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THE ABILITY OF CHILDREN WITH LANGUAGE IMPAIRMENT
TO UNDERSTAND EMOTION CONVEYED BY PROSODY
IN A NARRATIVE PASSAGE

by

Chelsea C. Voorhees

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

December 2008

BRIGHAM YOUNG UNIVERSITY

GRADUATE COMMITTEE APPROVAL

of a thesis submitted by

Chelsea C. Voorhees

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

Date

Martin Fujiki, Chair

Date

Bonnie Brinton

Date

Barbara Culatta

BRIGHAM YOUNG UNIVERSITY

As chair of the candidate's graduate committee, I have read the thesis of Chelsea C. Voorhees in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill 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.

Date

Martin Fujiki
Chair, Graduate Committee

Accepted for the Department

Date

Ron W. Channell
Graduate Coordinator

Accepted for the College

Date

K. Richard Young
Dean, David O. McKay School of Education

ABSTRACT

THE ABILITY OF CHILDREN WITH LANGUAGE IMPAIRMENT TO UNDERSTAND EMOTION CONVEYED BY PROSODY IN A NARRATIVE PASSAGE

Chelsea C. Voorhees

Department of Communication Disorders

Master of Science

Several recent studies indicate that children with Language Impairment (LI) have difficulty recognizing and inferring meaning from emotional prosody. The present study is a replication investigating the ability of children with LI to recognize emotion conveyed by prosody in an orally presented narrative passage. Twenty-two children with LI and twenty-two age matched peers ranging from age 7;0 to 10;11 ($M= 9.11$, $SD= 2.54$) were selected to participate. Participants listened to recordings of a seven sentence passage read by actors to express happiness, anger, sadness, and fear. The children's task was to identify which emotion the speaker portrayed. Scores obtained from the children with LI as a group were significantly lower than the scores of typically developing children. Differences in the degree of recognition of individual emotions were also apparent; happiness being correctly identified most frequently,

followed by anger, sadness, and then fear. Evidence supports the supposition that children with LI struggle to understand emotion conveyed through prosodic cues, which may contribute to the social challenges children with LI experience.

ACKNOWLEDGMENTS

This work was supported, in part, by a research grant from the McKay School of Education, Brigham Young University. I would like to express my appreciation to the school administrators and speech language pathologists who helped identify participants. I would also like to acknowledge Noel Quist, Emily Rowbury, Dorothy Stott, Lara Goldi, Veronica Gardner, Jami Potter, and Bethany Hillary for their assistance in data collection and analysis.

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Introduction

Children with Language Impairment (LI)¹ often have difficulty maintaining positive relationships with others. These children are often viewed as less preferred playmates by their peers (Brinton & Fujiki, 1993; Gertner, Rice, & Hadley, 1994), have difficulty making friends (Fujiki, Brinton, Hart, & Fitzgerald, 1999) and are rated by teachers as having poorer social skills than linguistically typical peers (Fujiki, Brinton, & Todd, 1996). Some of these problems are in all likelihood attributable to the LI, in that the well-documented linguistic problems of these children almost certainly have an impact on interaction. Despite the important influence of language skills, however, there are reasons to believe that other factors may interact with language to influence social outcomes. For example, some researchers suggest that the social barriers faced by children with LI may be influenced by their inability to recognize emotion in others. Being able to correctly identify and label emotions enables positive social interaction, while a lack of emotion understanding leads to behavior and learning challenges (Izard, Fine, Schultz, Mostow, Ackerman, & Youngstrom, 2001).

Saarni (1999) defines emotion understanding as the "ability to discern and understand others' emotions, using situational and expressive cues that have some degree of cultural consensus as to their emotional meaning" (p.106). To

1. The term LI is used in reference to individuals who have language deficits without evidence of cognitive, sensory, or motor deficits. In this study, individuals with an IQ score of 70 or better, eliminating a diagnosis of intellectual disability, were considered acceptable for inclusion. However, this IQ level does not meet traditional standards for individuals diagnosed with specific language impairment (SLI). Because the terms LI and SLI are frequently used interchangeably throughout the literature, the terms used in the literature review of the current investigation are consistent with the terms employed by the authors of the reported studies.

develop close social relationships, individuals must be able to anticipate and react to others while gauging when to suitably express self-assertions into the interaction (Ford & Milosky, 2003; Izard et al. 2001). Emotion understanding also allows a person to vicariously experience the emotion that someone else is feeling, a phenomenon known as empathy. Expressing empathy requires the ability to infer emotion in others, such as recognizing the appropriateness of expressing happiness for the success of another (Izard et al. 2001). Positive social connections often result when individuals relate their feelings to one another and reach a mutual understanding.

Several investigations have indicated that children with LI struggle with aspects of emotion understanding. For example, Brinton, Spackman, Fujiki, and Ricks (2007) compared the ability of children with Specific Language Impairment (SLI) and their typical peers to dissemble emotion. Dissemblance is the ability to hide true emotion to be polite or socially acceptable according to cultural norms and expectations. Understanding that the emotion expressed does not have to match the emotion felt is considered to be a relatively sophisticated application of emotional competence. Scenarios designed to elicit specific emotions from a character in the scenario were presented to the participants. Children then judged how the character should react to the situation. For many of the scenarios presented, both typically developing children and children with SLI indicated that emotion should be openly displayed rather than dissembled. Still, typically developing children chose dissemblance as the correct behavior significantly more often than the children

with SLI. Some of the participants with SLI offered generic responses that were judged to be “rigid” and “ineffective.”

The social difficulty experienced by children with LI may be impacted by many aspects of emotion understanding. The present investigation focused on a basic aspect of this ability: the ability to recognize emotion conveyed by prosodic cues. Emotional cues in contextual situations are not limited to spoken words or facial expressions. Affect is also interpreted through prosodic vocal cues. There is some evidence that children with LI have difficulty recognizing prosodic cues that convey emotion (Fujiki, Spackman, Brinton, & Illig, 2008).

Fujiki et al. (2008) examined the ability of children with LI to interpret prosodic cues in a short narrative. The seven sentence stimulus passage used was designed to be well within the syntactic and semantic skill level of the participants with LI. The children listened to recordings of the passage as actors conveyed the emotions happiness, anger, sadness, and fear. The length of the passage provided multiple opportunities for the participants to identify prosodic cues to the speaker’s emotion. Fujiki et al. (2008) found that this task was more difficult for children with LI than it was for their peers with typical language abilities. Of all the emotions used in the task, happiness was most easily recognized by all of the children. Anger was also readily recognized by all the participants. Emotions such as fear and sadness were often confused by children with LI.

The current study was a replication of the Fujiki et al. (2008) study. The goal was to determine if these findings were consistent across a second sample

of children with LI. An inability to correctly interpret prosodic cues signaling emotion would be a serious handicap to social interaction. Further documentation of difficulty would help to clarify the role of this ability in the social deficits of children with LI. The current study was designed to address the following questions.

1. Is there a difference between the ability of children with LI and their typical peers to recognize emotion expressed by prosody?
2. Are some emotions more easily recognized than others when conveyed by prosody?
3. Is there a difference between males and females in the ability to recognize prosodic cues associated with specific emotions?

Review of Literature

The following review focuses on emotion understanding and how it relates to social functioning. The role of prosody as a cue to understanding emotion is considered followed by general information regarding emotion understanding in children with LI. Then, research focusing specifically on the influence of prosody on emotion understanding in children with LI is presented. The review concludes with a summary of the Fujiki et al. (2008) study, which the current study replicates.

The Nature of Emotion Understanding

There is an extensive body of literature supporting Saarni's (1999) claim that the failure to perceive or to correctly interpret emotional cues can cause socio-emotional difficulties. The small sample of studies reviewed here is presented with the intent of providing the reader with a sampling of this work.

Emotion understanding and social adjustment. Saarni (1999) defines emotion understanding as the "ability to discern and understand others' emotions, using situational and expressive cues that have some degree of cultural consensus as to their emotional meaning" (p.106). Recognizing affect in another individual is an important part of successful interaction. An individual who misses affective cues in others is at a disadvantage in knowing how to respond appropriately. Understanding and applying emotional knowledge results in more positive social interactions as children are able to react to the communicative intent of their conversational partners more appropriately (Denham, 1998).

Emotion understanding also allows a person to vicariously experience the emotion that someone else is feeling; a phenomenon known as empathy. A basic element of expressing empathy is the ability to infer emotion in others (Ford & Milosky, 2003; Izard et al. 2001). Denham (2002) suggested that children are capable of recognizing and labeling basic emotions by the time they are 3 or 4-years-old, and that they become increasingly competent with age. The ability to differentiate between emotional expressions facilitates further development of emotion understanding as children begin to meditate about their feelings and vocalize those feelings in emotional situations.

Caretaker or family expressiveness of emotion can influence the quality of children's social behavior and emotion understanding. Caretaker instruction as to how to handle emotion in constructive ways prepares children to learn about other's emotions and thoughts in various contexts. Eisenberg et al. (1998) suggested that positive parent-child communicative relationships are a precursor to positive social interactions outside of the home. Parental reaction to emotion can have an impact on children's feelings of emotional security, their willingness to express ideas, and their feelings about social interactions. In families where parents discussed emotional reactions, the children were rated by teachers as being more pro-social and cooperative. The degree of positive and negative expression of emotion was predictive of how children were perceived and whether or not they were liked by their peers (Eisenberg et al., 1998). Conversing about emotion seemed to help children develop awareness of their emotional state. They were better able to communicate their own emotions,

were more able to understand the emotions of others, and consequently developed higher levels of social competence. Children were more able to control negative emotional arousal if they could discuss their emotions. In addition, children who possessed the ability to negotiate, refuse, or change the subject to avoid an undesirable topic demonstrated less frustration in stressful situations. Parental feedback facilitated children's understanding of what expressions of emotion was acceptable and possible problem solving reactions that facilitated pro-social behavior (Eisenberg et al., 1998).

Brown and Dunn (1996) also found a significant relationship between understanding emotion and social development. These authors conducted a longitudinal study designed to evaluate the understanding of basic emotions in children at age three and then at age six to determine if the children's understanding of emotion at 33 months was significantly correlated to their understanding of emotion at age six. Results showed continuity of individual differences suggesting that emotion understanding is gradually built upon previously acquired skills. *Discourse causality*, meaning their ability to verbalize understanding of cause and effect relationships, positive child-sibling interaction, and the child's language ability when they were 33 months were significantly related to their understanding of emotion of opposing valence at age six. The relationship between discourse causality and emotion understanding was evident regardless of language ability, family SES, and the quality of the children's interaction with their older siblings. Evidence showed that the early experience of participation in family discussions about people's

behavior was related to children's later understanding of conflicting emotions. The children that could match basic emotions to situations and facial expressions were also better at explaining two conflicting emotions experienced by characters in given scenarios. This may be predictive of more mature behavior when encountered with complex social and emotional experiences. Findings suggest that a mature understanding of social situations is marked by a blend of positive and negative appraisals of experience (Brown & Dunn, 1996).

An important consideration in regard to social adjustment is children's ability to recognize emotion in other people. If children cannot decode the emotions of others, they may also have difficulty encoding a proper response to those emotions. Moreover, inability to identify emotion might lead to a lack of empathy that would make these children less well liked among their peers (Izard et al. 2000). Izard et al. (2000) provided support for this notion by asking children to identify what emotions would be elicited from provocative situations within 18 different stories. Joy and interest were the positive emotions presented. Negative emotions included sadness, anger, fear, and shame. Judges determined if the emotion described appropriately matched the emotion presented in the situation. It was observed that emotion understanding served as a mediator for temperament and cognitive abilities which further affected positive social skills.

In addition, emotion understanding is related to social appropriateness in behaviors. Fantuzzo, Bulotsky-Shearer, Fusco, and McWayne (2005) found correlations between behavioral problems and emotion understanding. It was

observed that children who exhibited socially disconnected behavior demonstrated lower levels of emotional understanding in themselves and others. Children who were reticent were less affective in social engagement and emotional adaptation.

Lemerise and Arsenio (2000) described a model of how emotion impacts social skills. These authors argue that affective cues provide important information for those involved in a conversation to know how an interaction will proceed, enabling the individuals involved to appraise and adjust their own affective signals to achieve a desired outcome. The nature of previous emotional ties with others may influence reactions to affective cues, motivating a child to consider a variety of perspectives and possible response options. Positive affect in another person may increase the child's desire to obtain a particular goal, whereas negative affect may influence him or her to abandon an idea or discourage the original goal. The child's attention, perception of the situation, memory of past experience, and processing rate all affect their chosen response in a social situation. The emotion an individual experiences in relation to the perception of a situation may impact the chosen response with the intent of modifying the current emotion. Affective cues of a conversational partner in reaction to a response also provide information on the success or failure of the chosen statement. Specific interaction partners may be preferred on the basis of their ability to produce affective signals which are easier to interpret, thus making feelings of empathy more naturally accessible. Lemerise and Arsenio stated that emotion understanding is needed for an individual to control, modify,

and manage emotions. In turn, the ability to effectively regulate emotion is a good predictor of social competence. Individuals with high emotionality and poor regulatory skills are more prone to demonstrate behavioral problems.

Developing understanding of emotion in one's self and others impacts how one interacts and displays emotion to meet valued social and cultural norms. Saarni (1999) explored children's ability to hide their feelings when it was socially appropriate to do so. To do this, Saarni created scenarios in which children who were expecting a positive reward actually received a negative reward. She then observed whether or not they would hide their emotions to conform to social standards of appropriateness. Saarni found that as the children matured they were better able to hide their emotions to conform to social standards of appropriateness.

The evidence cited above demonstrates that understanding emotion is an important component of positive social interaction. Understanding emotion in one's self and others facilitates appropriate responses in social interaction and is fundamental to socially appropriate behavior.

Emotion understanding through prosody. Prosodic cues may play an important role in emotion understanding that impacts communication and social interaction. Paul, Augustyn, Klin, and Volkmar (2005) defined prosody as, "the suprasegmental properties of a speech signal that modulate or enhance its meaning" (p. 206). Prosody can provide information regarding gender, age, physical well being, attitudes, and emotion experienced concerning an interactional partner or the situation (Mozziconacci, 2002). Prosody influences

the grammatical, pragmatic, and affective meaning of an utterance through the modification of stress, frequency (pitch), tempo, rhythm, intensity (loudness), articulation voice quality, duration, and clausal boundaries. These variations are combined throughout running speech to aid the comprehension of the listener (Fisher, Plante, Vance, Gerken, Glatke, 2007; Gerken & McGregor, 1998; Mozziconacci, 2002; Paul et al. 2005). Illustrative of the importance of prosody is the fact that an individual may produce words that convey one meaning, at the same time producing prosodic features that contradict that meaning (Denham, 2002; Nowicki & Duke, 1991; Samuelsson, 2005). When prosodic information conflicts with content, the meaning conveyed by prosody will generally override the meaning conveyed by lexical elements (Banse & Scherer, 1996; Ford & Milosky, 1997; Morton & Trehub, 2001; Semrud-Clikeman & Hynd 1991).

Manipulating prosody enables speakers to adjust to their listeners. For example, an adult may use a different tone of voice when speaking with peers as compared to speaking with children or to infants. Prosody can also signify expression of emotion. One statement, unchanged in content, can convey differing emotions depending on the prosody with which it is spoken. The listener must be able to focus on prosodic aspects of speech to recognize what affect the speaker is communicating; intentional or unintentional (Fisher et al. 2007; Gerken & McGregor, 1998; Paul et al. 2005).

A significant amount of research has been done examining the use of prosody as a cue to understanding emotion. Banse and Scherer (1996) suggested that vocal cues alone are sufficient to understanding emotion in

others. Vocal cues concerning affect are recognized reliably by listeners due to specific vocal patterns and acoustic characteristics that are used to express particular emotional states or motives. Vocal acoustic parameters including energy (intensity), fundamental frequency, speech rate, respiration, phonation, and articulation change naturally with change in emotion because emotion arousal affects many of the body's systems interdependently. Specific physiological changes occur in association with specific emotions. For example, the expression of elation tends to be a signal that is perceptually high pitched (increased fundamental frequency) with a rapid speech rate, while sadness is characterized by lower pitch and slowness of speech.

Understanding emotion in prosody is an important aspect of communication from birth. Typically developing infants are sensitive to prosody and utilize prosodic cues to aid them in language acquisition. Stressed syllables appear to be more salient to infants because of their greater duration, pitch range, or loudness (Fernald, 1993; Fisher et al. 2007; Gerken & McGregor, 1998). Illustrative of this point is that fact that infants are more likely to respond to child-directed speech, with exaggerated prosodic features, than to typical adult-to-adult speech. For example, Fernald (1993) found that infants were more likely to react positively to approval and negatively to prohibition when adults used infant-directed speech, as opposed to adult-directed speech. Infants were also more likely to recognize speech that was directed to them and respond differentially to the associated valence, whether positive or negative, when child-directed speech was used. These results

demonstrate that emotion understanding through prosody is important even in the preverbal period of development.

Studies show that young children are capable of interpreting emotion in prosody and are exposed to prosodic information in the form of ironic statements at an early age. Ford and Milosky (1997) evaluated typical developing 6- and 9-year-old children's ability to understand a speaker's communicative intent from prosodic contours. Findings suggested that the older children were able to recognize sarcasm and did not misinterpret it as deception. Though the participants in the younger group were less accurate at discriminating intonation or correctly interpreting the intent of the intonation, they were sensitive to the use of prosody when discriminating between complimentary and sarcastic statements.

Research also shows that the ability to recognize and understand prosodic cues improves with age. Morton and Trehub (2001) compared the ability of adults and children to recognize linguistic and paralinguistic (verbal and nonverbal) cues. They presented stimuli with emotional content words with conflicting paralinguistic emotional cues. The children and adults were asked how the speaker felt. Adults relied on paralinguistic cues to infer the emotion while children relied on the linguistic content, depending on the age. Thus, even though paralinguistic cues are understood early in development (e.g., child directed speech), it is only with increasing experience and sophistication that children are able to correctly interpret social meaning when they are presented with conflicting information.

Understanding emotion in prosody can have a significant impact on development. Nowicki and Duke (1992) looked at the relationship between children's ability to recognize emotional cues in facial expression and tone of voice with popularity, academic achievement, and locus of control. Administering a battery of tests to 456 students, Nowicki and Duke (1992) found that children who were more adept at decoding nonverbal information were, in fact, more popular, more academically competent, and demonstrated better self regulation than those who were less able to understand nonverbal information. Children who had difficulty understanding emotional cues in others were more likely to be maladjusted and unpopular as well as more prone to behave inappropriately and lack self control. Because of the interpersonal skills required for successful learning in an elementary education setting, this type of miscommunication tended to result in negative reactions from both teachers and peers, negatively affecting the learning process.

Other research has provided a more focused exploration of the affect of understanding nonverbal cues on social development. Leppanen and Hietanen (2001) evaluated children's ability to process emotional information from nonverbal cues to determine if emotion understanding affected social adjustment. During experimentation, participants listened to a tape recording of a female actor speaking a one-word utterance (Finnish word for the name "Sarah") to convey the following emotions: satisfied, angry, frightened, sad, surprised, scornful, and neutral. Participants were asked, "Was that person surprised, angry, scornful, frightened, just neutral, happy, or sad?" The task

was to select the perceived emotion by verbalizing their choice or pointing to the card with the respective emotion labeled on it. There was a marginally significant relationship between vocal affect recognition scores and social competence scores. Leppanen and Hietanen found that the emotion surprise was more difficult to identify than the emotions happiness, sadness, and anger. With further analysis these authors found that the relationship between emotion awareness and social adjustment was more significant for emotions that were difficult to interpret.

Evidence suggests that prosody is an important component of communication which enhances or changes the meaning of an utterance. Intentional or unintentional, the prosodic variations of a speaker often convey the true meaning of an utterance. From infancy to adulthood, prosody plays a significant role in communicating the emotion of a speaker. As children mature, they become more able to correctly interpret meaning when linguistic meaning and prosodic cues conflict. Correct interpretation of the emotion conveyed through prosody is an important part of positive social development.

Emotion understanding and LI. A number of researchers have found that individuals with language difficulties have trouble recognizing nonverbal cues to emotion understanding. A sample of this extensive research includes studies on Autism (e.g. Grossman, Klin, Carter & Volkmar, 2000) intellectual disabilities (e.g. Mayer, Caruso, & Salovey, 2000; Nabuzoka, & Smith, 1995; Rojahn, Lederer, & Tasse, 1995; Salovey & Mayer 1990) and learning disabilities (Sams, Collins, & Reynolds, 2006; Worling, Humphries, &

Tannock, 1999). In that the current study involves children with LI, the review will be limited to this population. Studies suggesting general difficulty with emotion understanding are examined first, followed by research focusing specifically on emotional understanding and prosody.

An example of the differences in emotion recognition noted between children with LI and their typically achieving peers is their interpretation of emotion in the presentation of nonverbal information. Spackman, Fujiki, Brinton, Nelson, and Allen (2005) explored the ability of children with LI and their typical peers, ages 5-8 and 9-12, to recognize emotion in nonverbal information, specifically from facial expressions and music. In the first task, the participants identified emotions from facial expressions. There were no significant differences between the ability of the children with LI and their typical peers to recognize facial expressions of the basic emotions, happiness, sadness, fear, and anger. The children with LI had significantly more difficulty recognizing surprise and disgust than did their typically developing peers. The children with LI made more errors in the identification of the emotions presented through facial expressions. The errors noted were due to confusion between emotions of the same valence.

In the second task, Spackman et al. (2005) asked the participants to identify emotion from musical excerpts. The performance of the typical children was used as the standard by which the performance of the children with LI was judged. There were significant differences between the agreement scores for the children with LI and the typical group indicating that the children with LI

recognized emotion conveyed by music differently than did their typically developing peers. The highest level of agreement was for musical excerpts conveying happiness. Excerpts conveying anger, fear, and sadness had lower agreement levels. Children with LI mistakenly identified surprise as fear and disgust as anger more often than typically developing children. Anger was most often misidentified as fear, and fear was most often misidentified as anger.

Other recent studies have shown that children with LI have difficulty inferring emotion from a short narrative. Ford and Milosky (2003) found that kindergarten children with LI were able to recognize and label emotions when presented with line drawings of facial expressions alone, when presented with verbal information alone, and when presented with the line drawings combined with the verbal information. However, when presented with a short scenario in which a character would be likely to experience a specific emotion, the children with LI had difficulty inferring the character's emotion. The children with LI also made more errors confusing positive and negative emotions within the scenarios than did their typically developing peers.

Spackman, Fujiki, and Brinton (2006) used methodology similar to Ford and Milosky (2003) to investigate the ability of children ages 5-8 and 9-12 to infer the emotion of characters from given social scenarios. This investigation also compared the ability of children with LI and their age-matched peers to describe emotion experiences in response to open ended questions relating to given social scenarios. Results indicated that older children and typical children identified emotions more accurately than the younger children and the children

with LI. The greatest amount of confusion among both the age and language groups was the identification of fear and anger as sadness. However, this misidentification was more common in the younger group than the older group. Results indicated that even as they mature, children with LI still lag behind their peers when inferring what emotion a specific scenario might elicit. Results from the open-ended questions demonstrated a greater frequency of inappropriate responses from the children with LI and a greater frequency of correct description among the typically developing children. Responses among children with LI tended to be more limited and vague. Some could only restate the emotion or the valence of the emotion presented. Findings from both tasks suggested that social difficulties as a result of misunderstanding emotion in day to day situations continue to affect children with LI as they mature.

Emotion Understanding and Prosody in Children with LI

Evidence is not conclusive as to whether children with LI have difficulty with prosody in general or with understanding emotion conveyed by prosody in particular. The following studies examined this issue.

General studies of prosody in children with LI. Semrud-Clikeman and Hynd (1991) reviewed research suggesting that children with LI have general difficulty with nonverbal information. In their review of social and nonverbal learning disabilities, these authors compared behaviors of adults with right hemisphere disorders and children with LI. They hypothesized that nonverbal misunderstanding, such as misinterpretation of suprasegmental speech, was more damaging to interaction than verbal difficulties. From their observations,

they found that incorrect decoding of nonverbal cues such as prosody could cause individuals to misread the speaker's intent. They also found that popular children were better able to understand nonverbal information than children with LI.

Gerken and McGregor (1998) published a tutorial examining the role of prosody in children with SLI. The focus of the analysis was the influence of prosody on syntax at the syllable and phrase level and the ability of children with SLI to interpret semantic meaning from prosodic cues. The authors noted that phonological and syntactic deficits are commonly found in children with SLI. They found that the children with SLI had a tendency to omit weak syllables. Children with SLI also had difficulty processing grammatical morphemes (monosyllable unstressed), which are shorter in duration than content words. From this evidence, Gerken and McGregor (1998) concluded that the language demands of processing rapidly changing acoustic information contributed to the deficits noted in children with SLI. These conclusions also suggest that children with LI have difficulty with prosody.

Nielsen (2005) found further evidence that children with SLI have difficulty with prosody. Children with SLI and typically developing age-matched peers, all 7-years-old, were compared on two tasks evaluating their use of prosodic contours. In the contrastive focus task, a set of pictures were presented while the children listened to a tape recording of the examiner describing the associated scenario. They were given an incomplete sentence in relation to the story. The task was to complete the sentence. The second task

was a repetition task. The participants were given a word list to repeat three times. Results demonstrated that intonation patterns for children with SLI were more atypical for longer utterances, and that these children placed more phrase boundaries in their utterances than the control group. Nielsen noted that the children with SLI actually exhibited a wider pitch range than their typically developing peers. These unusual prosodic patterns indicated that syntax is not the only problem demonstrated by this population.

Fisher et al. (2007) compared the ability of children with LI and typically developing children to recognize prosodic cues. The task the children performed was to determine if the prosodic cues of low-pass filtered sentences matched the prosodic cues of unfiltered sentences. Children with LI were significantly less adept at correctly identifying whether or not the prosodic cues matched. The authors concluded that the children with LI derived less benefit from the communicative information provided through suprasegmental speech than their typically developing peers. This evidence also suggests that children with LI have difficulty with prosody in general.

Some evidence suggests that prosodic abilities of children with LI and their peers differ minimally. Creusere, Alt, and Plante (2004) examined the ability of preschoolers with SLI and their typically developing peers to judge vocal affect and facial cues. The investigation included four types of stimuli. Speakers were videotaped as they repeated utterances in a manner that would indicate one of four emotions: happy, sad, mad, or surprised. Two- to four-second segments, selected from the videos, were presented in four different

conditions: (a) unaltered face and speech, which served as a control, (b) face only, (c) filtered speech only (speech was low-pass filtered to eliminate semantic and syntactic information), and (d) face and filtered speech. Children were asked to identify the emotion conveyed in each segment. The two groups differed only on the control task involving the unaltered face and speech stimuli, with participants with SLI performing more poorly.

Snow (2001) found that children with LI produced rising speech contours in the same way that typical children did. This was surprising because rising pitch is thought of as being learned in a more advanced stage in language development. Results indicated that children with LI performed poorly on qualitative and quantitative measures of segmental phonology. However, deficits in children with LI were only noted on the lexical level. Results showed that the children with LI performed adequately at the prosodic level. Snow thus argued that lexical and prosodic aspects of phonology function independent of one another.

Other research evaluating the impact on prosody on emotion understanding includes work by Van Der Meulen, Janssen, and Den Os (1997). These authors compared the receptive and expressive abilities of younger children with SLI to their age-matched peers. The participants, ranging in age from 4-6 years, were given a prosody imitation task and an emotion recognition task. In the first task, participants imitated ten sentences with varying linguistic and emotional intonation contours. In the second task, the children listened to recordings of sentences conveying different emotions with prosody. There were

no significant differences between the two groups in their ability to imitate prosodic contours. However there were significant differences in performance between the two groups on the second task. The children with LI demonstrated greater difficulty recognizing emotion in unfiltered speech than their typically developing peers.

Wells and Peppe (2003) compared prosodic skills of 8-year-old children with varying speech and language problems to their age-matched peers and language comprehension-matched peers. Two of the tasks involved components related to understanding emotion as conveyed through prosody. In the first task, a monosyllable word with varied intonation was presented. The children were asked to indicate whether they thought the emotion was positive or negative by pointing to a picture of a smiling face or a doubting face. In the second task, the children were required to identify whether two monosyllables of filtered speech were the same or different. No significant differences were noted between the performance of the children with LI and their typical peers in either task.

Courtright and Courtright (1983) compared children with LI, ages 3 to 7 years, and their typically developing age matched peers in their ability to identify vocal affect with the intent of determining whether chronological age or language age had more impact on a child's ability to correctly identify affective vocal cues. Three actors portrayed the emotions happiness, anger, love, and sadness in the phrase "Would you bring that to me?" One recording of each emotion for each actor was presented for a total of 12 presentations. The first

task required the children to match pictures with the associated emotions. Then, the participants were asked to match the voice with the picture of the emotion. Findings indicated that children with LI were not as sensitive to emotion affect conveyed through prosody when compared to their typical peers. When chronological age and gender were included as factors, the differences between children with LI and typically developing children were actually greater. There was not a significant difference in the types of errors made in each group, but there was a significant difference in the amount of errors made in each group; with a greater frequency of errors noted among the children with LI.

Berk, Doehring, and Bryans (1983) speculated that children with language delays were less effective communicators, in part because they only perceived the speaker's intention by the content of their words, with little or no regard to the speaker's intentions conveyed through the voice. In their evaluation of children with language delay and their typically developing age-matched peers, ages 5 to 11, they found that children with language delay had greater difficulty recognizing affect in a speaker's voice than their typical peers. They felt that this barrier was due to children with language delay focusing the majority of their attention on the content of what the speaker was saying, rather than how the utterance was spoken.

Trauner, Ballantyne, Chase, and Tallal (1993) explored the abilities of children ages 9 to 13 with LI and their age-matched peers to understand and produce affective intent in language and facial expression. The children with LI were more dramatic in their production of facial expressions of emotion than

their typical peers. However, they performed more poorly in comprehension and spontaneous production of vocal affect as exemplified by the following task. The children were given a scenario about a rat stealing a mouse's cheese. Each child was told that the mouse was angry and then the child was asked to complete the phrase, "He said to the rat. . ." (p. 448). The expression of emotion was influenced by the child's ability to produce the correct prosodic features. These results showed evidence that children with LI have specific difficulty with understanding emotion as conveyed in prosody. The researchers suggested that the more dramatic display of facial emotion could be a compensatory mechanism for their lack of ability in vocal affect.

Boucher, Lewis, and Collis (2000) compared the voice processing abilities of children with Autism to the abilities of children with SLI, and to typically developing children. In experiments 1 and 2, participants were required to match the familiar voices of their teachers to those teachers' faces. In experiment 3, the ability of the children to discriminate between voices was tested. The voices were of individuals completely unfamiliar to the children. In experiment 4, the task was to name vocally expressed emotions and match vocal affect to facial affect. Boucher et al. found that children with Autism exhibited greater difficulty than younger typically developing peers in matching affect. However, their ability to discriminate unfamiliar voices was not impaired. Children with SLI performed similarly to children with Autism on recognizing familiar voices and matching familiar voices to familiar faces. However, children with SLI performed worse than the children with Autism when the task

required matching vocal expressions of affect to facial expressions of affect. The authors speculated that the difficulty exhibited by children with SLI may result from poor ability to process affect, voices, or social stimuli in general.

The previous research indicates that children with LI may not differ significantly from their typical peers in their ability to recognize basic emotions in filtered speech (Creusere et al. 2004; Wells & Peppé, 2003). When presented with unfiltered speech these children have greater difficulty identifying the emotion conveyed (Berk et al., 1983; Courtright & Courtright, 1983; Van Der Meulen et al., 1997).

Understanding emotion through prosody in an oral narrative passage.

Past research has provided insight into the ability of children with LI to understand emotion conveyed by prosody in filtered and unfiltered speech. However, previous research has not examined the ability of children with LI to understand emotion in unfiltered speech more comparable to speech produced in an actual communicative context. Fujiki et al. (2008) probed the emotion understanding abilities of children with LI as conveyed by prosody in connected speech. These researchers evaluated the performance of children with LI when presented with a seven sentence narrative passage of unfiltered speech that was neutral in semantic content. Children listened to this passage read in a manner to convey the emotions of happiness, anger, fear, or sadness.

The sample studied consisted of 19 children with LI and 19 typically developing children. These children listened to the passage a total of 16 times; four for each of the four emotions. The children were then asked to identify the

emotion the speaker was expressing. Participants' responses were compared across language groups, age, and emotions. Children with typical language skills correctly identified a significantly greater number of the emotions than children with LI. Portrayals of fear and sadness were confused more frequently than portrayals of happiness and anger among all the participants. However, children with LI misidentified anger for happiness more often than their typically developing peers.

The Fujiki et al. (2008) study supported previous work with unfiltered speech that demonstrated that children with LI performed significantly more poorly than typical peers on a task to identify emotion conveyed by prosody. The present study was conducted to replicate the Fujiki et al. work.

Method

The current study focused on the ability of children with LI to understand emotion conveyed in prosody. Data for this study were gathered as part of a larger research project examining emotion recognition in children with LI. The prosody task was one of four tasks designed to evaluate the ability of children with LI to understand varying aspects of emotion. The order of task presentation was systematically varied to control for order effects. All procedures were reviewed and approved by the Institutional Review Board of Brigham Young University to ensure the ethical treatment of human subjects.

Participants

Participants were selected from local elementary schools in three of the surrounding school districts. All subjects were native English speakers. Pure-tone hearing screenings were administered by certified audiologists and speech pathologists at the participating elementary schools, ensuring unremarkable hearing status. The mean percentage of families with incomes below the poverty level in the areas surrounding the schools involved in the study is presented in Table 1 (U.S. Census Bureau, 2008). The overall mean percentage of families below the poverty line for the block group was 3.58% ($SD = 3.45$).

The group of children with LI consisted of 8 female and 14 male subjects. A group of 8 female and 14 male age-matched peers were selected for the control group. The 44 participants' ages ranged from 7;0 to 10;11 ($M = 9.11$, $SD = 2.54$) years. The sample of children with LI consisted of 2 African American males, 2 Hispanic females, and 1 Hispanic male. The remaining 17

Table 1

*Mean Percentages of Participants' Families with Income**below the U.S. Census Bureau Poverty Level*

School	Number of participants	Percentage of people below the poverty line
1	4	3.62
2	6	0.89
3	8	2.76
4	4	3.79
5	4	11.02
6	10	5.18
7	4	1.40
8	4	0.00

children were Caucasian. Two of the typically developing children were Hispanic, and the other 20 were Caucasian.

In order to identify children with LI who qualified for the study, school SLPs were contacted. The school SLPs referred children with LI. Classroom teachers identified typically developing peers of the same gender whose date of birth was within six months of the child with LI. Permissions slips were sent home with each recommended participant. Participants were selected from the children who returned permission slips.

All subjects were assessed for language and nonverbal intelligence level. The Comprehensive Assessment of Spoken Language (CASL, Carrow-Woolfolk, 1999) was administered to ensure appropriate group assignment and to provide a consistent measure of global language abilities across all participants. To qualify for the study, all children with LI were required to score at least one standard deviation below the mean on the CASL. Subjects with LI were also required to have a nonverbal IQ score above 70 to eliminate children with intellectual deficits. The Universal Test of Nonverbal Intelligence (UNIT, Bracken & Macallum, 2003) was administered to ensure proper group assignment and to provide a consistent measure of nonverbal intelligence across all participants. A summary of language and cognitive test scores is included (see Table 2).

Table 2

Mean Language and Cognitive Test Scores for Participants

Test	Group			
	LI mean (SD)	range	Typical mean (SD)	Range
<i>CASL Subtests and Composite Score</i>				
Syntax construction	74 (10)	48-89	102 (15)	71-133
Paragraph comprehension	87 (9)	66-103	105 (15)	87-118
Pragmatic judgment	69 (10)	40-90	93 (15)	67-118
Antonyms	87 (12)	65-107	105 (10)	90-130
Nonliteral language	78 (10)	65-93	99 (15)	63-122
Composite score	74 (8)	57-84	102 (10)	82-119
<i>Universal Test of Nonverbal Intelligence (UNIT)</i>				
IQ standard score	89 (13)	71-116	107 (13)	85-141

Note. CASL is the Comprehensive Assessment of Spoken Language.

Assessment Materials

The children who participated in the study listened to a passage read with prosody to convey a specific emotion. The current project utilized the same materials as Fujiki et al. (2008) employed in the original study. The development of these tools is described on the subsequent page.

Passage. The children listened to the following passage, read 16 different times. Each time, the passage was read with prosody to convey one of the four emotions studied. The passage is presented below:

It was the first day of school. I got ready early. I wanted to see who was in my class. I walked in my class and sat down. Pat came in and sat next to me. Then the teacher walked in the room. I knew this year would be different.

The passage was designed to be emotionally neutral in content, meaning that there were no circumstances described or words spoken that would suggest specific emotions. The passage thus provided a context for expressing emotion without dictating what emotion should be experienced. The subject matter was selected to be familiar to all the children who participated. The passage was also designed with simple sentence structure and vocabulary to avoid exceeding the language capabilities of children with LI.

Speakers and recording. Four native English speakers, two male and two female, read the stimulus passage. The speakers were recruited from the university drama department and spoke with a standard American English dialect. Speakers were recorded in an anechoic chamber located on campus to

provide the best possible sound quality. The speakers were instructed to read the stimulus passage with prosody to convey a specific emotion (happiness, anger, fear, or sadness). The four speakers were individually recorded reading the passage conveying each emotion three times, producing a total of 48 recordings. The recordings were then presented to 48 university students to determine which recordings provided the best exemplar of the emotions being expressed. These students listened to each passage and indicated the emotion presented in the passage by circling one of five choices on a response sheet (happiness, anger, fear, sadness, and I don't know). The responses were then tallied, after which the average percentage of agreement was determined. The four recordings for each emotion (2 male, 2 female) that received the highest ratings were selected for use as stimuli in the study. The average percentages of agreement for the four highest rated recordings of each emotion were as follows: happiness 91% ($SD = 7\%$), anger 93% ($SD = 12\%$), fear 87% ($SD = 10\%$), and sadness 92% ($SD = 6\%$). The 16 passages were then recorded on a compact disc in random order.

Response cards. The children were presented with cards representing each emotion tested. Participants had the option of pointing to the cards to indicate the emotion they were selecting or naming the emotion. These cards were used for two reasons. First, giving the children a list of options narrowed the response possibilities. Second, the response cards assisted the children with LI by providing a visual cue, thus reducing the language demands of the task.

Response cards were created to represent happiness, anger, fear, sadness, surprise, and disgust (the surprise and disgust cards were used for training purposes, as indicated in the following section). There was also a card to represent “I don’t know.” Each emotion was depicted with a hand-colored drawing and a written label of the emotion. Happiness was pictorially represented by a sun and the word happy. Anger was represented with a picture of a lightning bolt and the word mad. Fear was represented with a ghost and the word fear. Sadness was presented with an eye and a tear drop with the word sadness. Surprise was presented with an exclamation mark and the word surprise, and disgust was presented with a picture of worms and the word disgust. The final response card had the words, “I don’t know,” written with a picture of a question mark (Spackman et al. 2006).

Participants were trained to use the response cards and to perform the prosody task. Training procedures were as follows. Participants were trained to indicate the answer by point to the emotion response cards before the administration of the emotion task. Each response card was presented to the child one at a time. The examiner verbally labeled each response card and set it on the table in front of the child. When all the cards had been presented, the examiner asked the child to “Show me _____.” The child pointed to the card in response. If the child could not identify the correct card, training would continue until the child was successful (Spackman et al. 2006).

In the process of developing these stimuli, two pilot studies were carried out previous to the original Fujiki et al. (2008) study to insure that the response

cards did not complicate the task (Spackman, Fujiki, & Brinton, 2006). In the first pilot study, typically developing preschoolers were presented with scenarios in which the main character in a story would be expected to experience a specific emotion (e.g., happiness at receiving a desirable toy). The children were asked to indicate the main character's emotion. Participants were randomly selected and divided into two groups: those responding by pointing to the response cards and those responding verbally only. The group which answered with response cards consisted of 25 children: 13 males and 12 females, with a mean age of 59 months. The group that labeled the emotions verbally consisted of 21 children: 11 males and 10 females, with a mean age of 56 months. Data were analyzed for group differences based on gender and the response condition (card/no card). Children using the response cards scored slightly higher than those who verbally labeled the target emotions. However, z-tests of proportions for the gender variable and the card/no card variable comparison indicated no significant differences.

A smaller pilot study involved five children with LI whose IQ scores ranged between 70 and 80. These children were presented with pictures of faces expressing different emotions. Participants were asked to identify the emotion being expressed. In the first condition, children were asked to indicate the emotion expressed in the picture verbally. In the second condition, children were asked to indicate the emotion expressed in the picture by pointing to the corresponding response card. The children who used the response cards performed better than the children who indicated the answer verbally.

However, the difference was not statistically significant. Based on the evidence from these two pilot studies, it was concluded that the response cards did not unnecessarily complicate the task.

Procedures

Four examiners administered the CASL and UNIT to the participants at their respective schools. Examiners practiced test administration on elementary children and had to be passed off by individuals previously trained in the administration of the CASL and UNIT to ensure accurate administration. Once the examiners were passed off they began administering the tests to the participants in the study.

The prosody task was also administered to the children at their respective schools. A single examiner administered the task to all of the participants. The examiner maintained neutral facial expression and vocal affect throughout administration. Comments were kept to a minimum to avoid providing emotion cues to the participants.

The children were trained to use the response cards and to perform the prosody task prior to the evaluation. Children were also trained to perform the prosody task (see the Appendix). After the participants were trained to use the response cards, the 16 audio clips were presented. The child and the examiner listened to the clips through headphones. The child responded to each segment by pointing to the response card. Occasionally the child would indicate his or her answer verbally, rather than by pointing. Saying the name of the emotion was considered an acceptable response.

Data Analysis

Participant responses were scored as to whether the emotion was correctly identified. Each participant received a score for each emotion, based on the number of times the emotion was presented. Each of the four emotions was presented four times. Thus, for an individual emotion a score of zero would indicate that the child was unable to identify the emotion on any of the four trials, and a score of four would indicate 100% correct identification. The data were then analyzed to assess performance based on gender, group, and individual emotion type.

Results

The percentage of correct responses produced by the group with LI and the typical group for each of the individual emotions identified is presented in Table 3. The data are organized in confusion matrices for each group, thus showing how often each emotion was correctly identified. Additionally, the number of times each of the other emotions was incorrectly selected in its place is also represented.

A three way, mixed model analysis of covariance (ANCOVA) was conducted, with language group (LI & typical) and gender serving as between subject factors, and emotion (anger, fear, happiness, & sadness) serving as a within subject factor. The IQ scores of the participants served as a covariate to account for the potential confounding effect of differences in IQ between the groups. The number of times each emotion was correctly identified served as the dependent variable.

A main effect for language group was found, $F(1, 39) = 6.802, p = .013, \eta^2 = .148$. Across the four emotions, the typical group produced higher scores than the group of children with LI. There was also a significant relationship in the interaction between emotion, group, and gender, $F(1, 39) = 4.648, p = .037, \eta^2 = .106$. Females with LI ($M = 3.08$) performed better than the typically developing males ($M = 2.99$) in identifying the emotion sad (see Appendix). Differences between emotions approached significance, $F(1, 39) = 3.058, p = .088, \eta^2 = .073$. Recordings of happiness were identified correctly most often ($M = 3.61, SD = .618$), followed by anger ($M = 3.25, SD = .651$), fear ($M = 2.91,$

Table 3

Confusion Matrices of Percentages of Correct Identification of Each Emotion

Emotion portrayed	Group with LI				
	Emotion Children Identified				
	Anger	Fear	Happiness	Sadness	I don't know
Anger	76.14	1.13	18.18	0.00	4.54
Fear	2.27	68.18	4.54	14.77	10.23
Happiness	3.41	4.55	84.09	4.55	3.41
Sadness	1.14	13.64	1.14	69.32	14.77

Emotion portrayed	Typical group				
	Emotion Children Identified				
	Anger	Fear	Happiness	Sadness	I don't know
Anger	86.36	0.00	7.95	0.00	5.68
Fear	1.14	77.27	1.14	7.95	12.50
Happiness	9.09	0.00	88.64	0.00	2.27
Sadness	4.54	7.95	0.00	75.00	11.36

$SD = .830$), and sadness ($M = 2.89$, $SD = .841$). Analysis indicated that gender was not a significant factor $F(1, 39) = .404$, $p = .529$, $\eta^2 = .010$.

By examining the confusion matrices it is also possible to determine the frequency of misidentified emotions in each of the language groups. The emotions happiness and anger were accurately identified more often than fear and sadness in both groups. In fact, fear and sadness were sometimes confused. The children with LI misidentified portrayals of fear as sadness 15% of the time and misidentified portrayals of sadness as fear 14% of the time. Though the typically developing children more accurately identified the emotions in general, a similar pattern of identification was noted in their scores. The typical children misidentified fear as sadness 8% of the time and misidentified portrayals of sadness as fear 8% of the time.

Though the confusion between fear and sadness may have been anticipated, the confusion between anger and happiness was surprising. Children with LI misidentified portrayals of anger as happiness 18% of the time. Similarly, typical children misidentified portrayals of anger as happiness 8% of the time. However, children with LI misidentified portrayals of happiness as anger only 3% of the time, while the typical children misidentified portrayals of happiness as anger 9% of the time.

The percentages of emotions accurately identified in the Fujiki et al. (2008) study per language group were comparable to the findings of the current study, with percentage differences of 4% or less for each category with the exception of the category of fear. In the previous study, children with LI

correctly identified portrayals of fear 49% of the time while children with LI in the current study identified portrayals of fear as fear 68% of the time.

Individual profiles of performance are presented in Table 4. These data support the inferential statistical analysis in that they illustrate the stronger performance of typical children in comparison to the children with LI. Five of the typical children performed with almost perfect scores (15 or 16), while only one child with LI scored in this range. Some overlap in performance is evident in scores within the 12-14 range. Eleven children with LI scored in this range while 14 typical children scored in this range. There is more disparity in the distribution of scores between the two language groups in the mid-lower to lower scores. Ten children with LI scored an 11 or lower, while only three typical children scored in this range.

Table 4

Individual Levels of Performance for Children with LI and Their Typical Peers

Number correct	Children with LI scoring at each level	Typical children scoring at each level
100% (16)	0	3
94% (15)	1	2
88% (14)	5	4
81% (13)	2	8
75% (12)	4	2
69% (11)	6	3
62% (10)	3	0
56% (9)	0	0
50% (8)	0	0
43% (7)	1	0

Discussion

Children with LI had significantly more difficulty than typical peers in identifying emotion conveyed by prosody when presented with a spoken narrative task. These findings supported other recent investigations demonstrating that children with LI have difficulty understanding emotion. For example, Spackman et al. (2005) found that children with LI had significantly more difficulty recognizing the emotions of surprise and disgust in facial expressions than did their typically developing peers. Ford and Milosky (2003) found that children with LI had more difficulty inferring what emotions would be experienced by a story character within a given scenario. In addition, Brinton, Spackman, Fujiki, and Ricks (2007) found that children with SLI had more difficulty than their typical peers at understanding when emotion should be dissembled. These authors found that although participants in both groups were able to identify when it was appropriate to dissemble emotion, typical children chose dissemblance as the correct behavior significantly more often than the children with SLI. All these findings suggest that some children with LI struggle to understand the emotions experienced by others.

Studies involving the ability of children with LI to understand emotion in prosody have produced variable results. Children with LI have demonstrated similar performance to typical children in many aspects of prosody, which suggests that prosody in general is not the root cause of concern in regard to the challenges faced by children with LI (Creusere, Alt, & Plante, 2004; Snow, 2001; Van Der Meulen, Janssen, & Den Os, 1997). However, other studies

have indicated that there are differences in some aspects of prosody between children with LI and their typical peers (Gerken & McGregor, 1998; Nielsen, 2005; Semrud-Clikeman & Hynd, 1991). It is of note that there are few differences between children with LI and typical peers in recognizing emotion from prosodic cues when content is not an issue, such as short segments of speech and filtered speech (Berk, et al., 1983; Courtright & Courtright, 1983; Trauner, et al., 1993). Tasks with little or no demands of language content are important because they control for the possible influence of linguistic differences between the two language groups. However, it is also important to consider how children with LI process emotion conveyed through prosody in a more naturalistic context. Children with LI must be able to interpret prosodic cues in conventional social interaction in order to understand the emotion of their conversational partners. Thus, it is important to consider the role that prosody plays in emotion understanding in more naturalistic excerpts of speech.

No previous studies have explored the ability of children with LI to understand emotion conveyed through prosody using speech stimuli that is like speech used in daily social interactions. Fujiki et al. (2008) examined the ability of children with LI to interpret emotion conveyed by prosody in one such context, a narrative passage designed to be more representative of day-to-day speech. Children with LI and children with typical language abilities were asked to identify emotion as portrayed through prosody in a spoken narrative about going to class. Results provided further evidence that children with LI perform more poorly than their typical language peers when asked to identify

emotion as conveyed through prosody. The current study was a replication of their work.

The current study used the same procedures as the original Fujiki et al. (2008) study. Again, children with LI and children with typical language abilities were asked to identify emotion as portrayed through prosody in a narrative about going to class. Content was designed to be emotionally neutral. The passage was also structured to be within the comprehension abilities of children with LI. To interpret emotion correctly, the children were required to focus on the emotion conveyed through prosodic cues rather than from the literal content of the passage. Each time the actors read the seven sentence passage, they read in a manner conveying a single emotion. Each child heard the same seven sentence passage.

Results of the current study were similar to those of the original Fujiki et al. (2008) study. Children with LI did not perform as well as the typical children in recognizing emotion conveyed through prosody in an orally presented narrative passage. It is of note, however, that all the children who participated had some success in understanding the emotion presented. The children with LI produced a response pattern similar to the performance of their typically peers in that both groups had difficulty identifying the same emotions. For example, like their typical peers, children with LI identified sadness and fear less accurately than happiness and anger (see Table 3).

Interestingly, anger and happiness were confused one for another in both groups. Children with LI misidentified portrayals of anger as happiness 18% of

the time while typical children misidentified portrayals of anger as happiness 8% of the time. Though the prosodic characteristics of these emotions were not empirically measured in this study, confusions may be attributed to the similarities in pitch, volume, stress, speed, and precision when emotional intensity was high or when enthusiasm was being expressed. Although both groups confused these emotions, children with LI confused these emotions more often than did their typical language peers.

Both groups had difficulty recognizing the prosody in the spoken narrative portraying sadness and fear. The typical language group identified sadness and fear 75% and 77% accurately, respectively. The children with LI identified sadness accurately only 69% of the time, and fear accurately 68% of the time. These performance scores verified that children with LI were capable of performing the task, although they did not perform at the level of their typical peers.

Previous research has indicated that children with LI perform poorly on tasks requiring the interpretation of prosody on shorter unfiltered speech stimuli (e.g., Berk et al., 1983; Courtright & Courtright, 1983; Trauner et al., 1993). The Fujiki et al. (2008) study found similar results using a longer narrative passage. The results of the current study replicated the findings of Fujiki et al. (2008). The similarities in the pattern of performance noted further confirmed that children with LI have difficulty understanding emotion conveyed through prosody.

The goal of the current project was to examine the ability of children with LI to identify prosody in a context more like conversation. It is recognized, however, that even the current context of a recorded narrative did not have the complexity of a typical conversational interaction. It will be important to determine if the difficulties noted are also evident in more authentic contexts.

Future research is also needed to probe how a lack of emotion understanding conveyed through prosody affects social interactions. For example, do children who have difficulty understanding emotion conveyed by prosody also have fewer friends? Are they rated as less desirable playmates by peers? Although it seems likely that children who have difficulty interpreting emotion cues conveyed by prosody would have more difficulty in social interaction, a relationship between understanding emotion cues conveyed by prosody and difficulties in social interactions has not been empirically demonstrated. The current study, consistent with the findings of Fujiki et al. (2008), indicated a difference in performance between children with LI and their typical peers in understanding emotion conveyed through prosody. If the observed performance in other authentic contexts reflects the patterns observed in this study, and if deficits in this ability are linked to peer-interaction problems, then understanding emotion conveyed through prosody may be a factor in the social challenges experienced by children with LI.

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Appendix 1

Prosody Task Training Procedures

The examiner began by saying, “There are lots of ways that people show how they feel. Sometimes people show feeling by how they talk. Listen. This person sounds disgusted.” At the same time the examiner laid out the disgust card and played a sound clip of a male voice saying, “Oh, we’re having chicken for dinner” with prosody conveying disgust. The examiner then said, “Listen, this person sounds surprised.” The clip with a female voice saying the same sentence in a surprised manner was then presented. The cards representing surprise, disgust and “I don’t know” were laid on the table, and the child was instructed to “Listen and point to how this person feels.” The sound clip of a voice saying, “Oh we are having chicken for dinner,” with prosody conveying disgust was presented. The child then pointed to the corresponding card. If the child correctly identified the response card, the examiner said, “Yes, that’s right. His voice sounded disgusted.” If the child responded incorrectly then the training sequence was repeated.

Appendix 2

Percentages of Emotions Correctly Identified

Emotion	Females with LI	Typical females	Males with LI	Typical males
Happy	87	97	82	96
Sad	81	81	63	71
Scared	63	81	71	75
Anger	69	88	80	86
Total	75	86	74	82
