Psychosocial functioning in toddlers with moderate hearing loss : the importance of caregivers

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It Takes Two to Read: Interactive Reading with Young Deaf and Hard-of-Hearing Children

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ABSTRACT

Objectives
Interactive storybook reading is an important activity to enhance the emergent literacy skills of young deaf and hard-of-hearing (DHH) children. The objective of the present study was to examine the effect of an interactive reading program on the interactive reading behavior of parents of young DHH children.

Design
Parents of 18 DHH toddlers in the Netherlands participated in an interactive reading program for parents of DHH children. Parents and children were videotaped during storybook reading before and after the program and their interactive reading behavior was compared to that of 10 parents who did not participated in the program. The Responsive Adult-Child-Engagement During Joint Book Reading Scale (DesJardin et al., 2014) was used to code the interactive reading behavior.

Results
The results showed that parents' interactive reading behavior tended to increase after they participated in the interactive reading program. After the program, they applied the interactive reading strategies more often than parents who had not participated in the program.

Conclusions
The findings suggest that participating in the interactive reading programs improved parents' interactive reading behavior. Therefore, it is recommended to incorporate interactive reading programs into early intervention programs for DHH children.

INTRODUCTION

Deaf and hard-of-hearing (DHH) children are more at risk for reading difficulties than hearing children (Traxler, 2000; Wauters, van Bon, Tellings, & van Leeuwe, 2006). To become a good reader, children need to possess skills such as expressive language, word knowledge, conceptual knowledge, narrative skills, and print knowledge (Ehri, 2005; Storch & Whitehurst, 2002). Because these skills are important precursors for later reading ability, they should receive early attention through experiences with literacy activities (Storch & Whitehurst, 2002). This may be self-evident for many young hearing children, but is even more important for DHH children who need more explicit opportunities to participate and profit from literacy activities to develop their emergent literacy skills to the same level as hearing children (Williams, 2004).

The concept of emergent literacy refers to the process through which children develop skills, knowledge, and attitudes about reading and writing before they start formal reading instruction (Vukelich & Christie, 2009; Whitehurst & Lonigan, 1998). The stage of emergent literacy starts as early as birth, when children start to develop their language and communication skills. In developing their language, they learn about the complex system of symbols and rules of the language, increase their vocabularies, and develop their communication skills (Barton & Brophy-Herb, 2006; Roskos, Tabors, & Lenhart, 2009). As children grow older, they develop their phonological awareness and their print knowledge (conventions, forms, and functions of print) (Vukelich & Christie, 2009). Children's literacy experiences in the early years provide the foundation for later literacy development and are essential for their motivation to learn to read and write (Storch & Whitehurst, 2002).

Parental involvement is a critical factor in the development of children's emergent literacy skills (Easterbrooks, Lederberg, & Connor, 2010). This might be even more important for DHH children, given that past research has shown that parental involvement in early intervention (Moeller, 2000) and in school programs (Calderon, 2000) was related to DHH children's language and literacy skills. Moeller (2000) found a high positive correlation in early intervention between parental involvement (measured by ratings from early interventionists about parent participation in program-related meetings and quality of communicative parent-child interactions) and children's vocabulary skills.

One activity that has been found to enhance these emergent literacy skills, both in hearing and DHH children, is parent-child interactive storybook reading (Bus, Van Ijzendoorn, & Pellegrini, 1995; DesJardin, Ambrose, & Eisenberg, 2009). Research indicates that most parents do not apply the techniques of interactive reading spontaneously but need training or instruction to do so (Huebner & Meltzoff, 2005; Mol, Bus, de Jong, & Smeets, 2008; Senechal, 1997). Most studies on the effects of interactive reading programs show positive results. However, these studies have focused on children with typical hearing levels (Huebner, 2000; Huebner & Meltzoff, 2005) or older deaf children (Fung, Chow, &

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McBride-Chang, 2005). The present study is the first study that investigated the effect of an interactive reading program on the reading behavior of parents of younger DHH children (between 20 and 46 months of age).

Interactive storybook reading

Storybook reading is an important activity to enhance children's emergent literacy skills and later reading performance (Bus et al., 1995). During storybook reading children are exposed to novel words and more complex sentence structures. Adults use more formal language during storybook reading than in their daily conversations with the child, and they talk more about topics beyond the here and now (De Temple & Snow, 2003). Through storybook reading children learn how to handle a book – for example, reading a book from left to right, front to back – and are exposed to print. These are all important aspects of storybook reading that promote emergent literacy skills. Further, storybook reading cultivates an interest in reading and is a predictor for later reading motivation (DesJardin et al., 2014).

The frequency of storybook reading is positively related to a child's vocabulary and literacy development (Bus et al., 1995; Senechal & Young, 2008). In general, the more frequently a child is read to, the better the outcomes (Bus et al., 1995). However, it is not only the quantity that counts, the nature of storybook reading is also important. Storybook reading is most effective when children are actively involved in the reading activity (Mol et al., 2008). This so-called *interactive reading* requires adults to "read *with* their child rather than reading *to* their child" (Dirks & Wauters, 2015, p. 420). Interactive reading is defined as reading aloud that includes conversations, turn-taking, and involving the child in the reading activity (DeBruin-Parecki, 2007). The adult can involve the child by asking questions, relating the story to personal experiences, actively responding to initiatives by the child, and providing positive feedback (DeBruin-Parecki, 2007; DesJardin et al., 2014). Within the context of the sociocultural theory, interactive reading helps the child to acquire knowledge, through the interaction with an adult, that would not be acquired if the child were reading alone (Robertson, Dow, & Hainzinger, 2006).

Research in hearing children has shown that interactive reading is positively associated with children's expressive vocabulary skills, narrative skills, phonological awareness, and knowledge of print (Bus et al., 1995; Trivette, Dunst, & Gorman, 2010). A research synthesis by Trivette and colleagues (2010) examined the effect of different characteristics of interactive reading on language development in 21 studies, which together included 1275 young children (12-42 months old). Findings showed that interactive reading strategies that promoted engagement and active child participation facilitated expressive language development. More specifically, strategies that linked the book to a child's own experiences, involved providing positive feedback during reading and asking the child open-ended questions were positively related to children's expressive language skills.

Although the importance of interactive reading is recognized, adults do not typically read this way without instruction (Huebner & Meltzoff, 2005). Various studies have shown that instruction in interactive reading leads to changes in reading style that have a positive effect on children's language skills (Fung, Chow, & McBride-Chang, 2005; Huebner, 2000; Huebner & Meltzoff, 2005). Huebner and colleagues (2000, 2005) showed that parents' use of an interactive reading style increased significantly after instruction. Before instruction parents just read the text directly without engaging their (hearing) children (two- and three-year-olds) in conversations about the story. After instruction parents involved their children more in telling the story, asked more questions, and labeled pictures more. In sum, interactive reading is an important method to enhance children's emergent literacy skills, and interventions are effective in promoting parents' use of interactive reading strategies.

Benefits of interactive storybook reading for DHH children
Interactive reading may be particularly beneficial for DHH children, who are more at risk for difficulties in language and reading (Easterbrooks & Beal-Alvarez, 2013; Harris & Terlektsi, & Kyle, 2017; Traxler, 2000). Though studies examining the effect of interactive reading activities on DHH children outcome measures are few in number, their findings are very promising (Aram, Most, & Mayafit, 2006; DesJardin et al., 2009; DesJardin et al., 2014; Fung et al., 2005).

Fung et al., (2005) showed that the use of interactive reading techniques during storybook reading was positively related to DHH children's receptive vocabulary skills. Aram and colleagues (2006) investigated interactive reading as a predictor for literacy skills in 30 Israeli DHH kindergartners. Their findings indicated that interactive reading predicted phonological awareness, general knowledge, and receptive vocabulary. These findings are supported by a study by DesJardin and colleagues (2009) on literacy skills in two- to seven-year-old children with cochlear implants. In this study, the mother's early use of facilitative language techniques (for example, asking open-ended questions and restating a child's utterance into a question format) during interactive reading was positively related to later phonological awareness and reading skills (e.g., letter-word identification, reading vocabulary, and passage comprehension).

In a more recent study, DesJardin and colleagues (2014) investigated the relation between the quality of interactive reading and language skills in 45 young DHH children (mean age 33 months). Parents and their children were videotaped during storybook reading, and the children's receptive and expressive oral language skills were tested after the reading session. Parental behaviors such as posing and soliciting questions about the book's content, pointing to letters and words in the book, soliciting predictions about the story, and referring to characters and settings were shown to be positively related to the child's expressive language skills. DesJardin et al. concluded that interactive reading is a good way to promote language development in young DHH children. They suggested that early

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childhood professionals should support parents of DHH children in using interactive reading strategies when reading storybooks with their children.

Trussell and Easterbrooks (2014) studied the effects of interactive reading on vocabulary learning in six DHH kindergartners (4;6 to 6;11 years). The children were involved in a scripted storybook intervention in which they were asked questions using the CROWD prompts (completion, recall, open-ended, wh-, and distancing questions). The researcher read three storybooks with the children, and a total of 15 vocabulary words were targeted. When target words occurred in the story, the researcher showed the children an accompanying picture card. Children's vocabulary was tested with a picture-naming task using these picture cards. The intervention occurred four times a week for four weeks; each session took 20 minutes. All children learned all target words during the intervention and still remembered these at follow-up two to three weeks after the intervention ended. The authors suggest that future studies should look at teacher- or parent-implemented storybook interactions and include appropriate levels of training.

Training parents of DHH children in interactive reading
Parent training programs for interactive reading (hereafter referred to as interactive reading programs) proved to be effective in training parents to use higher-level facilitative language techniques and to engage their children in the activity (DeBruin-Parecki, 2009; Huebner, 2000; Huebner & Meltzoff, 2005). However, to our knowledge only one study has examined the effect of a storybook reading intervention on parents of DHH children (Fung et al., 2005). In this study three groups of children (a comparison group, a typical storybook reading group, and an intervention group) were compared on a pretest and posttest of receptive vocabulary. Parents in the intervention group followed an eight-week reading intervention to learn and practice the techniques of interactive reading. Parents were encouraged to ask open questions and were given picture cards to use for asking questions and introducing new ideas to their children. For example, when parents asked a question about the book content the child could point to a card as a response. The receptive vocabulary skills of the children in the reading intervention group improved more than those of the children in the other groups. However, this study included older DHH children (five- to nine-year-olds) and the researchers stated that it would be preferable to practice with interactive reading in younger DHH children to promote their language and emergent literacy skills.

Most interactive reading training programs for parents of young children are developed for hearing parents with hearing children. However, research suggests that interactive storybook reading with young DHH children may be more challenging for hearing parents than for parents who are also deaf. Studies with deaf parents and their deaf children showed that they used specific strategies during book reading (Berke, 2013; Lartz & Lestina, 1995; Swanwick & Watson, 2005). For example, they used facial expressions and body posture to illustrate different characters in the book and made physical prompts like

tapping on a child's shoulder or lap, or moved the book up and down to maintain a child's attention (Lartz & Lestina, 1995). Further, they positioned themselves in a way that ensured they had enough signing space and good eye contact with the child while reading the book (Swanwick & Watson, 2005). Most DHH children are born to hearing parents (Mitchell & Karchmer, 2004). These parents may be challenged by the communication difficulties of their children when they read storybooks with them (DesJardin et al., 2014; Swanwick & Watson, 2007; Zaidman-Zait & Dromi, 2007). Therefore, interactive reading programs for DHH children should include specific strategies that help parents to overcome such challenges.

On the basis of the interactive reading program of the DeBruin-Parecki (2007) and the research of DesJardin et al. (2014) in young DHH children, Dirks and Wauters (2015) proposed strategies for interactive reading with young DHH children that should be part of an interactive reading program for young DHH children (Table 1; for a more detailed description of the strategies see Dirks and Wauters). These strategies were included in an interactive reading program for parents of young DHH children in the Netherlands. In the current study we examined the effect of this program on parent reading behavior.

Present Study

Interactive reading has been shown to be positively related to young DHH children's language and literacy skills (DesJardin et al., 2014; Fung et al., 2005). Parents play a crucial role in promoting these skills. Because parents do not typically read interactively with their children, interactive reading programs are developed to promote these skills in parents. While research indicates that for parents of young hearing children interactive reading programs are effective in changing parent reading behavior, we do not know about effects in parents of young DHH children. To the best of our knowledge, no study has yet examined the effect of an interactive reading program on parents of young DHH children.

In the present study the following research question was examined: What is the effect of an interactive reading program on the interactive reading behavior of parents of young DHH children in the Netherlands? The interactive reading program was based on the strategies for interactive reading with DHH children given in Table 1. Given that earlier research has demonstrated the effectiveness of interactive reading programs in parents of young hearing children (DeBruin-Parecki, 2009; Huebner & Meltzoff, 2005), we expected a program of this kind to be effective in enhancing the interactive reading behavior of parents of DHH children. More precisely, we expected that parents would use the interactive reading strategies more often during storybook reading after participating in the program.

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Table 1. Interactive reading strategies for DHH children[a]

1	Give child the opportunity to hold the book and turn the pages
2	Follow the child's lead
3	Introduce the book by discussing the cover
4	Use materials and/or toys
5	Allow enough time to observe, process, and respond
6	Elaborate on the child's ideas
7	Praise and reinforce
8	Ask questions about the story
9	Relate book content to personal prior experiences of the child
10	Point to pictures and/or words
11	Use mimicry, body posture, voice, and signs
12	Reflect on the story
13	Reread stories

Note. DHH = Deaf and hard of hearing. [a]From Dirks and Wauters (2015).

METHOD

Participants

A total of 28 parents (four fathers) and their 28 DHH children were included in the current study. All children and their parents were enrolled in a family-centered early intervention program in the Netherlands and were given the opportunity to participate in the interactive reading program. Eighteen parents voluntarily participated in the interactive reading program (experimental group), and ten parents did not (comparison group). Reasons for not participating in the program were parents' busy time schedules or another focus of interest at that moment. None of the parents had participated in an interactive reading program before the start of the study. Parents' educational levels ranged from higher general education to college/university level. The parents of 19 children reported using Sign Supported Dutch as the main communication with their child; the parents of one child used Sign Language of the Netherlands; and the parents of the other eight children used spoken Dutch as their main language. A chi-squared test revealed no significant differences between the parents in the experimental group and comparison group for communication mode.

Table 2 shows the demographics of the children. One child in the experimental group had two deaf parents, and one child in the comparison group had one parent who was hard of hearing. The children had moderate to profound hearing loss. 16 children had cochlear implants, and 12 children used hearing aids. The children ranged from 20 to 46 months of age (M = 34 months; SD = 8.1) at the start of the study. Chi-square and Wilcoxon tests revealed no significant differences between the children in the experimental group and the comparison group for age, gender, and maternal educational level.

Table 2. Demographic profile of the children

	Experimental Group	Comparison Group
No. of children	18	10
Age in moths, mean (SD)	33.8 (9.0)	35.5 (6.5)
Age in months, range	20-46	27-46
Gender, no.		
Male	10	5
Female	8	5
Type of amplification, no.		
Cochlear implant	14	2
Hearing aid	4	8

Note. No. = number, SD = standard deviation.

Procedure

To examine the effect of the interactive reading training program on parents' reading behavior, a research assistant or early interventionist videotaped the parents and their children with a video camera several times at home during storybook reading. Parents were instructed to read with their child the way they normally would and were not restricted in the time they needed to read the book. The video recordings were between 4 and 15 minutes long.

Figure 1 illustrates the design of the study. Parents and children in the comparison group were videotaped twice, with twelve to fourteen weeks between (pretest and posttest). The parents and children in the experimental group were videotaped during storybook reading two weeks before the start of the interactive reading program (pretest). After the interactive reading program, they were videotaped three times (posttest 1, posttest 2, and follow-up), with 5-7 weeks between each video recording. At pretest and follow-up the parents and children in the experimental group used one of their own books during reading, and at posttest 1 and posttest 2 they used the books provided by the research team (see Reading Materials below). After the video recordings at posttest 2, all books were returned. Data from the follow-up moment were collected for thirteen parents in the experimental group; data of the other five parents were lacking due to organizational issues (e.g., parents not having enough time to make an appointment within the study time-frame, or a child being ill).

Parents were asked to fill in a diary for each week, reporting their experiences of reading the books with their children. Further they could report which of the books they had read and how often. The parents did not succeed in filling in the diary for all weeks, and most parents only filled it in for one or two weeks. Therefore, we did not have reliable data on parents' experiences of interactive book reading during this study.
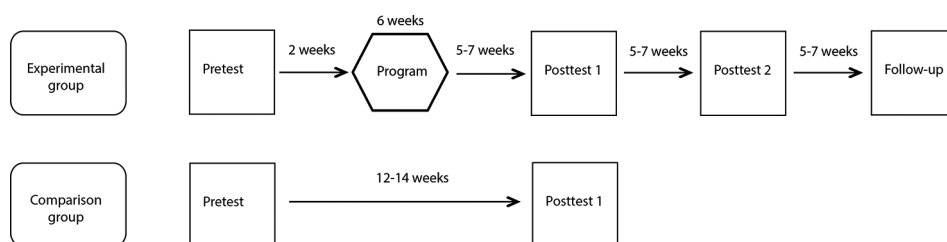
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Figure 1. Study design.

Parent interactive reading program

The researchers of the present study and a speech and language therapist developed the interactive reading program. The program was based on strategies of interactive reading with DHH children (Dirks & Wauters, 2015) and developed for DHH children between two and four years of age. Professionals followed a one-day training given by the developers of the program and received a manual of the program. The manual contained theoretical background information about interactive storybook reading and the use of interactive reading strategies with DHH children. Further, the information to be given to the parents and activities to model and practice the interactive reading strategies were extensively described for each session.

Two professionals (an early interventionist and a speech and language therapist) taught parents the strategies of interactive reading in three two-hour group sessions over a period of six weeks. The trainers used modeling techniques to teach parents the strategies and parents practiced the interactive reading strategies during the sessions. For example, they practiced with introducing the book by discussing the cover, asking open-ended questions, using mimicry and signs, and using book-theme-related materials during reading. Trainers used positive feedback techniques to reinforce parents' interactive reading behavior.

In the first session, parents learned about interactive storybook reading and its importance for children's language and literacy development. Also, the challenges of reading storybooks with DHH children were discussed. The professionals introduced and modeled the strategies for interactive reading with DHH children and parents practiced these strategies. In this session parents received two storybooks and accompanying materials/toys to practice interactive reading at home with their child. Parents also received fact sheets with suggestions for interactive reading; one general fact sheet and a specific one for each book (see Appendix for the general fact sheet). These fact sheets contained examples of how to introduce the story, types of questions parents could ask, and activities to do after reading the story. Parents were asked to use these materials to practice at home with their children in between the training sessions.

In the second session, parents first talked about their experiences of using the interactive strategies at home with their children. Secondly, strategies to attract and maintain DHH children's attention were taught. Strategies such as tapping a child's arm, waiting, following a child's lead, asking open-ended questions, making signs in a child's visual field were modeled and practiced. At the end of the session parents were asked to record a video at home during storybook reading with their child for the next session.

In the third session, the choice of appropriate books given the child's age and his or her interest in certain characters or themes was discussed. An important part of this session was watching and discussing the videos parents had made at home. Some parents had used their smart phone while others used a video camera to make the recordings. Parents showed their videos and discussed their use of interactive reading strategies and their child's responses with the other parents and trainers. The trainers used positive feedback techniques to reinforce parents' use of interactive reading strategies while reading with their child. Parents' recordings were only part of the reading program and not used to examine the effect of the program.

Reading materials
The current study was part of a larger study that examined the use of eBooks for interactive reading (Wauters & Dirks, 2017). In that study, parents' interactive reading behavior when reading eBooks was compared with their reading of print books. The same materials were used in the present study. Half of the parents of the experimental group received five eBooks at the last session of the interactive reading program, and the other half received five print books. After posttest 1, the conditions were switched, so that the parents who had been reading print books now received eBooks and vice versa; these were used for the following five to seven weeks until posttest 2. No differences emerged in parent interactive reading behavior in the eBooks and print books condition (Wauters & Dirks); for this reason, in the present study the posttest scores of both conditions were grouped together.

The five eBooks were adaptations of five existing print storybooks (see Wauters & Dirks, 2017). The text and pictures from the original storybooks were kept intact. The eBooks were developed in such a way that they enhanced the application of interactive reading strategies (e.g., parent or child could turn the pages; readers could set their own pace, giving the child enough time to process and respond; no audio narration was added). All eBooks had the following characteristics: the eBook started with the cover of the book; pages could be turned both forward and backward through swiping (pages did not turn automatically); the printed text was visible; no audio narration was added; a sign dictionary was included for the keywords in the book; no animations were added, but some pictures were automatically zoomed in to draw the attention. The fact sheets that parents received for the eBooks were included in the application and not provided on paper. Because the eBooks were installed on iPads in a test environment and were not yet available for individual's own iPads or other tablets, iPads were loaned to the parents.

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Measurement

The videos of the storybook reading activities were scored using the parent behavior categories of the Responsive Adult-Child-Engagement During Joint Book Reading Scale (RACED-JBR; DesJardin et al., 2014). This scale was found useful in the present study because it reflected many of the interactive reading strategies that were taught in the program and was used before in a study with young DHH children (DesJardin et al.). The RACED-JBR is an adaptation of the *Adult–Child Interactive Reading Inventory* (DeBruin-Parecki, 2007), which was developed for preschool children. The RACED-JBR was developed for a younger population than DeBruin-Parecki's inventory. Further, DesJardin et al. (2014) used this scale in studying the interactive reading behavior of parents of DHH children. The categories defined by DesJardin et al. are (a) engagement (6 items: sustaining attention, providing positive feedback, using emotional language, promoting and maintaining close proximity, and engaging child in interaction); (b) literacy strategies (4 items: pointing to pictures/objects in the book, posing and soliciting questions about book content, pointing to words and letters, and referring to characters); (c) teacher techniques (5 items: relating a story to child's personal experience, elaborating on a child's ideas, defining new vocabulary, soliciting predictions, and reviewing beginning, middle, and end of book); (d) interactive reading (5 items: following a child's lead, giving the child the opportunity to hold the book, using appropriate speed and volume of speech, responding to the child's vocalizations, and allowing time to observe, process, and respond). We made slight adjustments to the parent categories *literacy strategies* and *teacher techniques*: we left out the items *refers to characters or setting* and *reviews beginning, middle, and end of book* because these aspects were less addressed in the program. This resulted in three items for the parent category *literacy strategies* and four items for *teacher techniques.* The complete observation scale can be found in DesJardin et al. (2014).

Each item on the RACED-JBR could be scored from 0 to 3. A score of 0 was given when there was no evidence of the behavior, a score of 1 when the behavior occurred infrequently (<49% of the time), a score of 2 when it occurred some of the time (50-79% of the time), and a score of 3 when it occurred most of the time (≥80% of the time). Each item was scored separately, and total scores were calculated for each category by summing the scores of the individual items. A total parent interactive reading score was calculated by summing the categories. The maximum parent total score would be 54. The category scores and total score were used to examine differences between groups and over time.

The researchers scored the videos on the occurrence of the behaviors in the observation scale. One of the researchers was skilled in sign language to score the videos in which sign language was used without speech; this was the case for only one child. The researchers scored five videos (6%) together, so that they could discuss the rating scale of the items. Eleven additional videos (13% of all videos) were coded by both researchers independently of each other. Their scores for these videos were used to calculate the interrater reliability. A two-way mixed, absolute agreement, single-measures intraclass

correlation (ICC, McGraw & Wong, 1996) was used to assess the degree to which coders agreed in their ratings of parent and child reading behavior. The resulting ICC was in the excellent range, ICC = 0.92, indicating that there was a high degree of agreement between the coders.

Statistical Analyses
Because of the small sample size and unequal sample sizes between the experimental and comparison group non-parametric tests were used to measure the effects of the interactive reading program. Non-parametric one-tailed Wilcoxon signed ranks tests were used to examine differences in category scores and total score between pretest, posttest 1, posttest 2, and follow-up in the experimental group. Gain scores were calculated between pretest and posttest 1 scores to examine differences in the amount of progress over time between the experimental and comparison group.

RESULTS

Effect of the interactive reading program
Table 3 shows the mean scores of the experimental and comparison group at pretest and posttest 1. At pretest no significant differences were found between the experimental and comparison group for all categories and the total score. To examine whether over time the experimental group made greater progress in applying the interactive reading strategies than the comparison group, gain scores were calculated by subtracting the scores at pretest from the scores at posttest 1. The gain scores were larger in the experimental group than in the comparison group for *total parent behavior* ($Z = -2.49$, *p* = .006), *engagement* ($Z = -2.41$, *p* = .008), *teacher techniques* ($Z = -1.66$, *p* = .046) and *interactive reading* ($Z =-2.07$, *p* = .019). No differences in improvement were found for *literacy strategies* ($Z = -1.01$, *p* = .16).

Table 3. Scores of the RACED-JBR by group

	Experimental group n = 18		Comparison group n = 10	
	Pretest M (SD)	Posttest 1 M (SD)	Pretest M (SD)	Posttest 1 M (SD)
Engagement	10.56 (3.01)	12.72 (3.2)	11.40 (3.41)	10.20 (3.93)
Literacy strategies	3.66 (1.28)	3.67 (1.8)	4.10 (1.37)	3.50 (1.84)
Teacher techniques	1.56 (1.42)	3.61 (3.20)	0.80 (1.03)	0.90 (0.99)
Interactive reading	7.61 (3.71)	10.28 (4.01)	7.30 (3.26)	6.80 (3.46)
Total behaviors	23.39 (7.20)	30.27 (9.89)	23.60 (6.02)	21.40 (7.28)

Note. M = mean, SD = standard deviation.

To examine the effect of the interactive reading program in the experimental group, we compared the mean scores on the parent behavior categories at pretest and posttest 1 (see Table 4). Statistically significant differences emerged in terms of *total parent behavior* (*Z* =-2.68, *p* = .003), *engagement* (*Z* =-2.26, *p* = .012), *teacher techniques* (*Z* = -2.51, *p* = .006)*,* and *interactive reading* (*Z* = -2.33, *p* = .010)*,* with parents achieving higher scores after participating in the interactive reading program. No differences were found between pretest and posttest 1 for *literacy strategies* (*Z* = -0.45, *p* = .482)*.*

To examine whether the effect of the interactive reading program lasted after the books were returned, we conducted a comparison between pretest and follow-up (see Table 4). The results indicated positive changes in all categories and in the total score: *total parent behavior* (*Z* = -2.76, *p* = .011), *engagement* (*Z* = -2.00, *p* = .022)*, literacy strategies (Z* = -1.90, *p* = .029), *teacher techniques* (*Z* = -2.11, *p* = .017) and *interactive reading* (*Z* =-1.85, *p* = .032). The program was effective in positively changing parent interactive reading behavior.

Changes in interactive reading behavior over time
After the last session of the interactive reading program parents received five books and the associated fact sheets with tips and suggestions for reading for a period of five weeks. After these five weeks they returned the books and received five different books, also for five weeks. To examine the effect of practicing with these books, we compared parents' reading behavior scores at posttest 1 and posttest 2 (see Table 4). Differences were found between posttest 1 and posttest 2 for *total parent behavior* (*Z* =-2.03, *p* = .021), *engagement* (*Z* =-1.78, *p* = .037), and *interactive reading* (*Z* = -1.90, *p* = .03), with parents achieving higher scores at posttest 2 than at posttest 1. Over time parents further improved their interactive reading behavior. No differences were found for *literacy strategies* (*Z* = -1.59, *p* = .056) and *teacher techniques* (*Z* = -.90, *p* = .181).

To examine changes in parents' reading behavior after returning the books, we compared parent behavior at posttest 2 and at follow-up (see Table 4). There were no changes in parents' behavior between posttest 2 and follow-up as regards *engagement* (*Z* =-.31, *p* = .376), *literacy strategies* (*Z* = -.71, *p* = .240), *and interactive reading* (*Z* = -1.57, *p* = .058).

Table 4. Pretest, posttest1, posttest2 and follow-up scores of the RACED-JBR for the experimental group

	Pretest n =18	Posttest 1 n =18	Postest 2 n =18	Follow-up n =13
	M (SD)	M (SD)	M (SD)	M (SD)
Engagement	10.56 (3.01)	12.72 (3.27)	13.83 (3.31)	13.69 (3.79)
Literacy strategies	3.66 (1.28)	3.66 (1.84)	4.39 (1.24)	4.46 (1.39)
Teacher techniques	1.56 (1.42)	3.61 (3.23)	4.17 (2.68)	3.15 (2.30)
Interactive reading	7.61 (3.71)	10.28 (4.01)	11.83 (3.15)	9.6 (3.95)
Total behaviors	23.39 (7.20)	30.28 (9.88)	34.22 (7.68)	30.92 (8.85)

Note. M = mean, SD = standard deviation.

Parent behavior scores did change at follow-up for *total parent behavior* (Z =-1.89, p = .020) and *teacher techniques* (Z =-2.06, p = .029), with lower scores at follow-up than at posttest 2. Although these scores were lower than at posttest 2, they were still higher than at pretest.

DISCUSSION

Interactive reading is an important parent-child activity to promote children's emergent literacy skills. This is especially important for DHH children because they are more at risk for language and reading difficulties. Because most parents are not used to applying interactive reading strategies during storybook reading, interactive reading programs have been developed to train parents in applying these skills. In the present study we examined how an interactive reading program designed for parents of young DHH children affected these parents' behavior during storybook reading. The results were promising: parents of young DHH who participated in the reading program increased their interactive reading behavior. Their total scores on the observation scale increased after the interactive reading program and continued to increase through posttest 2. However, parents do not apply all categories to the same extent and the increase in using the strategies varied between categories.

In the category *interactive reading*, parents' use of strategies – such as following a child's lead, giving the child the opportunity to hold the book, using appropriate speed and volume of speech, responding to the child's vocalizations, and allowing the child time to observe, process, and respond – increased after the program and continued to increase through posttest 2. These are important strategies, not only to promote emergent literacy but also to promote parent-child interaction. Earlier studies on parent-child interaction (see Pressman, Pipp-Siegel, Yoshinaga-Itano, & Deas, 1999 for an overview) have indicated that hearing parents of DHH children are more directive and dominant in the interaction than parents of hearing children. Our finding that parents used more interactive reading strategies, such as following a child's lead, after the program may have a beneficial effect on the parent-child interaction in general.

In line with our expectations, we also found an increase in *engagement strategies* such as sustaining attention, providing positive feedback, using emotional language, promoting and maintaining close proximity, and engaging the child in interaction. Research has indicated that these strategies are related to children's expressive language skills (Trivette et al., 2010). Parents in both the reading program group and the comparison group already achieved relatively high scores on engagement before the start of the program. These findings are in line with DesJardin et al. (2014), who also reported relatively high scores on the *engagement* category of the RACED-JBR in parents of young DHH children. Given that all children and their families in the current study were participating in a family-

centered early intervention program, it is possible that these engaging strategies had already been taught to the parents by early interventionists. However, the results of the present study indicate that participating in the reading program further strengthened the use of these strategies.

Although the parents in the reading program group made progress in their overall interactive reading behavior, some aspects of interactive reading were still not applied very often. The scores on *teacher techniques* and *literacy strategies* were relatively low. For *teacher techniques* (elaborating on a child's idea, relating the story to personal experiences, soliciting predictions, and defining new vocabulary) the score increased after the program, but parents' scores were still very low (3.61 out of a maximum of 12). Some of the lower scores in these categories may have been caused by the fact that some aspects did receive less attention in the interactive reading program than others. For example, in the category *literacy strategies*, pointing to letters, words, or sentences did not receive much attention because the children were quite young (60% of the experimental group was younger than three years of age at the start of the study). This aspect of literacy strategies becomes more important at a somewhat later age (four to six years), when children start to learn to crack the code of written language (Ehri, 2005). However, the lower scores on this category may also indicate that parents find these strategies less intuitive. As for pointing to print, past research showed that parents do not typically do this during storybook reading with young children (Chang, Luo, & Wu, 2016; Ezell & Justice, 2000; Justice, Pullen, & Pence, 2008). Given that all these interactive reading behaviors are of relevance for children's literacy skills (DeBruin-Parecki, 2009), interactive reading programs for DHH children should focus more on practice with these strategies. Video-feedback intervention could perhaps be useful in enhancing these skills in parents. In a recent study, video-feedback intervention was shown to be effective in enhancing parent-child communication in parents of young DHH children (Lam-Cassettari, Wadnerkar-Kamble, & James, 2015). Although video-feedback techniques were used in the last session of the current program, it might be effective to make use of these techniques in all sessions.

The use of literacy strategies (pointing to pictures and objects in the book, posing and soliciting questions about the book content, and pointing to words, letters, and sentences) did not improve directly after participating in the program. Parents' use of these strategies did not significantly increase between pretest and posttest1. After posttest 1 a gradual increase in parent behavior occurred, almost reaching significance between posttest 1 and posttest 2 and with a significant difference between follow-up and pretest. This may indicate that parents need more time and practice to adopt these strategies. Another explanation might be that parents intuitively adapted their use of *literacy strategies* towards the end of the study because their children got older in the 22-28 weeks between pretest and follow-up. A recent study on interactive storybook reading in Taiwan showed that 42 mothers increased their pointing to print in books over time (Chang et al., 2016).

In this study interactive storybook reading activities were video recorded and analyzed when children were 1;2, 2;2, and 3;0 years of age. Although parents pointing behavior was relatively low, they pointed more often to printed text when their children were three years old than when they were one or two years old. No increase in pointing to print was found between the ages of one and two. The researchers explained these results by arguing that the mothers were sensitive to the development of their children and fine-tuned their interaction strategies to the growth of their children. Possibly, this adaptation of parent behavior when children get older explains the late changes in parents' use of *literacy strategies* in the current study.

Another interesting result of our study was that parents' scores for total parent behavior and for teacher techniques increased or remained stable until posttest 2, but then decreased somewhat at follow-up. In both cases, the scores at follow-up were still significantly above the pretest scores. An explanation for the decrease at follow-up could be that parents returned the books and the fact sheets to the early interventionist after posttest 2. Perhaps parents need continuous and explicit reminders to apply these strategies.

Limitations and suggestions for future research
One limitation of the present study is that we focused on changes in parents' behavior after they had participated in an interactive reading program specially designed for parents of young DHH children. Although we found positive changes in parent behavior, changes in children's literacy or language skills were not examined. The main goal of interactive reading programs is to promote children's interest in reading, to enhance children's emergent literacy and language skills by changing parents' reading behavior. In this study our interactive reading program positively affected parents' interactive reading behavior. On the basis of earlier studies showing interactive reading to be positively associated with the vocabulary skills, narrative skills, phonological awareness, and print knowledge of both deaf and hearing children (Bus et al., 1995; Fung et al., 2005; DesJardin et al., 2014; Trivette et al., 2010), we assume that the current program would also positively affect children's emergent literacy skills.

Fung et al. (2005) examined the effect on receptive vocabulary skills, but only in older children (five- to nine-year-olds). Future studies should also examine how interactive reading programs for young DHH children affect child outcomes. However, when children and their parents are part of a total early intervention program, it is much harder to examine the effects of a specific constituent program. Because the parents and children receive so much treatment and guidance, it is almost impossible to filter out the specific effects of an interactive reading program.
Another limitation concerned the program fidelity. Although the trainers followed a training and used the program manual to teach parents the interactive reading strategies during the session, we did not monitor the fidelity of the program. In future research, observations during the sessions and checklists could be used to monitor the fidelity.

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An additional limitation of the present study is that it was not possible to guarantee complete blind coding of the videos. The children and parents in the experimental group were videotaped more often than the ones in the comparison group. Also, in one of the videos the parents and children in the experimental group were reading on an iPad. As soon as a coder sees more than two videos of a parent-child dyad or sees that they read on an iPad, he/she may be biased in his or her judgment. The only solution for this problem, which should be considered for future research, would be a much larger group of coders who were not informed about the purpose and methodology of the study.

It may not be realistic to expect all parents to participate in an interactive reading program. Therefore, it would be relevant to examine different conditions to teach parents the interactive reading strategies. For example, by comparing participation in training sessions versus solely providing books and fact sheets. Further, in this digital era it would be interesting to compare an e-learning program with live training sessions. Future studies could compare different conditions to teach parents the use of interactive reading strategies.

Another limitation of the present study is the missing data on the parent reports about parents' interactive reading behavior during the study. Parents were asked to fill in a diary about their interactive reading behavior, for example about the frequency of reading storybooks with their child, their experiences, and the enjoyment and engagement of their child during reading. However, parents did not succeed in filling in theses diaries for all weeks. The frequency of storybook reading is related to children's literacy skills (Bus et al., 1995; Senechal & Young, 2008), and it would have been interesting to find out if the program also increased frequency of reading. Future researchers could consider interviewing parents before and after participating in a program in order to prevent this problem of missing data.

Conclusions

In the present study we focused on parent-child interactive storybook reading because of its proven positive effects on DHH children's emergent literacy skills (Fung et al., 2005; Aram et al., 2006; DesJardin et al., 2009; DesJardin et al., 2014). However, storybook reading is not only beneficial for children's language and literacy skills, but also for their social-emotional development. Storybook reading has the potential to bring perspectives of different characters and mental state language into a child's mind (Adrian et al., 2007). Because DHH children are more at risk for social-emotional difficulties (Stevenson et al., 2015), storybook reading may also be effective in promoting this developmental area.

Interactive reading programs to enhance parents' interactive reading strategies should be incorporated in early intervention. However, participation in an interactive reading program alone is probably not enough to ensure that parents increase and maintain their use of

interactive reading strategies. Early interventionists could play an important role in promoting storybook reading and parents' use of the interactive reading strategies. The strategies need to be modeled, taught, and monitored for continued use by early interventionists during their regular house-visits in order to be effective. Further, they could lend parents books and fact sheets with tips and suggestions about how to keep interactive storybook reading alive.

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APPENDIX

Fact sheet: Interactive storybook reading

What is interactive storybook reading?
In interactive storybook reading the child is actively involved in the story. Children learn to think about the story and are stimulated to talk about it in their own words. Storybook reading becomes more fun and promotes the language and socio-emotional development. In interactive storybook reading, you do not always read the exact text in the book, but you tell the story in such a way that it relates to the child's experiences and to what the child is attracted to in the pictures. Interactive storybook reading is divided in 5 steps.

Step 1: Planning
Make sure you have gone through the book before you read it with your child and decide what you will and what you will not talk about. What parts of the book will your child specifically enjoy, which parts are funny or exciting? Do you have materials or toys related to the story that you can use to bring the story to life? What activities can you undertake with your child to let him/her experience the story more? If necessary, look up the signs that you want to use. Children's storybooks are often written around a certain topic or problem. Maybe your child has experienced a similar thing that you can talk about or play it out together.

Step 2: Introduction
Storybooks often have a beautifully designed cover. This illustration tells you something about the main character or the topic of the story. By discussing the cover and the title of the book, your child can get an idea of what the story will be about before you start reading it together.
Singing a song or playing a game related to the topic can also be an introduction to reading a storybook. For example, if the storybook talks about something that is lost, you can introduce it by playing hide and seek. Or when you have recently visited a (petting) zoo, you can refer to that visit and introduce a book about animals.

Step 3: Read and tell the story
Tell the story with your child in your own words/signs. Not only signs, but also gestures can enhance your child's comprehension of the story. Maybe your child will spontaneously talk about something related to book or something in the pictures in the book. Give your child the opportunity to do so and respond to his/her initiatives. Switching between listening and talking strengthens your child's attention to the story. Make sure you ask some open questions about what is in the pictures or about what your child thinks or how he/she feels about the story.
Use mimicry and your body posture to make the story more alive. Children really enjoy this. Storybooks often have many opportunities to impersonate the characters, which is even more fun if you use a hand puppet.

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Step 4: Reflecting on the story
After reading the book together, talking about it and going through some pages again helps your child in understanding the story and topic. Children often like to play out the story with their own stuffed animals or dolls. Also , you can do an art project with your child about the topic. Making something together gives an opportunity to talk about the topic in a different way than during storybook reading. . Looking at the topic from different perspectives increases comprehension.

Step 5: Relating events to the story
The last step "relating events to the story" involves events that take place later. By relating these events to the story, the topic of the book is discussed in a different way. These can be small things, for example, when you are walking in the rain with your umbrella you can refer to the story you read about an umbrella and pointing out the similarities between the story and your walking in the rain. This helps your child in better and more deeply understanding the story, relating it to the real world, and it benefits his/her language development.

General tips for interactive storybook reading
• Give your child enough time to look at the pictures, process the information, and respond
• Make sure you pause explicitly to check what your child looks at or spontaneously talks about. You can then connect to what your child is interested in and add information.
• Use mimicry, body language, gestures, and signs to impersonate the people or animals from a story and clarify or stress events in the story. Body language, facial expression, and gestures/signs match the language development of young children. They really enjoy looking at it and will try to copy you.
• Point at the pictures while you are telling the story.
• Children enjoy going through the pages of a book, forward or backward. They like to look back to see what exactly happened or whether the picture matches the story. Repetition is important in learning.
• Ask questions that invite your child to think about the story, not just the what, where, and who questions, but also the how and why questions. If your child does not know the answers yet, you can answer them yourself by telling your child what you think.
• Make sure you adapt your speed to your child and pause timely for your child to process the information. Adults often tend to go faster than children's mind can process.

To conclude: Have fun in interactively reading a storybook with your child!

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