participants were asked to sort 28 photographs (14 photographs each of two women) according to either the emotion displayed or the identity of the face. The emotional expressions were posed using standard facial expressions identified by Ekman and Friesen (1973) and Izard (1982). The photographs were sorted twice by each child, once for identity and once for emotional expression. These researchers found no significant differences between the children with autism and the typically developing children on the identity sort. However, significant differences were found when the children were asked to sort by the emotion displayed on the face, supporting the authors’ hypothesis of specific emotion perception deficits in children with autism.

Downs and Smith (2004) found similar results when they examined children with autism, and their ability to recognize (by labeling) facial expressions of emotion. In this study, even the children with autism who had completed intensive behavioral training (part of which was specific to emotion perception) performed significantly below the comparison groups. This, again, was evidence that children with autism have a deficit in their ability to recognize facial expressions of emotion.

In a study conducted by Grossman, Klin, Carter, and Volkmar (2002), 13 children with Asperger’s syndrome (AS) and 13 typically developing children were given three tasks to examine the facial perception abilities of those with AS. The stimuli used in this study consisted of photographs from Ekman (1976) of the emotions happiness, sadness, anger, fear, and surprise, and a printed label representing each emotion. The labels and pictures were presented on a computer screen, and the participants were required to respond by touching a keypad on which five keys were each labeled with one emotion.
As soon as the keypad was touched, the next face and/or word was presented on the screen. Also, the participants were given a time limit; if the keypad was not touched within 10 seconds, a new stimulus was given.

The first task involved only responding to the printed labels representing each emotion presented on the computer screen. Participants were told that this task was to practice using the keypad, however, it was also used to obtain baseline data regarding response time, to be sure each subject could read and match the words, and to follow directions appropriately.

The second task involved using the keypad to respond to visual representations of each of the five emotions. Twenty photographs were presented of faces displaying the five emotions, happiness, sadness, anger, fear, and surprise.

The third task paired the photographs with a word on the screen. The subjects saw a total of 30 images, each with a single photograph with a single word. The faces pictured were those of two different women each displaying the 5 different emotions (for a total of 10 faces), and each of the 10 faces appeared three times. The following stimulus combinations were presented: once the face was paired with a matching emotion word (e.g., a happy face with the word happy), once the face was paired with a mismatching emotion word (e.g., a happy face with the word angry), and once the face was paired with an irrelevant word (e.g., a happy face with the word apple). All of the irrelevant words used were names of fruit. Again, for each task, as soon as the keypad was touched a new stimulus was presented, and a 10 second limit was given for each stimulus.

The authors hypothesized that the children with AS would utilize different strategies in recognizing and interpreting facial expressions of emotion when additional
parameters were given with the face. So, they expected that the children with AS would perform as well as the typically developing children in recognizing basic facial expressions, but would have difficulty when other conditions were present, such as a distractor word.

For task 1, no significant differences were found for the percentage of correct words identified. However, a difference was found for response time, with the children with AS responding significantly slower than the control group. Task 2 found that there were no significant differences between the groups at identifying the facial emotions, nor were there significant group differences in response time. There was however, a significant effect for emotion, with both groups performing poorly on fear. Task 3 revealed significant differences for group, emotion, and kind of word. There was also a significant group by word interaction. Follow-up pairwise comparisons found that out of the three types of words, the groups only differed in the mismatch condition. Within the control group alone, there was no effect for word, whereas the AS group had a significant effect for word; they performed as well as the control group when the facial expression was paired with a matching word or irrelevant word, but significantly worse when a mismatched emotion word was present. It was found that 80% of the errors made by those with AS were in favor of the mismatched verbal label (e.g., selecting afraid when a happy face was paired with the word afraid). There were no significant differences on response time for this task.

These findings supported the authors’ hypothesis that the children with AS would be able to identify the simple facial expressions of emotions as correctly as their typical counterparts, but that when other parameters were present, the children with AS would
utilize different processing strategies in interpreting the facial expressions of emotion. Indeed, these findings seem to suggest that when presented with conflicting verbal and nonverbal emotions, children with AS are more inclined to rely on verbal messages (words), whereas typically developing children rely more on the affective (facial expression) message being sent.

Mental Retardation. Social incompetence is inherent in the definition of mental retardation (Adams & Markham, 1992). Because of this, many researchers have examined the social deficits of children with mental retardation, including their ability to recognize facial expressions of emotion. As was the case for individuals with ASD, only a sampling of the available work is reviewed in the following sub-section.

McAlpine, Kendall, and Singh (1991) studied 511 children and adults with mental retardation or borderline intelligence. The participants in this study were shown 4 sets of 6 photographs of the following facial expressions of emotion: happiness, anger, surprise, fear, disgust, and sadness. It was found that the children and adults with borderline to severe mental retardation were less proficient at identifying the expressions than were children in a control group with average intelligence. It was also found that the recognition accuracy increased with IQ among individuals with mental retardation, and increased with age among children of average intelligence. For both the control group and those with mental retardation, happiness was the most accurately identified, and surprise and fear were often confused.

The previous study is supported by work done by Leung and Singh (1998), who studied adults with mental retardation in a non-western population. In this study, 60 Chinese adults (30 with mild retardation, 30 with moderate retardation) were asked to
identify the same six facial expressions of emotion adapted from Matsumoto and Ekman’s (1988) standardized photographs. When compared with 60 children from elementary and junior high schools who were used as controls, the adults with mental retardation performed significantly worse. In addition, the Chinese adults had similar levels of accuracy when compared to their Western counterparts with mental retardation.

Rojahn, Rabold, and Schneider (1995) found similar results in a study that included 16 adults with mental retardation, 16 mental age-matched children, and 16 chronological age-matched adults. In this study, each group was asked to identify black and white photographs of faces that were either happy, sad, or neither happy nor sad. For those answers that were happy or sad, the subjects were asked to rate whether the face was “a little” happy (or sad) or “a lot” happy (or sad). The results of this study found that the adults with mental retardation performed significantly lower than the two control groups on the identification task, while the two control groups were not significantly different from each other. It was also found that the adult control group performed significantly better than both the children and the mentally retarded adults on specifying whether pictures were “a little” happy or “a lot” happy. However, when specifying whether pictures were “a little” sad or “a lot” sad, both control groups performed more accurately than the mentally retarded group and did not differ from one another.

Adams and Markham (1991) reported an additional study indicating that individuals with mental retardation have difficulty interpreting facial expressions of emotion. The participants for this study included 49 children and adolescents with retardation and 61 children and adolescents without retardation. The two groups were matched for either CA or mental age (MA). In this study, all participants were given two tasks of emotion
recognition using the primary expressions identified by Ekman and Friesen (1975); namely, happy, sad, angry, scared, surprise, and disgust. The first task was a recognition task, where verbal descriptions of the emotions were given and the children were asked to point to one of three photographs that represented the emotion. To reduce the dependence of knowledge on specific emotion labels (e.g. happy, scared), situations were described that represented each given emotion. For example, for the emotion happy, the examiner would say “the one who is having fun”, and for the emotion scared, the examiner would say “the one who saw a monster” (p. 23). The second task was also a recognition task, however, verbal descriptions were not given. Rather, children were shown a single photograph and asked to identify someone in another set of three photographs who was “feeling the same” as the person in the single photo. For both tasks, children responded by pointing. The results of this study found that when comparisons were made regarding CA, the participants with mental retardation performed significantly lower on both tasks. When comparisons were made regarding MA, however, this was not consistently the case. The younger children with and without mental retardation, with a mean MA of 6.75, performed no differently from each other on either task. The older children (mean MA = 10) with and without mental retardation, however, did differ from each other on both tasks, with those with mental retardation performing less accurately.

Specific Language Impairment. Based on traditional interpretations, children with SLI are considered to have typical emotional development. There is some limited evidence, however, that these children do experience difficulty with emotion understanding.

In a recent study that addressed the ability of children with SLI to infer emotion,
Ford and Milosky (2002) examined 24 kindergarten children (12 with SLI and 12 normally developing peers). These children were given three experimental tasks involving drawings of the following emotional expressions: happy, sad, mad, and surprised. In the production task, the children were presented the four facial expressions one at a time and asked to label the expression. In the comprehension task, children were shown the four drawings and asked to point to each emotion (i.e., point to surprised). In the inferencing task, children were shown line drawings depicting common situations. For example, one set of pictures might show a child opening a present, and then holding a new teddy bear in the concluding picture. For each story, the first two drawings showed profiles or back views of the character, and the last drawing showed a front view of the character with the face missing. The children were then asked to use one of the four facial expressions used in the previous tasks to complete the last picture in the story. The results of this study found that in the kindergarten children, there were no differences between the children with SLI and their normally developing peers in labeling (verbally or by pointing) the four expressions of emotion. However, the children with SLI did have difficulty inferring emotions in the third task. In this task, the children with SLI were more likely to infer emotions of a different valence than the picture presented (e.g., choosing the emotion “mad” when shown a picture of opening a present). The authors concluded that the ability to infer emotional responses appears to be a language skill, and that language ability accounted for the variability within the scores (Ford & Milosky, 2002).

As previously stated, this study is a follow-up investigation of work done by Spackman et al. (2006). The authors examined 43 children with SLI and 43 of their
typically developing peers. Children in this study were selected from two age groups, 5 to 8 years and 9 to 12 years old. The participants of this study were given a modified version of Matsumoto and Ekman’s (1988) collection of standardized photographs containing the following facial expressions of emotion: happiness, sadness, anger, fear, disgust, and surprise. The children were asked to nonverbally identify each presented photograph by pointing to cards that pictorially represented each emotion. The authors found significant differences between children with SLI and typically developing children in identifying disgust and surprise. Additionally, children with language impairment were found to give more fear, anger, and I don’t know responses and fewer disgust and surprise responses than the children with typically developing language. The results of the Spackman et al. (2006) preliminary investigation suggest that children with SLI have difficulty interpreting facial expressions of emotion, which may be indicative of deficits in emotion understanding.

Summary

Emotion understanding is an important element in social functioning. A specific aspect of this behavior, the recognition of facial expressions of emotion, has great influence on the success of social interactions. The current study replicated the Spackman et al. (2006) work to provide additional information regarding the relationship between emotion understanding, social competence, and children with SLI.
Method

Participants

Study participants included 38 children, 18 males and 20 females. The participants were selected from the 1st through 5th grades, and their ages ranged from 7 to 10 years of age. The sample consisted of 19 children with SLI, 10 females and 9 males (mean age = 8 years, 10 months, SD = 12.13 months). With respect to ethnicity, the group with SLI consisted of the following distribution: 15 White, 3 Hispanic, and 1 Polynesian. The children with SLI were paired with 19 children with normally developing language, 10 females and 9 males (mean age = 8 years, 11 months, SD = 12.93 months). With respect to ethnicity, this group was comprised of 17 White children and 2 Hispanic children. Table 1 represents the average socioeconomic status of the neighborhoods surrounding the schools from which participants were selected. This information was obtained using block group data from the 2000 U.S. Census (http://www.census.gov). Prior to beginning the study, the application for protection of human subjects was approved by Brigham Young University. Permission was also obtained from the school districts from which the children were selected. Parent or guardian written permission was also obtained for each child involved in the study.

Children with SLI were identified by certified speech-language pathologists in two school districts. The speech-language pathologists were asked to recommend children with SLI from their caseloads. These children were required to meet the following criteria:

1. Diagnosis of language impairment by certified speech-language pathologist
2. Current enrollment in speech and language services
Table 1

*Social Economic Status Data for Participating Schools*

<table>
<thead>
<tr>
<th>School</th>
<th>Number of SLI participants</th>
<th>% of population below the poverty line(^a)</th>
<th>Median family income(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>2.4</td>
<td>$62,880</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>0.0</td>
<td>$70,417</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>0.0</td>
<td>$72,071</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>3.4</td>
<td>$43,472</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>7.3</td>
<td>$51,773</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>0.0</td>
<td>$66,250</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>9.3</td>
<td>$37,200</td>
</tr>
</tbody>
</table>

Note. http://www.census.gov. \(^a\)Data calculated for the census block in which the school is located.
3. Nonverbal IQ score of 80 or more on standardized intelligence test, in order to rule out mental retardation as a basis for language difficulties

4. No history of emotional or behavioral problems, cognitive deficits, or neurological problems (i.e., autism) requiring special services, as indicated by school records and placement

5. Standard score on standardized language test below 85 (one standard deviation below the mean)

6. Native English speaker

Nonverbal intelligence was measured using the Universal Nonverbal Intelligence Test (UNIT; Bracken & McCallum, 1998). Language ability was assessed using the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1998).

Each participating child with SLI was paired with a typically developing child from the same classroom. Classroom teachers were asked to submit names of children who met the following criteria:

1. Same gender and age (within 6 months) of the child with SLI

2. Not enrolled in any special services (i.e., resource, speech therapy)

3. No diagnosis of emotional, behavioral, cognitive, or neurological deficits

4. Standard score of 85 or above on a standardized language test

5. Standard score of 80 or above on standardized intelligence test

6. Typically developing (as reported by the teacher) in language, behavior, and academics

7. Native English speaker
The typically developing peers were randomly selected based on a chronological of age within 6 months of a child with SLI. Permission slips were sent to the parents of each of these children, and a participant was randomly selected from the children whose parents gave consent for their children to participate. The selected participants were each given the UNIT and CASL to ensure that language and nonverbal intelligence levels were typical for their age; a minimum score of 80 was required for the UNIT, and a minimum score of 85 was required for the CASL.

Assessment Instruments

To assess each child’s recognition of facial expressions, a booklet of 24 pictures was used. The booklet was created from Matsumoto and Ekman’s (1988) standardized photographs of facial expressions of emotion. Each photograph contained either a male or female adult expressing one of the following specific facial expressions of emotion: happiness, sadness, anger, fear, disgust, or surprise. The order of the emotions (and thus the gender of the person in the photographs) was randomized.

Each child responded to the pictures of emotions nonverbally by pointing to cards that represented each of the emotions; however, if a child elected to vocally name the emotion this was also considered as an acceptable response. Each card contained a hand drawn picture representing the emotion as well as the written emotion at the bottom. The card representing happy had a drawing of the sun, mad was represented by lightning, scared was represented by a ghost, sad was represented by a tear, surprised was represented by a firecracker, and disgusted was represented by worms. An additional card represented I don’t know, and contained a drawing of a question mark (See Appendix A).
Procedure

The facial expression recognition task was administered to each child at school. One examiner, a graduate student in speech-language pathology, assessed each child. The facial expression recognition task was given in combination with three other emotion tasks.

At the beginning of the four tasks, the examiner instructed the child in the meaning of each card, and trained them to answer by pointing to one of seven different cards (six emotion cards and an “I don’t know” card). For example, the examiner would say “Look at this card. It means surprised. See the firecracker. It means surprised.” Each card, including I don’t know, was presented in this way.

In order to ensure the child’s understanding of the cards, after the instruction, the examiner presented the cards in random order before the child and had him/her point to the cards requested (i.e., show me surprised). If the child was not able to point to each card correctly, the examiner repeated the training (See Appendix A for exact instructions).

At the beginning of the facial expression recognition task, each child was given the following instructions:

I am going to show you some faces. I want you to tell me how each person feels by pointing to our cards. Remember that: This card means happy. This card means mad. This card means scared. This card means sad. This card means surprised. This card means disgust. This card means “I don’t know.” (See appendix A)

The examiner then presented the 24 pictures one at a time. Before each picture, the examiner would say, “How does this person feel? Point to the card that shows how the
person feels” (See Appendix B). If it was clear that the child understood the task after 5 items, these directions were omitted before the remaining pictures were presented. Each of the child’s responses was recorded on an answer form immediately following the response (See Appendix C for scoring sheet). During the task, the child was asked once for each emotion, “I wonder why he/she feels that way. Can you make up a story to tell me why he feels that way? Can you think about a time when you felt that way?” These questions served as a way to analyze whether or not the child was using correct emotion labels for their perception of the emotion.

Data Analysis

In order to assess the results of this study, several statistical analyses were calculated. First, a three-way analysis of variance (ANOVA) was computed, with gender and group (SLI vs. typical) as between subjects measures, while emotion (fear, sadness, happiness, anger, surprise, and disgust) served as the repeated subjects measure. Each child’s overall facial recognition score served as the dependant variable. All comparisons were made at the .05 alpha level.

Next, confusion matrices were created in order to examine the types of errors made by the subjects. No statistical analyses were computed on the matrices; rather, they were used for descriptive purposes. Finally, the data collected in this study was compared to the normative data presented by Matsumoto and Ekman (1988). A z-test of proportions was computed using these data.
Results

Inferential analysis revealed that there was a significant difference between groups for recognition of emotion, $F(1, 34) = 4.473, p = .04$. Thus, the typical children performed better than the children with SLI (typical mean, 3.29; SLI mean, 2.98).

The analysis also revealed a significant main effect for emotion $F(5, 34) = 15.995, p = .000$. Regardless of group (SLI vs. Typical) or gender, some emotions were recognized more accurately than others. The overall mean for both groups of subjects for *happiness* was 3.944. This was the most accurately recognized of the emotions. *Anger* and *sadness* were next, with overall means of 3.525 and 3.442, respectively. *Surprise* received a mean of 3.136, followed by *disgust* with a mean of 2.397. The lowest overall mean was *fear*, at 2.375. The ANOVA did not reveal a significant main effect for gender or any interaction effects between variables.

*Error Patterns in Responses*

*Females with SLI.* Tables 2 through 5 present the confusion matrices for each subject group. Results of the confusion matrix for females with SLI revealed that *happiness*, *sadness*, and *anger* were the most accurately identified of the six emotions, with few errors. *Fear*, *surprise*, and *disgust* were the least accurately identified. The most common error response given for *fear* was *disgust*. *Surprise* was most often confused with *fear*, and *disgust* was most often confused with *anger*.

*Typical females.* The typical females showed similar error patterns to their counterparts with SLI with one exception. While those with language impairment made
Table 2

*Error Patterns in Responses (Confusion Matrix) for Females with Specific Language Impairment*

<table>
<thead>
<tr>
<th></th>
<th>Happiness</th>
<th>Sadness</th>
<th>Anger</th>
<th>Fear</th>
<th>Disgust</th>
<th>Surprise</th>
<th>“Don’t Know”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td>36</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>35</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td>2</td>
<td>1</td>
<td>28</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Disgust</td>
<td>18</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surprise</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td>27</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Table 3

*Error Patterns in Responses (Confusion Matrix) for Females with Typically Developing Language*

<table>
<thead>
<tr>
<th></th>
<th>Happiness</th>
<th>Sadness</th>
<th>Anger</th>
<th>Fear</th>
<th>Disgust</th>
<th>Surprise</th>
<th>“Don’t Know”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td></td>
<td>35</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td></td>
<td></td>
<td>36</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td></td>
<td></td>
<td></td>
<td>27</td>
<td>5</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Disgust</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>26</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Surprise</td>
<td></td>
<td>4</td>
<td>1</td>
<td>34</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4

Error Patterns in Responses (Confusion Matrix) for Males with Specific Language Impairment

<table>
<thead>
<tr>
<th></th>
<th>Happiness</th>
<th>Sadness</th>
<th>Anger</th>
<th>Fear</th>
<th>Disgust</th>
<th>Surprise</th>
<th>“Don’t Know”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td></td>
<td>29</td>
<td>5</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td></td>
<td>1</td>
<td>34</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Fear</td>
<td></td>
<td>9</td>
<td>3</td>
<td>13</td>
<td>3</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Disgust</td>
<td></td>
<td></td>
<td>17</td>
<td>16</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Surprise</td>
<td></td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>27</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Table 5

*Error Patterns in Responses (Confusion Matrix) for Males with Typically Developing Language*

<table>
<thead>
<tr>
<th></th>
<th>Happiness</th>
<th>Sadness</th>
<th>Anger</th>
<th>Fear</th>
<th>Disgust</th>
<th>Surprise</th>
<th>“Don’t Know”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td></td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td></td>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td>1</td>
<td></td>
<td>22</td>
<td>5</td>
<td></td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Disgust</td>
<td></td>
<td>9</td>
<td></td>
<td>25</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Surprise</td>
<td>2</td>
<td></td>
<td>1</td>
<td>32</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
the most errors for *fear* by answering with *disgust*, those without language impairment made more errors by choosing *surprise* for *fear*.

*Males with SLI.* As with the female subjects, *happiness, sadness,* and *anger* were the most accurately identified emotions for the males with SLI. The error patterns seen in the males with SLI are as follows: *surprise* was commonly substituted for *fear; fear* was commonly substituted for *surprise; anger* was commonly substituted for *disgust.* It is interesting to note that for the males with SLI, more *anger* responses were given for the emotion *disgust* than correct *disgust* answers.

*Typical males.* The typical males responded quite accurately to *happiness, sadness, anger,* and *surprise* with few errors. The error patterns for *fear* and *disgust* were similar to the SLI males; namely, *surprise* was commonly answered for *fear,* and *anger* was commonly answered for *disgust.*

*Assessment of Normative Data*

Figure 1 presents the percentage of emotions accurately identified by the children with SLI, their typically developing peers, and the adults in Matsumoto and Ekman’s study. In order to compare these sets of data, a $z$-test of proportions was calculated. For some emotions, there were significant differences in the scores obtained in this study and the scores presented by Matsumoto and Ekman.

The results of the $z$-test of proportions for *happy* found that there were no statistical differences between the three sets of scores. In the present study, the subjects, both SLI and typical, had a 99% success rate with this emotion. The subjects in Matsumoto and Ekman’s study had a 98% success rate. Similarly, with regard to *anger,* no statistical differences were found. The subjects with SLI in this study had a 90%
Figure 1. Percentage of emotions accurately identified in normative data (adults) and data collected in this study (children).
success rate with this emotion, the typical children had a success rate of 85%, and the
normative data presented a 90% success rate. Also, no significant differences were found
for sad between the children with SLI, their typically developing peers, and the
normative data. While the adults in Matsumoto and Ekman’s studies identified sad with
91% accuracy, the typical children and the children with SLI identified sad with 86 and
85% accuracy, respectively.

The results of the z-test of proportions for fear revealed a significant difference (z
= -3.63, p = < .001) between Matsumoto and Ekman’s data and the data obtained from
the children with SLI in this study. While the adults recognized 73% of the fear
photographs correctly, the children with SLI recognized only 53% accurately. However,
no differences were found between the typical children and the normative data; these
children recognized fear with 66% accuracy. Additionally, the difference between the
scores for the children with SLI and their typically developing peers for the emotion fear
was not significant (p = .134).

A significant difference was found for disgust, with both the typical children (z =
-2.17, p = .030) and the children with SLI (z = -7.12, p = < .001) scoring well below the
established norms. While the children with SLI recognized disgust with 48%, and the
typical children recognized disgust with 71% accuracy, the adults recognized this
emotion with 80% accuracy.

Lastly, the differences between the three groups (normative adults and children in
this study) for the emotion surprise were also statistically different, for both the children
with SLI (z = -7.24, p = < .001) and the typically developing children (z = -2.40, p =
.016). The adults from which the normative data was obtained recognized surprise
correctly 93% of the time, while the children with SLI and the typically developing children recognized this emotion correctly only 71 and 85% of the time, respectively.
Discussion

This study examined the ability of children with SLI and their typically developing peers to identify six facial expressions of emotion, namely, happiness, sadness, anger, fear, surprise, and disgust. Significant differences were observed between the two language groups (SLI vs. Typical) in the recognition of facial expressions of emotion. A significant effect was also found for emotion, with some emotions more accurately identified than others. Some significant differences were also found when comparing the data produced by the participants in this study to established normative data.

Differences Between Language Groups

The children in both groups had relatively high scores for happiness, sadness, and anger. Thus, the scores for these emotions were not significantly different. Additionally, although both groups of children scored somewhat low on the emotion fear (in fact, this was the least accurately identified emotion for those without language impairment), the difference between the two groups was not significant. However, the scores for surprise and disgust were significantly different, with the children without language impairment scoring higher than those with SLI. These findings replicated earlier work by Spackman et al. (2006), and also supported work in the literature that has demonstrated that surprise and disgust are often difficult facial expressions of emotion to identify (Holder and Kirkpatrick, 1991; Camras and Allison, 1985).

Although the definition of SLI is quite specific in excluding those with diagnosed emotional or behavioral problems, recent research has nevertheless shown that children with SLI often have social difficulties. These difficulties, documented by numerous
researchers, are extensive, ranging from being less likely to be chosen as playmates (Gertner et al., 1994), to being more likely to be rated as having behavior problems by teachers (Fujiki et al., 1996), to using more threats and physical actions to resolve conflicts (Craig, 1993). Given the fact that successful social interactions depend upon good communication skills (Craig, 1993) and that children with SLI have a primary deficit in language, these social struggles may be expected.

Recently, however, several researchers (Craig, 1993; Fujiki et al., 2004) have asked whether or not the social difficulty manifested by those with SLI is a result of language impairment alone. Several studies have suggested that children with SLI may have difficulties that extend beyond their linguistic difficulties. In some cases these problems are likely to impact social functioning. For example, Ford and Milosky (2003) found that children with SLI were less able than their peers to infer emotional states based on situational information, which, according to the authors, may contribute to the social difficulty experienced by this population. Additionally, Spackman et al. (2006) found that children with SLI performed significantly worse than typically developing children in interpreting some facial expressions of emotion. Again it was suggested by the authors that this impairment may influence the social problems demonstrated by this group of children.

The fact that the children with SLI in the current study were significantly less able to identify *surprise* and *disgust* than their typical peers provides support for the idea that children with SLI have difficulties with emotion understanding. It is possible that these difficulties make an important contribution to the social problems often observed in children with SLI. It seems likely that an impairment in emotion understanding would
negatively affect social interactions and relationships with others. Social exchanges require an ability to decode a variety of signals, whether they be emotional, physical, or verbal. Additionally, these signals may conflict, requiring one to infer and interpret the message being sent. The crucial abilities needed to decode social exchanges allow a person to understand how another is feeling, and to then respond appropriately. However, if one is not able to accurately understand emotion, they are at a disadvantage in social situations. For instance, if in response to the simple question “How are you doing today?” a peer responds positively but exhibits an angry facial expression, an appropriate reply might be, “What’s wrong?” However, if one is not able to infer that perhaps their friend is not really “fine,” an opportunity is lost to inquire, listen, and respond appropriately, and the social interaction is negatively affected. As stated by Holder and Kirkpatrick (1991), this misunderstanding or misinterpretation of emotional signals may lead to disrupted social interactions, negative social relationships, and possibly inappropriate behavior.

**Differences Between Emotions**

The finding that there was a significant main effect for emotion is not surprising. In this way, these results support past research indicating that some emotions are recognized more readily than others (Camras & Allison, 1985; Felleman et al., 1983; Spackman et al., 2006). In the current study, *happiness* was the most accurately identified emotion, followed by *anger, sadness, surprise, disgust,* and finally *fear.* The finding that both groups performed poorly at recognizing *fear* is surprising, as this emotion is often rated as a more primary emotion, and the percentage correct for Matsumoto and Ekman’s norms was relatively high at 73%. In contrast, the children with SLI in this study
identified fear with 53% accuracy, and the typically developing children identified this emotion with 66% accuracy.

**Comparisons to Normative Data**

With regard to the comparisons between the children with SLI, the typically developing children, and Matsumoto and Ekman’s norms, it is not surprising that no differences were found between the two groups of children and the adults for the emotions happiness and anger. Children in both groups identified these emotions with a high degree of accuracy. It is also not surprising that there were no significant differences found for sadness, as this was also a highly recognized emotion. This is also in accordance with the work done by Spackman et al. (2006); both children with SLI and the typically developing children in their study had similar scores to the normative data for the emotions happiness, sadness, and anger.

The finding that the children with SLI and the children without language impairment both scored significantly lower than the established norms on the emotion disgust suggests that at this age children may not have complete mastery of this emotion. This is also supported by previous research. For example, Camras and Allison (1985) found that disgust is a difficult emotion for typically developing children (preschool to second-grade) to recognize. Additionally, the work done by Spackman et al. (2006) found a significant difference between the children with SLI and the normative data for the emotion disgust, but no difference was found between the children with typically developing language and the normative data. It is interesting to note that in the current study, although both children with SLI and the typically developing children performed significantly below the established adult norms, children with SLI produced a
significantly larger gap than the typical children. Children with SLI were 23% less accurate at recognizing *disgust* than the typical children. Thus, children with language impairment are at a greater disadvantage in recognizing this emotion. Similar results were observed for the emotion *surprise*. Here again, both groups were significantly below the normative data, suggesting again that children of this age may not have a complete mastery of this emotion. This replicated the results found by Spackman et al. (2006), with both children with SLI and the typically developing children performing below the established norms. In the current study, the results for *surprise* also show that the children with SLI were significantly below their typical peers, again indicating that they have additional difficulties.

It is interesting to note that for the emotion *fear*, a significant difference was found between the children with SLI and the established norms, but no significant differences were found between the typically developing children and the normative data. This finding was not observed the work done by Spackman et al. (2006); rather, both children with SLI and their typically developing peers in their study performed as well as the established norms. The discrepancy found in the scores in this study for the emotion *fear* provides additional insight into the difficulties children with SLI have in interpreting facial expressions of emotion. The difference in the scores may be attributed to the condition of SLI, with those with language impairment at a disadvantage when interpreting this emotion. However, it may also be possible that the difference between the scores is also a result of the social difficulties demonstrated by those with language impairment. This is in accordance with the hypothesis suggested by Spackman et al. (2006) that perhaps these difficulties stem from a deficit in emotion understanding.
Conclusions

Researchers studying children with language impairment over the past several years have documented that in many cases, these children have social difficulties. These social difficulties include being socially withdrawn (Brinton & Fujiki, 1999; Fujiki et al., 1999; Redmond & Rice, 1998), having limited social interactions (Brinton et al., 1997), and having poorer quality interactions (Craig, 1993) than children without language impairment. Children with SLI are also less likely to be chosen as playmates (Gertner et al., 1994), more likely to interact with fewer peers in social activities, and more likely to be rated as having behavior problems by teachers (Fujiki et al., 1996).

There are indications, however, that not all of these social difficulties are language based. For example, K. Hart et al. (2004) found that some social problems were linked to the severity of language impairment while others were not. This variability leads one to ask if the social deficits manifested by children with SLI are a result of their language problems, or are influenced by other deficits, perhaps interacting with language impairment. Spackman et al. (2006) suggested that one factor that may influence the social problems of children with SLI is reduced emotional competence. The current study examined the ability of children with SLI to recognize facial expressions of emotion, which is a specific aspect of emotional competence.

The primary finding of this study replicates the work done by Spackman et al. (2006), indicating that children with SLI perform significantly more poorly than their typically developing peers in recognizing some facial expressions of emotion. This difficulty is likely to have important social implications in naturalistic peer interaction,
which requires the on-line processing of a range of social cues, of which facial expression would be only one.

Given that the social deficits for children with SLI are well documented, this study provides insight into a factor that may be influential for many of these deficits. Facial expressions of emotion are one of the fundamental components that normally developing individuals use to understand the emotions of others (Grossman et al., 2002). In this study, it has been documented that children with SLI do not interpret facial expressions of emotion as accurately as their typically developing peers. Individuals who are not able to accurately interpret these basic emotions are at a disadvantage in social situations. Indeed, if the most basic of emotions are not easily understood, it stands to reason that more subtle, complex messages such as humor, gesture, and the ability to interpret conflicting verbal and nonverbal messages would also be impaired for this population. Thus, the consequences of this deficit for social interaction could have serious consequences.

*Suggestions for Future Research*

Given the fact that children with language impairment have been found to manifest diverse social difficulties and that, in the current study, children with SLI exhibited decreased competence on one specific aspect of emotion understanding, it seems imperative that further research be conducted to explore the emotion understanding of children with SLI.

The children in this study were shown still photographs representing emotions. It would be interesting to observe how these children process live expressions of emotions, not only of adults, but of children as well. Additionally, it would be helpful to examine
how children with SLI interpret emotions in realistic contexts, where verbal messages, body language, and facial expressions all come into play. Furthermore, it must be realized that there are several aspects of emotion understanding (in addition to the recognition of facial expressions) that if examined in children with SLI, could provide valuable information for clinicians, teachers, and parents alike. It is suggested, then, that more research be performed to gain a greater understanding of children with SLI and their ability to understand emotions.
References


Appendix A

Emotion Training Instructions and Response Cards

“Here are some cards. These cards show some feelings. Each card shows a different feeling. Look at these cards.

(Examiner lays out cards one at a time as she reads the corresponding description. Cards are put out in random order for each child.)

Look at this card. This means happy. Look at the sun. It means happy.

Look at this card. It means mad. See the lightening? It means mad.

Look at this card. It means scared. See the ghost? It means scared.

Look at this card. It means sad. See the tear? It means sad.

Look at this card. It means surprised. See the firecracker. It means surprised.

Look at this card. It means disgusted. See the yucky worms. It means
disgusted.
Look at this card. It means, I don’t know or I’m not sure. See the question mark? It means I don’t know.”

(Examiner puts out all the cards in a line, random order, before the child.)

“Show me happy. Show me mad. Show me scared. Show me sad. Show me surprised. Show me disgusted. Show me I don’t know.”

(Repeat this training if there was any interruption during the testing, and if the child cannot point to each label correctly.)
Appendix A

Response Cards

<table>
<thead>
<tr>
<th>Sun</th>
<th>Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>happy</td>
<td>mad</td>
</tr>
<tr>
<td>Sad</td>
<td>scared</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>disgusted</strong></td>
<td><strong>Surprised</strong></td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>I don't know</strong></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Training Instructions for Recognition of Emotion of Facial Expressions in Pictures

“I am point to show you some faces. I want you to tell me how each person feels by pointing to our cards. Remember that:

This card means happy.
This card means mad.
This card means scared.
This card means sad.
This card means surprised.
This card means disgust.
This card means “I don’t know.” (Examiner has all cards out)
The examiner presents the photographs one at a time and asks:

How does this person feel? Point to the card that shows how the person feels.
(Repeat before each item—can discontinue the directions before each item after 5 items if it is clear that the child understands the task).
Appendix C

Sample Scoring Sheet for Recognition of Emotion in Facial Expressions in Pictures

1. E26(M)  happy  mad  scared  sad  disgusted  surprised  DK
2. E41(M)  happy  mad  scared  sad  disgusted  surprised  DK
3. E20(F)  happy  mad  scared  sad  disgusted  surprised  DK

“I wonder why she feels that way. Can you make up a story to tell me why she feels that way?”

“Can you think about a time when you felt that way?”

4. E49(M)  happy  mad  scared  sad  disgusted  surprised  DK
5. E33(M)  happy  mad  scared  sad  disgusted  surprised  DK
6. E28(F)  happy  mad  scared  sad  disgusted  surprised  DK
7. E1(M)  happy  mad  scared  sad  disgusted  surprised  DK

“I wonder why he feels that way. Can you make up a story to tell me why he feels that way?”

“Can you think about a time when you felt that way?”

8. E35(F)  happy  mad  scared  sad  disgusted  surprised  DK
9. E3(F)  happy  mad  scared  sad  disgusted  surprised  DK
10. E18(M)  happy  mad  scared  sad  disgusted  surprised  DK
11. E50(M)  happy  mad  scared  sad  disgusted  surprised  DK

“I wonder why he feels that way. Can you make up a story to tell me why he feels that way?”
“Can you think about a time when you felt that way?”

12. E43(F) happy mad scared sad disgusted surprised DK
13. E52(F) happy mad scared sad disgusted surprised DK
14. E34(M) happy mad scared sad disgusted surprised DK
15. E42(M) happy mad scared sad disgusted surprised DK

“I wonder why he feels that way. Can you make up a story to tell me why she feels that way?”

“Can you think about a time when you felt that way?”

16. E2 (M) happy mad scared sad disgusted surprised DK
17. E36(F) happy mad scared sad disgusted surprised DK

“I wonder why she feels that way. Can you make up a story to tell me why she feels that way?”

“Can you think about a time when you felt that way?”

18. E44(F) happy mad scared sad disgusted surprised DK
19. E4 (F) happy mad scared sad disgusted surprised DK
20. E25(M) happy mad scared sad disgusted surprised DK
21. E17(M) happy mad scared sad disgusted surprised DK
22. E27(F) happy mad scared sad disgusted surprised DK

“I wonder why she feels that way. Can you make up a story to tell me why she feels that way?”

“Can you think about a time when you felt that way?”
23. E51(F) happy mad scared sad disgusted surprised DK
24. E19(F) happy mad scared sad disgusted surprised DK