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Assessing the Effects of a Parent-Implemented Language Intervention for Children With Language Impairments Using Empirical Benchmarks: A Pilot Study

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Purpose: The purpose of this study was to investigate the extent to which a parent-implemented language intervention improves language skills in toddlers at risk for persistent language impairment (LI) as compared with a group of typically developing toddlers.
Method: Thirty-four children with LI between 24 and 42 months of age were randomly assigned to a treatment or nontreatment experimental condition. Participants in the treatment group received 24 biweekly 1-hr sessions for 3 months. An additional sample of 28 age- and gender-matched children with typically developing language (TL) was also included. Norm-referenced child assessments and observational measures were used to assess changes in children's language growth.
Results: Results from multilevel modeling indicate that children in the treatment group made greater gains than children in the control group on most language measures. Whereas children in the treatment group had lower language scores than children with TL at the end of intervention, the rate of language growth was not significantly different between groups. Child receptive language and parent use of matched turns predicted expressive language growth in both children with and without LI.
Conclusion: The results of this preliminary study indicate that parent-implemented interventions may be an effective treatment for children with expressive and receptive LI.

Key Words: parent training, early intervention, language impairments

Young children who have expressive and receptive language impairment (LI) during their toddler years are at increased risk for persistent LI and later academic failure (Snowling, 2005). Developing effective early language interventions for this population is essential. Few studies have investigated the effects of early language intervention for this population (Law, Garrett, & Nye, 2004). Because both remediation of current LI and prevention of later impairments and related problems are important, analyzing the impact of intervention on both developmental outcomes and growth trajectories during intervention has merit. In the current study, a randomized group experiment was combined with a benchmarking analysis of children with typically developing language (TL) to assess the impact of a naturalistic intervention on children's language outcomes and to determine whether the language growth that occurred during intervention was similar to the amount of growth in children with TL during the same time period.

Previous Research on Children With LIs

There is relatively little intervention research on children with expressive and receptive LI (Law et al., 2004). The majority of research on children with LI has included children older than 36 months. Furthermore, research with children between 24 and 36 months of age has focused primarily on expressive language outcomes (Gibbard, Coglan, & McDonald, 2004; Girolametto, Pearce, & Weitzman, 1996; Weismer, Murray-Branch, & Miller,

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1993). Few studies have examined receptive language outcomes following intervention for children with expressive and receptive LI (Glogowska, Roulstone, Enderby, & Peters, 2000). In the largest randomized control trial of children with LI, 159 children were randomly assigned to a "wait and see approach" or to receive speech and language therapy in one of 16 community-based clinics (Glogowska et al., 2000). Children in the treatment group received one-on-one speech and language therapy. The actual therapy delivered to children varied substantially within the treatment group. The large range in intensity, frequency, duration, and type of therapy in the treatment group may explain why differences in outcome measures of expressive language skills were not statistically significant between groups. Despite variability in the treatment protocols, auditory comprehension outcomes were significantly higher in the treatment group as compared with the control group ($d = 0.26$, $p = .025$). These findings suggest that early intervention may impact auditory comprehension abilities that are a key factor in long-term language development (Flax, Realpe-Bonilla, Roesler, Choudhury, & Benasich, 2009).

The Need for Parent-Implemented Interventions

Associations between aspects of parent–child interaction and child language development indicate that including parents in early intervention may be important. Several aspects of parent–child interactions are associated with child language development in mainstream American cultures: (a) amount of parent–child interaction (Alston & St. James-Roberts, 2005), (b) responsiveness to child communication (Tamis-LeMonda, Bornstein, & Baumwell, 2001), (c) amount and quality of linguistic input (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Rowe, 2008), and (d) use of language learning support strategies (Vigil, Hodges, & Klee, 2005).

Given the critical role that parents play in their children's language development, teaching parents to support language development is an important component of effective remediation of young children's communication deficits. The need for interventions that include typical communication partners and that are delivered in children's natural environments is widely recognized (Individual with Disabilities Improvement Act [IDEA], 2004). IDEA (2004) highlights the importance of parent–child interactions in the home environment by mandating that interventions for young children with disabilities be implemented within typical and authentic learning experiences.

It is important to note that cultural values and beliefs of child-rearing practices potentially influence the aforementioned aspects of parent–child interactions as well as the language support strategies taught to parents (van Kleeck, 1994). Johnston and Wong (2002) found differences in child-rearing beliefs and interaction styles between Chinese and Western mothers. Vigil, Tyler, and Ross (2006) found that in contrast to American children, Mexican-immigrant children learned more words in an attention-directing than attention-following style. In a review of interaction styles across multiple cultures, Vigil and Hwa-Froelich (2004) found that cultural background influences several aspects of parent–child interactions. Cultural beliefs and practices that impact parent behavior include directing child attention, using directives, and controlling objects in play. Thus, each individual family's cultural beliefs and interaction styles must be considered when choosing where intervention should occur, who should be included in the intervention process, how family members should be included, and what language support strategies should be used.

Triadic intervention. Training parents to implement specific language intervention strategies to improve language development in their children is a triadic intervention model. That is, a skilled trainer teaches parents to use specific language intervention strategies with their children. The success of this approach depends on parents learning and using the strategies with sufficient frequency and accuracy to influence their children's development. The content of these language support strategies vary. Generally, the strategies have been derived from (a) descriptions of the parent–child interactions from mainstream cultures discussed previously (Tamis-LeMonda et al., 2001; Vigil et al., 2005), (b) behavioral learning principles (Schreibman & Koegel, 2005), or (c) a hybrid of these (Dawson et al., 2010; Kaiser, 1993).

Studying triadic interventions requires a three-level method for monitoring and measuring parent training, parent implementation of intervention strategies, and child language outcomes. Methodologically strong studies measure the procedures for teaching parents specific strategies, parents' implementation of these strategies, and the effects of the intervention on child language development. Few studies measure all aspects of the triadic intervention. However, over the last 3 decades, there has been a sufficient body of research to build a case for the efficacy of parent-implemented interventions.

Effects of parent-implemented interventions. Beginning in the 1970s, studies demonstrated that parents could be taught specific strategies to support their children's language learning (Cheseldine & McConkey, 1979; Fey, Cleave, Long, & Hughes, 1993). Although there was early evidence to suggest that parent behavior could be altered to create a more supportive interactional context for children (Cheseldine & McConkey, 1979), only more recent studies have included evidence that changes in children's communication are associated with specific changes in parent behavior (Delaney & Kaiser, 2001; Fey et al., 1993).

A recent meta-analysis of parent-implemented interventions found that parent-implemented language interventions have positive effects on child language (Roberts & Kaiser, 2011). Effect sizes across parent-implemented interventions, when compared with a nontreatment or business-as-usual comparison group, were positive, were significant, and ranged from $g = .35$, $p = .02$, 95% confidence interval (CI) [0.05, 0.65] for receptive language to $g = .82$, $p < .01$, 95% CI [0.37, 1.38] for expressive morpho-syntax. There were several intervention strategies that were common across studies: (a) responding to child communication, (b) increasing quality of linguistic input, (c) adjusting the balance of adult–child communication, and (d) expanding or recasting child communication. These strategies mirror those characteristics observed in parent–child interactions of mainstream cultures that are predictive of child language development.

The meta-analysis highlighted the limitations of studies of parent-implemented interventions. First, the majority of studies failed to measure treatment fidelity or to describe the parent training procedures. Without specific description of how the parent training was actually implemented, it is difficult to determine what specific parent training strategies resulted in changes in parent behaviors. Second, the majority of studies did not measure parent use of intervention strategies or examine the relationship between parent strategy use and child language growth, making it impossible to determine which specific language strategies were effective at improving language skills. Third, whereas studies included children with autism, Down syndrome, developmental delays, and expressive LI, only one study included children with receptive and expressive LI and typical cognitive development (Law, Kot, & Barnett, 1999).

Parent-implemented enhanced milieu teaching (EMT; Kaiser, 1993). EMT is an early language intervention that has been studied primarily using single subject methodology. EMT is a conversation-based model of early language intervention that uses child interests as opportunities to model and prompt language use in everyday contexts. The use of parent-implemented EMT has been widely researched with preschool-age children with varying levels of language and cognitive abilities (Kaiser & Trent, 2007).

Although no published study of parent-implemented EMT has included exclusively children with LI, the results of many studies indicate that parent-implemented EMT facilitates language growth for young children with varying degrees of language and cognitive ability as well as for children with developmental disabilities. In addition, unlike the majority of intervention studies of children with LI, all parent-implemented EMT studies have included participants with receptive and expressive impairments and cognitive delays, suggesting its potential effectiveness for children with LI and no cognitive delays.

The Importance of Using Empirical Benchmarks

Despite the potential for early intervention to improve language skills for children with LI, the current practice for this population is a "wait and see" approach because it is assumed that many children will recover from their LI without intervention (Law, Boyle, Harris, Harkness, & Nye, 2000). Given that a wait and see approach is the recommended standard of care for young children with receptive and expressive LI, it is especially important to be able to quantify intervention effects beyond the treatment versus control group comparison (Hill, Bloom, Black, & Lipsey, 2008). Comparing language growth of children with typical language skills to children with LI who do and do not receive intervention allows for a more meaningful examination of treatment effects. For the treatment group, normative benchmarks extend the research question beyond "Does early intervention work?" to "How well does early intervention work?" By examining normative growth over time, researchers can determine whether early intervention is able to accelerate growth in language development such that growth in language for children with LI is closer to that of their peers with TL. Having a nontreatment control group with TL provides an opportunity to index the rate of development in children with LI in comparison with their peers with TL.

Normative benchmarks also allow for the examination of parent use of language support strategies that are associated with between-child differences in rate of children's language development. The inclusion of a sample of children with TL and their parents allows for the comparison of language interactions of parents of children with TL to those of parents of children with LI. In addition, it is possible to compare interactions of parents trained in the EMT intervention with the interactions of parents of children with TL to determine whether training in EMT results in parent interactions that are typically associated with positive developmental outcomes in children with TL.

Purpose of the Present Study

In a randomized controlled trial (RCT), the effectiveness of parent-implemented EMT on the expressive and receptive language abilities of 80 children with receptive and expressive LI is being examined. The current study occurred concurrently with the larger RCT and used a subset of the data collected from that study. In addition, the current study included a group of children with TL who were not included in the RCT. The purpose of the current study was to extend the analysis of the effects of parent-implemented EMT beyond the treatment- versus control-group comparison to examine

the effects of the treatment on children with LI in relation to a group of children with TL. A group comparison experimental design was used to address the following research questions:

1. How do parental language support strategies (e.g., responsiveness, expansions) compare between the parents of children with LI who received intervention and parents of children with TL after intervention?
2. Do children with LI in the treatment group have better language skills (e.g., a greater number of different spoken words, higher scores on the Preschool Language Scale, Fourth Edition [PLS–4; Zimmerman, Steiner, & Pond, 2002]) than children with LI in the control group at the end of the intervention?
3. Does rate of language growth increase for children with LI in the treatment group, such that their growth is closer to that of their peers with TL by the end of intervention?
4. Does rate of language growth increase for children with LI in the control group, such that their growth is closer to that of their peers with TL by the end of intervention?
5. What child characteristics (e.g., cognitive skills, risk factors, receptive language) predict language growth for children with and without LI?

Method

Design

A small randomized group design study, conducted as part of a larger efficacy study, was used to evaluate the effects of parent-implemented EMT for children with LI. Children with LI were randomly assigned to the LI-treatment or the LI-control group (i.e., business-as-usual). A second aspect of the study compared the language development of treatment and control children with LI to a group of children with TL and examined parent language support strategies in the three groups of children (LI-treatment, LI-control, TL).

Participants

A total of 62 children and their parents participated. Families were recruited through local agencies and schools serving preschool children with disabilities and through advertisements placed in local newspapers. Continuous recruitment of children with and without LI began in October 2009 through Tennessee Early Intervention Services, local pediatricians' offices, the Bill Wilkerson Speech and Hearing Center at Vanderbilt University, and advertisement in the community. Recruitment was a continuous process that occurred until January 2011. Criteria for inclusion for children with LI were as follows: (a) between 24 and 42 months of age at screening; (b) Cognitive Composite standard score of 80 or greater on the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley–III; Bayley, 2006); (c) Receptive Communication Scaled score of 8 or less on the Bayley–III; (d) Expressive Communication Scaled score of 7 or less on the Bayley–III; and (e) a Total Language standard score of 79 or less on the Bayley–III. These criteria were selected to identify children who had expressive and receptive LI and who are presumed to be at greater risk for persistent LI. The 10th percentile cutoff on standardized language measures is a commonly used standard for identifying LI (Paul, 2007). Children with TL were evaluated to determine whether they met the following inclusion criteria: (a) Cognitive Composite standard score of 90 or greater as measured by the Bayley–III, (b) Receptive Communication Scaled score of 9 or greater as measured by the Bayley–III, (c) Expressive Communication Scaled score of 9 or greater as measured by the Bayley–III, and (d) a Total Language standard score of 95 or greater on the Bayley–III. In addition, children were excluded from the study if they (a) had a primary diagnosis of any specific disability other than LI (e.g., autism, Down syndrome, developmental disabilities); (b) had sound field hearing thresholds greater than 30 dB, as measured by an audiologist; (c) demonstrated symptoms of a motor speech disorder on the basis of the Kaufman Speech Praxis Test for Children (Kaufman, 1995); (d) spoke a language other than English at home, as measured by parent report; or (e) demonstrated signs of autism spectrum disorder (i.e., a score of 2.0 or greater), as measured by the Screening Tool for Autism in Two-Year-Olds (Stone, Coonrod, & Ousley, 2000).

After the initial screening, eligible children with LI were randomly assigned to the treatment or control group. The majority of children were male, Caucasian, and from middle-class families. Child and parent demographic characteristics for families enrolled in each experimental condition are shown in Tables 1 and 2. Children and parents in the three groups did not differ significantly on all of these demographic characteristics except income and education.

Measures

Several methods of assessment were used to evaluate treatment outcomes. A list of child measures and corresponding testing periods are included in Table 3. Parents' use of language support strategies and children's language scores between the LI-treatment and LI-control groups did not differ at the start of the study. Children were assessed at the start of the study (T0), 1 month later (T1), 2 months later (T2), and 3 months later (i.e., at the end of intervention for the LI-treatment group [T3]).

Table 1. Child characteristics at the start of the study.

Characteristic	Definition	EMT (*n* = 16)	Control (*n* = 18)	Typical (*n* = 28)
Age, *M* (*SD*)	Age in months	31.00 (4.52)	30.83 (4.94)	29.86 (4.17)
Gender, *n* (%)	Male	14 (87)	13 (72)	26 (93)
Race, *n* (%)	African American	3 (19)	4 (22)	2 (7)
	Caucasian	12 (75)	14 (78)	23 (82)
	Asian	0 (0)	0 (0)	1 (4)
	Other	1 (6)	0 (0)	2 (7)
Speech-language therapy, *n* (%)	Number of children who received additional speech language therapy	1 (7)	0 (0)	0 (0)
Cognitive skills, *M* (*SD*)	Bayley–III Cognitive Composite	87.81 (5.47)	87.78 (6.47)	103.21 (7.48)
Language skills, *M* (*SD*)	Bayley–III Expressive subscale	4.81 (1.08)	5.11 (1.41)	13.14 (3.95)
	Bayley–III Receptive subscale	5.44 (1.55)	5.94 (1.35)	12.04 (1.86)
	Bayley–III Language Composite	71.56 (6.47)	74.05 (6.45)	114.07 (12.58)
	Mean length of utterance (MLUm)[a]	1.16 (.20)	1.18 (.19)	2.35 (.85)
	Number of different word roots (NDW)[a]	16.98 (10.62)	11.94 (9.73)	66.50 (32.05)
	Total number of words (TNW)[a]	36.60 (44.37)	28.31 (43.25)	165.81 (119.86)

Note. EMT = enhanced milieu teaching; Bayley–III = Bayley Scales of Infant and Toddler Development, Third Edition.

[a]On the basis of a 20-min language sample with a staff member in the clinic.

Screening. The Bayley–III was chosen as a screening measure because it includes both cognitive and language subscales, from which two important inclusion criteria were determined. In addition, the Bayley–III does not depend exclusively on parent report and has more test items for this age range (24–42 months) than many standardized language assessments. The mean score for composite scores is 100 (*SD* = 15). Subscales have a mean of 10 (*SD* = 3).

Child outcomes measures. Both observational and norm-referenced measures were used to assess child language development at T0, T1, T2, and T3. Observational measures included a parent–child interaction and a language sample in the clinic. In the parent–child interaction, the parent and the child played with a standard set of toys for 10 min. Parents were shown the toys and were asked to "play as you normally would until the

Table 2. Parent characteristics at the start of the study.

Characteristic	Definition	EMT (*n* = 16)	Control (*n* = 18)	Typical (*n* = 28)
Mother's age, *M* (*SD*)	Age in years	32.69 (6.00)	32.71 (7.26)	35.00 (4.49)
Child lives with, *n* (%)	Mother and father	14 (87)	14 (78)	26 (93%)
	Mother only	2 (13)	2 (11)	2 (7)
	Father only	0 (0)	1 (6)	0 (0)
	Did not respond	0 (0)	1 (6)	0 (0)
Mother's employment, *n* (%)	Not working	5 (31)	11 (61)	10 (36)
	Full time	7 (44)	2 (11)	12 (43)
	Part time	4 (25)	4 (22)	6 (21)
	Did not respond	0 (0)	1 (6)	0 (0)
Income (in dollars), *M* (*SD*)	Yearly income	68,347 (28,626)	36,650 (30,849)	71,125 (23,300)
Mother's education, *n* (%)	High school	0 (0)	1 (6)	2 (7)
	Some college	2 (13)	6 (33)	6 (21)
	Bachelor's degree	6 (38)	7 (39)	6 (21)
	Master's degree	7 (44)	3 (17)	14 (50)
	Did not respond	1 (6)	1 (6)	0 (0)
Parent participant, *n* (%)	Mother	13 (81)	15 (83)	27 (96)
	Father	3 (19)	3 (17)	1 (4)

Table 3. Child measures.

Construct	Assessment	Time point
Cognitive	Bayley–III: Cognitive Composite score	Screening
Overall language ability	Bayley–III: Language Composite score	Screening
	PLS–4 total score	T0, T3
Expressive language	Bayley–III: Expressive Communication subscale	Screening
	Language sample: NDW and MLUm	T0, T3
	Parent–child interaction: NDW and MLUm	T0, T1, T2, T3
	PLS–4 Expressive Communication subscale	T0, T3
Receptive language	Bayley–III: Receptive Communication subscale	Screening
	PLS–4: Auditory Comprehension subscale	T0, T3

Note. PLS–4 = Preschool Language Scale, Fourth Edition; T0 = assessment at the start of the study; T1 = assessment 1 month later; T2 = assessment 2 months later; T3 = assessment 3 months later.

timer beeps." Language samples were collected using a standard set of materials. The examiner followed a standardized protocol for presenting materials and eliciting language. Each 20-min language sample included five segments: (a) adult–child conversation using a wordless picture book, *Good Dog Carl* (Day, 1997), and (b) free play with four sets of toys (e.g., Play-Doh, babies, cars, barn). Each segment lasted approximately 4 min. Procedural fidelity for the language sample protocol was completed by an independent observer who completed a fidelity checklist for 20% of language samples that were evenly distributed between groups and over time. Average fidelity for language samples was .96, with a range from .89 to 1.0.

Both the language samples and the parent–child interactions were video-recorded and transcribed using Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2011). Analyses of linguistic measures were completed using the automated analysis program of SALT. The primary outcome variable obtained from the language samples was number of different word roots (NDW), and the secondary outcome variables were mean length of utterance (MLUm) and total number of words (TNW). NDW, MLUm, and TNW are standard measures generated by SALT.

In addition to observational data, the PLS–4 (Zimmerman et al., 2002) was used to measure children's expressive and receptive language abilities at T0 and T3. The PLS–4 has a mean score of 100 (*SD* = 15). The administration of the PLS–4 was supervised by an America Speech-Language-Hearing Association certified speech-language pathologist. All assessments were administered in the clinic by an experienced master's level special educator or speech-language pathologist. All testing sessions were video-recorded, and procedural fidelity for test administration was measured for 20% of videos to assess and ensure accuracy of test administration. Procedural fidelity exceeded .95 for all direct assessments.

Parent outcome measures. Parents' use of language strategies was measured by transcribing and coding parent–child interaction sessions during clinic observations at T0, T1, T2, and T3. Sessions were coded for the adult strategies listed and defined in Table 4 (i.e., matched turns, responsiveness, targets, expansions, time delay strategies, and prompting). Prior to coding, all observers achieved 85% point-by-point interobserver agreement (IOA) on utterance codes on three consecutive videos. Point-by-point IOA was calculated for 20% of sessions. Reliability exceeded 80% for each parent behavior and is summarized in Table 4.

Experimental Procedures

Control group and typical language group. Participants in the LI-control group did not receive EMT parent training. Information regarding the type and amount of community language intervention their child received was collected at T0 and T3. Because current practice for this population is a wait and see approach, the majority of

Table 4. Definitions of strategies and interobserver agreement (IOA) for parents' use EMT strategies.

		IOA
EMT strategy	Measure	*M* (*SD*)
Matched turns	Percentage of adult turns that are in response to a child's previous utterance	.84 (.12)
Parent responsiveness to child verbal turns	Percentage of child verbalizations that are followed by a contingent, related response	.97 (.09)
Parent talk at the child's level	Percentage of parent utterances that are at the child's target level	.93 (.09)
Expansion of child's utterances	Percentage of child utterances that the parent expands	.92 (.11)
Time delay strategies	Percentage of episodes that include correctly executed steps of the nonverbal prompting hierarchy	1.00 (0.00)
Prompting strategies	Percentage of episodes that include correctly executed steps of the verbal prompting hierarchy	.87 (.19)

children with LI (92%) did not receive language intervention. Only one child received speech-language therapy for one 30-min session a week.

Treatment group. Participants in the EMT experimental group received individual parent training. An experienced master's level special educator or speech-language pathologist provided the parent training. Two therapists received 6 months of direct supervision and coaching from the first author, who has 8 years of experience working with families of children with LI. Each therapist coached eight parents. Parents were taught to use EMT strategies at home and in the clinic during 28 individual training sessions (i.e., four workshops and 24 practice sessions). Parents were taught EMT strategies in four phases: (a) setting the foundation for communication, (b) modeling and expanding communication, (c) time delay strategies, and (d) prompting strategies. Each phase included a specific set of EMT strategies taught to parents. Language targets were chosen for each child prior to the intervention on the basis of the review of language sample transcripts. All children fell into one of two categories: (a) single word targets (i.e., fewer than 50 words and less than 10 verbs) or (b) early word combinations (i.e., more than 50 words but not combining words regularly). Single word targets included nouns, verbs, locatives (in, on), and requesting/protesting words (help, more, all done). Word combination targets included agent–action (the dog eats), action–object (eat the bone), preposition–location (in the bowl), and modifier–noun (e.g., big dog). A summary of skills taught to parents is provided in Table 5. A new set of skills was introduced when the parent reached criterion level listed in Table 6. The criterion levels are based on previous levels of EMT implementation that most parents achieve within the time frame specified for training.

At the beginning of each phase, the topic for the phase was introduced through an hour-long workshop in which the therapist (a) defined the strategy, (b) provided a rationale for each component of the strategy, (c) described how to do the strategy, (d) showed video examples of the strategy, and (e) answered parent questions about the strategy. Each of the four workshops included standardized information so that each parent received the same information in the same format. Following each 1-hr workshop, parents practiced the specific set of strategies during sessions that occurred twice weekly (one clinic and one home session). Each of the clinic sessions contained four, 15-min segments that occurred in the following order: (a) the therapist reviewed the EMT strategies taught in the workshop (teach); (b) the therapist modeled the EMT strategies with the child (model); (c) the parent practiced the strategies with his or her child with coaching from the therapist (coach); and (d) the therapist provided feedback to the parent, summarized the session, and answered the parent's questions (review). This teach–model–coach–review method of parent training was used during all sessions.

Therapists followed a specific protocol for teaching parents during all four segments of the hour session. During the initial review segment, the therapist reviewed the target EMT strategies previously discussed in the workshop. Then, she explained these strategies in relation to

Table 5. Description and sequence of EMT strategies taught to parents.

Phase	Specific strategies	Outcome measures	Practice sessions
A context for communication	• Responding to communication • Taking turns • Waiting • Mirroring and mapping	• Percentage of adult turns that are in response to a child's previous utterance • Percentage of child verbalizations that are followed by a contingent, related response	1–5
Modeling and expanding communication	• Modeling specific child language targets • Expanding verbal and nonverbal communication	• Percentage of parent utterances that are at the child's target level • Percentage of child utterances that the parent expands	6–12
Time delay strategies	• Assistance • Choices • Waiting with routine • Waiting with cue • Inadequate portions	• Percentage of episodes that include correctly executed steps of the nonverbal prompting hierarchy	13–15
Prompting strategies	• Open questions • Choice questions • "Say" prompt	• Percentage of episodes that include correctly executed steps of the verbal prompting hierarchy	16–21
All of EMT	• All of the above strategies		22–24

Table 6. Fidelity of parent training in home and clinic sessions.

Parent training strategy	Home *M* (*SD*)	Clinic *M* (*SD*)
Teaching the strategy	.87 (.18)	.90 (.15)
Modeling with child	.95 (.18)	.95 (.12)
Coaching the parent	.96 (.05)	.99 (.04)
Reviewing the session	.84 (.37)	.91 (.17)
Overall	.94 (.07)	.94 (.07)

the selected toys, discussed different ways to play with these toys, and checked for understanding by asking whether the parent had any questions. During the therapist modeling segment, the therapist used all EMT strategies but verbally highlighted the target strategies at least six times during the segment. During the parent–child practice segment, the therapist provided the parent with constructive feedback or specific praise at least once per minute for 15 min. After the session, the therapist asked the parent how he or she felt about the session, summarized how the parent used the target strategies, and related parent use of strategies to child communication during the session.

Home sessions followed the same parent training protocol with three additional components. The modeling segment by the therapist occurred only in the play routine at home. Parents also practiced the target strategies while reading a book, eating a snack, and doing a common household routine of their choice. These routines lasted between 3 and 5 min each. During these routines, the therapist provided constructive feedback or specific praise at least once per minute.

Treatment Fidelity

Because of the triadic nature of this intervention, fidelity of implementation occurred at three levels: (a) the delivery of parent training sessions by the therapist, (b) therapist's use of intervention strategies during her interactions with the child, and (c) the parent's use of the intervention strategies. First, every workshop and practice session was video-recorded. Therapists used clinic and home fidelity-of-implementation assessments to guide their implementation of parent training. In addition, trained observers completed fidelity assessments for 20% of training sessions to determine a percentage of parent training components implemented. Point-by-point IOA for parent training fidelity assessments was completed for 20% of observed sessions. Point-by-point IOA on fidelity exceeded 85% for all sessions. A summary of the fidelity of parent training is presented in Table 6. The average level of fidelity was 94% for all parent training components across home and clinic sessions.

Second, therapist use of EMT strategies during 20% of intervention sessions with the child was coded for the presence of EMT strategies. Use of EMT strategies by the therapist exceeded the criterion levels for all strategies (see Table 7). Third, parent use of EMT strategies was coded for the clinic session prior to the next workshop (i.e., Sessions 4, 11, 14, 19, 23) to ensure that parents met the criterion levels prior to introducing the next skill. Average parent use of each strategy is summarized in Table 7. Parents exceeded criterion levels of the target skills prior to learning a new skill, and all parents attended all 28 intervention sessions. In addition, the use of EMT strategies during parent–child interactions was measured across all time points (T0, T1, T2, and T3) and for all three experimental conditions, as mentioned previously. Point-by-point IOA was determined by having a second observer code 20% of the sessions as described above and summarized in Table 4.

Data Analysis

First, demographic, observational, and standardized measures were summarized. Means and standard deviations for each group were examined to assess differences between groups at the beginning of the study. Next, data related to each research question were analyzed using multilevel modeling (MLM). MLM is similar to repeated measures analysis of variance but has several advantages. MLM (a) allows for the estimation of growth curves that are different for each child, (b) allows for the number of observations and timing of these observations to vary across children, (c) has more power to detect differences than repeated measures analysis of variance, and (d) does not have the assumptions of homoscedasticity or sphericity (Quené & van den Bergh, 2004).

Two key assumptions of MLM (e.g., normal distribution of residuals and normal distribution of the dependent variable) were met for all dependent variables. Several models were tested to determine the best fit as outlined by Singer and Willet (2003). Time was rescaled at the last intervention point, such that the intercept value was equal to outcomes at the end of the study

Table 7. Fidelity of therapist and parent use of EMT strategies.

EMT strategy	Criteria	Therapist *M* (*SD*)	Parent *M* (*SD*)
Matched turns	> .80	.89 (.07)	.81 (.08)
Responsiveness to child verbal turns	> .80	.87 (.15)	.83 (.08)
Talk at the child's level	> .50	.73 (.12)	.53 (.11)
Expansion of child's utterances	> .40	.68 (.16)	.62 (.11)
Time delay strategies	> .80	.86 (.27)	.74 (.18)
Prompting strategies	> .80	.94 (.20)	.73 (.31)

(T3). First, an unconditional means model was tested to examine mean differences in NDW across children without regard to time. This model evaluated the amount of variability within and between children. The interclass correlation was .81 for NDW, indicating that 81% of the total variability in NDW was due to individual differences. Second, an unconditional or baseline growth model was tested to examine individual variability in growth rates. Significant intercept and linear slope parameters indicated that the group mean scores at T3 and growth between T0 and T3 were significantly greater than zero (i.e., growth was not constant over time). Furthermore, random error terms associated with the intercept and linear growth were significant ($p < .01$), suggesting that the variability in these parameters might be explained by between-child variables.

A comparison of the within-child variability for the unconditional mean model and the unconditional growth model indicated that the residual variance declined by .58 (e.g., 58% of the within-child variability in NDW was associated with a linear rate of change). Next, two higher order polynomial models (e.g., quadratic) were tested to examine whether the rate of growth accelerated or decelerated over time. Results indicated that only the linear growth parameter was significant ($p < .01$) and that growth was not accelerating over time. Furthermore, the –2 log-likelihood statistics were equal between the linear and quadratic models (302.43) but were smaller than the unconditional mean model (395.77). These results indicate that the quadratic term did not significantly improve the growth model and therefore was not included in the final model.

Child age in months was used as a covariate, and experimental condition was used as the independent variable. Age at the start of the study was not a significant predictor of linear growth and only accounted for 1% of the variance. Similar results were found for all other dependent variables. On the basis of these results, age was not included as a covariate, and a linear model was used with specific outcome measures as the dependent variables and experimental condition as the independent variable. All statistical analyses were conducted using SPSS Version 17. A description of these procedures may be found in West (2009).

Results

Pretest Comparisons Among Groups

LI groups were equivalent on all child characteristics presented in Table 1. As indicated by chi-square analyses, groups were equivalent on race, $\chi^2(6, N = 62) = 3.88$, $p = .69$; gender, $\chi^2(2, N = 62) = 3.83$, $p = .15$; and the number of children who received additional speech-language therapy, $\chi^2(2, N = 62) = 2.92$, $p = .23$. Groups were also comparable on age, $F(2, 59) = 0.43$, $p = .65$. As expected, children with LI scored significantly lower than children with TL on all language measures at pretest. Children with TL had significantly higher cognitive scores than children with LI, $F(1, 59) = 82.04$, $p < .01$. This difference may be due to the fact that the Bayley–III is not a nonverbal test of cognitive abilities. There were no differences between the LI-treatment and LI-control groups on cognitive skills, $F(1, 30) = 0.09$, $p = .77$; expressive language, $F(1, 30) = 1.76$, $p = .26$; receptive language, $F(1, 30) = 0.52$, $p = .46$; or total language, $F(1, 30) = 1.31$, $p = .26$. There were no differences in MLUm, $F(1, 30) = 0.22$, $p = .64$; NDW, $F(1, 30) = 1.39$, $p = .25$; or TNW, $F(1, 30) = 0.13$, $p = .72$.

Groups were also equivalent on the majority of parent characteristics listed in Table 1. As indicated by chi-square analyses, groups were equivalent on employment, $\chi^2(4, N = 61) = 6.32$, $p = .18$; parent with whom the child lives, $\chi^2(4, N = 61) = 3.11$, $p = .54$; and parent age, $F(2, 57) = 0.855$, $p = .43$. However, groups were not comparable on income, $F(2, 57) = 6.89$, $p < .01$, or education, $\chi^2(4, N = 61) = 25.82$, $p < .01$. Parents of children with TL and parents in the LI-treatment group had significantly higher average income than parents in the LI-control group. However, this difference in income did not appear to impact differences in child language scores and parents' use of strategies for children with LI. Parents of children with TL had more education than both the parents of children in the LI-treatment and LI-control groups. There were no differences between parents in the LI-treatment and LI-control groups in years of education. There were also no differences between the parents of the LI-treatment and LI-control groups in their use of responsive feedback, $F(1, 30) = 0.03$, $p = .86$; matched turns, $F(1, 30) = 0.01$, $p = .91$; use of language targets, $F(1, 30) = 0.98$, $p = .33$; expansions, $F(1, 30) = 0.26$, $p = .62$; and prompting, $F(1, 30) = 1.57$, $p = .24$. However, there were differences between the parents of children with LI and the parents of children with TL in the levels of responsiveness, $F(1, 60) = 43.86$, $p < .01$; matched turns, $F(1, 60) = 23.68$, $p < .01$; and use of language targets, $F(1, 60) = 13.11$, $p < .01$. These results support previous research showing differences between parents of children with and without LI (Wulbert, Inglis, Kriegsmann, & Mills, 1975) and indicate that parents of children with TL use more language targets and have higher levels of responsiveness and matched turns than parents of children with LI.

Comparison of Parent Use of EMT Strategies

To test differences between groups with regard to parent use of the six EMT strategies, experimental condition was included as a subject-level predictor. Initial

strategy use at T0 was included as a covariate. Separate analyses were conducted for matched turns, responsive feedback, use of language targets, expansions, time delays, and prompting. Means and standard deviations for all language measures are presented in Table 8. Effect sizes and significance levels are listed in Table 9.

EMT strategy use comparison between treatment and control groups. Following intervention, parents in the LI-treatment group had significantly higher percentages of matched turns (β = 0.46, $p < .01$, 95% CI [0.41, 0.51]), responsive feedback (β = 0.21, $p < .01$, 95% CI [0.17, 0.25]), use of language targets (β = 0.36, $p < .01$, 95% CI [0.32, 0.41]), expansions (β = 0.36, $p < .01$, 95% CI [0.31, 0.41]), and prompting (β = 0.19, $p < .01$, 95% CI [0.07, 0.30]) after controlling for initial levels of these parent behaviors. These results indicate that parents in the LI-treatment group had significantly higher rates of all EMT strategies than parents in the LI-control group following intervention.

EMT strategy comparison between treatment and typical groups. Parents in the LI-treatment group also had significantly higher rates of EMT strategies when compared with parents of children with TL. Parents in the LI-treatment group had significantly higher percentages of matched turns (β = 0.48, $p < .01$, 95% CI [0.44, 0.52]), responsive feedback (β = 0.20, $p < .01$, 95% CI [0.17, 0.24]), use of language targets (β = 0.35, $p < .01$, 95% CI [0.32, 0.38]), and expansions (β = 0.37, $p < .01$, 95% CI [0.33, 0.40]) after controlling for initial levels of these parent behaviors. There were no differences in prompting (β = 0.03, $p = .56$, 95% CI [–0.07, 13.88]) between the two groups for parents. These results indicate that, following intervention, parents in the LI-treatment group also had significantly higher rates of using all EMT strategies except for prompting than parents of children with TL.

EMT strategy comparison between control and typical groups. There were no differences between parents in the LI-control group and parents of children with TL for matched turns (β = –0.03, $p = .36$, 95% CI [–0.09, 0.03]) and responsive feedback (β = –0.02, $p = .65$, 95% CI [–0.11, 0.07]). Parents of children with TL used more language targets (β = 0.03, $p = .03$, 95% CI [0.00, 0.06]) than parents in the LI-control group. However, parents of children with TL used fewer expansions (β = –0.06, $p = .01$, 95% CI [–0.10, –0.01]) than parents in the LI-control group. There were no differences in prompting (β = 0.06, $p = .72$, 95% CI [–0.28, 0.40]) between groups. These results indicate that parents' use of most EMT strategies did not differ for parents of LI-control children and parents of children with TL.

Comparison of Language Outcomes

To test differences in child language outcomes after intervention and growth in language during intervention, experimental condition was included as a subject-level predictor, and age was included as a subject-level covariate. Time (e.g., month) was nested within subjects. The intercept was equal to the language outcome value at the end of intervention. An interaction between time and experimental condition was also included to determine the effects of experimental condition on growth in language for observational language measures (NDW, TNW, MLUm). Means and standard deviations for all language measures are in Table 10. Effect sizes and significance levels are in Table 11.

Language outcomes for treatment and control groups. There was a statistically significant difference in PLS–4 Total standard scores between LI-treatment and control groups (β = 9.02, $p = .03$, 95% CI [1.08, 16.97]) and in PLS–4 Expressive Communication scores (β = 7.41, $p = .04$, 95% CI [0.30, 14.51]). These results indicate that children in the LI-treatment group had higher overall language skills and higher global expressive language skills than children in the LI-control group at the end of intervention. Differences in TNW between the LI-treatment and the LI-control groups were

Table 8. *M*s and *SD*s for parent outcome measures.

	EMT		Control		Typical	
	T0	T3	T0	T3	T0	T3
Measure	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Matched turns	.48 (.12)	.69 (.17)	.48 (.11)	.23 (.11)	.67 (.11)	.26 (.09)
Parent responsiveness to child verbal turns	.15 (.07)	.73 (.08)	.15 (.09)	.52 (.14)	.26 (.09)	.58 (.10)
Parent talk at the child's level	.06 (.05)	.42 (.17)	.04 (.04)	.06 (.03)	.09 (.03)	.09 (.04)
Expansion of child's utterances	.10 (.25)	.44 (.20)	.12 (.15)	.10 (.08)	.07 (.05)	.06 (.04)
Time delay strategies	0 (.00)	.65 (.17)	0 (.00)	0 (.00)	0 (.00)	0 (.00)
Prompting strategies	.15 (.23)	.47 (.36)	.03 (.08)	0 (.00)	.01 (.04)	.06 (.13)

Table 9. Regression coefficients, standard errors, significance values, and effect sizes for parent outcome measures.

Measure	EMT: Control				EMT: Typical				Control: Typical			
	β	*SE*	*p*	*d*	β	*SE*	*p*	*d*	β	*SE*	*p*	*d*
Matched turns	0.46	0.03	.00	3.19	0.48	0.02	.00	3.45	–0.03	0.02	.09	–0.31
Parent responsiveness to child verbal turns	0.21	0.02	.00	1.85	0.20	0.02	.00	1.61	–0.02	0.02	.34	–0.52
Parent talk at the child's level	0.36	0.02	.00	2.90	0.35	0.02	.05	3.10	–0.03	0.00	.00	–0.81
Expansion of child's utterances	0.36	0.03	.00	2.20	0.37	0.02	.00	3.07	0.03	0.01	.00	0.70
Time delay strategies	0.65	0.00	.00	5.32	0.65	0.00	.00	6.04	0.00	0.00	1.0	0.00
Prompting strategies	0.19	0.06	.00	1.81	0.03	0.05	.56	1.72	–0.06	0.05	.24	–0.57

also statistically significant at the end of intervention (T3; β = 50.44, p = .03, 95% CI [4.11, 96.78]). There was also a statistically significant difference in the growth of TNW over time (β = 15.03, p = .02, 95% CI [2.60, 27.46]). Children in the LI-treatment group used 50 more total words after intervention and gained 15 more total words each month than children in the LI-control group.

Language comparison between LI and typical groups. There were statistically significant differences favoring the TL group in comparison with the LI-treatment group on all language measures at T3 (see Table 11). However, children in the LI-treatment group did not grow at a significantly slower rate for NDW (β = –3.61, p = .15, 95% CI [–8.53, 1.32]), TNW (β = –14.97, p = .16, 95% CI [–35.95, 6.00]), or MLUm (β = –0.02, p = .72, 95% CI [–0.14, 0.10]). However, children in the LI-control group grew at statistically significantly slower rates than children in the TL group. Children in the LI-control group experienced a significantly slower growth rate for NDW (β = –6.81, p = .01, 95% CI [–11.97, –1.65]), TNW (β = –29.82, p = .01, 95% CI [–50.35, –9.29]), and MLUm (β = –0.11, p = .07, 95% CI [–0.23, –0.02]).

Child Characteristics That Predict Language Growth

To test which child characteristics predicted language growth for all children, risk at birth (e.g., whether the child was admitted to the neonatal intensive care unit), cognitive skills (Bayley–III Cognitive Composite), and receptive language skills (Bayley–III Receptive Composite) were included as subject-level predictors. In addition, an interaction between time and each of these predictors was included to examine the effects of

Table 10. *M*s and *SD*s for child language measures.

Measure	EMT				Control				Typical			
	T0	T1	T2	T3	T0	T1	T2	T3	T0	T1	T2	T3
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
PLS–4: Total score	69.88 (9.90)			79.31 (15.87)	71.29 (10.40)			71.00 (11.21)	113.96 (13.85)			117.41 (12.49)
PLS–4: Auditory Comprehension subscale	69.31 (12.31)			79.56 (18.07)	72.00 (13.05)			71.90 (14.65)	111.86 (9.63)			115.11 (10.74)
PLS–4: Expressive Communication subscale	76.06 (7.74)			82.06 (12.14)	75.82 (6.63)			75.30 (7.20)	113.04 (16.35)			116.44 (12.59)
MLUm	1.16 (0.20)	1.34 (0.26)	1.50 (.42)	1.74 (0.45)	1.18 (0.19)	1.31 (0.23)	1.33 (0.33)	1.49 (0.42)	2.35 (0.85)	2.60 (0.85)	2.80 (0.74)	2.95 (0.62)
NDW	16.98 (10.62)	29.62 (19.08)	41.48 (22.92)	48.87 (21.37)	11.59 (9.91)	21.20 (16.95)	27.08 (21.99)	33.99 (27.20)	66.50 (32.05)	80.59 (40.08)	95.24 (36.27)	105.63 (36.83)
TNW	36.60 (44.37)	60.97 (47.16)	92.18 (66.36)	127.11 (73.24)	28.31 (43.25)	43.49 (43.71)	61.06 (59.72)	73.75 (68.20)	165.81 (119.86)	209.07 (148.05)	245.24 (147.10)	295.54 (165.44)

Table 11. Regression coefficient, standard errors, significance values, and effect sizes for child outcome measures.

Measure	Time point	EMT: Control				EMT: Typical				Control: Typical			
		β	*SE*	*p*	*d*	β	*SE*	*p*	*d*	β	*SE*	*p*	*d*
PLS–4: Total score	T3	9.02	3.84	.03	0.60	−34.75	5.16	.00	−2.76	−43.76	5.52	.00	−3.85
PLS–4: Auditory Comprehension subscale	T3	8.00	4.79	.11	0.46	−32.70	4.91	.00	−2.57	−40.66	5.05	.00	−3.54
PLS–4: Expressive Communication subscale	T3	7.41	3.43	.04	0.67	−31.17	4.88	.00	−2.77	−38.88	5.42	.00	−3.72
MCDI	T3	86.90	47.14	.08	0.29	−341.24	57.57	.00	−1.77	−390.87	64.50	.00	−2.19
MLUm	T3	0.25	0.15	.13	0.57	−1.28	0.18	.00	−2.14	−1.51	0.17	.00	−2.61
	Growth	0.10	0.05	.07		−0.02	0.06	.72		−0.11	0.06	.07	
NDW	T3	15.86	9.75	.06	0.62	−59.47	10.29	.00	−1.76	−74.85	10.54	.00	−2.12
	Growth	3.37	2.14	.11		−3.61	2.47	.15		−6.81	2.58	.01	
TNW	T3	50.44	6.05	.03	0.75	−174.92	10.39	.00	−1.20	−225.31	41.57	.00	−1.58
	Growth	15.03	0.78	.02		−14.97	10.39	.16		−29.82	10.17	.01	

child characteristics on language growth. Risk at birth and cognitive skills did not predict NDW, TNW, or MLUm at T3 or growth in these measures between T0 and T3. Receptive language at T0 predicted growth in NDW (β = 0.20, $p < .01$, 95% CI [0.06, 0.34]) and TNW (β = 0.82, $p < .01$, 95% CI [0.29, 1.35]) but did not predict growth in MLUm (β < 0.01, $p = .82$, 95% CI [0.00, 0.00]. Receptive language also predicted NDW (β = 1.43, $p = .01$, 95% CI [0.84, 2.03]), TNW (β = 4.35, $p < .01$, 95% CI [2.20, 6.52]), and MLUm (β = 0.02, $p < .01$, 95% CI [0.02, 0.04]) at T3.

Discussion

The purpose of this study was to evaluate the effects of a parent-implemented intervention on the language skills of children with LI and to compare language growth in the treatment and control groups with the language growth of a sample of children with TL during the intervention period. Because the sample size was small and represented a subsample of a larger study, these results should be considered preliminary. Nevertheless, statistically significant differences in standardized language measures (e.g., PLS–4) and in observational measures (e.g., TNW) at the end of intervention suggest that EMT is a promising intervention for children with receptive and expressive LI. Children in the treatment group used 50 more total words than children in the control group at the end of intervention. They gained 15 more total words each month than children in the control group. In addition to gains in expressive vocabulary, children in the treatment group also had significantly higher global expressive language scores than children in the control group. Children in the treatment group scored 7 standard score points higher on the Expressive Communication subtest and 9 points higher on the Overall Language subscale of the PLS–4 than children in the control group. These results are similar to studies of children with expressive impairments, which found statistically significant positive results for expressive language measures such as expressive vocabulary (Roberts & Kaiser, 2011).

It is important to note that because the majority of participants were from the mainstream American culture, it is unclear whether these results generalize to other cultures that may have different beliefs regarding child-rearing practices (van Kleeck, 1994). Although further research on parent-implemented interventions for nonmainstream cultures is needed, these parent training procedures and language support strategies may be adapted to fit the individual needs of families from different cultural backgrounds. Hammer (1998) described different data collection methods (interviews, observations) to gather information regarding cultural beliefs and practices that may influence language skills targeted during intervention. By collecting information about each family, a clinician is better able to customize intervention to the individual needs of the family. Wing et al. (2007) have provided recommendations for adapting common language support strategies for different cultural groups. For example, older siblings may be used to model language targets, or language may be taught in additional routines that are of higher priority to the family (e.g., social greetings). Individual family beliefs and preferences styles must be considered when choosing how best to involve family members in the intervention process.

These results differ from the results of the only other study of a parent-implemented intervention for children with expressive and receptive LI (Law et al., 1999), which did not find statistically significant differences in language outcomes between the treatment and control groups. Law et al. (1999) used a modified version of the Hanen Parent Program, which included 25 hr of training in a group format. In the current study, parents

were taught individually using a teach–model–coach–review method with practice in the clinic and at home, and the intervention included selection of specific language targets for each child. The total hours of intervention were similar in the current study and the study by Law et al. (i.e., 28 hr for the current study and 25 hr for the study by Law et al.), suggesting that the dosage of parent training was not the source of the difference in results.

Law et al. (1999) reported low levels of parent intervention fidelity (e.g., parent attendance to group training sessions and parent use of intervention strategies), whereas the current study reported high levels of fidelity of parent training and parent use of intervention strategies. On average, parents in the intervention group exceeded criterion levels for use of all EMT strategies, indicating a high rate of strategy use by parents in the intervention group. Because the Hanen Parent Program and EMT interventions and the methods of training parents differ in several ways, it is not possible to determine which specific components of the EMT intervention (e.g., levels of parental strategy use, individualized training, parent training procedures, selection of individualized child language targets, inclusion of time delay and prompting procedures) contributed to the differential results.

In addition to the analysis of the main effects between treatment and control groups, the current study also examined the effects of the intervention in comparison with a sample of children with TL. Whereas children in both LI groups continued to have significantly lower language skills than children with TL at the end of intervention, children in the LI-treatment group grew at similar rates to children with TL during intervention. In contrast, LI-control children's NDW and TNW increased at a significantly slower rate than children with TL.

Analysis of parents' use of EMT strategies at the start of the study indicated parents of children with TL used some EMT strategies (e.g., responsiveness, matched turns, talk at the target level) more often than parents of children with LI. These differences before intervention are consistent with findings that parents of children with TL use more language support strategies than parents of children with LI (Conti-Ramsden, Hutcheson, & Grove, 1995; Vigil et al., 2005). Following intervention, parents in the LI-treatment group used significantly more EMT strategies than parents in the TL group. The positive changes in language outcomes for children in the EMT group as compared with the control group suggest that children with LI do benefit from higher rates of parent support for language learning and possibly may require increased use of these strategies to learn language in the natural environment. Furthermore, the low language scores at the start of the study coupled with the slower growth rates for children in the control group illustrates the need for immediate treatment rather than a "wait and see" approach for children with LI.

Contributions of the Current Study

The current study confirmed and extended the research on parent-implemented naturalistic language interventions for children with LI. In addition to demonstrating that parent-implemented EMT is a promising intervention for this population, the current study provided further evidence of the relationship between receptive language and overall language growth. Previous research has suggested that receptive impairments may be better predictors of long-term language problems than expressive impairments. Receptive language at the start of the study predicted growth in language for all three groups of children after controlling for differences in IQ. It is important to note, however, that children with LI in the EMT group gained 10 points on the Auditory Comprehension subscale of the PLS–4 during a 3-month intervention, whereas the children with LI in the control group did not change. If receptive skills are an important predictor of persistent LIs, then the differential gain in receptive skills for the intervention group is a promising indicator for the potential of EMT to improve long-term language outcomes.

The current study was the first study to clearly describe and report fidelity for specific parent training procedures in addition to reporting the effects of training on parent use of specific intervention strategies. Furthermore, the study was the first to examine the direct relationship between parent use of specific intervention strategies and changes in child language. The overall high level of internal validity in this study—including the randomized design, the high levels of parent training treatment fidelity, and reliability of the measures of parent and child behavior—increases confidence in the outcomes of the study. This was also the first study of an early intervention for children with LI that quantified intervention results in comparison with language growth in a group of typically developing children. This comparison allowed the intervention effects to be evaluated in relation to a clinically relevant metric. Children in the LI-treatment group not only made greater gains than children in the LI-control group but intervention changed their rate of growth such that the growth of children in the LI-treatment group became more similar to the rate of growth observed in children with TL than to the LI-control group.

These results have several clinical implications. First, these findings highlight the value of including parents in early language intervention for children with LI. These findings also illustrate the relationship between

systematic parent training procedures, changes in parent behavior, and changes in child language. Using teaching, modeling, coaching, and reviewing in a systematic training protocol supported parents' acquisition of specific language support strategies and implementation of these strategies at criterion levels. Teaching specific strategies using individualized video examples provided the initial foundation by teaching parents why and how to use each strategy. Modeling of specific EMT strategies in interactions between the therapist and the child gave parents an applied example of the strategy and provided children with increased dosage of the intervention. Coaching provided immediate and direct feedback to parents regarding their use of a specific strategy. Feedback connected parents' strategy use and their children's language progress. Finally, training at home during various routines provided additional opportunities for parent and child generalization.

In addition to findings from the experimental portion of the study, the study yielded other findings of interest. First, only one of the 34 children with LI received speech and language services outside the study. This finding suggests that "wait and see" is still the standard for community care in the community where this study was conducted. Although the rationale behind this approach is that the majority of children will catch up over time, the short-term results of this study do not support this reasoning. Children in the LI-control group did not catch up but fell farther behind their peers with TL. Although long-term observations are needed, the current findings suggest that intervention is warranted for children with receptive and expressive LI.

Limitations

The long-term outcomes for this population of children with LI are unknown, and the current findings should be considered in the context of several limitations of the study. First, the sample of children with TL in this study may not be representative of children in this age. The current sample of children with TL had language skills that were 1 *SD* above the standardization sample. The TL sample also had parents with higher levels of education and income than the LI sample. Second, the sample size for the LI treatment and control groups was small (i.e., less than 20 children in each group). Small sample sizes yield more variable results than larger samples, and the findings should be considered preliminary. Third, only short-term intervention outcomes were examined. Longer term outcome measures (e.g., 12 months following intervention) that are part of the larger study may yield different results. On the basis of other research, we expect that the effects of the intervention will maintain over time if parents continue to use the EMT strategies. These limitations will be addressed in the larger study, by increasing the sample size, following children for a longer period of time and by recruiting a more representative sample of typical children.

Future Research

Although some key research questions will be addressed in the larger study, the current findings suggest a need for research in a number of related areas. First, there is a need to further examine the effects of fidelity and dosage of parent language support strategies on child language outcomes. A proxy for dosage of parent use of strategies may be obtained from analysis of audio recordings from home and may be examined in relation to child language outcomes at home and in the clinic over time. Second, given the promising short-term outcomes of the current study, it would be valuable to directly compare EMT with another frequently used early language intervention—the Hanen Parent Program—and to include a systematic analysis of the skills taught and learned by parents in the both programs. Such a study would not only allow for evaluation of which language intervention strategies (e.g., prompting, focused stimulation, mirroring and mapping) are most effective but also which components of parent training (e.g., teach, model, coach, feedback) are most effective for different types of parents.

Conclusion

The results of this study indicate that parent-implemented EMT may be an effective early intervention for children with expressive and receptive LI. Parents can be taught to implement language support strategies, and these strategies are associated with growth in language. Children with LI who received intervention had greater receptive and expressive language skills than children who did not receive intervention. Including a sample of children with TL allowed for the comparison of growth between children with LI and children with TL. Results of this comparison indicate that the language growth was similar between the TL and LI-treatment groups but different between the TL and LI-control groups. These conclusions must be considered in the context of the limitations and the exploratory nature of the current study.

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