One-Year Language Outcomes in Toddlers With Language Delays: An RCT Follow-up

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abstract

OBJECTIVES: The current study is a 1-year follow-up analysis of data from a randomized controlled trial of Enhanced Milieu Teaching (EMT) for toddlers with language delays. Outcomes and predictors of child language and parent intervention implementation were examined 6 and 12 months after the end of the intervention.

METHODS: Toddlers with language delays were recruited from the community, and 97 toddlers and parents were randomly assigned to receive usual community treatments or a 3-month EMT intervention with parent training. Multiple regression analyses were used to estimate the differences between groups at the 6- and 12-month follow-up periods. A subgroup of participants with receptive and expressive language delays was used in a post hoc moderator analysis of treatment outcomes.

RESULTS: Children in the treatment arm did not differ from children in the control arm at 6- and 12-month follow-ups. However, post hoc analyses revealed that children with receptive-expressive language delays were persistently delayed relative to normative performance throughout the follow-up period.

CONCLUSIONS: The immediate effects of the brief delivery of EMT were not sustained over the 1-year follow-up period. However, the short-term intervention may not have been sufficient for children with receptive-expressive delays to develop typical language abilities, suggesting they may need more intensive early intervention. Although this intervention may not be necessary for all children with primary language delays, future research should determine the extent to which children with receptive-expressive delays may benefit from more intensive intervention.

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Dr Hampton conceptualized and designed this analysis and drafted the initial and revised manuscripts; Dr Kaiser contributed to the design of the study and reviewed and contributed to the current manuscript; Dr Roberts contributed to the design and analysis of this study and reviewed and contributed to the current manuscript; and all authors approve of the final version as submitted and agree to be accountable for all aspects of the work.

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WHAT'S KNOWN ON THIS SUBJECT: Some children with primary language delays recover without intervention, yet some children persist to present with language delays over time. Effective intervention strategies for those who are persistently delayed have yet to be identified.

WHAT THIS STUDY ADDS: This study identifies a parent training program as a promising strategy for children with receptive-expressive delays 6 months following treatment. The effects diminish after 12 months, potentially because of reactivity and spontaneous recovery in children with expressive-only delays.

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As many as 17% of young children present with language delays of unknown etiology that are not associated with deficits in cognition, sensory disorders, or other developmental, medical, or genetic diagnoses.[1,2] Although as many as 60% of these children may catch up to their typically developing peers' language abilities by age 4 years, a considerable percentage of children will demonstrate persistent, long-term, language-related deficits in academic and social skills.[3,4] Because of the apparent spontaneous recovery in some children, there is a tradition of delaying language intervention for this population until it is clear that the delays are persistent.[5,6]

Effects of early interventions for young children with primary language delays in randomized trials are limited to short-term outcomes.[7–9] A review of language interventions for children with primary language delays found positive effects on phonology and vocabulary, but not on receptive language.[8] Children with expressive language delays and typical receptive language appear to recover at a greater rate than children with both expressive and receptive delays.[9] No researchers have examined the long-term outcomes from randomized trials of early language intervention for this population or examined differential outcomes. More specific research is needed to make recommendations for practitioners about when and if to intervene.[9]

A recent randomized clinical trial in toddlers with primary language delays is the basis for the current analysis. Roberts and Kaiser[10] examined the effectiveness of an early language intervention, Enhanced Milieu Teaching (EMT), in 97 toddlers. Results immediately after the intervention indicated that toddlers who received EMT improved in their receptive language abilities, assessed on the Preschool Language Scale–Fourth edition (PLS-4),[11] and expressive vocabulary diversity (the number of different words produced in a language sample) as compared with the toddlers in the usual-care control arm. The variability within groups suggested some participants did make substantial gains in expressive language whereas others did not improve. To expand on the current intervention literature for toddlers with primary language impairments, the current analysis examined 1-year outcomes and predictors of 1-year outcomes for these toddlers with primary language delays parallel to the primary effects immediately after intervention.[10]

We hypothesized that toddlers in the intervention arm, relative to toddlers in the control arm, would have (1) higher scores on a standardized measure of expressive and receptive language (the registered primary outcome) and (2) higher scores of caregiver-reported vocabulary and observational measures of expressive vocabulary (the secondary outcomes) 6 months (Post 2) and 12 months (Post 3) after the intervention. We also hypothesized that caregivers in the intervention arm would (3) continue to use more language facilitation strategies 6 months (Post 2) and 12 months (Post 3) after the intervention than caregivers in the control arm (the primary outcome), but their strategy use would diminish over time and (4) the stress level of caregivers in the intervention arm would not be greater than that of caregivers in the control arm (the secondary outcome) during the follow-up period. In a post hoc analysis to better understand the main results, we examined how (5) baseline language ability and (6) outside language intervention impacted child language growth over time.

METHODS

Data Set

This analysis used the data set from a randomized trial (NCT01975922) comparing EMT to a control arm for toddlers with language delays in Nashville, Tennessee.[10] The trial was approved by Vanderbilt University's Institutional Review Board (090904), and all participating caregivers provided written, informed consent. This study reports 6- and 12-month follow-up data to the primary study, published in this journal in 2015.[10]

Participants

This data set includes observational, standardized, and parent-report measures for 97 toddlers with primary language delays and their caregivers (see Fig 1 and Table 1). Toddlers were between 24 and 42 months of age at the beginning of the study (M = 30.5 months, SD = 5.1 months) and were mostly boys (82%). All toddlers were recruited from pediatricians, parenting magazines, and university distribution lists. All participants had scores at least 1.3 SDs below the norm on a standardized assessment of expressive language (Bayley Scales of Infant Development[12]) and did not meet the criteria for autism spectrum disorder on the Screening Tool for Autism in Toddlers and Young Children.[13] Toddlers with a cognitive standard score <85, a medical condition, or hearing loss were excluded from participation.

Randomization

By using a computerized random-number generator before the beginning of the study, 45 toddlers with language delays were randomly assigned to the intervention arm and 52 were assigned to a usual-treatments control arm. Recruitment and baseline assessments were completed before research personnel accessed the randomization sequence for each child. Two participants in the control arm were removed from the analysis because of incomplete data because of withdrawing after the screening assessment.

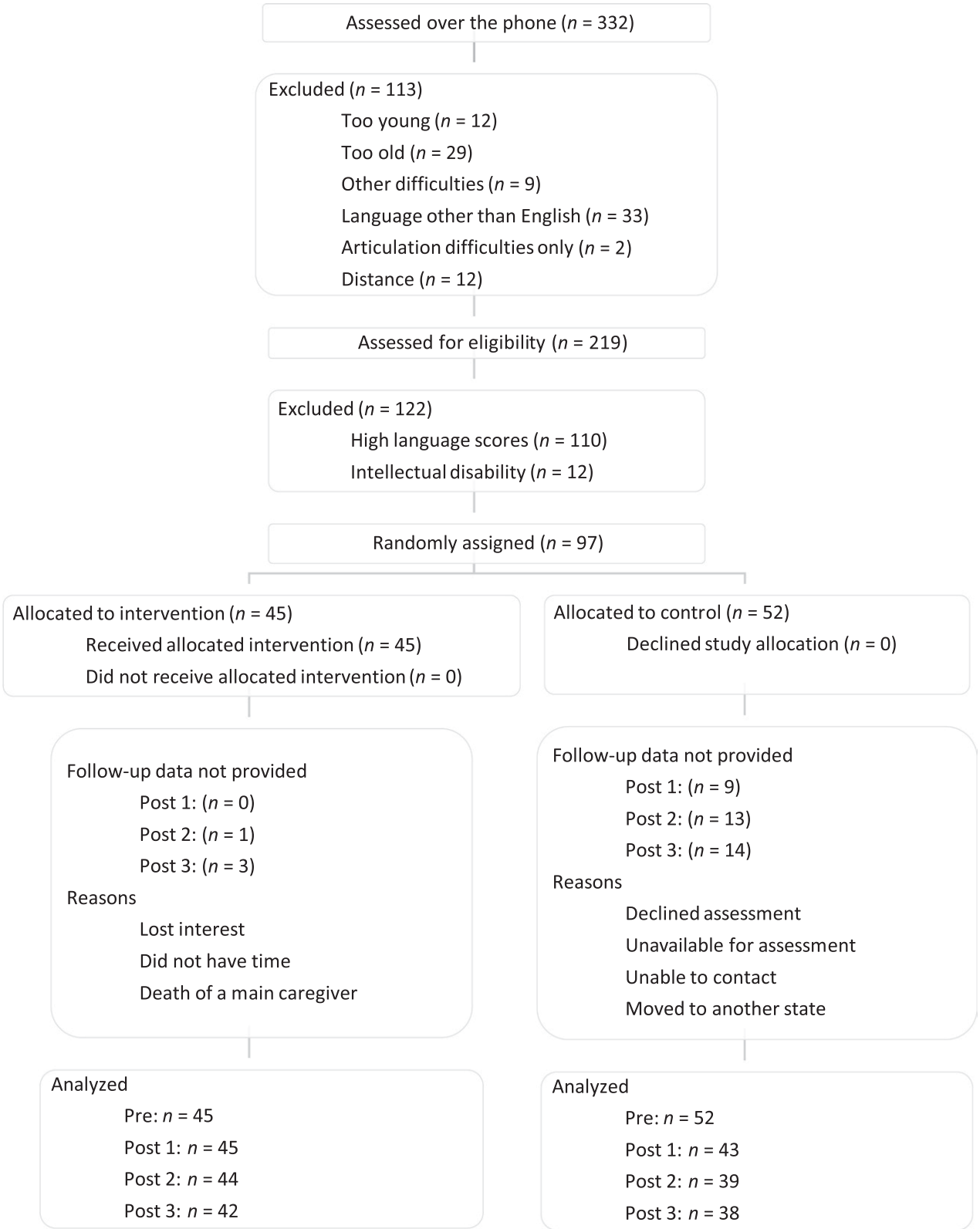

FIGURE 1
Participant flowchart.

TABLE 1 Participant Characteristics at Baseline

Measure	Intervention	Control[a]
Mean (SD)	*n* = 45	*n* = 52
Age, mo	30.3 (5.0)	30.6 (5.1)
Boys (%)	82	80
Race (%)		
African American	18	13
White	78	85
Other	4	2
Income, $	71 000 (35 000)	60 000 (52 000)
Mother's education (%)		
High school	39	44
Undergraduate degree	37	27
Graduate degree	24	29
Baseline scores		
Cognitive, Bayley composite	91.3 (8.4)	88.6 (7.6)
Expressive language, PLS-4[11]	75.2 (7.9)	75.0 (7.2)
Receptive language, PLS-4[11]	76.5 (17.3)	73.8 (15.2)
Expressive vocabulary, EOWPVT-3[14]	60.9 (11.5)	59.8 (10.7)
Expressive vocabulary, NDW	19.0 (17.9)	17.2 (17.5)
Expressive vocabulary, MCDI[15]	92.1 (105.1)	94.4 (97.2)
Community services, h per wk	0.3 (0.7)	0.1 (0.5)
Parent received coaching	7%	8%

Community services were reported by parents at baseline; parent coaching includes all parents who reported receiving coaching during outside interventions over the course of the study. EOWPVT-3, Expressive One-Word Picture Vocabulary Test, Third Edition; MCDI, Macarthur-Bates Communication Development Inventories; NDW, number of different word roots in a 20-minute play interaction.

[a] Two participants were removed from all subsequent analyses because of missing data across all measures except IQ. No significant differences were observed between intervention and community groups during the preassessment period.

Intervention

Children assigned to the treatment arm received 28 intervention sessions provided by a master's-level interventionist. The hourlong sessions occurred twice per week (once in the clinic and once at home). The EMT intervention is a manualized intervention and includes Teach-Model-Coach-Review procedures for parent instruction and direct child intervention by the therapist.[10] During the play-based intervention sessions, interventionists and caregivers used the following 6 main strategies to support language learning: responsiveness, matched turn-taking, target-language modeling, language expansions, time delays, and prompting strategies (for a full procedure description, see Roberts and Kaiser[16]).

Outcomes

Child and caregiver primary and secondary outcome measures[10] were collected at the following 4 time points: immediately after the intervention (Pre), immediately after the 3-month intervention (Post 1), 6 months after the intervention (Post 2), and 12 months after the intervention (Post 3). Outcomes were assessed in a clinic by a master's-level special educator or speech-language pathologist who was unfamiliar with the child and who was trained to criterion fidelity on all assessments. Treatment arm assignment was concealed from assessors, but blindness was not always maintained because caregivers revealed treatment assignment to the assessors. However, bias was reduced by maintaining assessor scoring agreement on 100% of the norm-referenced assessments and assessing procedural fidelity on a 20% random sample of all observational assessments; agreement and fidelity exceeded 95%.

Child expressive language outcomes were measured by using the PLS-4 Expressive Communication subscale,[11] the Expressive One-Word Picture Vocabulary Test,[14] and the parent report of spoken vocabulary on the MacArthur-Bates Communicative Development Inventories.[15] Child receptive-language outcomes were measured by using the PLS-4 Auditory Comprehension subscale[11] and the Peabody Picture Vocabulary Test.[17] Total caregiver stress was estimated by using the Parenting Stress Index.[18]

Caregivers' use of responsiveness and matched turns were observed during a 20-minute, play-based, caregiver–child interaction. Child communication was assessed during a 20-minute, naturalistic language sample administered by an unfamiliar assessor, who presented 6 standard sets of toys and took turns in play but did not model specific content language. The caregiver–child interaction and naturalistic language sample interactions were coded for caregiver strategies, child communication, and vocabulary. Reliability of coding was calculated for 20% of randomly selected sessions; point-by-point interobserver agreement exceeded 90% for each caregiver and child behavior.

At each time point, caregivers reported the hours per week their children were enrolled in community-based language intervention services provided directly by an interventionist that included direct teaching of speech, language, or communication skills. These community services occurred at home or in a clinic setting and were provided by private-pay interventionists, state early-intervention services, school therapists, and/or insurance-funded therapists.

Post Hoc Covariates

Children's delay status based on their expressive and receptive language abilities was assessed by using the

PLS-4,[11] a standardized assessment with a mean of 100 and an SD of 15. Children were identified as having an expressive-only delay if they scored <85 on the Expressive Communication subscale only and as having an expressive-receptive delay if they scored <85 on both the Auditory Comprehension and Expressive Communication subscales.

Because of the variability within the sample and some observed but nonsignificant baseline differences, cognition and family income level were used as covariates in the analyses. Children's cognitive abilities were assessed by using Bayley Scales of Infant Development,[12] which was selected because it provides a valid developmental quotient for young children. All caregivers reported annual family income at the beginning of the study.

Data Analysis

Multiple linear regression was used to address each research question in an intent-to-treat analysis. Each regression analysis, subgroup analysis, and interaction analysis included family income and cognitive ability as covariates. The post hoc moderator analysis examining the interaction between group assignment and receptive-expressive language delay status over time was completed by using multiple linear regression. All computations were analyzed by using RStudio version 1.0.136[19] running R version 3.2.3[20] and using ggplot2[21] for all plotting.

RESULTS

Figure 1 presents the number of research participants at each time point. Table 1 summarizes characteristics of the participants. Forty-five language-delayed toddlers were randomly assigned to the intervention arm, and 52 were assigned to the control arm. Forty toddlers remained in the intervention arm and 38 in the control arm at 6 and 12 months after the intervention. From the whole sample, 63 toddlers were identified as having receptive-expressive language delays before the start of the study, 34 in the intervention arm, and 29 in the control arm. Scores at each follow-up period for all participants are presented in Table 2 and for the subgroup of participants with receptive-expressive delays in Table 3.

Six-Month Follow-Up

During the 6-month follow-up, children in both arms gained on average 6 points on the PLS Expressive subscale, 7 points on the Receptive subscale, and used ~26 new words in a language sample (Table 2). The 6-month follow-up analyses indicate no differences between the treatment and control arms, indicating that the effects of the intervention on child global language and vocabulary observed at Post 1 did not maintain at Post 2 (6 months after the intervention) (Table 2). Differences in caregiver outcomes between the treatment and control arms were large at the 6-month follow-up for matched turns. However, caregiver responsiveness, did not differ between study arms. Additionally, parents reported similar levels of stress across study arms. Children in the intervention arm received fewer hours of community intervention services per week than children in the control arm ($P < .1$, $d = 0.39$); although these effects are not significant, this pattern is potentially meaningful.

Twelve-Month Follow-Up

A similar pattern of results was observed 12 months after the intervention (Post 3), with the exception of total child utterances during the caregiver–child interaction. Children in the intervention arm produced significantly more total utterances in a 20-minute sample than children in the control arm. Caregiver responsiveness did not differ between groups; a high level of responsiveness was observed in both groups. Caregiver stress was similar between groups over time, indicating that perhaps parents in the treatment arm's use of intervention techniques over time did not result in additional stress. Children in the control arm received twice as many community intervention services as children in the treatment arm 1 year after the intervention. Although differences were not significant ($P = .15$, $d = 0.33$), only 8 children in the intervention arm compared with 19 children in the control arm were receiving community services.

Post Hoc Subgroup Analyses

Because of the null effects in the follow-up trial, post hoc subgroup analyses were performed to better understand the extent to which children with receptive-expressive delays responded as compared with children with expressive-only delays. Results for children with receptive-expressive language delays and children with expressive-only delays at baseline are summarized in Table 3. Children in the receptive-expressive delay subgroup who were randomly assigned to the treatment arm performed significantly better on measures of receptive language, parental report of vocabulary size, and productive vocabulary use (the number of different word roots in a 20-minute play interaction) 6 months after the intervention ($P < .05$, Table 3). Children did not differ significantly on other expressive measures of communication. There was a significant interaction between the trial arm and receptive-expressive language delay status over time ($B = -16.11$, $P < .5$; Fig 2), indicating that over the initial 6-month follow-up, children in the intervention arm who had a receptive-expressive delay

TABLE 2 Postintervention Outcomes (Post 1, Post 2, and Post 3) for all Participants in the Intervention and Control Groups

	Outcome	Mean (SD)		Adjusted		Effect Size
		Intervention	Control	Mean Difference (95% Confidence Interval)	*P*	
Post 1		*n* = 45	*n* = 43			
Primary	Receptive: PLS-AC[11]	86.3 (19.4)	77.3 (20.4)	5.3 (0.15 to 10.4)	.04	0.27
	Expressive: PLS-EC[11]	84.0 (13.9)	80.2 (12.0)	0.37 (−4.5 to 5.3)	.88	0.03
Secondary	NTU	149.1 (61.6)	122.8 (66.1)	10.2 (−14.3 to 34.7)	.41	0.16
	NDW	54.9 (30.2)	38.0 (30.3)	11.4 (2.5 to 20.4)	.01	0.38
	MCDI[15]	263.7 (172.6)	214.5 (146.3)	32.8 (−17.3 to 83.0)	.20	0.21
	EOWPVT-3[14]	75.7 (16.3)	70.0 (17.7)	3.5 (−4.2 to 11.12)	.40	0.21
	PPVT-4[17]	94.3 (13.6)	85.6 (16.7)	5.3 (0.4 to 10.5)	.04	0.35
	Community, h per wk	0.52 (0.87)	0.61 (0.85)	−0.22 (−0.55 to 0.11)	.19	0.22
Caregiver	Matched turns	74 (13)	32 (15)	40 (34 to 46)	<.01	2.86
	Responsiveness	85 (9)	80 (14)	5 (1 to 10)	.05	0.43
	Stress, PSI-4[18]	194.2 (43.4)	216.6 (38.2)	−6.7 (−16 to 2.6)	.15	−0.16
Post 2		*n* = 44	*n* = 39			
Primary	PLS-AC[11]	91.5 (18.0)	85.7 (21.4)	2.8 (−2.9 to 8.5)	.34	0.21
	PLS-EC[11]	89.4 (17.1)	86.8 (17.4)	−1.3 (−7.5 to 5.0)	.69	0.09
Secondary	NTU	179.8 (58.2)	157.9 (63.2)	16.4 (−9.7 to 42.4)	.22	0.27
	NDW	81.8 (39.2)	64.6 (36.4)	12.6 (−2.3 to 27.4)	.09	0.37
	MCDI[15]	386.9 (197.4)	370.4 (189.4)	9.2 (−60.8 to 79.1)	.79	0.06
	EOWPVT-3[14]	79.1 (29.5)	80.6 (23.7)	−6.0 (−17.2 to 5.1)	.29	0.24
	PPVT-4[17]	98.2 (14.5)	93.7 (17.9)	0.5 (−5.2 to 6.2)	.87	0.04
	Community, h per wk	0.7 (1.0)	1.4 (2.1)	−0.7 (−1.5 to 0.1)	.08	0.39
Caregiver	Matched turns	69 (18)	4 (13)	31 (24 to 37)	<.01	1.95
	Responsiveness	92 (6)	92 (7)	0 (−3 to 2)	.60	0
	Stress, PSI-4[18]	200 (41.0)	207 (34)	0 (−11 to 12)	.92	0
Post 3		*n* = 42	*n* = 38			
Primary	PLS-AC[11]	92.7 (21.9)	89.3 (19.8)	−2.5 (−8.5 to 3.5)	.41	0.19
	PLS-EC[11]	91.6 (21.6)	86.0 (28.8)	−4.7 (−11.4 to 2.1)	.17	0.31
Secondary	NTU	205.0 (60.4)	157.6 (62.8)	34.8 (8.6 to 61.0)	<.01	0.59
	NDW	108.5 (40.3)	101.5 (48.6)	−0.64 (−18.2 to 16.9)	.94	0.02
	MCDI[15]	512.6 (152.4)	495.0 (171.9)	−0.92 (−63.0 to 61.1)	.98	0
	EOWPVT-3[14]	92.4 (19.6)	91.3 (19.6)	0.39 (−10.0 to 10.7)	.94	0.02
	PPVT-4[17]	96.9 (14.7)	96.1 (17.40)	−2.60 (−7.5 to 2.4)	.30	0.23
	Community, hr per wk	0.8 (1.0)	1.7 (3.2)	−0.94 (−2.2 to 0.3)	.15	0.33
Caregiver	Matched turns	63 (15)	39 (12)	23 (17 to 29)	<.01	1.79
	Responsiveness	93 (5)	91 (8)	0 (−2 to 3)	.79	0
	Stress, PSI-4[18]	196 (38)	212 (33)	0 (−12 to 11)	.59	0

Adjusted outcomes include baseline scores, household income, and child cognitive scores as covariates. Effect sizes are calculated by dividing the adjusted mean difference by the pooled SD of the intervention and control arms. AC, Auditory Comprehension subscale; EC, Expressive Communication subscale; EOWPVT-3, Expressive One-Word Picture Vocabulary Test, Third Edition; MCDI, Macarthur-Bates Communication Development Inventories; NDW, number of different word roots in a 20-minute play interaction; NTU, number of total utterances; PPVT-4, Peabody Picture Vocabulary Test, Fourth Edition; PSI-4, Parenting Stress Index, Fourth Edition.

performed significantly better on the receptive language measures (Peabody Picture Vocabulary Test and PLS-4 Auditory Comprehension) than the control arm, whereas children with expressive-only delays performed similarly across groups.

At 12 months after the intervention, the participants with receptive-expressive delays in the treatment arm performed similarly to children in the intervention arm across measures ($B = -7.38$, $P > .05$; Fig 2). Children with receptive-expressive delays in both study arms improved across all measures between the 6- and 12-month follow-up. On average, children with baseline expressive-receptive delays in the treatment arm reached normative levels on standardized assessments (standard scores >85; see Table 3) whereas children with receptive-expressive delays in the control arm did not reach normative levels. Additionally, for children with receptive-expressive delays, children in the control arm received significantly more community intervention hours as compared with those in the treatment arm 12 months after the intervention ($P < .05$), and more children received services in the control arm ($n = 15$) as compared with the treatment arm ($n = 6$).

DISCUSSION

Main Findings

After a 3-month early language intervention, children in the treatment arm demonstrated continued improvement over the 12-month follow-up period. Children in the control arm also improved, which results in smaller and

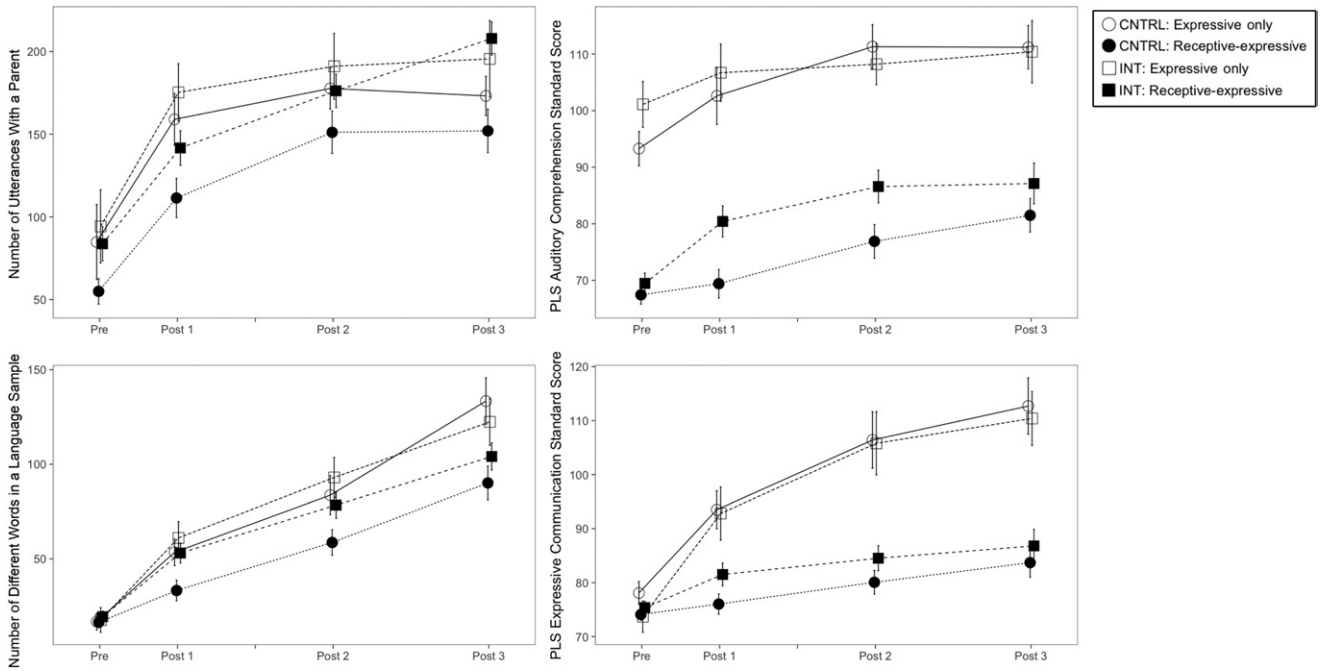

FIGURE 2
Interactions of receptive-expressive subgroups over time for multiple outcomes. Error bars represent SE. CNTRL, control; INT, intervention.

TABLE 3 Subgroup Outcomes at 3, 6, and 12 Months for Participants With Receptive-Expressive Language Delays at Baseline

	Outcome	Mean (SD)		Adjusted	*P*	Effect Size
		Intervention	Control	Mean Difference (95% Confidence Interval)		
Post 1		*n* = 35	*n* = 33			
Primary	PLS-AC[11]	80.4 (16.2)	69.4 (14.3)	8.7 (2.9 to 14.6)	<.01	0.57
	PLS-EC[11]	81.5 (12.6)	76.0 (10.6)	3.2 (−1.7 to 8.2)	.20	0.27
Secondary	NTU	141.7 (62.1)	111.5 (67.2)	11.7 (−15.2 to 38.6)	.39	0.18
	NDW	53.1 (31.1)	33.3 (31.1)	15.7 (6.5 to 24.8)	<.01	0.50
	MCDI[15]	244.3 (170.7)	187.75 (135.8)	65.0 (21.7 to 108.3)	<.01	0.42
	EOWPVT-3[14]	60.9 (35.6)	48.9 (34.4)	8.0 (−9.4 to 25.4)	.36	0.23
	PPVT-4[17]	90.5 (12.8)	86.4 (13.1)	8.0 (1.6 to 14.4)	<.05	0.62
	Community, h per wk	0.59 (0.92)	0.70 (0.92)	−0.22 (−0.55 to 0.11)	.19	−0.24
Post 2		*n* = 34	*n* = 29			
Primary	PLS-AC[11]	86.6 (16.7)	76.9 (16.0)	8.7 (1.7 to 15.7)	<.05	0.63
	PLS-EC[11]	84.5 (13.5)	80.1 (11.8)	2.9 (−2.8 to 8.5)	.32	0.26
Secondary	NTU	176.2 (57.1)	151.1 (68.8)	14.6 (−15.1 to 44.2)	.33	0.25
	NDW	78.4 (40.6)	58.7 (36.4)	18.9 (2.3 to 35.5)	<.05	0.58
	MCDI[15]	358.9 (201.6)	314.1 (165.7)	77.8 (11.9 to 143.7)	<.05	0.60
	EOWPVT-3[14]	74.2 (31.3)	75.0 (24.2)	−2.7 (−16.9 to 11.5)	.70	0.10
	PPVT-4[17]	94.3 (12.8)	86.7 (13.0)	6.5 (0.1 to 12.9)	<.05	0.52
	Community, h per wk	0.78 (1.02)	1.29 (1.84)	−0.90 (−2.0 to 0.11)	.08	0.45
Post 3		*n* = 32	*n* = 28			
Primary	PLS-AC[11]	87.1 (20.3)	81.5 (15.7)	3.2 (−5.3 to 11.7)	.45	0.20
	PLS-EC[11]	86.8 (17.3)	83.7 (14.3)	1.0 (−6.7 to 8.8)	.78	0.07
Secondary	NTU	207.9 (56.8)	152.0 (69.3)	42.8 (11.6 to 74.1)	<.01	0.71
	NDW	104.1 (40.2)	90.1 (47.2)	13.1 (−7.0 to 33.1)	.20	0.34
	MCDI[15]	486.0 (161.1)	455.7 (175.8)	62.9 (−15.8 to 141.5)	.11	0.41
	EOWPVT-3[14]	87.6 (21.8)	78.5 (29.5)	6.7 (−6.47 to 20.0)	.31	0.27
	PPVT-4[17]	91.9 (11.0)	89.4 (14.5)	2.2 (−3.9 to 8.2)	.48	0.18
	Community, h per wk	0.74 (0.93)	1.77 (3.37)	−1.8 (−3.5 to −0.01)	<.05	0.53

Adjusted outcomes include baseline scores, household income and child cognitive scores as covariates. Effect sizes calculated by dividing the adjusted mean difference by the pooled SD of the intervention and control arms. AC, Auditory Comprehension subscale; EC, Expressive Communication subscale; EOWPVT-3, Expressive One-Word Picture Vocabulary Test, Third Edition; MCDI, Macarthur-Bates Communication Development Inventories; NDW, number of different word roots in a 20-minute play interaction; NTU, number of total utterances; PPVT-4, Peabody Picture Vocabulary Test, Fourth Edition; PSI-4, Parenting Stress Index, Fourth Edition.

mostly nonsignificant differences between study arms. Thus, the primary follow-up results of this study indicate that brief parent-training implementation of EMT was ineffective for resulting in improved outcomes in children with language delays over the yearlong follow-up period.

The post hoc analyses suggested that the apparent developmental boost in the control arm may have been related to children in this group receiving more hours of community services at 6 months after the intervention and the subgroup of children with receptive-expressive delays receiving significantly more hours of services at 12 months after the intervention. Although these results are exploratory and should be interpreted cautiously, these variables are important to better understand for future research. Additionally, among the subgroup of children with receptive-expressive language delays, there were significantly better outcomes for children in the treatment arm compared with children in the control arm at 6 months after the intervention, but this was not maintained at 12 months. Children with receptive-expressive delays in the treatment arm, on average, moved into the normative range by the end of the follow-up period, indicating a small but potentially meaningful boost from receiving the intervention. These results may indicate that across multiple outcomes, the intervention may be relatively more effective in supporting communication development in children with receptive and expressive language delays than in children with expressive-only delays.

Strengths

This is 1 of the first studies to examine 1-year outcomes after the intervention for young children with primary language delays. Although the wait-and-see approach may be an appropriate recommendation for children with expressive-only delays, this study indicates that services should not be delayed for children with receptive-expressive delays. A relatively brief and cost-effective intervention resulted in clear effects immediately and 6 months after intervention for children with receptive-expressive language delays.[10] Although differences did not maintain at 6 and 12 months after the intervention, it is important to note that the children in the control arm received twice as many hours of services as the children in the treatment arm; this difference may explain some postintervention gains by the control children. Long-term community services are costly and time consuming, and therefore, a low-dose parent training intervention, such as EMT, may be a more efficient solution for toddlers with primary receptive-expressive language delays. Although these results are not definitive, they do support further research on the potential impact of early intervention for toddlers with primary receptive-expressive language delays as an alternative to the wait-and-see approach.

Limitations

The results of this study must be considered relative to the study's limitations. First, the sample size, although larger than many other studies with children with primary language delays, is still relatively small. It may be that the small but meaningful impact of some theoretically important covariates could not be observed in this study because of the sample size. Second, although many participants did improve language abilities such that their scores fell within the low-average range and met or surpassed their baseline cognitive abilities, it is important to note that the cognitive measure in this study may not be the most valid estimate of cognition in children with language delays because of the reliance on verbal abilities within the measure.[22] Thus, this study would have benefited from a nonverbal language measure that did not incorporate language-based measures into the estimate of cognitive ability, and future researchers should consider this approach when evaluating children with primary language delays. Third, caregivers did not maintain their use of all core EMT strategies at established fidelity levels. It is possible that caregivers were unable to adapt some language support strategies to match their children's increasing language complexity. Another recent study identified parent training as an effective long-term strategy for children with autism spectrum disorder when extension sessions were used to maintain parent strategy use.[23] Therefore, booster sessions may be necessary to allow for caregivers to continue to be the most effective teaching partners. Finally, the post hoc analyses are exploratory and must be interpreted with caution and not as definitive results. These analyses are important for understanding how the pattern of results differs for children with and without receptive delays such that future researchers should examine this specific pattern of results.

CONCLUSIONS

A brief implementation of EMT with parent training was ineffective for maintaining outcomes in children with primary language delays over the 12 months after the intervention. Moreover, children with primary language delays may catch up to the typical range of language ability without intervention if no receptive language delays are present. However, for children with receptive-expressive language delays, additional intervention strategies may be necessary. Although children in the control arm were able to

eventually make the same progress as the intervention arm, it may be true that children in the intervention arm were able to achieve the following: (1) the preferred outcome with a smaller investment, (2) earlier access to improvements, and (3) a nonsignificant but potentially meaningful improvement in outcomes. Parent training affords children access to the intervention that is frequent, consistent, and effective for improving outcomes. Community services, although possibly similarly effective, are costly, time consuming, and possibly more inconvenient for families to accommodate multiple therapies in a week. Therefore, the wait-and-see approach may not be a cost-effective method for improving language outcomes for all late-talking toddlers.

ABBREVIATIONS

EMT: Enhanced Milieu Teaching
PLS-4: Preschool Language Scale–Fourth Edition

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