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Teaching spanish-speaking caregivers to implement *EMT en Español*: a small randomized trial

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ABSTRACT

The primary purpose of this study was to examine the effects of using the Teach-Model-Coach-Review approach to teach Spanish-speaking caregivers from low-income households to implement *EMT en Español* with their young children with language delays. A secondary purpose was to explore the effects of the caregiver-implemented intervention on children's vocabulary. A final and more exploratory goal was to gain insight into caregivers' perceptions of the intervention.

21 caregiver-child dyads participated in the intent-to-treat randomized control trial. Their children were 30-43 months old with language delays. Dyads were randomly assigned to receive 24 caregiver training sessions delivered at home in Spanish or a wait list control group. Pre, post and 3-month follow assessments included observational measures of caregiver-child interactions and child standardized vocabulary assessments. Caregivers completed surveys rating their perception of the intervention.

Caregivers in the intervention group had significantly higher percentages of matched turns, expansions, and targets at post-assessment and of expansions and targets at follow-up compared to the control group. Overall, children in the intervention condition had significantly higher receptive vocabulary scores and performed better than children in the control condition on observational measure of their lexical diversity, with moderate effect sizes for most outcomes. Caregivers perceived the intervention as effective and culturally appropriate.

Teach-Model-Coach-Review is effective in increasing Spanish-speaking caregivers' use of *EMT en Español* strategies with their young children with language delays. The intervention also appears to be effective for child vocabulary outcomes and acceptable to caregivers.

1. Introduction

Approximately 22% of all U.S. Latino children live in a Spanish-speaking household (Child Trends, 2018). These young emergent bilinguals (EBs) are a growing population in the U.S. (Park et al., 2018) and their families vary in acculturation to U.S. mainstream culture and spoken language(s). Further, Latino children from Spanish-speaking households are more likely to be from families with limited income and face cultural and linguistic barriers in accessing educational and health care services (Gaitan, 2012; Morgan et al., 2015). Although supporting early Spanish language use benefits children's development of both Spanish and English (e.g., Miller et al., 2006; Páez & Rinaldi, 2006; Winsler et al., 2014), such support is limited for EBs. In the U.S., sociocultural values and educational policies often implicitly or explicitly discriminate against Spanish language use and emphasize English language development only (Mancilla-Martinez, 2020; Moore & Pérez-Méndez, 2006).

In a national sample of children with identified disabilities, which included 22% Latino children, 46% of preschoolers with disabilities were identified as having a speech or language impairment as their primary disability (Markowitz et al., 2006). Early language delays negatively impact children's communicative, social, behavioral, and academic skills (Tomblin et al., 2000). In particular, children with identified receptive and expressive language delays in early childhood are at elevated risk for persistent developmental language disorders, leading to associated problems in reading and academics (e.g., Fisher, 2017). While intervention for EBs is a growing area of research, there are few interventions for EBs who have identified language delays (Durán et al., 2016; Guiberson & Ferris, 2019). Spanish-English EBs who have language delays can learn

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Spanish and English and demonstrate language learning difficulties in both of their languages (Restrepo et al., 2013). For EBs who show early delays in their language acquisition and who speak Spanish at home, supporting the development of their home language may be especially important to their growth of English, and growth and maintenance of Spanish.

When Spanish language development is supported, EBs with language delays are more likely to maintain their home language while continuing to develop English skills (Gutiérrez-Clellen et al., 2012; Restrepo et al., 2013). However, children who have language delays are less likely than typically-developing children to maintain their home language when it is not explicitly supported (Restrepo et al., 2013), thereby decreasing the likelihood they will remain bilingual. This may be a significant opportunity cost for these children given the many benefits associated with bilingualism. Children's skills in Spanish can help their acquisition of English (e.g., Miller et al., 2006; Winsler, Kim, & Richard, 2014), help them maintain their family and cultural ties (Moore & Pérez-Méndez, 2006), and provide cognitive benefits of bilingualism, such as better executive functioning and metalinguistic abilities (Barac et al., 2014). These cognitive benefits may represent important strengths and protective factors for EB's with receptive and expressive delays who are at risk for academic difficulties. Contrary to common misconceptions, research shows there is only benefit and no harm associated with learning two languages, even when children have speech and language disorders (Castro & Artiles, 2021).

2. Caregivers as language teachers

Naturalistic caregiver-implemented language interventions are derived from the Transactional Model of Language Development (McLean & Snyder, 1978). According to this model, young children learn language based on reciprocal interactions with their primary caregivers. Beginning in the first weeks of life, parents and other caregivers notice children's attentional focus and vocalizations. Adults may naturally respond to these early communicative behaviors, which increases the rate of these behaviors. As children's communication develops, parents and caregivers may respond to child communication (vocalization, gestures, words) with expansions of those behaviors by adding words for gestures and elaborating single words to phrases and sentences. These responsive interactions with rich linguistic input are critical factors in young children's language development (Hirsh-Pasek & Burchinal, 2006; Tomassello, 2003).

2.1. Spanish-speaking caregivers as language teachers

A few studies have examined the quantity and quality of Spanish-speaking caregivers' linguistic input and how it directly influences children's language outcomes (Hammer et al., 2009; Hoff et al., 2014; Weisleder & Fernald, 2013). Weisleder and Fernald (2013) examined the language input of Spanish-speaking caregivers from low-income households to their Spanish-learning infants. Despite substantial variability in caregivers' input, the amount of child-directed speech when children were 19 months old predicted children's receptive vocabulary size when they were 24 months old.

One important consideration for EBs is that the influence of language input is more complex compared to that of monolinguals. EBs receive varying amounts of Spanish and English input and the quality of the input in each language changes over time in a non-linear, dynamic fashion (Bialystok, 2001; Grosjean, 1982, 1989, 2008; Romaine, 1999). Among families that use both Spanish and English, research suggests that caregivers provide complex, rich linguistic models needed to advance children's language development best in the language(s) they speak with native proficiency (Hammer et al., 2009, 2012; Hoff et al., 2014; Mancilla-Martinez & Lesaux, 2011). This suggests that involving Spanish-speaking caregivers in intervention for their young children and providing intervention in the home language is essential.

2.2. Existing caregiver-implemented interventions for emergent bilinguals

Interventions for Spanish-English EBs with language impairment have primarily focused on preschool and school-aged children and been delivered in school settings by researchers or school staff (e.g., Restrepo et al., 2013; Simon-Cereijido & Gutiérrez-Clellen, 2014). Of the 27 early intervention articles reviewed by Guiberson and Ferris (2019) only six were intervention studies; of those six, only three included children who had language delays and their caregivers. For instance, Ijalba (2015) conducted a randomized trial examining the effects of a book sharing intervention with 24 mother-child dyads from low-income households in the U.S. The 3-year-olds were identified as having language delays and enrolled in a preschool for children with special needs; they were exposed to Spanish and English. Caregivers were given 6 researcher-developed individualized interactive books in Spanish and were taught book sharing strategies in Spanish during six 2-hour group workshops. At the end of 16 weeks, intervention participants had significantly higher scores on expressive vocabulary measures in both Spanish and English. The book themes were designed to be familiar and culturally congruent, but it is not clear if any cultural or linguistic adaptations were made to the book sharing strategies taught to the mothers.

Tsybina and Eriks-Brophy (2010) examined the effects of a bilingual dialogic reading intervention for 22 to 41-month-olds in a quasi-experimental design in Canada. The 12 children were considered to have "slow expressive language development" but only 3 met criteria for language delay (Tsybina & Eriks-Brophy, 2010, p. 542). Children and their mothers participated in 30-minute sessions over 6 weeks. Children were either assigned to the treatment group or a wait list, but assignment was not random. Ten target words were selected per language and were individualized to the child. Mothers provided input on children's Spanish vocabulary targets. No other cultural adaptations to the intervention were described. Children in the intervention group learned an average of 6.7 of the selected target words in English (d =1.2) and 3.2 of the selected target words in Spanish (d =1.8). In contrast, children in the comparison group learned an average of less than one of the selected words in each language.

Caregiver-Implemented EMT en Español. EMT en Español is a culturally and linguistically adapted version of Enhanced Milieu Teaching (EMT; Kaiser, 1993; Kaiser & Hampton, 2017), which was designed for and previously tested with English-speaking parents from a variety of racial and ethnic backgrounds and their children with language delays (Roberts & Kaiser, 2015). Consistent with the transactional model of language development, EMT strategies used by therapists and caregivers include following child interests, contingent responding to child communicative intent, matching linguistic input to the child's zone of proximal development, and prompting language in highly motivating contexts. Caregiver-implemented EMT has been shown to improve children's language outcomes for English-speaking toddlers with language delays (Kaiser & Roberts, 2013; Roberts & Kaiser, 2015). The contexts for intervention are play, book sharing, and naturally occurring home routines. EMT has been taught to caregivers using a systematic instruction and coaching protocol, Teach-Model-Coach-Review (TMCR; Kaiser & Roberts, 2013; Roberts et al., 2014; Roberts & Kaiser, 2015). In the "teach" component the therapist explains and

provides a rationale for the strategies. In "model" the therapist interacts with the child to demonstrate strategy use for the caregiver. The therapist supports the caregiver's interaction with the child through guided practice with feedback during "coach." The caregiver and therapist review the session and plan for future strategy use during "review".

EMT en Español is an adapted—not simply translated—intervention for Spanish-speaking caregivers (see [author reference] for a full description of the adaptation process). Several steps were taken prior to the present study to socially validate *EMT en Español*. The first step was to translate and create materials (e.g., video examples, handouts) in Spanish. Next, the intervention materials and the TMCR caregiver training approach were socially validated by service providers who identified as Latino and worked with Latino Spanish-speaking families in the U.S. The TMCR approach to teaching caregivers was found to be culturally appropriate and was not altered. Some strategies, such as following the child's lead within child selected activities, were adapted to fit with a more directive parenting style. While Latinos in the U.S. are a heterogeneous population, many Latino parents tend to value obedience and *respeto* over autonomy and independence in children (Calzada, 2010). Some work also suggests Latino parents from low-income households often ascribe to a "protective" parenting style that is high on warmth and demandingness and low to medium on granting autonomy (Domenech Rodríguez, Donovick, & Crowley, 2009). Thus, to honor and reflect what is known about Latino caregivers' parenting preferences, parents are taught to notice and comment on the child's interest within more adult led activities (as opposed to following the child's lead in play and giving the child more autonomy and independence).

The most significant adaptation to EMT for use with Spanish-speaking caregivers was changing linguistic targets. The language targets follow typical Spanish language development in early childhood (for reviews see: Baron et al., 2018; Bedore & Leonard, 2005; Gorman et al., 2016; Jackson-Maldonado, 2012). Young children's Spanish language skills are designated at the "one concept" or "two concept" target level based on their current language abilities. For children at the "one concept" level, caregivers were taught to model specific nouns and to include the article to indicate the number and gender of the noun (e.g., *el gato,* the [masculine, singular] cat*; las niñas,* the [feminine, plural] girls) and inflected verbs in the present and present progressive tenses (e.g., *como* [I] eat, *comen* [they] eat, *están comiendo* [they] are eating). For children identified at the "two concept" level, caregivers were taught to use short phrases that include an inflected verb and article+noun or article+noun and modifier (e.g., *el perro grande,* the big [masculine, singular] dog; *las niñas bailan,* the [feminine, plural] girls dance).

The adapted intervention was tested in a single case design with 3 mother-child dyads (author reference). Mothers were taught *EMT en Español* strategies by a bilingual interventionist in three phases using the TMCR procedures. During the first phase, matched turns and using language targets were the focus. Expansions were taught in the second phase, and a communication elicitation procedure (time delay or prompt) was taught in the last phase. Sessions occurred at home biweekly over a period of approximately 3 months and utilized toys and materials the children had at home. Generalization probes occurred before each phase change and at a one-month follow-up. All three caregivers generalized and maintained their use of matched turns, targets, and expansions. One caregiver also maintained and generalized use of a communication elicitation procedure (time delay). Further, modest effects on children's number of different words and total spontaneous words in interactions with their mothers were observed following the intervention. Mother's also evaluated the intervention upon completion. All mothers found the intervention strategies effective for their child, noting the "coach" portion of the sessions as the most helpful in their learning of the strategies.

Given the scarcity of language interventions for Spanish-speaking EBs, and particularly of interventions for those who evidence language delays, there is a clear need for studies of culturally and linguistically adapted interventions that include caregivers. Based on the promising results of the pilot study of *EMT en Español* (author reference), a warranted next step was to conduct a small randomized trial to evaluate the effects of teaching Spanish-speaking caregivers to implement *EMT en Español*.

2.3. Purpose of current study

This intent-to-treat randomized clinical trial was designed to contribute to nascent research on the effectiveness of caregiver-implemented language-based interventions for Spanish-speaking caregivers of young EBs (ages of 30–43 months) from low-income homes with significant language delays. The primary focus was to examine the extent to which systematically teaching Spanish-speaking caregivers *EMT en Español* strategies using the TMCR approach during home interactions with their children increased their use of these language support strategies. A secondary purpose was to explore the effects of *EMT en Español* on children's vocabulary outcomes compared to children in the control group. The third and more exploratory purpose was to assess caregivers' perceptions of the intervention.

2.4. Research questions

1. Do caregivers in the intervention group demonstrate more *EMT en Español* strategies than caregivers in the control group?

H1: Caregivers in the intervention group will use significantly more matched turns.

H2: Caregivers in the intervention group will use significantly more language targets.

H3: Caregivers in the intervention group will use significantly more expansions.

H4: Caregivers in the intervention group will use significantly more high-quality communication elicitation procedures.

2. Do children in the intervention group show higher expressive and receptive vocabulary after the *EMT en Español* intervention than children in the control group?

H1: Children in the intervention group will have higher expressive vocabularies at the end of intervention and the 3-month follow-up.

H2: Children in the intervention group will have higher receptive vocabularies at the end of intervention and the 3-month follow-up.

H3. Do caregivers in the intervention group find *EMT en Español* to be a culturally valid intervention?

3. Method

3.1. Participant eligibility

Child participants were eligible to participate in the study if they were between 30 and 43 months old at entry, had cognitive skills no more than 1 SD below the mean on the Leiter-R (Roid & Miller, 1997) and were identified as having language delays through (1) parent concern/report of their child's language abilities, and (2) scoring 1.5 SD's or more below the total language standard score on the Preschool Language Scale-5th Edition Spanish (PLS-5 Spanish; Zimmerman et al., 2012). Children were excluded if they had another primary diagnosis (e.g., intellectual disability, ASD, cerebral palsy). Caregiver participants were eligible if they reported speaking primarily Spanish to the child based on the Home

Table 1
Child and caregiver characteristics.

	Intervention		Wait-list Control	
Variable	N	%	N	%
Child sex				
Male	6	60%	5	50%
Female	4	40%	5	50%
Receiving EI (Part C) services				
Yes	9	90%	8	80%
No	1	10%	2	20%
Caregiver education level				
Less than high school	7	70%	6	60%
Completed high school	3	30%	2	20%
Above high school	0	0%	2	20%
Caregiver country of origin				
Mexico	7	70%	5	50%
U.S. (Puerto Rico)	1	10%	0	0%
Honduras	1	10%	2	20%
El Salvador	1	10%	1	10%
Peru	0	0%	1	10%
Dominican Republic	0	0%	1	10%

Language Scale (adapted from Francis et al., 2005) and if they were willing to participate in all sessions. Because socioeconomic status and language use are often confounded for immigrant families in the US and the majority of EBs come from households whose income is below 200% of the federal poverty level (Park et al., 2018), families were required to qualify as low-income to participate. They were eligible if they participate in federal programs serving low-income families or by reporting an income that did not exceed 200% of the federal poverty level as determined by the U.S. Census (2017).

3.2. Participant characteristics

Twenty-one children and their caregivers were randomized to participate in the study. Caregivers were primarily mothers (N=18); one aunt and one grandmother also participated. One family dropped the study immediately following randomization (assigned to intervention group) and did not complete any demographic or pretest assessments, resulting in data for 20 participants for analysis. Two additional children and caregivers in the intervention group withdrew from the study prior to post-intervention assessment due to the time commitment but were still included in analyses; these participants received 2 and 4 intervention sessions respectively. One additional family from the control group did not complete the follow-up visit due to scheduling conflicts but was still included in analyses. Figure 1 shows the flow of participants from phone screening to follow-up. Demographic information was available for 20 families in the analytic sample (See Tables 1 and 2).

3.3. Recruitment and enrollment procedures

Participants were recruited through agencies and service providers in the community who work with Spanish-speaking families. 45% of referrals came from the families' Part C providers; 13% came from Early Head Start or Head Start; 5% were referred by a speech and language therapist; and 17% of the sample were caregivers who attended a community recruitment event and spoke directly to project staff. The remaining 20% of caregivers heard about the study from other families or other community providers. Interested caregivers signed a recruitment flyer giving permission to be contacted by project staff. A phone screening was completed by a bilingual staff member. The phone screening served to: (1) determine if the family met eligibility requirements for the project and (2) clarify expectations for participation.

Caregivers were consented by a bilingual project staff member during the 2-hour in-person screening visit. The screening assessment visit was conducted in participants' homes by a bilingual master's or doctoral level staff with expertise in psychology and child bilingual language development. All procedures were approved by the university's IRB.

3.4. Sample size and power

Given the primary research question, the study was powered for the primary outcomes, caregiver use of *EMT en Español* strategies. The power analysis was based on effect sizes reported in a previous caregiver-implemented EMT study enrolling 92 English speaking caregivers and their toddlers with language delays. Effect sizes for caregiver outcomes in that study ranged from 1.25 to 3.19 (Roberts & Kaiser, 2015). We assumed an effect size of 1.20, 80% power, and an alpha of .05. A minimum of 10 participants per group was required to detect differences between groups (Cohen, 1988). This study was underpowered to detect effects on child outcomes; however, we analyzed differences between conditions on child measures to see if they suggested promise of *EMT en Español* to change child outcomes.

3.5. Screening measures

Home Language Scale (adapted from Francis et al., 2005). The home language scale asks who resides in the home with the child and what language/s each person speaks to the child. Caregivers who participated in the study with the child reported speaking mostly Spanish or only Spanish to the child as was required for eligibility to the study.

PLS-5 Spanish (Zimmerman et al., 2012). The PLS-5 Spanish is a comprehensive standardized assessment of receptive and expressive language. The PLS-5 Spanish was normed on a population of Spanish-speaking or bilingual children residing in the U.S. The PLS-5 Spanish has a 78% sensitivity and 89% specificity in identifying children with language delays. The standard administration procedure is to first test the child in Spanish and then follow up on any missed items by re-administering the items in English.

Leiter-R (Roid & Miller, 1997). This is a non-verbal measure of IQ and is standardized for children as young as 24 months. Test-retest reliability is .96 and the correlation between the Leiter and the WISC-III is .85. Additionally, the Leiter-R has been validated for children who are Spanish-speaking and reside in the US (mean scores for this population = 96).

3.6. Descriptive measures (at pretest only)

Demographic survey. The survey included child sex, caregiver education level, caregiver country of origin and length of time in the U.S., household size and income, child developmental and medical history, and child participation in education or therapy programs.

Family Values and Activities Interview (author reference). The Family Values and Activities interview is an ethnographic interview. The interview protocol was translated into Spanish for use in this study. During this 60–90 minute interview, one of the bilingual parent coaches asked about the child's family and caregivers' cultural beliefs about parenting and expectations for young children, child and family strengths, family support systems, and family activities or routines.

3.7. Outcome measures (pre, post, and follow-up)

*Caregiver use of EMT en Español strategies***.** The primary caregiver outcome variables for this study were coded from the caregiver-child 15-minute video-recorded interaction during play and book

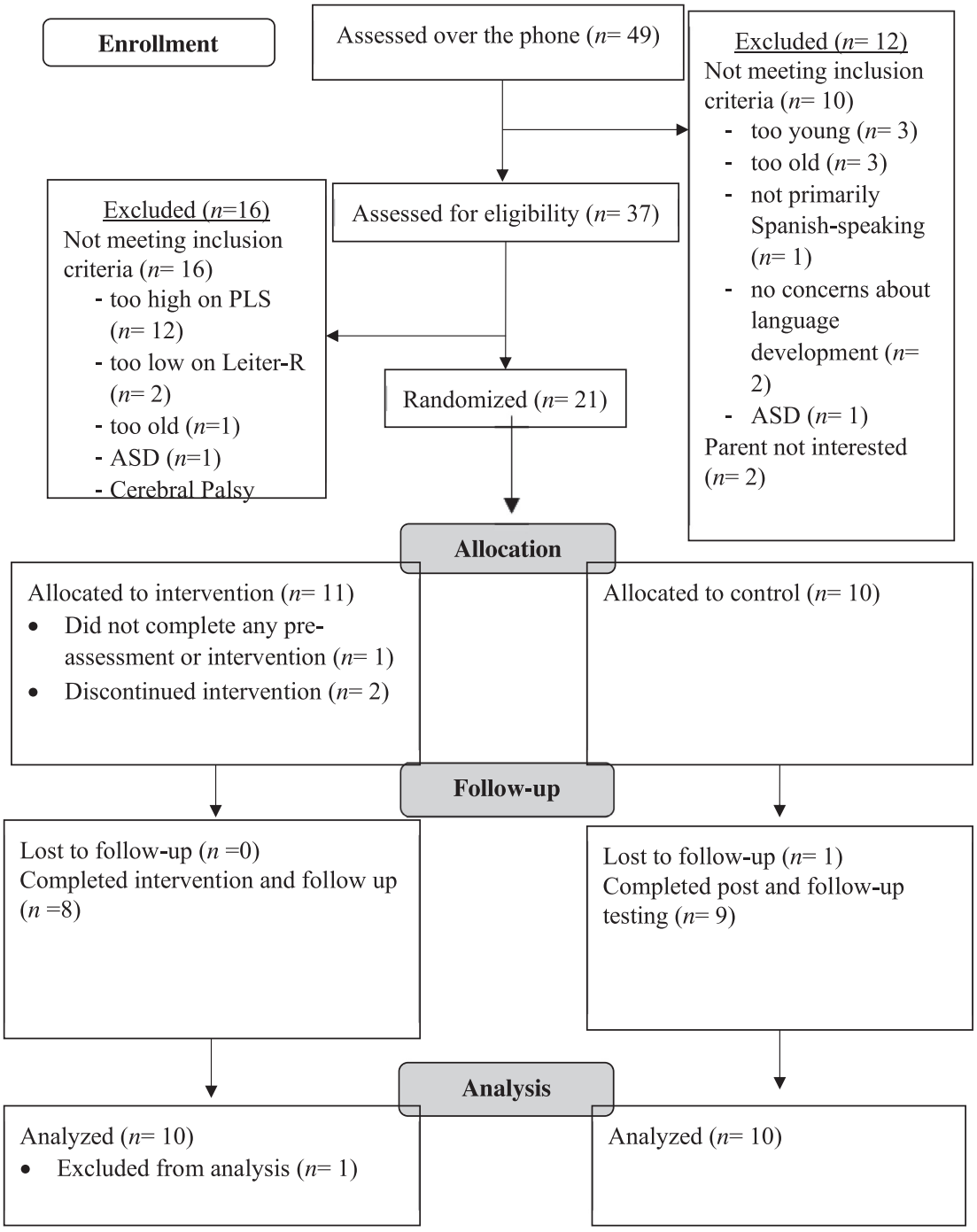

Fig. 1. CONSORT flowchart of participants.

Table 2
Child characteristics at entry.

	Intervention		Wait-list Control			
	Range	M (SD)	Range	M (SD)	*t*	*P*
PLS-5 Standard Score	50-81	67.60 (9.43)	55-90	74.20 (9.58)	-1.55	0.14
Receptive Standard Score	50-88	65.10 (12.62)	50-102	74.40 (15.25)	-1.49	0.16
Expressive Standard Score	57-84	74.40 (8.77)	67-84	77.60 (5.76)	-0.96	0.35
Leiter-R Standard Score	82-117	99.80 (9.39)	83-119	100.00 (11.20)	-0.04	0.97
Child Age (Months)	30-43	34.23 (4.15)	29-35	31.78 (2.28)	1.63	0.13
Family income-to-needs ratio	.61-2.53	1.22 (0.71)	.31- 1.18	0.87 (0.25)	1.42	0.09

Note. Income-to-needs is calculated by dividing the family income by the poverty threshold income for a family of that size published by the US Census Bureau (2017). A value of 1 represents a family living at the poverty level for that year.

Table 3
EMT en Español strategies.

Phase	Strategies taught	Coded behaviors from Caregiver Child Interaction (CCX)
1. Setting the foundation for communication, responsive interactions, child language targets	• Set a space and time to play and interact with limited distractions (turn off tv, put phones away) • Limit questions and directions • Notice the child's interests and focus of attention • Respond to all child communication • Pause to give the child a communication turn • Imitate the child's actions and describe what you are doing together • Use language at the child's target level about 50% of the time	• Percent caregiver responsiveness to child communicative turns • Percent caregiver turns that were matched to child turns • Percent caregiver utterances that included child language targets
2. Expansions	• Add a noun, verb or modifier to the child's word(s) • Recast the child's word if unintelligible • Correct the child's grammar	• Percent of child utterances that were expanded by the caregiver
3. Communication elicitation	• Set up a request or prompt for language following a naturally occurring request from the child • Use a time delay (showing two choices, pausing in a routine, setting up a situation in which the child needs help or will want more of an item) and respond with a language target or expansion of the child's utterance when the child requests. • Use a nonverbal prompt to set up an opportunity for the child to request and then asking the child an open question (e.g., *¿Qué quieres?* "what do you want?"] or telling the child exactly what to say (e.g. *di el gato* [say "the cat"]	• Number of episodes attempted • Quality rating for each episode (range 0-3)

sharing (caregiver-child interaction: CCX). Caregivers were given a standard set of materials and asked to interact with their children as they normally would during several routines (e.g., taking off or putting on the child's shoes; playing with toys; and book sharing). The standard set of toys included pretend food, plates, utensils, hats and sunglasses, balls, a shape sorter, a puzzle, and two books (*La oruga muy hambrienta,* Carle, 2002; and *Buenas noches, gorila,* Rathmann, 2004). Caregiver and child utterances were transcribed using Systematic Analysis of Language Transcripts software (SALT, Miller & Iglesias, 2012). SALT transcripts were coded for caregiver use of *EMT en Español* strategies (Table 3). The complete *EMT en Español* code, including definitions and examples, is available upon request.

Child spontaneous use of words during caregiver child interaction (CCX). Child unprompted number of different words (unprompted NDW) and unprompted number of total words (unprompted NTW) were analyzed in SALT from transcripts of the CCX. Words were coded as unprompted if the child spontaneously used the word without a preceding model, question or prompt. Child words that imitated the caregiver's utterance or answered a question from the caregiver were not coded as unprompted.

Receptive One Word Picture Vocabulary Test-4 Spanish-Bilingual Edition (Martin, 2012). The ROWPVT-4 SBE is a standardized Spanish language measure of children's conceptual receptive vocabulary. The child is asked to identify pictured objects, actions, and concepts by pointing from a field of 4 pictures. Children were presented with the targeted item in Spanish first. Any missed items were re-administered in English so scores reflect the child's conceptual vocabulary knowledge and not language specific vocabulary. Internal consistency of the ROWPVT-SBE is .95 and test-retest reliability for the raw scores is also .95.

Expressive One Word Picture Vocabulary Test-4 Spanish-Bilingual Edition (Martin, 2011). The EOWPVT-4 SBE is a standardized Spanish language measure of children's expressive vocabulary and yields a score for children's total expressive conceptual vocabulary. Children are asked to name a pictured object, action, or concept. Responses in Spanish or English are counted as correct, yielding an expressive conceptual vocabulary score. Internal consistency for the EOWPVT-SBE is .95. Test-retest reliability of the standard score is .91.

Caregiver Perception of the Intervention Measures (post; intervention families only)

Caregiver perception of the intervention was collected via (a) the evaluation of training and (b) the cultural acceptability of strategies surveys. The evaluation of training survey consisted of 10 questions designed to assess the experiences of the caregivers who participated in the intervention. The survey asked about the caregiver's use of the *EMT en Español* strategies outside of the intervention sessions, the effectiveness of the TMCR strategies in teaching the intervention, and the effects of caregiver use of strategies on child's language. The cultural acceptability survey included 27 questions and statements about the *EMT en Español* language teaching strategies with responses rated on a 5-point Likert scale. The scale asked caregivers to rate (a) how effective or appropriate each strategy was for their child; (b) what other Latino parents would think about the strategy and; (c) how well each strategy fit with their own views of parenting (see Supplementary Table 1. *Cultural Acceptability of EMT en Español Strategies* for a complete list of questions).

3.8. Data collection procedures

Assessments occurred at three timepoints: before intervention, within 2 weeks post-intervention, and three months post-intervention. Assessments were completed in participants' homes to make the study accessible to families who did not have reliable transportation or who may not have felt comfortable in a university clinic setting (Agazzi et al., 2010). Entry testing occurred during one 45-minute home visit and were completed within two weeks of eligibility testing. All child assessments were completed by a Spanish-English bilingual graduate student in speech and hearing sciences. The assessor was blind to the caregiver and child's experimental assignment. The assessor read manuals and protocols, observed the project director administering assessments with a child not enrolled in the study, practiced all assessments

with a child not enrolled in the study, and received feedback prior to testing any children enrolled.

The CCX was transcribed using the standard SALT procedures. An undergraduate research assistant who spoke Spanish with native proficiency completed the transcription. The assessor verified transcripts and coded caregiver and child behavior using the *EMT en Español* code. Both students completed 20 hours of SALT's online transcription training courses (https://www.saltsoftware.com/training/self-paced-online-training). Prior to coding, the assessor achieved 90% interrater reliability on three practice CCX transcripts from caregiver-child dyads not enrolled in this study. A research assistant with 10 years of experience coding EMT studies who could read and understand Spanish completed reliability coding for 20% of transcripts.

The training survey and cultural acceptability of strategies survey were administered to intervention families. Caregivers chose to complete the survey at their last intervention session and placed the survey in a sealed envelope to ensure confidentiality or to complete the survey orally over the phone with a bilingual staff member who was not their coach in the intervention.

3.9. Design, randomization, and blinding

This study was a randomized control trial. Eligible children and their caregivers were randomized to the *EMT en Español* intervention or "business as usual" wait-list control group. Families in both the intervention and control groups could continue to receive community services and to initiate any additional services. Randomization was completed using a tool of an online database platform (Vanderbilt Redcap; Harris, 2012). All personnel were blind to the allocation process; the project director informed the family of their group assignment.

3.10. Control condition

Caregivers in the control group participated in the three assessment sessions, but were not taught *EMT en Español* strategies during the intervention or follow-up periods. Participants were offered 10 sessions of the intervention following the completion of follow-up testing.

3.11. Intervention condition - EMT en Español

Caregivers in the intervention group were taught *EMT en Español* strategies using Teach Model Coach Review over 24 sessions occurring twice per week for about 3 months. The content of the intervention and the sequence for teaching is shown in Table 3. Each intervention phase began with a 20–30 minute workshop that included written materials, video examples of strategy use, and questions/discussion with the caregiver about how to apply the strategies with her child. Workshops were followed by eight intervention sessions targeting the behaviors taught in the workshop. Sessions lasted about an hour.

Two parent coaches taught caregivers during the workshops and intervention sessions. One coach was a master's level native Spanish speaker with 15 years of experience providing language and behavior therapy to Spanish-speaking children. The other coach was a doctoral level developmental psychologist fluent in Spanish with 10 years of experience working with young children with developmental delays and disabilities including Spanish-speaking families and 7 years of experience delivering EMT interventions and teaching families using TMCR. Prior to delivering the intervention, coaches demonstrated a minimum of 90% fidelity on implementation of *EMT en Español* with a practice child and the use of TMCR procedures to teach a caregiver during three home visits with a practice family. Fidelity of the coach use of *EMT en Español* and TMCR procedures was assessed during 20% of each coach's sessions with each caregiver-child dyad.

3.12. Reliability and Fidelity

Interobserver agreement (IOA) was assessed for 20% (11) of randomly selected CCX transcripts. IOA for two independent coders averaged 94% across all coded behaviors (two different observers agreed on 94% of the caregiver's use of language strategies). Treatment fidelity assessments were completed for 20% (37) of sessions; assessments sessions were randomly selected across treatment families and distributed over the period the intervention. The average fidelity score for coach's use of *EMT en Español* and following the TMCR training protocol was 94%. Adherence to the research protocol for training caregivers was high.

3.13. Data Analysis

To address the first research question about caregiver, use of *EMT en Español*, we examined the percentage of matched turns, expansions, targets, and responsiveness during the CCX at the three assessment time points (see [author reference] for detailed operational definitions of these language support strategies). Few caregivers in either condition used communication elicitation procedures during the CCX at any time point; thus, the quantitative changes in this behavior were not analyzed. We examined differences between conditions at pre-assessment, post-assessment and follow-up using independent samples *t*-tests. A power analysis indicated that the current sample size is appropriate for conducting such t-tests. We calculated standardized mean differences (Cohen's *d*) at post-assessment and follow-up.

To address the second research question on child outcomes, separate linear regression models were run for unprompted number of different words (NDW) and unprompted number of total words (NTW) from the CCX, ROWPVT-SBE total raw score, and EOWPVT-SBE total raw score at post-assessment and follow-up. These models included condition as a predictor, as well as child age at pre-assessment, the PLS-5 Spanish pre-assessment total language raw score, and the outcome measure score at pre-assessment as covariates, all grand mean centered. The number of possible covariates was limited based on the small sample size.

For the third research question, we read the descriptive ratings and qualitative comments in the intervention perception questionnaires completed by caregivers in the intervention group.

Due to the attrition of four families (3 intervention, 1 control) from the sample at follow-up, expectation-maximization imputation was conducted to address missing data from families with at least pre-assessment data. This method of imputation generally works well with small samples and is preferred to listwise deletion (Dong & Peng, 2013). Sensitivity checks indicated that the pattern of results were very similar for the imputed data and observed complete case data. Observed data were used in the final models. The full model results using imputation and observed complete case data are available in supplementary Tables 2 and 3.

4. Results

4.1. RQ1: Effects on caregiver outcomes

There were no significant differences in caregiver use of *EMT en Español* strategies between caregivers in intervention and control conditions at pre-assessment (Table 4, Fig 2). However, the intervention group had a significantly higher percentage of matched turns at post-assessment ($P = 0.010$, $d = 1.39$), but not at follow-up ($P = 0.289$, $d = 0.53$), compared to the control condition. The

Table 4
Caregiver language support behaviors by condition and group.

	Pre			Post				Follow-up			
	Intervention M (SD)	Wait-list Control M (SD)	*t*	Intervention M (SD)	Wait-list Control M (SD)	*t*	*d*	Intervention M (SD)	Wait-list Control M (SD)	*t*	*d*
% Matched turns	.31 (.10)	.27 (.19)	0.64	.45 (.11)	.28 (.13)	2.91*	1.39	.41 (.19)	.31 (.16)	1.10	0.53
% Expansions	.12 (.18)	.13 (.15)	-0.11	.25 (.15)	.09 (.09)	2.70*	1.24	.32 (.29)	.09 (.10)	2.22*	1.05
% Child Targets	.18 (.11)	.15 (.07)	0.91	.46 (.23)	.14 (.07)	3.84**	1.90	.40 (.20)	.14 (.04)	3.63***	1.81
% Responsiveness	1.00 (.00)	1.00 (.02)	1.00	.96 (.07)	1.00 (.00)	-1.44	-0.81	.98 (.03)	1.00 (.00)	-1.23	-0.94

* $P < 0.05$,
** $P < 0.01$,
*** $P < 0.001$

Table5 Effect
estimates for child outcomes at post and follow-up.

	Observed						Imputed					
	Intervention MN[a]	Wait-list Control MN[a]	SD	Coefficient for Trt-Control difference	*d*	*P*-value	Intervention MN[a]	Wait-list Control MN[a]	SD	Coefficient for Trt-Control difference	*d*	*P*-value
ROWPVT-SBE total												
Post	10.13	8.19	8.18	1.94	0.25	0.584	12.23	7.61	9.05	4.61	0.54	0.318
Follow-Up	12.78	7.42	8.65	5.36***	0.67	0.047	11.29	6.53	8.50	4.76†	0.60**	0.050
Unprompted NDW												
Post	14.09	12.43	12.12	1.65	0.14	0.634	12.27	11.59	12.08	0.68	0.06	0.836
Follow-Up	16.87	15.89	13.46	0.98	0.08	0.881	18.03	15.21	14.03	2.82	0.21	0.667
Unprompted NTW												
Post	37.17	28.16	41.81	9.01	0.22	0.461	33.71	24.64	40.61	9.08	0.23	0.427
Follow-Up	52.52	30.65	36.00	21.87	0.66	0.214	53.88	28.39	36.47	25.49	0.77	0.147
EOWPVT-SBE total												
Post	6.28	2.88	6.55	3.40	0.52	0.200	5.55	2.35	6.35	3.20	0.50	0.181
Follow-Up	5.26	4.32	5.50	0.94	0.17	0.746	4.77	3.86	5.20	0.90	0.17	0.721

Note. ROWPVT-SBE total is the total score on the Receptive One Word Picture Vocabulary Test-4 Spanish-Bilingual Edition. Unprompted NDW is the unprompted number of different words during the caregiver-child interaction. Unprompted NTW is the unprompted number of total words during the caregiver-child interaction. EOWPVT-SBE total is the total score on the Expressive One Word Picture Vocabulary Test-4 Spanish-Bilingual Edition.
† $P < .10$,*$P < 0.05$
** $P < 0.01$
*** $P < 0.001$ for coefficients.
[a] Covariate-adjusted means generated by models with covariates set at the grand means for the sample.

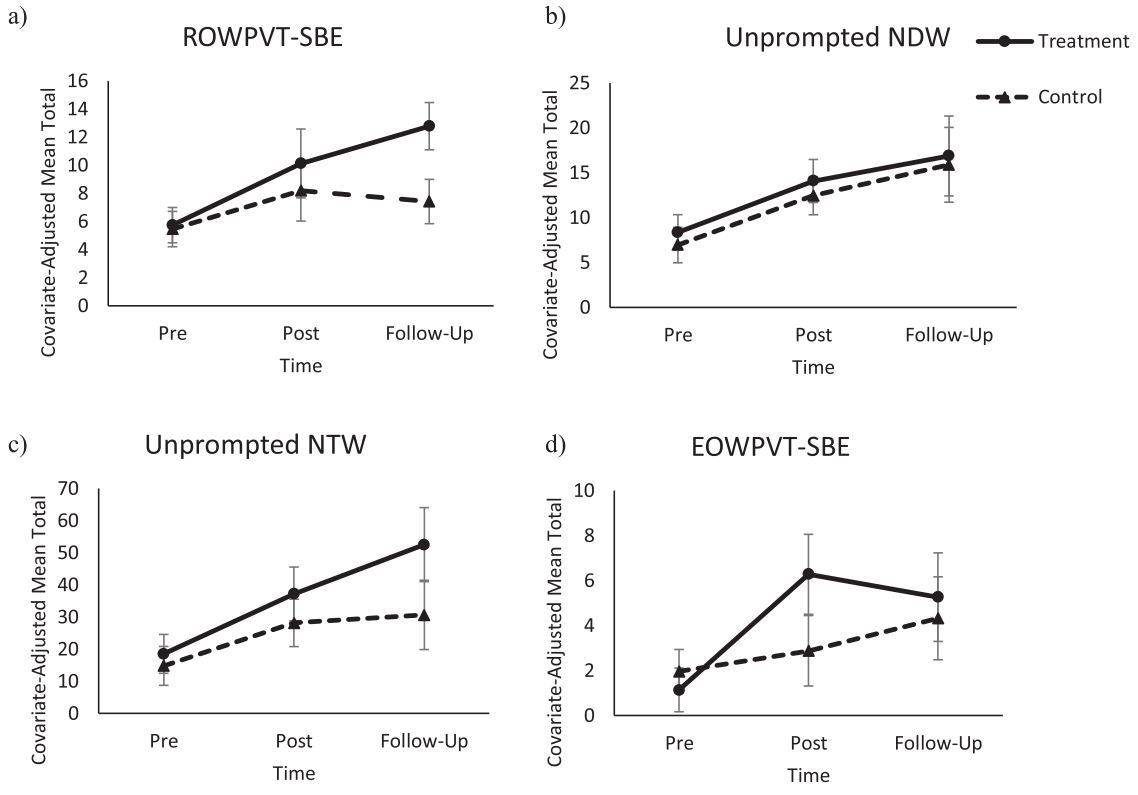

Fig. 2. Child outcomes by condition over time.

intervention group did have significantly higher percentages of expansions at post-assessment ($P = 0.016$, $d = 1.24$) and at follow-up ($P = 0.042$, $d = 1.05$). The intervention group also had significantly higher percentages of targets at post-assessment ($P = 0.005$, $d = 1.90$) and at follow-up ($P = 0.007$, $d = 1.81$). Differences between conditions on responsiveness at post-assessment or follow-up were not significant ($P = 0.192$, $d = -0.81$ and $P = 0.257$, $d = -0.94$, respectively). Detailed results over time are reported in Table 4 and Figure 2.

4.2. RQ2: Effects on child outcomes

Condition significantly predicted observed differences in child receptive vocabulary (ROWPVT-SBE) at follow-up, with children in the intervention condition scoring significantly higher than children in the control condition ($P = 0.047$, $d = 0.67$). Overall, children in the intervention condition performed better than those in the control condition on all child outcomes measures, with moderate effect sizes for many outcomes, although the rest beyond receptive vocabulary at follow-up were not statistically significant. Importantly, we note that the study was underpowered to detect child outcomes and significant differences between groups were not expected given the relatively small sample size. The full model results are in supplementary Tables 2 and 3. Table 5 reports the impact estimates of condition in each regression model after controlling for the previously listed covariates, as well as covariate-adjusted means for each condition and the effect sizes. Figure 2 illustrates these results by condition over time.

4.3. RQ3: Caregiver Perception of the Intervention

The 2 caregiver perception of the intervention surveys were not given to the first 3 caregivers completing the intervention; surveys were available for the last 5 families and each of these families completed the surveys. In the evaluation of training survey, 4 caregivers each reported practicing strategies for 3.5, 5, 10, and 35 hours during the week with their children outside of sessions. 3 caregivers reported teaching the *EMT en Español* strategies to other caregivers, including a spouse and older siblings. All 5 caregivers reported that the "coach" component of the caregiver training sessions was the most helpful to them in learning to implement the strategies with their child. All caregivers also reported they thought the intervention was helpful for their child, noting: "*Me ayudó entender mas ella, entender la situación*. [It helped me to understand her, understand the situation.]"; and "*Mi hija no hablaba casi nada antes de la terapia y lo que hablaba no se entendía claramente. Ahora dice frases, hace preguntas, canta y tiene mucho más vocabulario que antes*. [My daughter spoke almost nothing before the therapy and what she said you could not understand clearly. Now she uses phrases, asks questions, sings, and has much more vocabulary than before.]" When asked about improving the intervention for other Latino families, three caregivers wanted more sessions or a longer-term intervention.

Caregivers rated the *EMT en Español* strategies very positively on the cultural acceptability of strategies survey. Responses to the 27 questions ranged from 3–5 (based on a 1 to 5 scale, with 1 = not effective/appropriate to 5= very effective/appropriate). The question "How do you think other Latino caregivers would view not giving instructions in the activities?" was rated the lowest and thus, the least culturally congruent of the 27 items (M= 4). One caregiver explained, "*Tal vez pensarían que no es lo correcto ya que nos ensenan desde pequeños que se hace lo que los padres digan*. [Maybe they would think it is not correct since they teach us since we are young that you always do what parents say]." In response to, "How did this strategy fit with your views of how to interact/parent your child?" one caregiver said, "*Yo pensaba que tenía que darle instrucciones para que hiciera las cosas pero aprendí que hay maneras más efectivas*. [I thought I had to give instructions so that he/she would do things, but I learned there are more effective ways.]." Caregivers rated communication elicitation procedures (prompt or time delay) the highest. The average response for "How did time delay fit with your view of how to interact/parent your child" was 5. One caregiver explained, "*Me encantó que no tengo que forzarla a hablar porque esta estrategia es para que ella quiera hablar conmigo sin que lo pidas.* [I loved that I did not have to force her to talk because this strategy is for her to want to talk to me without me asking.]." Supplementary Table 1 shows ranges and average ratings for each item and includes additional caregiver comments

5. Discussion

As the first randomized trial to focus on Spanish-speaking caregivers from low-income homes and their young children (under age 4) with significant developmental language delays, results of this study offer much needed insight into how Spanish-English EBs' early language learning can be supported through culturally congruent intervention. Results revealed the effectiveness of *EMT en Español* for increasing Spanish-speaking caregivers' behaviors that support their children's language. Caregivers also attested to the cultural appropriateness of the intervention. Finally, a more preliminary finding given the study's sample size pointed to evidence of the effectiveness of *EMT en Español* for improving child language outcomes. We discuss our findings and their implications in the sections that follow.

5.1. Effectiveness of training caregivers to implement EMT en Español

The Spanish-speaking caregivers in this study applied key *EMT en Español* strategies taught during the relatively brief 24-session intervention. Caregivers in the intervention group increased their use of matched turns, doubled their use of expansions, and more than doubled their use of child targets following intervention, while these same behaviors for caregivers in the control group remained the same. Caregivers in the intervention also continued to use expansions and child targets at the same or higher levels as post-intervention testing 3 months after training concluded; use of matched turns decreased from post-testing but did not fall to the level of matched turns pre-intervention. The immediate and longer-term results provide empirical support for the effectiveness of *EMT en Español* for increasing language support in interactions between Spanish-speaking caregivers and young children with language delays.

It is also worth noting there were no statistically significant differences between conditions on caregiver responsiveness. This was not unexpected given that caregivers in both conditions were highly responsive at pre-assessment. Latino Spanish-speaking caregivers were highly responsive at pre-assessment in our previous study (author reference), and significantly more responsive than English-speaking caregivers from U.S. mainstream culture with their young children with language delay (author reference). Caregiver use of matched turns and language targets were relatively low at pre-assessment, suggesting that interventions for this population should use caregivers' responsiveness as a strength and focus on teaching caregivers *how* and *when* to respond to their children's communication.

Further, none of the Spanish-speaking caregivers used a structured communication elicitation procedure (time delay or prompt) at pre-assessment. Indeed, use of a structured communication elicitation procedure was infrequent in intervention and control groups at post-assessment and at follow-up. Caregivers were taught an elicitation procedure (time delay or prompt) based on

their children's individual needs in specific routines (e.g., showing a choice of snacks during a meal routine, prompting the child to ask for help to open a favorite toy, etc.). It may be that caregivers continued to use these strategies in those specific contexts, but did not generalize them to the caregiver child interaction assessment context. Interestingly, some caregivers described using communication elicitation strategies with their children in their qualitative comments in the cultural acceptability of strategies survey (supplementary Table 1). This suggests that caregivers may have used the communication elicitation strategies when they were needed and/or in routines in which they were taught the procedures.

5.2. Effectiveness of EMT en Español for child language outcomes

Children whose caregivers were taught *EMT en Español* strategies in this study had significantly higher receptive vocabulary scores than children in the control group at follow-up, with a moderate to large effect size. There were no other significant effects, although all outcomes favored the intervention group (effect sizes ranged from .16–67). Given the study was underpowered to detect child effects, coupled with the fact that these effect sizes are within the range of outcomes reported for similar standardized and language sample-based measures of vocabulary in the Heidlage and colleagues (2020) meta-analysis of caregiver implemented language interventions for young children, these outcomes are promising indicators of the effects on child language. It is also worth noting that child effects may lag adult effects by several months in caregiver-implemented interventions (Kaiser & Roberts, 2013; Roberts & Kaiser, 2015). It may take time for the caregiver's use of strategies to impact child language, particularly when caregivers are taught strategies sequentially over the course of the intervention period and are not using the full intervention until the end of training.

5.3. Cultural appropriateness of EMT en Español

The *EMT en Español* program included a systematic parent training protocol, evidence-based naturalistic intervention strategies**,** teaching at home and in the home language, and match of interventionist to caregivers (Latino background, Spanish fluency, parents) as key features. In general, caregivers found this intervention approach to be acceptable and effective, with most strategies were rated as culturally acceptable. However, one strategy emerged as least culturally appropriate. Spanish-speaking caregivers reported a tension with not giving instructions to their children. While they reported it as an effective strategy for their own child, caregivers rated it lower in terms of how other Latino parents would view the strategy. One parent commented that other Latino caregivers may view not giving instructions as "incorrect" since they were taught to always do what their parents say. Perhaps not providing instructions for young children feels incongruent with some cultural values, such as *respecto.* In contrast, the most highly rated strategy was communication elicitation (time delay or prompting) even though this strategy was used infrequently in the observed caregiver child interactions. Caregivers' judgements about these two strategies should be considered in further tailoring the intervention to this population.

5.4. Limitations and Future Directions

The primary limitation of this study was sample size. The small sample, attrition of four participants from the original sample, and soliciting cultural acceptability responses from only 5 caregivers limited the selection of data analysis approaches for both caregiver and child data. Further, the small sample did not allow for analyses of the effects of caregiver characteristics on outcomes. Because the sample was selected to represent primarily Spanish-speaking caregivers from low-income households, the results cannot be generalized to other caregivers of children with language delays from more varied socioeconomic backgrounds or Latino caregivers who are bilingual or primarily English-speaking. Similarly, the child population was limited to children who had language delays without cognitive delays or developmental problems in other areas. Thus, the effect on child language may be limited to children with similar profiles who will be bilingual. These limitations are particularly important in light of the growing population of children who come from Spanish speaking homes and have early language delays. Given the small sample, limited measures, and short time frame, conclusions cannot be made about the impact of intervention on children's longer-term and broader language development, including syntax. Nonetheless, the current study provides promising indicators that caregiver-implemented intervention may be one appropriate way to address the needs of this specific child population.

Future directions include conducting larger randomized trials with sufficient sample size and duration to examine short- and longer-term child outcomes and to determine which caregiver characteristics may be associated with relatively stronger and weaker caregiver and child outcomes. The effectiveness of *EMT en Español* for a wider range of Latino caregivers (e.g., those who are bilingual and from higher income households) and for children with other types of disabilities and/or developmental delays (e.g., Autism, Down syndrome) should also be examined. Finally, there is a critical need to prepare professionals to deliver culturally and linguistically appropriate caregiver-implemented intervention to Spanish-speaking families.

The implications of this study extend, in principle, to making adaptations of EMT for caregivers and children from a range of culturally and linguistically diverse (CLD) populations. Although EMT has been used effectively in South Africa and Brazil (Hampton, et al, 2019; Scherer et al, 2021), a systematic process for adaptations was not part of these studies. Interventions that are adapted for use with CLD populations are more effective (e.g., Larson et al., 2020). Additional research on adaptations processes as well as assessing the effectiveness of EMT in different cultural and linguistic contexts is needed.

6. Conclusion

This study adds to the evidence base that using TMCR to teach caregivers *EMT en Español* strategies is effective in increasing their use of language support strategies with their young children with language delays. There is also some promising initial evidence that *EMT en Español* is effective for increasing children's early receptive and expressive vocabulary outcomes. *EMT en Español* is an effective and culturally congruent caregiver-implemented intervention for young Spanish-speaking EBs with language delays who have been historically underrepresented in research and are a vulnerable population at risk for academic difficulties.

Credit Author Statement

*Tatiana Nogueira Peredo***:** conceptualization, methodology, investigation, writing-original draft, project administration, funding acquisition

*Jeannette Mancilla-Martinez***:** conceptualization, writing- review & editing, supervision

*Kelley Durkin***:** formal analysis, visualization, writing- review & editing

Ann Kaiser: conceptualization, methodology, writing- review & editing, funding acquisition, supervision

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Supplementary materials

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