

Parent-Implemented Language Interventions for Children with a Developmental Delay: A Systematic Review

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Abstract

Background: Young children with a developmental delay (DD) show significant delays in communication and language development. Although several parent-implemented language intervention programs have been developed to facilitate the communication and language abilities of children with a DD, no systematic review has examined the effects of these programs. **Method:** The literature search for this systematic review focused on parent-implemented early language interventions for children with a DD age 1–5 years. Searches were conducted in PubMed, Scopus, and Web of Science (search period 1974–2015). Level of evidence (levels I and II) as developed by the American Academy for Cerebral Palsy and Developmental Medicine (AAPDM) and study effectiveness were evaluated. Seven intervention studies met the inclusion criteria. Interventions comprised the Hanen Parent Program, Responsive Education/Prelinguistic Milieu Teaching, and Enhanced Milieu Teaching. A substantial proportion of children with a DD also had a diagnosis of Down syndrome (DS). **Results:** Five of the seven studies reported a significant effect of intervention on parent responsiveness, child communication, and aspects of language interactions (favoring intervention groups over control groups), but no studies reported significant effects of intervention on expressive language vocabulary. **Conclusions:** Intervention programs aimed at facilitating the communication and language development of children with a DD appear to improve a child's general communication abilities but have limited impact on expressive language development.

Keywords: parent-implemented intervention, developmental delay, language acquisition, communication, parent responsiveness

Introduction

Young children with a developmental delay (DD) show significant delays in communication and language development. In the area of communication, for example, the frequency of (pre-linguistic) intentional communication is much lower in children with a DD than typically developing (TD) children. In addition, mothers of children with a DD tend to be more directive and less responsive to their child compared to mothers of TD children (Cable & Domsch, 2011; Roberts & Kaiser, 2011). As a result their language development hampers, and they show, for example, obvious delays in expressive vocabulary development (Cable & Domsch, 2011; Roberts & Kaiser, 2011).

Parent-implemented early language interventions aim to promote the language development of children with DD and to support the family during the critical years of language development (i.e., birth to 3 years of age). The rationale of these parent-implemented language interventions is to teach parents how to interact with their child, how to meet their child's specific communication needs, and how to enhance their child's language development (Sanz & Menendez, 2010). Evidence suggests that the amount of parent–child interaction, degree of parent responsiveness, amount of language input, and the use of language support strategies are all positively associated with child language development (Roberts & Kaiser, 2011).

These findings suggest that it is important that parents are involved in early language interventions (Cable & Domsch, 2011; Roberts & Kaiser, 2011). Although some systematic reviews and meta-analysis papers on parent-implemented language interventions for specific groups of children (such as children with ASD (McConachie & Diggle, 2007) and children with LI (Roberts &

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Kaiser, 2011, Law, Garrett, & Ney, 2004)) have been carried out, no systematic review has been published on the effectiveness of parent-implemented early language interventions focused on stimulating language development of children with a DD.

The aim of the present systematic review is to evaluate the effects of parent-implemented interventions for children with a DD. We addressed the following research questions:

1. Do parent-implemented interventions positively affect child–parent interaction behavior?
2. Do parent-implemented interventions improve the child communication and the language abilities of young children with a DD?

Method

Identification of Studies

A literature search was conducted in the databases PubMed, Scopus, and PsycINFO for the period 1974–2015 in which the following combination of keywords was applied: “language intervention” OR “early intervention” OR “communication intervention” OR “parent training” AND “Developmental Delay.” We also screened the reference lists of empirical studies for additional intervention studies. Due to the fact that a study was done on the effects of parent-implemented language intervention programs on communication and language of children with a DD, only studies were included that met the predetermined inclusion criteria based on study design (Nontreatment, “care as usual,” or therapist-implemented comparison; AACPD level I or II and published) (Darrach, Hickman, O’Donnell, Vogtle, & Wiart, 2008), type of intervention (Implemented only by parents; included a component that directly affected child communication and language), participants characteristics (children with DD between the age of 12–60 months), and outcome measures (at least one language and one communication outcome measure) were included in the systematic review.

The above combination of keywords and subsequent examination of reference lists resulted in 403 identified studies. During the first selection phase, the first author (DK) screened the abstracts according to the inclusion criteria. For a study to be excluded, the abstract had to clearly indicate that the study failed to meet one of the specified inclusion criteria. In the first selection phase, 349 articles were excluded because the study did not involve parent-implemented interventions to stimulate early language development or because the children with a DD were older than 5 years of age.

During the second selection phase, the first and second authors (DK and CV) retrieved the full-text articles for the remaining 54 studies. These articles were retrieved from the Utrecht University Library and were examined according to the inclusion/exclusion criteria. The number of studies was reduced from 54 to 15. Finally, the first and second authors (DK and CV) discussed eight articles in which it was unclear whether they met the inclusion criteria or not. Table 1 lists the articles and reasons for exclusion. This systematic review reports on seven studies investigating the effects of parent-implemented language interventions on communication and language development of children with a DD.

Classification of Level of Evidence and Study Quality

Effect studies were classified according to the level of evidence as formulated by the AACPD (Darrach et al., 2008) (Table 2). This classification system rates each study based on two aspects: (1) the level of evidence the research design provides and (2) a quality indicator reflecting how well threats to validity appear to be controlled within the parameters of the research design. The first and second authors evaluated each study with regard to the level of evidence and quality of the research. Discrepancies in ratings were resolved through discussion.

Data Analysis

Standardized effect-sizes (Cohen’s *d*) were calculated from the *t*-tests or *F*-tests for the main effects of Time (preintervention and postintervention test scores) for the intervention and control groups, the main effects of Group (on postintervention test scores), and/or for the interaction between Time and Group (intervention and control groups) (Thalmeier & Cook, 2002). Effect sizes *d* of 0.20 are considered small, 0.50 medium, and 0.80 large (Cohen, 1992). Using standardized effect size allows the intervention effects of studies to be compared.

Description of Included Studies

Table 3 lists the key information on each study including research design, the level of evidence, and the quality of conduct, the nature and duration of the intervention(s) for the experimental group(s) and the control group (if applicable), the number of participants and the age of participants. All seven studies were rated as having level of evidence II with either a moderate or strong quality of conduct and were, therefore, considered of adequate methodological quality. The study by Warren et al. (2008) was a reevaluation of the study by Fey et al. (2006) in which Warren et al. evaluated the long-term effects of RE/PMT. Table 4 lists the results of these seven studies.

Sample characteristics. In almost all studies, half of the participants were (parents of) children with DS. The other half consisted of (parents of) children with mixed etiologies (e.g., DD with cerebral palsy, DD with William’s syndrome) or with an unknown etiology. Preschool age children with a DD, including children with DS, were recruited in six studies (Fey et al., 2006; Girolametto, 1988; Tannock, Girolametto, & Siegel, 1992; Warren et al., 2008; Yoder & Warren, 2002), whereas Girolametto et al. (1998) only recruited preschool age children with DS. Kaiser and Roberts (2013) was the only study that recruited preschool children with DD (including DS) and preschool children with ASD.

Mental developmental indices were below 70 for all children in all studies. All seven studies recruited monolingual children age 15–62 months along with the children’s primary caregiver(s) (predominately the mother). All the children lived at home, came from middle-class families, and English was the primary language (see Table 2 for further details of participant characteristics).

TABLE 1
Excluded studies and reasons for exclusion

Study name	Reasons for exclusion
Adamson, L.B., Ronski, M., Bakeman, R., Sevcik, R.A. (2010). Augmented language intervention and the emergence of symbol-infused joint engagement. <i>Journal of Speech, Language, and Hearing Research</i> , 53, 1769-1773.	Both experimental and control conditions included parent training.
Iacono, T. A., Chan, J. B., & Waring, R. E., 1998, Efficacy of a parent-implemented early language intervention based on collaborative consultation. <i>International Journal of Language & Communication Disorders</i> , 33(3), 281-303.	Level of evidence IV
Ludlow, J.R., Allen, L.M. (1979). The effect of early intervention and pre-school stimulus on the development of the Down's syndrome child. <i>Journal of Mental Deficiency Research</i> , 23(1), 29-44.	Article not available
MacDonald, J. D., Blott, J. P., & Gordon, K., 1974, An experimental parent assisted treatment program for preschool language delayed children. <i>Journal of Speech and Hearing Disorders</i> , 39(4), 395-415.	Level of evidence III
Mahoney, G., Perales, F., Wiggers, B., Herman, B. (2006). Responsive teaching: early intervention for children with Down syndrome and other disabilities. <i>Down's Syndrome, Research and Practice : the Journal of the Sarah Duffen Centre / University of Portsmouth</i> , 11(1), 18-28.	Review article
Ronski, M., Sevcik, R.A., Adamson, L.B., Smith, A., Cheslock, M., Bakeman, R. (2011). Parent perceptions of the language development of toddlers with developmental delays before and after participation in parent-coached language interventions. <i>American Journal of Speech-Language Pathology</i> , 20(2), 111-118.	Dependent variable not measured
Ronski, M.A., Sevcik, R.A., Adamson, L.B., Cheslock, M., Smith, A., Barker, R.M., Bakeman, R. (2010). Randomized comparison of augmented and nonaugmented language interventions for toddlers with developmental delays and their parents. <i>Journal of Speech, Language, and Hearing Research</i> , 53(2), 350-364.	Both experimental and control conditions included parent training
Yoder, P.J., Warren, S.F. (2001). Relative treatment effects of two prelinguistic communication interventions on language development in toddlers with developmental delays vary by maternal characteristics. <i>Journal of Speech, Language, and Hearing Research</i> , 44(1), 224-237.	Both experimental and control conditions included parent training

Intervention characteristics. All studies provided parents with training in responsive communication. Two studies examined the general stimulation version of the Hanen Parent Program (HPP) (Girolametto, 1988; Tannock et al. 1992), and one study examined the focused stimulation version of the HPP (Giralometto et al., 1998). HPP is based on the transactional model of communication development and can only be provided by speech-language pathologists (SLPs) certified to offer the program. Through the use of activities and group discussions, small groups of parents learn to create and take advantage of everyday opportunities to improve their child's communication skills.

In the HPP general version, parents are taught over 11–13 weeks how to observe, wait, and listen to their child and how to be less directive. Parents learn how to follow their child's lead, and in doing so, parents become more aware of their child's needs and learn strategies to facilitate interaction and communication (Manolson, 1991). In the HPP-focused stimulation version, mothers are given a list of 20 target words in which the mothers select 10 words to teach their child while still following their child's lead. The mothers are also trained to use signs, which are to be used simultaneously with spoken target words.

Two studies tested the short-term effects and one study tested the long-term effects of the Responsivity Education/Prelinguistic Milieu Teaching (RE/PMT) program, which was offered by a speech therapist or other clinician (Fey et al., 2006; Warren et al., 2008; Yoder & Warren, 2002). Similar to the HPP, the RE/PMT program is based on a transactional model of communication development (McLean & Snyder-McLean, 1978), in which parents are encouraged to be more responsive and less dominant and directive in interactions with their child. It is assumed in this program that stimulating intentional communication facilitates a child's later language development. Compared to the HPP, the RE/PMT program is a more direct intervention method to teach children specific gestures, vocalizations, and coordinated eye gaze behavior to communicate more effectively (Yoder & Warren, 2002). The underlying principles of RE/PMT are, however, based on the same principles as the HPP, namely following the child's lead, increasing communication attempts and using social games.

RE/PMT procedures are imbedded in the social interactions that take place in the child's home environment. The goal of RE/PMT is to increase the number of child-directed communication acts. During a 6-month RE/PMT course, parents are taught various language facilitation techniques. First, parents are taught to

TABLE 2

AACPDM levels of evidence as shown in two parts: indicating the highest level of evidence the research design provided (Levels I–V, part A) plus an evaluation of the quality of conduct of the study (part B)

Part A: Type of research design		
Level	Intervention (group) studies	Single-subject design studies
I	Systematic review of randomized controlled trials (RCTs) Large RCT (with narrow confidence intervals) ($n > 100$)	Randomized controlled N-of-1 (RCT), alternating treatment design (ATD), and concurrent or non-concurrent multiple baseline design (MBDs) generalizability if the ATD is replicated across three or more subjects and the MBD consists of a minimum of three subjects, behaviors, or settings.
II	Smaller RCTs (with wider confidence intervals) ($n < 100$) Systematic reviews of cohort studies	Nonrandomized, controlled, concurrent MBD; generalizability if design consists of a minimum of three subjects, behaviors, or settings.
III	Cohort study with concurrent control group Systematic reviews of case control studies	Nonrandomized, noncontrolled, concurrent MBD; generalizability if design consists of a minimum of three subjects, behaviors, or settings
IV	Cohort study without concurrent control group Case series	Nonrandomized, controlled SSRDs with at least three phases (ABA, ABAB, BAB, etc.); Generalizability if replicated across three or more different subjects.
V	Case-control study Expert opinion Case study or report	Nonrandomized, controlled AB SSRD; Generalizability if replicated across three or more different subjects.

Part B: Conduct of study

Conduct of the study is judged as strong (“yes” score of 6 or 7), moderate (score 5), or weak (score ≤ 4)

1. Were inclusion and exclusion criteria of the study population well described and followed?
1. Was the intervention well described and was there adherence to the intervention assignment? (For two-group designs, was control exposure also well described?)
1. Were the measures used clearly described, valid, and reliable for measuring the outcomes of interest?
1. Was the outcome assessor unaware of the intervention status of the participants (i.e., was there blind assessment)?
1. Did the authors conduct and report appropriate statistical evaluation including power calculations?
1. Was drop-out/loss to follow-up reported and less than 20%? For two-group designs, was drop-out balanced?
1. Considering the potential within the study design, were appropriate methods for controlling confounding variables and limiting potential biases used?

recognize their child’s nonverbal communication attempts and to respond to these attempts in a meaningful way. Children are then taught to communicate more effectively by using specific gestures, vocalizations and coordinated eye gaze behavior.

Kaiser and Roberts (2013) tested the Enhanced Milieu Teaching (EMT) program as implemented by parents and therapists versus the program implemented by therapist only. EMT is a naturalistic, conversation-based model of early language intervention in which parents are taught over 24–36 sessions to use the child’s interest and initiations as opportunities to model and prompt language use in everyday contexts (Kaiser, 1993). The goal of EMT is

to increase functional communication skills. The key elements of EMT are (1) to teach parents to respond to the child’s interests at the child’s ability level, (2) to create an environment that stimulates communication, and (3) to communicate in a way that promotes meaningful play and interaction. EMT was offered by a therapist with a bachelor’s degree related to child development or special education (see Table 3 for more details).

Outcome measures. Parent–child interaction behavior was measured in all studies during observation of a free-play situation between parent and child. Within this parent–child interaction

TABLE 3
Summary of studies—interventions and participants

Study	Level of evidence/quality of conduct	Design	Intervention control	Participants	Age range	Duration	Intensity
Fey et al. (2006)	II-S(7/7)	RCT	I:RE/PMT C: No Tx	I= 13 DS/12 DD C= 13 DS/13 DD	24 to 33 months	6 months	RE 8 1-hr session PMT 4 days a week in 20-min sessions
Girolametto et al. (1988)	II-M(5/7)	RCT	I: HPP C: No Tx	I= 5 DS/4 DD C= 6 DS/5 DD	15 to 62 months	11 weeks	8 groups sessions 3 home visits
Girolametto et al. (1998)	II-M(5/7)	RCT	I:HPP C: No Tx	I= 6 DS C= 6 DS	29 to 46 months	13 weeks	9 evening sessions 4 home visits
Kaiser & Roberts (2013)	II-S (7/7)	RCT	I: EMT parent / therapist C: EMT therapist only	I= 8DS/9ASD/21DD C= 10DS/8ASD/21DD	31 to 50 months	8 months	24 clinic sessions (30min)
Tannock et al. (1992)	II-S(6/7)	RCT	I:HPP C: No Tx	I= 3DS/13 DD C= 6DS/10 DD	14 to 60 months	12 weekfollow up at 4 months	9 group sessions a 3 home visits
Warren et al. (2008)	II-S(7/7)	RCT	I:RE/PMT C: No Tx	see Fey et al. (2006)	6 months +follow up at 12 and 18 months	6 months +follow up at 12 and 18 months	see Fey et al. (2006)
Yoder & Warren (2002)	II-S(6/7)	RCT	RE/PMT C: not mentioned	I= 8 DS/ 10DD C= 9 DS/ 9DD	18 to 26 months	6 months follow up	PMT 3-4 days aweek in 20-min RE 12 sessions

S= Strong, M= Moderate, W= Weak, RCT= Randomized Controlled Trial, SDSS= Single Subject Design Study, RE= Responsivity Education, PMT= Prelinguistic Milieu Teaching, HPP= Hanen Early Language Parent Program, MT= Milieu Teaching, EMT= Enhanced Milieu Teaching, ELIS= Environmental Language Intervention Strategy, Tx= Treatment, ELI= Environmental Language Inventory; I= Intervention group, C= Control group, DS= Down's syndrome, DD= Developmental Delay.

TABLE 4
Results

Study	Outcome of interest	Measures	Results	
			Time (pre-post)	Time x Group or Group posttest
Fey et al. (2006) Girolametto (1988)	Child communication behavior (rate of intentional/declarative/imperative acts) Child vocabulary (words and signs) Parental responsive behavior Child communication behavior (turn taking, vocabulary diversity) Child receptive and expressive language Parent interaction behavior (responsiveness, topic control)	CSBS CDI PCX SICD SICD SICD	No posttest scores	intentional acts*; $d = .68$, $I > C$ DS subgroup <i>ns</i> ; $d = .65$ responsiveness*; d^\dagger , $I > C$ responsiveness* DS group < non-DS, d^\dagger % verbal turns**, $d = 1.2$, $I > C$ vocabulary diversity**, $d = 1.3$, $I > C$ receptive and expressive language <i>ns</i> , d^\dagger responsiveness* d^\dagger , $I > C$ topic control* d^\dagger , $I > C$
Girolametto et al. (1998)	Child communication behavior (talkativeness, complexity, labeling, vocabulary diversity) Child vocabulary (words and signs) Parent interaction behavior (talkativeness, complexity, labeling)	SICD CDI SICD	No posttest scores	vocabulary diversity*: d^\dagger , $I > C$ vocabulary: <i>ns</i> , d^\dagger labeling different words* d^\dagger , $I > C$ focused labeling** d^\dagger , $I > C$
Kaiser & Roberts (2013)	Child language Parents use of strategies (responsive interaction, language modeling, expansions, and milieu teaching [MT] prompts)	CDI PPVT/EVT HOME/ MTPKC PCX		after intervention / at 12 months follow up number of different words* $d = 0.10 / 0.46$ MLU** $d = 0.32 / 0.60$ $I > C$ responsive interaction** $d = 2.18 / 1.56$ $I > C$ language modeling** $d = 2.24 / 1.78$ $I > C$ expansions** $d = 1.90 / 1.56$ $I > C$ MT prompt episodes** $d = 1.86 / 1.17$ $I > C$
Tannock et al. (2002)	Child communication behavior (turn taking, social interaction skills, language abilities) Child vocabulary (words and signs) Parent interaction behavior	ESCS SICD SICD	nonverbal turn taking* d^\dagger receptive language**, d^\dagger	vocal turns* d^\dagger , $I > C$ receptive language: <i>ns</i> , d^\dagger vocabulary: <i>ns</i> , d^\dagger responsiveness** d^\dagger , $I > C$
Warren et al. (2008)	Child communication behavior (intentional acts)	CSBS CDI PCX	intentional acts*, $d = .53$; lexical density**, $d = .85$ vocabulary*,	intentional acts <i>ns</i> , $d = .14$; lexical density <i>ns</i> , $d = .11$; DS=DD vocabulary <i>ns</i> ,

TABLE 4
Continued

Study	Outcome of interest	Measures	Results	
			Time (pre-post)	Time x Group or Group posttest
	Lexical density Child vocabulary (words and signs) Parent responsive behavior		d = .68 responsiveness* d [†]	d = .13; DS = DD responsiveness* *; d [†] , I > C
Yoder & Warren (2002)	Communication behavior (intentional acts) Lexical density Child vocabulary (words and signs) Parent responsive behavior	CSBS CDI PCX	intentional acts <i>ns</i> : growth curves DS < DD* d [†] Lexical density: <i>ns</i> No post test scores responsiveness* d = .50	intentional acts <i>ns</i> , d [†] lexical density <i>ns</i> , d [†] responsiveness*; d = .61, I > C

*p < .05, **p < .01, d[†] effect size could not be calculated.

CSBS = Communication and Symbolic Behaviors Scales, EVT = Expressive Vocabulary Test, HOME = Home Observation for Measurement of Environment, MTPKC = Milieu Teaching Project Kidtalk Code, PCX = Parent Child Interaction, PPVT = Peabody Picture Vocabulary Test, SICD = Sequenced Inventory of Communication Development, CDI = Communication Development Inventory, MLU = Mean Length of Utterance, ESCS = Early Social Communication Scales, DS = Down's syndrome, DD = Developmental delay, I = Intervention, C = Control.

the parent's responsiveness (*n* = 7) and language modeling strategies (i.e., labeling, comments) (*n* = 2) was measured. The number of intentional acts (*n* = 3), verbal/vocal turns (*n* = 2), lexical density (*n* = 2), vocabulary diversity (*n* = 2), and mean length of utterance (MLU) (*n* = 1) of each child was measured on the Communication and Symbolic Behaviors Scales (CSBS) or Sequenced Inventory of Communication Development (SICD).

Language ability in the form of expressive vocabulary (*n* = 6) was measured with the Communication Development Inventory (CDI). Two studies included measures of receptive language. A summary of the measures used in the studies is listed in Table 3.

Results

Do Parent-Implemented Interventions Positively Affect Parent-Child Interaction Behaviors?

All studies reported significant effects of parent-implemented language intervention on parental responsiveness. The three HPP studies found that parents who followed either version of the HPP intervention were significantly more responsive which resulted in significantly higher rates of turn-taking, target labels, and use of focused stimulation of target words and comments in parent-child interactions (Girolametto, 1988, 1998; Tannock et al., 1992). However, there was no significant effect of intervention on the complexity of parental language input. In addition to these findings, the improved parent-child interaction behaviors of the mother were sustained for at least 4 months directly after the intervention (Tannock et al., 1992).

Only Yoder and Warren (2002) reported significant effects of RE/PMT intervention on the number and the proportion of child communication acts to which the parent optimally responded.

Kaiser and Roberts (2013) found that parents who followed EMT in the parent + therapist group used significantly more responsive interaction strategies in both trained and untrained activities than parents in the therapist only group. In addition, parents in the parent + therapist group used more language modeling, language expansions, and Milieu Teaching Prompts (e.g., prompt with exact words, prompt with cues) than parents in the therapist only study group.

Do Parent-Implemented Interventions Affect Child Communication and Language Abilities?

Within the child communication domain, significant short-term effects of intervention were found on intentional acts (*d* = .68), verbal turns (*d* = 1.2), vocal turns (*d* not calculated), vocabulary diversity (*d* = 1.3), and MLU (*d* = .32). Significant long-term effects of intervention on child communication behavior were found for the HPP and EMT interventions but not for the RE/PMT intervention. Tannock et al. (1992) reported concomitant increases of children's use of vocal turns 4 months after the HPP intervention. Kaiser and Roberts (2013) also reported significant long-term effects (12 months after EMT intervention) on lexical diversity (*d* = 0.46) and MLUs (*d* = 0.60). Warren et al. (2008) investigated the long-term effects of RE/PMT at 6 and 12 months after the RE/PMT intervention. Although a significant main effect of Time on the rate of intentional communication acts (*d* = 0.53) and lexical density (*d* = 0.85) was found, no significant Time x Group interaction effects were found (0.11 < *d* < 0.14). This indicates that the RE/PMT group did not outperform the control group (children on waiting list for speech therapy).

Another interesting finding was that studies involving the RE/PMT intervention (Fey et al., 2006; Warren et al., 2008; Yoder & Warren, 2002) reported mixed results on communication

behavior in children with DD. For instance, the study by Fey et al. (2006) reported a significant effect of RE/PMT on the rate of intentional communication acts compared to a control group (children on a waiting list for therapy; $d = 0.68$), whereas Yoder and Warren (2002) did not find significant effects of RE/PMT on communication outcomes.

Considering the subgroup children with DS, no significant differences were found on communication behavior. Yoder and Warren (2002) reported that the growth curves in child-initiated requests in children with DS were below those of children with a DD. The authors concluded that for this communication outcome, that children with DS did not benefit as much from the RE/PMT intervention as the other children with a DD. The other two studies did not find any significant differences between children with DS and children with a DD.

Finally, regarding the language vocabulary development (mostly measured on the CDI), none of the studies reported significant short-term or long-term effects of an intervention on expressive language vocabulary.

Discussion

Principal Findings

The primary purpose of this systematic review was to evaluate the effect of parent-implemented language interventions on parent-child interaction behavior and child communication and language abilities in children with a DD age 1–5 years. Although in general we found positive effects of interventions on parental responsiveness and on children's communication, including significant increases in the frequency of specific aspects of language (i.e., vocabulary diversity, lexical density, MLU) as a part of the child's communication, there was no effect of intervention on children's expressive language vocabulary development.

These findings are not surprising, because all programs were focused on parent-child interaction (e.g., frequency and duration of parent-child interaction, parent responsiveness, the amount of language input and the use of strategies to support language) (Sanz & Menendez, 2010). In all programs, it seems that mothers learnt to be more responsive and less directive, which gave the child the possibility to communicate and use more vocal and verbal turns. Parents were taught to observe their child's behavior and to follow their child's lead so that parents could anticipate their child's behavior. Parents also learnt to use language consistent with the language level of their child and to wait for a response from their child. The idea behind using appropriate language and waiting for a response is to create balanced communication between parent and child and provide the child with an opportunity to respond. As shown in our results, however, increased participation of the child per se may not enhance the language abilities of the child. It may be that informal measures, such as lexical density, vocabulary diversity, and MLU, are more sensitive to this change than formal measures such as expressive vocabulary. Informal measures would capture not only changes in frequency but also may capture changes in expression complexity.

The language abilities of the children included in our systematic review were less developed compared to the children in two

other systematic reviews (Cable & Domsch, 2011; Roberts & Kaiser, 2011). The children in our review predominately used preverbal communication (i.e., having not yet learned to speak), whereas the children in the two other reviews were mostly functioning at a verbal level (i.e., using spoken words). Compared to our findings, both systematic reviews found significant effects of intervention on formal measures of language in children with late-language emergence (LLE) (Cable & Domsch, 2011) and children with intellectual disability (ID) (Roberts & Kaiser, 2011). It may be that it is easier to detect changes in expressive language for children who operate on a verbal level rather than when children function on a preverbal level.

On the other hand, ID also seems to influence the effect of parent-implemented language interventions on expressive language. Roberts and Kaiser (2011) found that parent-implemented language interventions had a significant positive impact on the receptive and expressive language skills of children with an ID and children without an ID (mean effect sizes from 0.35 to 0.82, children age 18–60 months with primary and secondary language impairments). The effect sizes, however, for expressive vocabulary (but not receptive vocabulary) were significantly smaller in children with an ID compared to children without an ID (mean effect sizes 0.23 and 0.80, respectively). Conceivably, development of expressive vocabulary is harder to influence in children with an ID than children without an ID.

Finally, in the studies that we included in our systematic review, all children with a DD were children with a mild to moderate intellectual disability. The interactive model, which all intervention programs were based on, is very important for stimulating the parent-child interaction but it may not provide the best model for stimulating language acquisition for children with a DD. A linguistic-based program may be more appropriate for influencing the language development of children with a DD, as it could be that children with a DD require consistent and high levels of language support strategies to stimulate expressive language development. Further research is required to identify optimal intervention strategies for enhancing language development of children with a DD (i.e., to identify the best fit between a child with a DD and a specific intervention program).

Limitations

The results of a systematic review are only as strong as the studies included in the review: seven studies met our eligibility criteria and all studies had small sample sizes. These small sample sizes could have limited the ability to detect real effects on language outcomes. As we could not calculate effect sizes for all studies, we are unable to draw conclusions on the efficacy of the different interventions approaches. These methodological limitations should be considered when interpreting the results.

Finally, the treatment and control groups in six studies consisted of children with DS and children with a DD not associated with DS (Fey et al., 2006; Girolametto, 1988, Girolametto et al., 1998; Tannock et al. 1992; Warren et al., 2008; Yoder & Warren, 2002). All the PE/PMT studies evaluated the effect of diagnosis (i.e., comparing children with a DD to children with DS) on communication, but conclusions regarding the subgroup with

DS should be interpreted with caution because the sample sizes were very small.

Clinical Implications

Our results suggest that when children show low-frequency comments and canonical vocal communication, parent-implemented early language interventions can have a significant effect on the communication of children with a DD. The implication is that interventions based on an interactive model (Tannock & Girolametto, 1992) do not, at least in the short-term, enhance language acquisition, but they do increase the frequency of communicative skills that were already part of the child's repertoire (Tannock et al., 1992).

Before language can be stimulated, children with a DD need to learn how to communicate with their parents and parents need to learn (1) how to interact with their child and (2) which strategies they should use to increase their child's comments and canonical vocal communication acts. It is important to decide on a case-by-case basis which intervention program is most appropriate for a child with a DD. For the child with a DD who uses many comments and canonical vocal communication, even if he/she does not yet use verbal words, a linguistic approach could be more appropriate.

Conclusion

Published studies on the effect of early intervention on the communication and language development of children with a DD are limited. Although the conclusions drawn from this review should be treated with caution given the small number of studies included in the review, the conclusions provide a modest indication of what results might be expected from early language intervention programs for this population. Despite the well-understood challenges which parents of children with a DD face in communicating with their child, there is a paucity of literature on parent-based intervention programs for parents of children with a DD. The findings of our systematic review suggest that there might be significant positive effects of parent-implemented early language intervention programs for children with a DD, including children with DS, on communicative behavior, but that the effects of intervention on language development are smaller. The effects of intervention on communication are promising, particularly for children with a DD who show few comments and canonical vocal communication acts. We suggest, however, that future studies investigate whether a more linguistic-based program is more appropriate to stimulate language development for children in this population.

References

- Cable, A. L., & Domsch, C. (2011). Systematic review of the literature on the treatment of children with late language emergence. *International Journal of Language & Communication Disorders*, 46, 138–154. doi: 10.3109/13682822.2010.487883
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155–159. doi: 10.1037/0033-2909.112.1.155
- Darragh, J., Hickman, R., O'donnell, M., Vogtle, L., & Wiart, L. (2008). AACPDm methodology to develop systematic reviews of treatment interventions (revision 1.2). Retrieved from <http://www.aacpdm.org/publications/outcome/resources/systematicReviewsMethodology.pdf>
- Fey, M. E., Warren, S. F., Fairchild, M., Sokol, S., & Yoder, P. J. (2006). Early effects of responsivity education/prelinguistic milieu teaching for children with developmental delays and their parents. *Journal of Speech, Language, and Hearing Research*, 49, 526–547. doi:10.1044/1092-4388(2006/039)
- Girolametto, L. E. (1988). Improving the social-conversational skills of developmentally delayed children: an intervention study. *The Journal of Speech and Hearing Disorders*, 53, 156–167. doi:10.1044/jshd.5302.156
- Girolametto, L., Weitzman, E., & Clements-Baartman, J. (1998). Vocabulary intervention for children with down syndrome: Parent training using focused stimulation. *Infant-Toddler Intervention: The Transdisciplinary Journal*, 8, 109–125.
- Kaiser, A. P. (1993). Parent-implemented language intervention: An environmental system perspective. In A. Kaiser & D. Gray (Eds.), *Enhancing children's communication: research foundations for intervention* (pp. 63–84). Baltimore, MD: Brookes.
- Kaiser, A. P., & Roberts, M. Y. (2013). Parent-implemented enhanced milieu teaching with preschool children who have intellectual disabilities. *Journal of Speech, Language, and Hearing Research*, 56, 295–309. doi:10.1044/1058-0360(2011/10-0055)
- Law, J., Garrett, Z., & Ney, C. (2004). The efficacy of treatment for children with developmental speech and language delay/disorder: a meta-analysis. *Journal of Speech, Language, and Hearing Research*, 47, 924–943. doi:10.1044/1092-4388(2004/069)
- Manolson, A. (1991). *It takes two to talk*. Toronto, ON: The Hanen Centre.
- McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: a systematic review. *Journal of Evaluation in Clinical Practice*, 13, 120–129. doi:10.1111/j.1365-2753.2006.00674.x
- McLean, J. E., & Snyder-McLean, L. K. (1978). *A transactional approach to early language training*. Columbus, OH: Merrill.
- Roberts, M. Y., & Kaiser, A. P. (2011). The effectiveness of parent-implemented language interventions: A meta-analysis. *American Journal of Speech-Language Pathology*, 20, 180–199. doi:10.1044/1058-0360(2011/10-0055)
- Sanz, M. T., & Menendez, J. (2010). Parents' training: effects of the self-help skills programme with Down's syndrome babies. *Early Child Development and Care*, 180, 735–742. doi:10.1080/03004430802279918
- Tannock, R., Girolametto, L., & Siegel, L. S. (1992). Language intervention with children who have developmental delays: effects of an interactive approach. *American Journal on Mental Retardation*, 97(2), 145–160.
- Tannock, R., & Girolametto, L. (1992). Reassessing parent-focused language intervention programs. In Warren, S. F. & Reichle, J. E. (Eds.), *Causes and effects in communication and language intervention* (pp. 49–79). Baltimore, MD: Brookes.
- Thalmeier, W., & Cook, S. (2002). How to calculate effect sizes from published research Articles: A simplified methodology. Retrieved from http://work-learning.com/effect_sizes.htm.
- Warren, S. F., Fey, M. E., Finestack, L. H., Brady, N. C., Bredin-Oja, S. L., & Fleming, K. K. (2008). A randomized trial of longitudinal effects of low-intensity responsivity education/prelinguistic milieu teaching. *Journal of Speech, Language, and Hearing Research*, 51, 451–470. doi: 10.1044/1092-4388(2008/033)
- Yoder, P. J., & Warren, S. F. (2002). Effects of prelinguistic milieu teaching and parent responsivity education on dyads involving children with intellectual disabilities. *Journal of Speech, Language, and Hearing Research*, 45, 1158–1174. doi:10.1044/1092-4388(2002/094)