Rieffe, C., & Wiefferink, C.H. (2017). Happy faces, sad faces; Emotion understanding in toddlers and preschoolers with language impairments. *Research in Developmental Disabilities*, *62*, 40-49. doi: 10.1016/j.ridd.2016.12.018

Happy faces, sad faces;

Emotion understanding in toddlers and preschoolers with language impairments

Abstract

Background

The capacity for emotion recognition and understanding is crucial for daily social functioning. We examined to what extent this capacity is impaired in young children with a Language Impairment (LI). In typical development, children learn to recognize emotions in faces and situations through social experiences and social learning. Children with LI have less access to these experiences and are therefore expected to fall behind their peers without LI.

Method

In this study, 89 preschool children with LI and 202 children without LI (mean age 3 years and 10 months in both groups) were tested on three indices for facial emotion recognition (discrimination, identification, and attribution in emotion evoking situations). Parents reported on their children's emotion vocabulary and ability to talk about their own emotions.

Results

Preschoolers with and without LI performed similarly on the non-verbal task for emotion discrimination. Children with LI fell behind their peers without LI on both other tasks for emotion recognition that involved labelling the four basic emotions (happy, sad, angry, fear). The outcomes of these two tasks were also related to children's level of emotion language.

Implications

These outcomes emphasize the importance of 'emotion talk' at the youngest age possible for children with LI.

What this paper adds

The outcomes of this study show that toddlers and preschoolers with a language impairment (LI) fall behind their peers in the basic skills of emotion recognition (facial and situational). Given the importance of emotion recognition for social functioning, this emphasizes that even at this young age, the social development of children with LI is already at risk.

In the absence of another diagnosis that explains this delay, only limited access to social learning explains this difference in emotion recognition between preschoolers with and without LI. Parents also note more difficulties talking with their child with LI about their daily emotion evoking episodes, compared to parents of children without LI. These outcomes stress the importance of parent-child emotion talk for children with LI, even during their early years, which can scaffold the development of children's emotion understanding at the earliest possible age.

Keywords: Emotional competence, language impairment, theory of mind, facial recognition, emotion talk

Happy faces, sad faces;

Emotion understanding in toddlers and preschoolers with language impairments

1. Introduction

The ability to 'read' others' emotions is an important skill for positive daily social interactions (Cutting & Dunn, 1999). Relationships rely largely on this ability to understand how the interaction partner feels towards specific situations. For example, this skill forms the basis for adaptive empathic reactions. Albeit the capability may be innate, its development requires social input to come to its full potential (Catmur, Walsh, & Heyes, 2007). A previous study showed that even a nonverbal task on facial emotion recognition can be more difficult for toddlers and preschoolers who have less access to their social world (i.e. due to hearing impairments), and thus less opportunity for social learning (Wiefferink, Rieffe, Ketelaar, De Raeve, & Frijns, 2013). To the best of our knowledge, it is yet unknown to what extent a language impairment can also hamper the early steps in the development of emotion recognition. Children diagnosed with language impairments (LI) are also limited in their social learning (Vissers & Koolen, 2016), which in turn could affect their capacity for emotion recognition. In this study we will examine the capacity for emotion recognition in toddlers and preschoolers with and without LI on three different indices for emotion recognition: recognizing facial expressions, labelling facial emotion expressions, and recognizing emotions in a social context.

1.1. Psycho-social development in children with Language Impairments

The diagnosis of a language impairment refers to persistent deficits in either children's language comprehension, production, or both, in the absence of other diagnoses that can explain these impairments. According to the DSM-V, the language impairment involves a reduced vocabulary, a limited sentence structure, and difficulties with discourse (DSM-V,

American Psychiatric Association, 2013). It is the most common developmental disorder in children: it is prevalent in 5-7% in children aged 0-7 years (Shriberg, Tomblin, & McSeeny, 1999; Tomblin et al., 1997).

Children with LI experience more difficulties in daily functioning than typically developing children. They have an increased risk for social and behavioral problems (Lindsay, Dockrell, & Strand, 2007; Maggio et al., 2014; Schoon, Parsons, Rush, & Law, 2010; Van Daal, Verhoeven, & Van Balkom, 2007). Their position within the peer group is also at risk. Children with LI experience lower levels of peer acceptance, have fewer friends, and they are more often bullied by their peers (Lindsay et al., 2007).

These problems start early in life. Typically developing preschool children already avoid verbal interaction with children with LI (Hadley & Rice, 1991), and elementary school children consider children with LI less likeable (Andrés-Roqueta, Adrian, Clemente, & Villanueva, 2016; Gertner, Rice, & Hadley, 1994). These psycho-social problems persist when LI children grow older: children, adolescents, ánd adults with LI are at greater risk for depression and anxiety disorders, but also social problems, social isolation, or social phobia (Beitchman et al., 2001; Brownlie et al., 2004; Clegg, Hollis, Mawhood, & Rutter, 2005; Durkin & Conti-Ramsden, 2010; Lewis et al., 2016; Schoon, Parsons, Rush, & Law, 2010; St Clair, Pickles, Durkin, & Conti-Ramsden, 2011; Wadman, Durkin, & Conti-Ramsden, 2011). Therefore, it is important to find the early roots of these psycho-social problems in children with LI in order to start preventive treatment as young as possible.

A striking outcome in various studies is that the social problems in the LI population are not directly related to their language levels (Marton, Abramoff, & Rosenzweig, 2005; St Clair et al., 2011; Wadman et al., 2011). Or, as Marton (2005) phrased it “the two problems are co-occurring” (p. 143). Rather, the relation between language skills and social problems is indirect. Impaired language skills cause communication difficulties, i.e. problems overhearing

and understanding conversations by others; participating in group conversations where people often take turns at unexpected moments; being able to follow discussions that go fast or where people start talking simultaneously. Due to their communication difficulties, children with LI miss out on full participation in many social situations and therefore, have fewer opportunities for social learning. Limited access to the social world is not only a problem for children with LI, but also for other children with communication impairments, such as children with autism and children with hearing loss, albeit for different reasons, from very early on (Rieffe, Dirks, Van Vlerken, & Veiga, 2016). Studies in these groups confirm that not language levels but communication skills are related to children's psycho-social functioning (e.g. Netten et al., 2015).

1.2.Emotion recognition in children with LI

In typical development, children's ability to understand, predict and explain emotions in others is strongly related to their social functioning (Denham, 1999). For instance, social competence and peer-rated popularity in children are predicted by children's ability to recognize the facial expression of emotions in other people, and to understand their causes (Denham, McKinley, Couchoud, & Holt, 1990). The question is to what extent the noted social impairments in children with LI are also related to possible difficulties with emotion recognition. We divided emotion recognition in the nonverbal capacity for facial emotion recognition, and the verbal capacity of labelling emotions.

First, an important aspect of emotion recognition is the ability to accurately read facial expressions in others. Babies already use this capacity to infer from their caregiver's face if a situation is safe or not (Soken & Pick, 1999); and from very early on, reciprocal positive facial expressions strengthen the relationship between caregiver and child (Messinger, 2008). To date, the capacity to read facial expressions in toddlers and preschoolers with LI has not

yet been studied. Although reading emotions from faces is a nonverbal capacity, research on deaf toddlers with a cochlear implant showed a delay in this particular group compared to hearing peers (Wiefferink et al., 2013). This emphasizes the importance of communication and being able to fully participate in the social world in order to make sense of the different facial expressions that people can have, and to be able to interpret these different facial expressions in the social context that they appear. In other words, learning how to read facial expressions, a nonverbal capacity, also requires a social context (Catmur et al., 2007; Messinger, 2008).

Second, an important way to learn about the meaning of different facial expressions is by labeling the emotions they reflect. Happy and sad (in very young children sad reflects all negative facial expressions) are usually the first emotion words that children acquire in typical development (Denham, 1999). Many parents read books with their children, and label the facial expressions of the story character (Symons, Peterson, Slaughter, Roche, & Doyle, 2005); or children pick up emotion words from overhearing others. Eventually, this also enables children to communicate their pleasure or displeasure with certain events, in order to achieve their goals. In other words, 'emotion talk' becomes increasingly important.

Although research on emotion recognition in toddlers and preschoolers with LI is still lacking, this capacity has been studied in school-aged children with LI (e.g. Delaunay-El Allam, Guidetti, Chaix, & Reilly, 2011; Ford & Milosky, 2003; Loukusa, Makinen, Kuusikko-Gauffin, Ebeling, & Moilanen, 2014; Spackman, Fujiki, & Brinton, 2006). Findings from these studies consistently show no problems in the labeling of the basic emotions (happiness, anger, sadness, fear) based on facial expression from either drawings or photos. This might not come as a surprise, since children start labeling these basic emotions around two-years of age in typical development (Way, Yelsma, Van Meter, & Black-Pond, 2007). Nevertheless, the children with LI seem to fall behind their peers without LI when the

studies include more advanced emotions that develop during childhood, such as disgust and surprise (for an overview of these studies see Bakopoulou & Dockrell, 2016).

1.3.Emotion recognition in a social context

A third important aspect of emotion recognition is to understand the emotion in its social context. Different from a mood state which is more general and not linked to any specific situation, an emotion, by definition, is linked to an emotion-evoking event (Frijda, 1986). In fact, an emotional reaction to an event reflects that i) the event is important to the person; ii) the focus of attention is now dominantly on this event; and iii) the person has a strong wish to achieve something from this event. Knowing how the person feels about an event, therefore, gives insight into what is important to that person; and what he or she wants to achieve. For example, anger in a peer conflict situation reflects that the child feels mistreated and wants to restore what he or she thinks is right; whereas sadness reflects an experienced loss of something important that cannot be restored (Rieffe, Meerum Terwogt, & Cowan, 2005).

Again at a very early age in typical development, children acquire 'scripted emotion knowledge', i.e. they learn what emotion fits what kinds of situations for most people in their social environment, such as happiness with a present, and sadness when your beloved pet dies (Rieffe, Meerum Terwogt, & Smit, 2003). A few studies have examined this in school-aged children with LI, showing a serious impairment in this particular group (Ford & Milosky, 2003; Spackman et al., 2006).

1.4.Present study

The first aim of the present study was to examine emotion recognition (i.e. recognizing facial emotion expressions, labelling facial emotion expressions, and recognizing

emotions in a social context) among children with and without LI at an early age (i.e. in toddlers and preschool children). We expected children with LI to perform less well on all indices for emotion recognition than their peers without LI, because we see that children with LI fall behind their peers without LI on age-appropriate tasks for emotion recognition during childhood (Bakopoulou & Dockrell, 2016; Ford & Milosky, 2003; Spackman et al., 2006).

The second aim of this study was to examine the relation between children's capacity for emotion recognition with how well parents think they can talk with their child about emotions; and their children's emotion vocabulary. Especially during the first years of life, parental input and talk about emotions is a crucial factor for children's development (Adrian, Clemente, Villanueva, & Rieffe, 2005). Talking about emotions or an emotion vocabulary does not simply involve connecting words to objects, but instead to inner states, reflecting how one feels, which can change over time or situations. We expected the relation between the outcomes on the emotion recognition indices to be related to children's emotion talk and emotion vocabulary, especially for the tasks involving verbal responses (i.e.. the tasks for labelling facial emotion expressions; and recognizing emotions in a social context), since these tasks might rely more heavily on children's level of 'emotion talk' (Loukusa et al., 2014; Wiefferink et al., 2013). In addition, gender was controlled for, but no specific gender differences are expected at this young age (Wiefferink et al., 2013).

2. Method

2.1.Participants

The sample consisted of 89 children with LI and 202 children without LI, aged 28 – 57 months (Table 1). LI children were recruited from special treatment groups for children with LI, spread all over the Netherlands. Children visiting these groups were diagnosed with

language impairment (1.5 standard deviation below average on standardized language tests) without additional conditions such as hearing loss, autism or general developmental delay. Children visited their treatment group three times a week. In each group, eight to ten children participated. A speech-language therapist, two preschool teachers and a remedial educational scientist worked together in these groups to stimulate the language development of the children. Most LI children were boys, in accordance with prevalence of LI (Law, Boyle, Harris, Harkness, & Nye, 1998). Non-verbal IQ was assessed by the Snijders-Oomen Nonverbal Intelligence Test 2.5-7-Revised (SON-R 2.5-7) (Tellegen, Winkel, Wijnberg-Williams, & Laros, 2005) in 59 LI children and 65 children without LI. Spoken language is not required for this test. The SON-R 2.5-7 covers two domains: performance and reasoning. Although all children had non-verbal IQ within the normal range, non-verbal IQ of children without LI was higher than that of children with LI ($t(122) = 3.21$, $p = .002$).

Children without LI were recruited through day-care centers and playgroups in the Netherlands in the context of a larger project on children with communicative difficulties (Wiefferink, Rieffe, Ketelaar, & Frijns, 2012). For this study, we defined the group without LI through exclusion of participants outside the age range of the sample with LI (Table 1). Informed consent was obtained from all parents and the study was approved by the university's medical ethical committee.

2.2.Materials and procedure

Children with LI were tested individually in a quiet room in the treatment group, TD children were tested in a quiet room at the day-care center or playgroup. Tasks requiring language (Emotion Identification Task and Emotion Attribution Task) were only administered if the language comprehension of the children was sufficient. This was assessed by asking parents whether their children understood the word "why". Second, children's passive vocabulary was

assessed with a picture task. The experimenter named 13 objects (e.g. bike, carrot) and asked children to identify the correspondent picture. Children were considered to have insufficient language comprehension if they did not understand the word 'why', or if children misidentified more than four pictures. All sessions were recorded on video and took approximately 30 minutes, including other tasks which are not presented in this paper. After the sessions, the researcher made transcripts of the tapes. The tasks used in this study were used before in a study of deaf children with cochlear implants (Wiefferink et al., 2013).

Parents filled out the questionnaire Emotion Vocabulary and Emotion Expression Questionnaire at home around the time their child was tested.

2.2.1. Emotion recognition in facial expression

Two tasks were used to assess emotion recognition in facial expression: a discrimination task, and an identification task. Psychometric information about each task can be found in Table 1.

First, children's ability to discriminate between different facial emotion expressions was examined in the *Emotion-Discrimination Task* (Wiefferink et al., 2013) consisting of two conditions, each covering two performance tasks of increasing difficulty. In the neutral condition, children were tested on their ability to discriminate between cars and flowers (task 1), and faces with hats versus faces with glasses (task 2). It was assumed that the first task was easier than the second for both LI and typical developing children, because the distinction between different objects is much more noticeable than the distinction between objects in otherwise similar faces. This neutral condition was also used to check if children understood how to sort different cards. Children did not proceed to the second condition if they did not pass the first condition, because we assumed different objects are easier to distinguish than different facial expressions. The second (facial expression) condition was designed to test children's ability to discriminate between different facial emotion expressions between

valences (task 1; happy versus sad), and within the same valence (task 2; angry versus sad). It was assumed that the first task would be easier than the second, because the difference in facial expression is much more prominent between valences than within one valence.

In both conditions, children had a sheet in front of them with a sample drawing of one category in the top left corner (e.g. an angry face) and a drawing of the other category in the top right corner (e.g. a sad face). The children were then handed six cards one by one in fixed order (e.g. three drawings of an angry face and three drawings of a sad face), and non-verbally instructed to place each card in the correct category after a demonstration. The drawings of facial emotion expressions used in this task were all computer-generated, in black and white, and based on photos of different three- and four-year-old boys which were randomly chosen from a large data base with photos of various facial expressions. The cards that were placed correctly were counted, with a maximum of three per category.

To examine children's ability to link emotion words to the facial expressions accompanying the four basic emotions (happiness, sadness, fear, and anger), they were presented with the *Emotion Identification Task* (Wiefferink et al., 2013). The task consists of eight drawings of facial emotion expressions, two for each emotion, designed especially for this study. The researcher showed two sheets with four drawings of facial emotion expressions on each sheet and asked the children: "Who looks happy?" Children had to point to the drawing with the correct facial expression. Next, the researcher asked: "Is there anybody else who looks happy?" After that, she repeated the same procedure for anger, sadness, and fear. The number of emotions correctly identified was recorded, with a maximum score of two per emotion.

2.2.2. Emotion attribution in prototypical situations

The material for the third task, the *Emotion-Attribution Task*, consists of eight vignettes depicting prototypical emotion-evoking events (Wiefferink et al., 2013). Two vignettes were designed for each basic emotion (happiness, anger, sadness, and fear) (table 2). Children were shown drawings accompanied by a simple explanation, such as “Look, the boy sees a dog”. They were first asked “How does he feel?” (verbal condition), and “How does he look?” (visual condition). The test includes a visual and a verbal condition, because children who do not know the word for an emotional state might recognize the correct facial expression. Scores were computed as proportion of correct responses for each condition separately. A correct answer was achieved when a child predicted an emotion within the intended valence domain, i.e., negative (anger, sadness, fear) versus positive (happiness). The reason for scoring this way is that it is possible that children experience different emotions in a prototypical situations. For example, when the spade of a boy is broken, it is possible that a child will feel angry, but also that he feels sad. Moreover, there is evidence that children until the age of 3½, label all positive emotions as happy and use the same label for all negative expressions, for example, angry or sad (Widen, 2013; Martins et al., 2016).

2.2.3. Emotion talk

The measure for Emotion Talk is a subscale from the questionnaire for Emotion Expression Questionnaire (EEQ; Rieffe, Ketelaar, & Wiefferink, 2010). Parents were asked to rate how well they could talk with their children after an emotion episode. The scale consists of 5 items, containing 2 positive and 3 negative emotions (happiness, joy, anger, sadness and fear). Parents can rate to what degree each item is true on a 5-point response scale (1 = (almost) never, 2 = rarely, 3 = sometimes, 4 = often, 5 = (almost) always). The scale showed a good internal consistency (Alpha = .91 and mean inter-item correlation = .68).

2.2.4. Emotion vocabulary

Emotion vocabulary was assessed by a parent questionnaire (Ketelaar, Rieffe, Wiefferink, & Frijns, 2013). Parents were asked whether their child used 20 emotion words, varying from basic emotions such as happy and sad, to more complex emotions such as disappointed, to words about inner-thoughts, such as 'thinking'. The parents answered 'yes' (2 points) when their child mastered the word, 'not clear' (1 point) when their child imitated the word, but the parent was not sure whether the child understood the meaning of the word, and 'no' (0 points) when the child did not use the word. Mean scores were calculated ranging from 0 – 2. The scale showed a good internal consistency (Alpha = .90 and mean inter-item correlation = .32).

2.3.*Data analysis*

Children who were unable to perform a task (including children who did not pass the language comprehension test) received a score 0 for that particular task, because this means that they were not able to correctly recognize facial expressions and attribute emotions. To determine whether accuracies in the recognition of facial expressions and the attribution of emotions in prototypical situations differed between children with and without LI, all scores were entered in a multivariate analysis of variance. All multivariate analyses were also carried out including gender. No differences were found in this respect. For reasons of clarity, these analyses are not reported in the manuscript.

To test the second research questions, Pearson correlations were computed for the indices of emotion recognition with Emotion Talk and Emotion Vocabulary. These correlations were first computed per group and the strength of the correlations was tested using Fisher r-to-Z transformations between the groups. Because we found no differences in the strengths of the correlations between the groups, the scores are presented collapsed for Group.

3. Results

3.1.Emotion Discrimination

Table 3 presents means and standard deviations of children's performances on the Emotion-Discrimination Task. Children's scores for the neutral condition were analyzed with a 2 (Group) x 2 (Difficulty: flower/car, glasses/hat) analysis of variance; this revealed a main effect for Difficulty ($F(1,288) = 78.30$, $p < .001$), but not for Group ($F(1,288) = 1.79$, $p = .182$). No interaction effect was found ($F(1,288) = 4.13$, $p = .053$). It was more difficult for children in both groups to distinguish between the glasses/hat task than the flower/car task.

Children's scores for the facial-expression condition were analyzed with a 2 (Group) x 2 (Difficulty: positive/negative, sad/angry) analysis of variance; this revealed a main effect for Difficulty ($F(1,288) = 7.89$, $p = .005$), but not for Group ($F(1,288) = 1.31$, $p = .253$). No interaction effect was found ($F(1,288) = .08$, $p = .776$). It was more difficult for children in both groups to distinguish between sad and angry faces than between positive and negative faces. .

3.2.Emotion Identification

Table 4 presents the accuracy with which children identified the four basic facial emotion expressions. A 2 (Group) x 4 (Emotion: happy, angry, sad, fear) analysis of variance revealed main effects for Group ($F(1,289) = 5.19$, $p = .023$) and Emotion ($F(3,867) = 30.82$, $p < .001$). No interaction effect was found ($F(3,867) = 1.11$, $p = .345$). Children with LI had more difficulties identifying facial emotion expressions. Post hoc t-tests showed that children in both groups were better able to link the emotion words to the faces for happy and angry than for fear and sad (happy-angry: $t(290) = .52$, $p = .602$; fear-sad: $t(290) = .14$, $p = .892$; happy-

sad: $t(290) = 7.78$, $p < .001$; happy-fear: $t(290) = 7.59$, $p < .001$; angry-sad: $t(290) = 7.54$, $p < .001$; angry-fear: $t(290) = 7.05$, $p < .001$).

3.3.Emotion Attribution in prototypical situations

Children's scores for the prediction of emotions in prototypical situations were analyzed by means of a 2 (Group) x 2 (Emotion: Positive, Negative) x 2 (Mode: Verbal, Visual) analysis of variance (Table 4).Main effects were found for Group ($F(1,289) = 15.83$, $p < .001$) and Mode ($F(1,289) = 54.78$, $p < .001$), which was qualified by an interaction of Group x Mode ($F(1,289) = 12.34$, $p = .001$) and Emotion x Mode ($F(1,289) = 16.51$, $p < .001$). No significant effect was found for Emotion ($F(1,289) = 3.35$, $p = .068$) and no interaction effect for Group x Emotion ($F(1,289) = 1.50$, $p = .222$) and Group x Emotion x Mode ($F(1,289) = .76$, $p = .384$).

Children with LI had more difficulties predicting emotions in prototypical situations than children without LI. Post hoc t-tests showed that children with and without LI were better in verbally predicting negative emotions than positive emotions (children with LI: $t(88) = 3.48$, $p = .001$; children without LI: $t(201) = 1.98$, $p = .049$). Also, all children were better in visually predicting positive emotions, compared to verbal predicting positive emotions (children with LI: $t(88) = 5.60$, $p < .001$; children without LI: $t(201) = 4.16$, $p < .001$). Only children with LI were better in visual prediction than verbal prediction in negative emotions (children with LI: $t(88) = 4.24$, $p < .001$; children without LI: $t(201) = 1.88$, $p = .061$).

3.4. Differences between children with and without LI on indices for 'emotion language'

Table 1 shows the mean scores per group on the two indices for children's 'emotion language'. Children without LI had a better emotion vocabulary than children with LI ($t(237) = 6.88$, $p < .001$). Moreover, parents of children without LI were more positive about being

able to talk with their children about the child's emotion than parents of children with LI ($t(238) = 3.60$, $p < .001$).

3.5. *Associations with emotion vocabulary and language levels*

Pearson correlations (Table 5) showed that Emotion Identification and Emotion Attribution were significantly correlated with Emotion Talk and Emotion Vocabulary, whereby we controlled for Age, except for the visual version of the Emotion Attribution task. Emotion Discrimination was unrelated to Emotion Talk and Emotion Vocabulary.

4. Discussion

The ability to recognize emotions in others starts at the youngest possible age (Jessen & Grossmann, 2016), which marks its importance for children's development and social functioning. First, the outcomes in this study showed no differences between toddlers and preschoolers with and without LI on a nonverbal task for facial emotion recognition (i.e. emotion discrimination). Yet, on both tasks for emotion recognition that involved labelling the emotions (i.e. emotion labeling; and attributing an emotion to a story character), children with LI performed less well than children without LI. Second, whereas the task for emotion attribution was unrelated to children's level of emotion talk and emotion vocabulary, the two indices for emotion recognition that involved labeling (i.e. emotion labeling and emotion attribution) were related to children's level of emotion talk and emotion vocabulary. These outcomes seem in line with previous studies. Other studies on older children with LI also found impairments in the attribution of emotions in prototypical situations (Ford & Milosky, 2003; Spackman, 2006). This emphasizes the fact that emotion knowledge is based on social learning through access to social interactions in various ways, which is more difficult for

children with LI. Yet, especially emotion talk seems to play a crucial role in this process, which we will discuss more elaborately below.

Taken together, the outcomes of our study show that even preschoolers with LI are already behind their peers without LI. Yet, there is no reason to think that their development is qualitatively different from the population without LI. These outcomes indicate that an early diagnosis of LI is essential to open the possibility for early intervention and prevention. Professionals and parents should be aware of the risks for young children with LI. Trying to prohibit an unnecessary delay in children's emotional development at the youngest possible age, will in turn also have a positive effect on children's social functioning, although future studies should further explore the predictive value of children's skills for emotion recognition on other areas of development.

A noteworthy outcome of this study that coincides with other studies is the importance of emotion talk (Grazzani, Ornaghi, Agliati, & Brazzelli, 2016). We did not find differences between the children with or without LI regarding the importance of emotion talk, although children with LI had a less well-developed emotion vocabulary and parents found it more difficult to talk with their LI child about emotions. At this young age, the care-giver plays a particulary important role when it comes to discussing emotions. Emotion talk involves much more than simply connecting words to objects. Understanding the specific meaning of an emotion label, such as being able to differentiate between 'anger' or 'sad', also implies the evaluation of a specific event and an action tendency, i.e. the tendency to approach the situation in a certain way in order to achieve the desired state (Frijda, 1986). Studies show that when parents spend more time reading books with their children, children's understanding that different people can have different emotions to the same event matures more rapidly (Adrian et al., 2005). Especially when parents invite the child to join in conversations about the story character, and have the child express his or her own thoughts

and feelings on the matter, children's knowledge about other people's feelings develops to a higher level (Roberts & Kaiser, 2011).

We also want to note some limitations of this study and give suggestions for future studies. First, the materials presented to the children to test their emotion recognition involved drawings of facial expressions on which the emotion expressions were pronounced and thus easy to detect. However, in daily life situations, people show different intensities, ranging from intense to very subtle facial emotion expressions. Yet, it is more difficult to recognize emotions from photos of faces with subtle emotion expressions, and this might apply especially to children with LI. Second, emotions usually occur dynamically, while people talk or move, and intensities vary over time, depending on changes in the situation. In other words, the materials we have used in our study are a first step in unraveling children with LI's emotion understanding. Yet, for a profound understanding of daily life interactions and the role of emotions in this process, materials with a higher ecological validity, such as changing faces or behaviors in a situational context (photo and film materials) should be included in future studies. Third, based on studies with different groups of children with communication impairments (LI, ASD, HL) that reveal similar patterns in the social and emotional development of these different groups (Rieffe et al, 2016), we assume that the role of social learning is crucial for an optimal development of these children. Nevertheless, other factors, such as speed processing or executive functioning, could also play an additional role in this development, and should be considered in the future.

To conclude, we hope that the outcomes of this study signify the importance of paying attention to children's emotion talk and emotion understanding at the youngest age possible, to strengthen children in their social understanding. It is well-known that children with LI need more processing time to formulate and express their thoughts, and to process the content of other people's speech (Leonard et al., 2007). Since parent-child interactions are so vital at

the toddler and preschool years, these young children with LI might benefit from parent-child interactions at a slower pace than for children without LI. Yet, to the best of our knowledge, no studies have yet looked into the effect of this on children's emotion understanding. Therefore, future studies might also examine the effect of a longer processing time on children's emotional functioning, including their emotion understanding, since emotion communication and understanding will form the basis for their later social understanding and functioning.

Acknowledgements

This research was financially supported by "Care for the Young: Innovation and Development program by ZonMw" (grant number 80-82430-98-8025), and the research fund "Applied research cooperating organizations for auditory and communicative intervention". We want to thank Anna van 't Veer for designing the drawings that were used in this study.

5. References

Adrian, J. E, Clemente, R. A, Villanueva, L., & Rieffe, C. (2005). Parent-child picture-book reading, mothers' mental state language and children's theory of mind. *Journal of Child Language, 32, 3,* 673-686.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.).* Arlington, VA: American Psychiatric Publishing.

Andrés-Roqueta, C., Adrian, J.E., Clemente, R.A., & Villanueva, L. (2016). Social cognition makes an independent contribution to peer relations in children with Specific Language Impairment. *Research in Developmental Disabilities, 49,* 277-290.

Bakopoulou, I., & Dockrell, J.E. (2016). The role of social cognition and prosocial behaviour in relation to the socio-emotional functioning of primary aged children with specific language impairment. *Research in Developmental Disabilities, 49-50,* 354-370.

Beitchman, J.H., Wilson, B., Johnson, C., Atkinson, L., Young, A., Adlaf, E., Escobar, M., & Douglas, L. (2001). Fourteen-year follow-up of speech/language-impaired and control children: Psychiatric outcome. *Journal of American Academy of Child and Adolescent Psychiatry, 40,* 75-82.

Bosacki, S.L., & Moore, C. (2004). Preschoolers' understanding of simple and complex emotions: links with gender and language. *Sex Roles, 50(9/10),* 659-675.

Brownlie, E.B., Beitchman, J.H., Escobar, M., Young, A., Atkinson, L., Johnson, C., Wilson, B., & Douglas, L. (2004). Early language impairment and young adult delinquent and aggressive behavior. *Journal of Abnormal Child Psychology, 32,* 453-467.

Catmur, C., Walsh, V., & Heyes, C. (2007). Sensorimotor learning configures the human mirror system. *Current Biology, 17,* 1527-1531.

Clegg, J., Hollis, C., Mawhood, L., & Rutter, M. (2005). Developmental language disorders – a follow-up in later adult life. Cognitive, language and psychosocial outcomes. *Journal of Child Psychology and Psychiatry, 46*, 128-149.

Cutting, A. L., & Dunn, J. (1999). Theory of mind, emotion understanding, language, and family background: individual differences and interrelations. *Child Development, 70*, 853–865.

Delaunay-El Allam, M., Guidetti, M., Chaix, Y., & Reilly, J. (2011). Facial emotion labelling in language impaired children. *Applied Psycholinguistics, 32*, 781-798.

Denham, S.A., McKinley, M., Couchoud, E.A., & Holt, R. (1990). Emotional and behavioral predictors of preschool peer ratings. *Child Development, 61*, 1145-1152.

Denham, S.A., Blair, K.A., DeMulder, E., Levitas, J., Sawyer, K., Auerbach-Major, S., & Queenan, P. (2003). Preschool emotional competence: Pathway to social competence? *Child Development, 74(1)*, 238-256.

Durkin, K., & Conti-Ramsden, G. (2010). Young people with specific language impairment: A review of social and emotional functioning in adolescence. *Child Language Teaching and Therapy 26*, 105-121.

Ford, J.A., & Milosky, L.M. (2003). Inferring emotional reactions in social situations: Differences in children with language impairment. *Journal of Speech, Language, and Hearing Research 46*, 21-30.

Frijda, N. (1986). *The emotions*. Cambridge, MA: Cambridge University Press.

Gertner, B.L., Rice, M.L., & Hadley, P.A. (1994). Influence of communicative competence on peer preference in a preschool classroom. *Journal of Speech and Hearing Research, 37*, 913-923.

Grazzani, I., Ornaghi, V., Agliati, A., & Brazzelli, E. (2016). How to Foster Toddlers' Mental-State Talk, Emotion Understanding, and Prosocial Behavior: A Conversation-Based Intervention at Nursery School. *Infancy, 21*, 199-227.

Hadley, P.A., & Rice, M.L. (1991). Conversational responsiveness of speech and language-impaired preschoolers. *Journal of Speech and Hearing Research, 34*, 1308-1317.

Jessen, S., & Grossmann, T. (2016). The developmental emergence of unconscious fear processing from eyes during infancy. *Journal of Experimental Psychology, 142,* 334-343.

Ketelaar, L., Rieffe, C., Wiefferink, C. H., & Frijns, J. H. M. (2013). Social competence and empathy in young children with cochlear implants and with normal hearing. *The Laryngoscope, 123*, 518-523.

Law, J., Boyle, J., Harris, F., Harkness, A., & Nye, C. (1998). Screening for speech and language delay: a systematic review of the literature. *Health Technology Assessment, 2(9)*, 11-16.

Lewis, B. A., Patton, E., Freebairn, L., Tag, J., Iyengar, S. K., Stein, C. M., et al. (2016). Psychosocial co-morbidities in adolescents and adults with histories of communication disorders. *Journal of Communication Disorders, 61*, 60–70.

Leonard, L.B. (2001). Specific language impairments across languages. In D.V.M. Bishop & L.B. Leonard (Eds.), *Speech and Language Impairments in Children: Causes, Characteristics, Intervention and Outcome*s, pp. 115-129. Hove, UK: Psychology Press.

Leonard, L.B., Weismer, S.E., Miller, C.A., Francis, D.J., Bruce Tomblin, J., & Kail, R.V. (2007). Speed of processing, working memory, and language impairment in children. *Journal of Speech, Language, and Hearing Research, 50*, 408-428

Lindsay, G., Dockrell, J.E., & Strand, S. (2007). Longitudinal patterns of behaviour problems in children with specific speech and language difficulties: Child and contextual factors. *British Journal of Educational Psychology, 77,* 811-828.

Loukusa, S., Makinen, L., Kuusikko-Gauffin, S., Ebeling, H., & Moilanen, I. (2014). Theory of mind and emotion recognition skills in children with specific language impairment, autism spectrum disorder and typical development: group differences and connection to knowledge of grammatical morphology, word-finding abilities and verbal working memory. *International Journal of Language & Communication Disorders, 49,* 498-507.

Martin, E.C., Osorio, A., Verissimo, M., & Martins, C. (2016). Emotion understanding in preschool children. The role of executive functions. *International Journal of Behavioral Development, 40(1),* 1-10.

Maggio, V., Grañana, N. E., Richaudeau, A., Torres, S., Giannotti, A., & Suburo, A. M. (2014). Behavior problems in children with specific language impairment. *Journal of Child Neurology,* 29, 194–202.

Marton, K. , Abramoff, B., & Rosenzweig, S. (2005). Social cognition and language in children with specific language impairment (SLI). *Journal of Communication Disorders, 38,* 2, 143–162.

Messinger, D. (2008). Smiling. In: M. M. Haith & J. B. Benson (Eds.), *Encyclopedia of Infant and Early Childhood Development, Vol. 3,* pp. 186-198. Oxford: Elsevier.

Netten, A.P., Rieffe, C., Theunissen, S.C.P.M., Soede, W., Dirks, E., Korver, A.M.H., Konings, S., Oudesluys-Murphy, A.M., Dekker, F.W., & Frijns, J.H.M., on behalf of the DECIBEL Collaborative study group (2015). Early identification: Language skills and social functioning in deaf and hard of hearing preschool children. *International Journal of Pediatric Otorhinolaryngoly, 79*(12), 2221-2226.

548 Rieffe, C., Dirks, E., van Vlerken, W. & Veiga, G. (2016). The empathic mind in children
549 with communication impairments: The case of children who are Deaf or Hard of
550 Hearing (DHH); children with an Autism Spectrum Disorder (ASD); and children with
551 Specific Language Impairments (SLI). In V. Slaughter and M. de Rosnay (Eds) *Theory*
552 *of mind development in context* (pp. 106-120). Hove: Psychology Press.
553 Rieffe, C., Ketelaar, L., & Wiefferink, C. H. (2010). Assessing empathy in young children;
554 construction and validation of an empathy questionnaire (EmQue). *Personality and*
555 *Individual Differences, 49*, 362–367.
556 Rieffe, C., & Meerum Terwogt, M. (2000). Deaf Children's Understanding of Emotions:
557 Desires Take Precedence. *Journal of Child Psychology and Psychiatry, 41,* 601-608.
558 Rieffe, C., Meerum Terwogt, M., & Cowan, R. (2005). Children's understanding of mental
559 states as causes of emotions. *Infant & Child Development, 14*, 259-272.
560 Rieffe, C., Meerum Terwogt, M., & Smit, C. (2003). Deaf children on the causes of emotions.
561 *Educational Psychology, 23*, 159-168.
562 Roberts, M.Y. & Kaiser, A.P. (2011). The Effectiveness of Parent-Implemented Language
563 Interventions: A Meta-Analysis. *American Journal of Speech-Language Pathology, 20,*
564 180-199.
565 Schoon, I., Parsons, S., Rush, R. & Law, J. (2010). Children's language ability and
566 psychosocial development: A 29-year follow-up study. *Pediatrics 126*, e73-e80.
567 Shriberg, L.D., Tomblin, J.B., & McSeeny, J.L. (1999). Prevalence of speech delay in 6-year-
568 old children and comorbidity with language impairment. *Journal of Speech, Language,*
569 *and Hearing Research 42*, 1461-1481.
570 Soken, N. H., & Pick, A. D. (1999). Infants' perception of dynamic affective expressions: Do
571 infants distinguish specific expressions? *Child Development, 70,* 1275-1282.

572 Spackman, M.P., Fujiki, M., & Brinton, B. (2006). Understanding emotions in context: the
573 effects of language impairment on children's ability to infer emotional reactions.
574 *International Journal of Language & Communication Disorders 41*, 173-188.
575 Spackman, M.P., Fujiki, M., Briton, B., Nelson, D., & Allen, J. (2006). The ability of children
576 with language impairment to recognize emotions conveyed by facial expression and
577 emotion. *Communication Disorders Quarterly, 26*, 131-143.
578 St Clair, M.C., Pickles, A., Durkin, K., & Conti-Ramsden, G. (2011). A longitudinal study of
579 behavioral, emotional and social difficulties in individuals with a history of specific
580 language impairment (SLI). *Journal of Communication Disorders, 44, 2*, 186–199.
581 Symons, D. K., Peterson, C. C., Slaughter, V., Roceh, J., & Doyle, E. (2005). Theory of mind
582 and mental state discourse during book reading and story-telling tasks. *British Journal*
583 *of Developmental Psychology, 23,* 81-102.
584 Tellegen, P.J., Winkel, M., Wijnberg-Williams, B., & Laros, J.A. (2005). *SON-R 2,5-7:*
585 *Snijders-Oomen niet-verbale intelligentietest: Verantwoording en handleiding.*
586 Amsterdam: Hogrefe uitgevers.
587 Tomblin, J.B., Records, N.L., Buckwalter, P., Zhang, X., Smith, E., & O'Brien M. (1999).
588 Prevalence of specific language impairment in kindergarten children. *Journal of Speech,*
589 *Language, and Hearing Research, 40,* 1245-1260.
590 Van Daal, J., Verhoeven, L., & Van Balkom, H. (2007). Behaviour problems in children with
591 language impairment. *Journal of Child Psychology and Psychiatry, 48*, 1139-1147.
592 Vissers, C., & Koolen, S. (2016). Theory of Mind deficits and social and emotional
593 functioning in preschoolers with Specific Language Impairment. *Frontiers in*
594 *Psychology.*
595 Wadman, R., Kevin Durkin, K., & Conti-Ramsden, G., (2011). Social stress in young people
596 with specific language impairment. *Journal of Adolescence, 34, 3*, 421–431.

Way, I., Yelsma, P., Meter, A.M. van, & Black-Pond, C. (2007). Understanding alexithymia and language skills in children: Implications for assessment and intervention. *Language, Speech, and Hearing Services in School, 38,* 128-139.

Widen, S. (2013). Children's interpretation of facial expressions: The long path from valence-based to specific discrete categories. *Emotion review, 5(1),* 72-77.

Wiefferink, C. H., Rieffe, C., Ketelaar, L., & Frijns, J. H. M. (2012). Predicting social functioning in children with a cochlear implant and in normal-hearing children: The role of emotion regulation. *International Journal Of Pediatric Otorhinolaryngology, 76,* 883-889.

Wiefferink, C. H., Rieffe, C., Ketelaar, L., De Raeve, L., & Frijns, J. H. M. (2013). Emotion understanding in deaf children with a cochlear implant. *Journal of Deaf Studies and Deaf Education, 18,* 175-186.

610 Table 1. *Characteristics of the participants*

	LI (*n*=89)	Control (*n*=202)
Gender		
Boys	73 (82%)	110 (55%)
Girls	16 (18%)	92 (45%)
Age (months)		
Mean	42.2	42.3
SD	5.2	8.2
Range	28 - 57	28 - 57
Non-verbal IQ		
Mean	104	113
SD	15	15
Range	70-149	75-149
Emotion Vocabulary (0-2)	1.12 (.42)	1.48 (.35)
Emotion Talk (mean Q-score (SD))	3.72 (.92)	4.10 (.66)

611

612

Table 2. *Content of the eight stories*

	Story content
1.	Boy is building a tower; someone knocks it down
2.	Boy receives an ice-cream
3.	Someone is pulling at the boy's shirt
4.	Boy falls from bicycle
5.	Boy receives a present
6.	Boy sees a frightening dog
7.	The spade of the boy is broken
8.	Boy sees a crocodile

Table 3. *Mean scores of correct responses (SD) for Emotion Discrimination task (range 0-3)*

	LI	Control	Total
Neutral condition			
Flower/car	2.89 (0.35)	2.70 (0.65)	2.76 (0.58)
Glasses/hat	2.39 (0.77)	2.38 (0.81)	2.38 (0.80)
Facial-expression condition			
Positive/negative	1.63 (0.79)	1.75 (0.90)	1.71 (0.87)
Sad/Angry	1.47 (0.88)	1.56 (.89)	1.53 (0.89)

Table 4. *Mean score of correct responses (SD) for Emotion Identification and Emotion Attribution tasks (range 0-2)*

	LI	Control
Emotion Identification		
Happy	1.18 (0.87)	1.50 (0.78)
Angry	1.26 (0.90)	1.43 (0.82)
Sad	0.92 (0.92)	1.06 (0.87)
Fear	0.89 (0.91)	1.06 (0.88)
Emotion Attribution		
Positive emotion		
Verbal prediction	0.23 (0.36)	0.51 (0.46)
Visual prediction	0.47 (0.46)	0.61 (0.44)
Negative emotions		
Verbal prediction	0.33 (0.37)	0.55 (0.41)
Visual prediction	0.47 (0.39)	0.58 (0.40)

Table 5. *Correlations between Emotion Talk and Emotion Vocabulary with all indices for Emotion Recognition, collapsed over Group, controlled for Age*

	Emotion Talk	Emotion Vocabulary
Emotion Discrimination		
Positive/negative	.07	.11
Sad/Angry	.06	.07
Emotion Identification		
Positive facial expression	.20**	.23**
Negative facial expression	.21**	.16*
Emotion Attribution		
Verbal prediction	.16*	.31**
Visual prediction	.09	.22**

* $p <. 05$; ** $p <. 01$