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Addressing Clinician–Client Mismatch: A Preliminary Intervention Study With a Bilingual Vietnamese–English Preschooler

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Abstract

Purpose—This project examined receptive vocabulary treatment outcomes in the two languages of a bilingual preschooler with moderate to severe language impairment.

Method—A series of single-subject experimental designs was used to compare English-only (EO) and bilingual (BI) approaches to receptive vocabulary treatment. The participant, Nam, was a boy age 3;11 (years;months) who was learning Vietnamese as a first language at home and English in his early childhood education program. Treatment was implemented by an EO interventionist using a computer interface and prerecorded audio files in Vietnamese and English. The dependent measure was the percentage of items that were correctly identified in each language.

Results—Combined studies revealed that the BI approach increased Nam’s attention to task and was as effective as the EO approach for increasing his receptive vocabulary in English. Nam made vocabulary gains in both treatment conditions; receptive vocabulary gains were evident in both Vietnamese and English.

Conclusion—This project showed that it is feasible for an EO clinician to promote gains in both the home and school languages of a BI child through creative collaborations with BI colleagues and the use of technology. Replication with additional participants and treatment activities is needed to make further generalizations.

Keywords

bilingual language impairment; single-subject experimental design; clinician–client mismatch

In the United States, nearly 20% of children are reported to speak a language other than or in addition to English (U.S. Census Bureau, 2003). Many children require two languages to navigate bilingual (BI) home, school, and community settings; many others speak one language at home (first language, or L1) and a different language (second language, or L2; e.g., English) at school and in the larger community. Although Spanish is the most common L2 spoken in the United States, languages such as Chinese, French Creole, Tagalog, and Vietnamese each have more than 1 million speakers in the United States (U.S. Census

Bureau, 2003). Based on a nationwide survey of speech-language pathologists (SLPs) working in schools, 60% of respondents reported having English language learners on their caseload (American Speech-Language-Hearing Association [ASHA], 2010). Similarly, in a statewide survey of SLPs in Minnesota, a state once known for its relative homogeneity and the location for the current study, more than 65% of respondents reported working with more than one language or dialect, and nearly half of all respondents reported serving clients from three or more different language groups (Kohnert, Kennedy, Glaze, Kan, & Carney, 2003).

It is important for young children with communication disorders to have access to the languages spoken by their family and community members, both at home and school (Kohnert, 2007; Kohnert & Derr, 2004; Kohnert, Yim, Nett, Kan, & Duran, 2005). Typically developing children from immigrant families who are able to speak the language of their parents (L1) as well as the language of the larger community (L2) have better psychological, social, and academic outcomes than their same-ethnic peers who speak only English (Feliciano, 2001). Children of immigrant families who are BI have a stronger sense of identity (Phinney, Romero, Nava, & Huang, 2001), closer parent-child relationships (Tseng & Fuligni, 2000), and higher academic achievement (Feliciano, 2001) as compared to English-only (EO) peers with similar cultural, ethnic, and immigration histories.

It is likely that these same advantages hold for BI children with communication disorders (see Kohnert, 2007, for discussion). It is also the case that with appropriate support, children with language impairment can learn two languages, although by definition this will be with less efficiency than BI learners without underlying language impairment (e.g., Paradis, Crago, Genesee, & Rice, 2003). BI approaches have been found to be as effective as EO approaches in regular education (Rolstad, Mahoney, & Glass, 2005), and there is no empirical evidence to suggest that intervention in a child's L1 contributes to confusion or delays in language development (see reviews in Gutierrez-Clellen, 1999; Kohnert & Medina, 2009). On the flip side, young minority L1 learners with language impairment are at a disproportionate risk for rapid regression or loss of their L1 if it is not systematically supported (e.g., Restrepo & Kruth 2000; Salameh, Håkansson, & Nettelbladt, 2004).

Supporting both home and school languages in BI children with communication disorders presents significant challenges. One duly noted challenge is the shortage of BI SLPs. Less than 6% of SLPs in the United States report proficiency in an L2 (ASHA, 2009). In addition, there are very few SLPs who speak many of the languages present in U.S. homes, such as Hmong, Somali, and Vietnamese. The practical reality is that the vast majority of U.S. children with communication disorders who speak a minority L1 receive services solely in English, their L2, by providers who do not speak the child's L1 (ASHA, 2009, 2010; Kohnert et al., 2003).

It is imperative to consider options that address language mismatch between clinicians and clients—a situation that is more often the rule than the exception. Collaborations with BI SLPs, paraprofessionals, professionals in related fields, interpreters, and families are essential in designing and implementing intervention programs that promote development of a child's L1 alongside gains in English (Kohnert, 2007; Kohnert et al., 2005). SLPs often

train other professionals in a team approach (Longhurst, 2003) as well as incorporate technology or computer software (Westby & Atencio, 2002) in intervention in an attempt to increase the students' number of communicative partners and opportunities to model and practice language. Furthermore, applying research methods is an important step toward systematically documenting treatment outcomes and building the empirical evidence for best practice among BI populations (Kohnert et al., 2003).

Single-subject experimental design (SSED) is one research methodology that can be particularly useful for examining treatment effects for low-incidence populations such as preschool children with language impairment who speak Urdu, Korean, or Vietnamese as an L1, as is the case here, and attend early childhood education in the L2, English.

This project incorporated collaboration among BI SLPs and professionals in related fields. We used technology to support learning in two languages and measured treatment outcomes using an SSED. Specifically, this project investigated the feasibility of an EO-speaking educator implementing a successful BI vocabulary treatment program for a Vietnamese–English-speaking preschool child with moderate to severe language impairment. To date, no experimental studies have examined treatment outcomes in each of a BI child's languages when the clinician was *not* BI. In the following sections, we review the few studies that have investigated treatment outcomes in BI children who received intervention from BI interventionists and then describe the utility of SSED.

Studies With BI Interventionists: Treatment Outcomes in the L1 and L2

In a recent systematic review of the literature, Kohnert and Medina (2009) found only four treatment studies that included BI children with language impairment (vs. speech or other communication disorders). Of these four studies, three used a type of experimental design versus case report (Perozzi, 1985; Perozzi & Sanchez, 1992; Thordardottir, Ellis Weismer, & Smith, 1997). Perozzi (1985) explored the facilitation effect of an L1 on an L2 using an SSED. Participants were three children who spoke Spanish as their L1 and English as their L2, and three children who spoke English as their L1 and Spanish as their L2. Participants were 4 to 5 years old and were classified as having normal language, mild language delay, or a language impairment. Vocabulary targets were determined individually and consisted of common objects and actions that the children could not identify in either language. There were a total of 12 target vocabulary words used in treatment with each 4-year-old and 16 target words used in treatment with each 5-year-old. A BI Spanish–English graduate clinician conducted all intervention sessions.

During treatment, the interventionist placed four pictures in front of the child and named each one. Then she named one picture at a time and asked the child to point to that picture. Criterion for receptive vocabulary acquisition was three consecutive correct responses per item. Perozzi (1985) used a within-subject design in which Condition A consisted of vocabulary intervention first in the L1 (until criterion was met), then in the L2, and Condition B consisted of intervention in the L2, then the L1. All participants completed an ABBA sequence with a different set of vocabulary targets per condition. All six children reached criterion with fewer trials in Condition A (treatment in the L1, then in the L2) than

in Condition B. That is, L2 words were learned more quickly when the children were first trained in the L1.

Perozzi and Sanchez (1992) extended findings from Perozzi (1985) to the group level: Group A received vocabulary treatment in the L1 (Spanish) followed by the L2 (English); Group B received vocabulary treatment solely in the L2. Participants ($n = 38$) were Spanish-dominant first graders living in El Paso, TX, who scored 85 or below on the Woodcock Language Proficiency Battery: Spanish Form (Woodcock, 1981). Vocabulary targets were prepositions and pronouns. Treatment was the same as in Perozzi. Results showed that, on average, children in Group A (who received treatment in Spanish and then in English) reached criterion for L2 vocabulary comprehension in fewer trials (mean of 1.4 trials/item) than children in Group B (who received EO treatment; mean of 3.1 trials/item). In fact, the total number of trials to reach criteria for L1 and L2 (348) was less than the number of trials required to reach criterion in EO for Group B (511). These results were consistent with findings by Perozzi and showed that treatment in the L1 paved the way for faster L2 vocabulary learning in Spanish (L1) speakers in the United States who are at risk for persistent language delays.

Thordardottir et al. (1997) used an SSED to compare BI versus EO approaches to intervention with an Icelandic–English-speaking preschooler with a severe language delay. A set of eight vocabulary items was selected for treatment in each condition (BI or EO). New vocabulary words were introduced in semistructured play activities during 50-min sessions, 2 times/week, for a total of 14 sessions (7 BI and 7 EO). A BI Icelandic–English SLP conducted all treatment, and conditions were distinguished by the presence of a second adult who was either a BI Icelandic–English speaker or an EO speaker. Results showed that both BI and EO interventions improved the preschoolers' English vocabulary production. Progress in the L1, Icelandic, was not reported, although it was presumed to have increased from the BI treatment.

In sum, the three previous studies that compared BI to EO treatment in young minority L1 learners with language delays found that their English vocabulary improved in both conditions. The rate of English vocabulary acquisition was either comparable across treatment conditions (Thordardottir et al., 1997) or superior when treatment was provided first in the L1 (Perozzi, 1985; Perozzi & Sanchez, 1992). The added advantage of the BI condition was continued development of the L1. Of these three studies on L1 and L2 treatment outcomes, two studies used an SSED, which is a research methodology that can help address the paucity of literature on treatment efficacy with BI children.

The Utility of the SSED

SSED, also known as single-case design, is a rigorous experimental method that is used to investigate functional relationships between treatment and changes in behavior (Barlow, Nock, & Hersen, 2009). SSEDs allow us to examine how treatment affects individual children—information that is highly relevant to clinical practice and often unavailable in group designs (Barlow et al., 2009). Well-designed SSEDs are considered Level 2 evidence on hierarchies that rank the quality of empirical evidence from highest (1) to lowest (5)

(Gillam & Gillam, 2006). SSEDs differ from case studies (considered Level 4 evidence) in the extent of experimental control and the ability to make causal inferences between treatment and effects (Barlow et al., 2009). The strength of SSED is based on high internal validity through the use of within-subject control. Extraneous variables are assumed to impact baseline and intervention phases equally for each individual participant. Therefore, the only difference between baseline and intervention is the treatment (Barlow et al., 2009). Target behaviors are operationally defined and repeatedly measured to evaluate individual change over time. A separate rater monitors whether treatment is implemented consistently across sessions (i.e., procedural fidelity) using a scoring system that can be verified by another rater (i.e., procedural reliability). Interrater reliability is also conducted to score participant responses (i.e., response reliability). External validity, or the ability to generalize findings to other individuals or a larger group, is established through replication of findings with additional individuals, settings, or behaviors (Barlow et al., 2009).

SSED encompasses several design options to address a variety of clinical questions from overall treatment efficacy to the relative effectiveness of two or more different treatments or treatment conditions (Holcombe, Wolery, & Gast, 1994). Our project used an adapted alternating treatments design (AATD) to compare outcomes from two treatment conditions. AATD involves the rapid alternation of two or more treatments for the same participant. The term *rapid alternation* signifies that the two treatments are counterbalanced and implemented one after the other within the same time frame such as a single session or day in order to control for order effects and extraneous variables (Holcombe et al., 1994). Different targets are selected for each treatment condition to control for carryover effects across conditions. Targets need to be functionally independent and comparable in difficulty. For instance, in this project, we used separate vocabulary targets in BI and EO conditions that were comparable in difficulty yet distinct in form and meaning.

For AATDs, an overall treatment effect is demonstrated by a visual difference between the baseline and intervention phases; an effect for a relatively better/best treatment is demonstrated by visually distinct rates of learning. When the rates of learning for two treatments overlap across repeated measures, the two treatments are considered to be equally effective. One treatment is considered to be more effective than the other when there is a separation between the rates of learning (i.e., nonoverlapping lines) and an overall greater performance in that treatment (Holcombe et al., 1994).

SSEDs are flexible in that modifications can be made during the treatment phase based on individual needs to improve the child's overall performance. This is consistent with clinical procedures used by SLPs and lends additional ecological validity to SSEDs. Causal inferences can still be made as long as modifications are well documented and other extraneous variables are controlled (Barlow et al., 2009). SSEDs provide a wide variety of methods to experimentally capture individual-level change and can contribute to the knowledge base concerning intervention with BI children.

Study Overview and Objectives

This was a “feasibility of concept” study in that our ultimate goal was to determine if a monolingual interventionist can implement treatment that promotes L1 and L2 development of a young BI learner with language impairment. To set the stage for investigating this question, two preliminary studies were needed to address specific teacher and parent concerns. In Study 1, we examined whether BI input in the classroom was confusing for the child as, up to this point, Vietnamese had been spoken exclusively at home, and English had been the sole language in his early childhood educational program. The concern was that the integration of both languages in a single context might be confusing and counterproductive. In Study 2, we examined whether BI input may take time away from learning English. The possibility that BI input may slow the pace of English vocabulary acquisition for the study participant was an unacceptable outcome for parents and teachers and so required direct investigation. Finally, in Studies 3 and 4, we examined the main research question by treatment of new vocabulary learning in the L1 and the L2 as well as generalization of these newly learned concepts. Of key interest was to examine project feasibility in a real-life setting to begin to address the practical issue of clinician–client language mismatch.

Based on research with typically developing BI children (Rolstad et al., 2005) and the few intervention studies available that include BI children with language disorders (for review, see Kohnert & Medina, 2009), we anticipated that a BI approach would not confuse the participant but rather would contribute to his overall language learning. Based on findings from previous intervention studies, we anticipated at least equal rates of learning for the BI and EO approaches (e.g., Thordardottir et al., 1997) if not a faster rate of learning using the BI approach (e.g., Perozzi & Sanchez, 1992). However, there are fundamental differences between the methods used in this study and those used in previous treatment studies. Namely, the interventionist in this project spoke solely English within an EO classroom and relied on computer interface to provide input in Vietnamese as well as English. These combined procedures may produce results that are very different from treatments administered by a BI interventionist using live interface.

GENERAL METHOD AND PROCEDURES

This project consisted of four brief treatment studies conducted with a single participant over a 6-month time period. In this section, we describe the participant; intervention setting; and elements of the experimental stimuli, design, and procedures shared across all studies. Details specific to each study are provided in separate sections.

PARTICIPANT

“Nam” was a BI Vietnamese–English preschool-age boy with moderate to severe language delay. He was born in the United States and lived with his parents and younger sister in a small Midwestern town. His parents were born in Vietnam and had earned college degrees in either Vietnam or the United States. They were BI and reported speaking Vietnamese more than 90% of the time at home.

Before this study, Nam, age 2;4 (years;months), was referred for an initial evaluation due to parental concern about his language skills. The school district's early intervention team conducted a developmental evaluation in the areas of cognition, language, motor, and social development. Nam qualified for early intervention services under the category of developmental delay with a secondary disability of speech/language impairment.

The early intervention team (including an SLP) assessed Nam's language skills in Vietnamese and English using the Sequenced Inventory of Communication Development (Hendrick, Prather, & Tobin, 1984) and the Bayley Scales of Infant and Toddler Development, 3rd edition (Bayley, 2006), which were administered during the initial evaluation in collaboration with a Vietnamese interpreter. Standard scores were not reported as these tests have not been normed for BI speakers. Instead, the early intervention team compared Nam's performance to typical child development using estimated age ranges. Based on the initial evaluation report, Nam demonstrated language comprehension and production skills at the 12- to 16-month level (chronological age was 28 months). He did not identify body parts, clothing, or household items, and he needed visual cues to follow simple one-step instructions. Expressively, Nam's parents reported that Nam used four words: *Ba* [dad], *Má* [mom], *cây* [tree], and *okay*. He babbled and used jargon while playing, he inconsistently initiated social interaction, and he often used adults' hands to reach for desired objects without visually "checking in" or making eye contact with others.

After receiving home-based intervention for 8 months, Nam transitioned to school-based services at age 3;1 and attended a special education classroom 3 days/week for 2.5 hr/day. Special services included 20 min/week of direct and 20 min/week of indirect speech-language services and 15 min/week of direct and 15 min/week of indirect occupational therapy. English was the sole language of instruction and classroom-based therapies. At the same time, Nam's SLP encouraged his parents to continue speaking with him in Vietnamese to help him develop his L1.

At the beginning of this project (at which time Nam was 3;11), the research team, which consisted of a BI Vietnamese-English SLP (first author), BI SLPs of Spanish and English (second and third authors), and Nam's teacher and parents, re-assessed Nam's language skills in Vietnamese and English using vocabulary checklists, language sampling, school and home observations, school progress notes, and parent report. Nam produced ~60 words in Vietnamese, which mainly consisted of nouns (e.g., household objects, animals, body parts, or clothing), relatively fewer verbs, and few to no adjectives. At home, Nam produced 1- to 2-word utterances in Vietnamese to make requests (e.g., *Mommy n* [Mommy eat], *đẹp vô* [clean up]) and comment on events (e.g., *mất rồi!* [(it's) gone!]). He answered basic *wh*-questions using 1- to 2-word utterances and gestures (e.g., pointing). He appeared to have difficulty answering unfamiliar or novel questions. When he did not know how to respond, he repeated part of the question rather than answering. Nam could imitate up to 3-word utterances such as *Cho con n* (Let me eat). He demonstrated initiation and turn-taking skills during one-on-one play with his mother. Nam's mother reported that he had made notable progress with therapy but agreed that Nam's Vietnamese language skills continued to be highly limited compared to other Vietnamese-speaking children his age.

Nam began learning English, his L2, upon entering school at age 3;1. At the start of this project (age 3;11), Nam's L2 expressive vocabulary consisted of less than 10 objects (e.g., *bus, spoon, crackers*), letter names, colors, numbers, and a few rote phrases such as *clean up* and *sit down*. (His mother reported that she taught him letters, colors, and numbers in English to prepare him for school.) In the classroom, Nam followed simple, familiar directions when they were paired with gestures. He did not respond to novel directions and primarily repeated the last words of questions rather than answering. During routine activities (e.g., snack), Nam answered choice questions when they were paired with a visual cue (i.e., showing him the two items that were available). In structured activities, Nam identified common objects when they were requested by name (single-word utterances). Most of his utterances were directed to teachers rather than peers. Teachers were concerned with Nam's limited social communication (e.g., greetings, turn taking). Although Nam demonstrated social communication inconsistently at home in his L1 with familiar communication partners, these skills were not demonstrated in English in the classroom. Nam passed his newborn hearing screening as well as a hearing screening conducted at age 3;1.

In sum, Nam, age 3;11, exhibited moderate to severe delays in language comprehension and production in both of his languages. At the start of this project, Nam had relatively greater skill in his L1 (although still significantly delayed), as demonstrated in his expressive vocabulary (60 words in Vietnamese vs. < 10 words in English), language production (2-word spontaneous utterances in Vietnamese vs. 1-word utterances upon imitation in English), language comprehension (answered basic *wh*-questions in Vietnamese vs. needing visual cues to follow simple instructions in English), and social communication skills (spontaneous in the L1 at home vs. elicited in the L2 at school). Nam's family gave their written consent to participate in this research project, which was approved by the institutional review board at the first and second authors' university and by Nam's teacher and SLP.

SETTING

Treatment was conducted on an individual basis in a quiet corner of Nam's special education classroom during free play or small-group work. The classroom consisted of two to four peers, one classroom teacher, one teacher's assistant, and an SLP. English was the language of classroom instruction and all other therapy. For this project, the professional trained to implement the experimental treatment was Nam's classroom teacher, who was an EO speaker with more than 20 years of experience working in early childhood special education. Nam's teacher was chosen as the interventionist for ecological validity as she was the primary educator who interacted with him on a daily basis. Having the classroom teacher conduct intervention ensured that Nam would consistently complete treatment activities at multiple times throughout his preschool day with the same familiar and trained educator. The first and third authors provided training on the treatment protocol and regular feedback on the fidelity of implementation at team meetings.

EXPERIMENTAL STIMULI

Target vocabulary items consisted of single words in Vietnamese and English embedded into the carrier phrase *Chỉ* ____ in Vietnamese or *Point to* ____ in English. Target items did not phonetically overlap across languages as Vietnamese and English do not share translation equivalents that are similar in form (e.g., *elefante* in Spanish and *elephant* in English). Vietnamese and English both use a Romanized writing system and share the common word order of subject-verb-object (for a comparison between Vietnamese and English, see Tang, 2006).

The first author, a BI SLP fluent in Vietnamese and English, audio-recorded each target vocabulary item in English, Vietnamese, and bilingually (English–Vietnamese and Vietnamese–English) using a digital audio recorder. An example of a BI English–Vietnamese presentation is *Point to apple. Chỉ táo*. Sentences were recorded using natural speech intonation, which consisted of a rising and falling pitch in both languages. In addition, speech intonation in Vietnamese included the production of lexical tones for each syllable that alter word meaning (Tang, 2006). For example, the word *má* with a rising tone means *cheek*, whereas *ma* with a level tone means *ghost*. Audio files were trimmed to play for approximately 3 s each using GoldWave 5.55 software (GoldWave, 2009). Target words were represented using black-and-white line drawings from the International Picture Naming Project (Szekely et al., 2004) in Studies 1 and 2 and using digital color pictures from public Internet sources in Studies 3 and 4.

Picture and audio stimuli were presented on a laptop computer using Microsoft PowerPoint software. Each Power-Point slide consisted of four pictures that depicted the target word and three foils from the same word class (e.g., action target with three action foils). Studies 3 and 4 targeted adjectives and used visually similar pictures that primarily differed on the target description (e.g., four kites, three with short tails and one with a long tail). Pictures were approximately 3 in. × 3 in. (7.6 cm × 7.6 cm) in size and were presented in a 2 × 2 array, separated by horizontal and vertical lines. The audio file with the target word was inserted into each slide to play automatically with the audio icon in the center of the slide (see Appendix A for an example). The complete set of experimental stimuli is available at www.vnspeechtherapy.com.

EXPERIMENTAL DESIGN AND PROCEDURES

All four studies in this project used AATD to compare BI and EO treatment conditions, which were alternated within the same treatment day and counterbalanced in order (i.e., first BI, then EO, or vice versa) to minimize potential confounding factors such as time of day and order effects. In addition, Studies 2, 3, and 4 incorporated an untreated Vietnamese-only (VO) condition that was measured in the home. Although treatment was not provided solely in Vietnamese, we probed target vocabulary from BI and EO conditions in the VO condition for ecological validity, considering the importance of developing Nam's L1, which naturally occurred in the home setting. Child performance was repeatedly measured across baseline and intervention phases. Separate vocabulary items were targeted in each condition.

For all studies, treatment was conducted 2 days/week, 2 times/day, for approximately 10 min each time. In each session, Nam and his teacher sat beside each other facing a computer screen. The teacher clicked the mouse to proceed to each PowerPoint slide. Nam listened to the audio recording instructing him to point to the target word. His teacher waited 3 s for Nam to respond (i.e., point to a picture). If there was no response, one repetition of the audio file was allowed. For Studies 2, 3, and 4, corrective feedback was provided after every item to reinforce learning of the target word. If Nam pointed to the correct picture, his teacher nodded her head, smiled, or said “you’re right,” “yes,” or “good job.” If Nam pointed incorrectly, his teacher replayed the audio file and pointed to the correct response while saying “listen again” or “this one.” Nam’s teacher scored his responses as correct, incorrect, or no response.

The first author served as the first independent rater and scored child responses and procedural fidelity for 100% of the sessions. The third author served as the second rater and independently scored child responses and procedural fidelity for 39%–72% of the sessions. Procedural fidelity was calculated as the percentage correct based on scoring by the first rater on all sessions. Procedural reliability was calculated as the percentage of agreement between the first and second raters based on the sessions in which the second rater was present. Response reliability was calculated as the percentage of agreement on scoring Nam’s responses by his teacher and the first rater based on all sessions.

STUDY 1

At the time of this study, Nam, age 3;11, had attended a special education preschool classroom for nearly 1 year. Although he was making progress, his teachers and staff wondered how much he was learning from this EO language environment. Nam often appeared distracted and had difficulty attending to classroom activities in his L2, English. The school consulted with the first author on this case, and one of the recommendations was to incorporate Nam’s L1 into his therapy. Because Nam’s two languages were used in specific contexts (i.e., Vietnamese at home and English at school), his parents and teachers were concerned whether BI input within the classroom would confuse him. Study 1 addressed this concern by asking (a) How would Nam respond to instructions spoken in English versus spoken in both Vietnamese and English? and (b) How would he respond to the use of technology as a means to listen to input in his two languages? The study was conducted in 10 sessions over a 2-week period.

METHOD

Experimental stimuli—Twenty-four common objects and actions (e.g., apple, eat) were selected that were reported to be familiar to Nam in his L1 and L2. His mother reported that Nam understood and produced all words in his L1, Vietnamese, and his teachers reported that he was exposed to these words in his L2 during classroom activities.

Experimental design and conditions—We used AATD to examine how Nam would respond to BI versus EO conditions in terms of accuracy and attention to task. Twenty-four target items were divided into three sets of eight words each. Sets were rotated across two conditions (BI and EO) so that each set would be used in each condition. A session consisted

of both conditions (BI and EO) separated by a 30-s musical and visual distracter. The order of conditions was counterbalanced across sessions to control for sequence effects. Within the BI condition, the sequence of languages was also counterbalanced (i.e., Vietnamese–English or English–Vietnamese). The dependent measures were vocabulary comprehension (number of items correctly identified) and attention to task (number of responses, whether correct or incorrect).

Procedure—This study followed the procedure outlined in the General Method section, with no corrective feedback.

Procedural fidelity and reliability—Procedural fidelity was based on five steps per trial in which the teacher (a) waited 3 s for Nam to respond, (b) clicked on the next slide within 1 s of his response, or (c) repeated the audio file if he did not respond, (d) did not look at the target picture, and (e) did not provide feedback regarding response accuracy. Procedural fidelity was calculated as 98% correct, procedural reliability was 98% agreement, and response reliability was 94% agreement.

RESULTS AND DISCUSSION

The top of Figure 1 displays the number of Nam's correct responses across 10 sessions. Nam performed more accurately in the BI condition, with an average of 3.4 of 8 correct (range 2 to 5), as compared to the EO condition, with an average of 2.2 of 8 correct (range 0 to 4). In addition, repeated measures in the BI condition were higher than in the EO condition in 8 of 10 sessions. It was noted, however, that Nam's overall accuracy across both conditions was low, with all but one data point at 50% correct (4 of 8 items) or lower. Given that these vocabulary items frequently occurred in Nam's environment and were reported to be produced in his L1 and at least understood in his L2, 90% or greater accuracy was considered typical performance. In contrast, Nam's low accuracy (< 50%) reflected his difficulties in comprehending language. Nam remained consistently low in accuracy throughout Study 1 as no corrective feedback was provided.

The bottom of Figure 1 displays Nam's attention to task as defined as the number of items in which he responded either correctly or incorrectly (i.e., response vs. no response). Nam initially responded more often in the BI condition, as demonstrated by a higher response level and nonoverlapping data points in Sessions 1 to 4. Nam consistently responded to 6 of 8 items or more in the BI condition throughout the study. His attention to task increased in the EO condition, and after Session 5, there was no difference in his number of responses across conditions (i.e., 6 of 8 in both conditions).

Overall, findings showed that Nam was not confused by the BI input. On the contrary, BI presentation facilitated Nam's attention to task, particularly at the initial stages of this new activity. Nam's accuracy was relatively higher in the BI condition than in the EO condition. Findings supported the use of both languages to engage the child. In addition, Nam appeared to respond well to the use of technology. Given that English was the sole language of classroom instruction, the use of technology appeared to be a useful and practical method of incorporating input in two languages.

STUDY 2

Findings from Study 1 indicated that BI input may be beneficial for Nam to improve his overall accuracy and attention to task. However, Nam's parents and teachers continued to question whether BI input would take away time from learning English in the classroom (i.e., less time on task for English learning). Study 2 examined this concern by posing the question: Does BI presentation interfere with English (L2) word learning? That is, would learning new words in English take longer in the BI condition? Nam was 4;2 at the start of Study 2. This study was completed in 12 sessions within a 1-month time period.

METHOD

Experimental stimuli—Researchers selected 10 vocabulary items from Study 1 that Nam knew in Vietnamese (L1) but not in English (L2) and divided them into five items in the BI condition and five items in the EO condition (see Appendix B for complete list). Each target word was presented in two consecutive PowerPoint slides (i.e., trials), with a different picture arrangement across Trials 1 and 2 to control for location bias. In the BI condition, Trial 1 was presented in Vietnamese and English (*Chỉ áo. Point to shirt*), and Trial 2 was presented in English only (*Point to shirt*). The purpose of the BI condition was to provide an opportunity to link the *known* Vietnamese word with the *unknown* English word (Trial 1) as well as to listen to the unknown English word separately (Trial 2). The EO condition mirrored the BI condition by including two trials for each target word (e.g., Trial 1 and 2 in English only). Across conditions, Nam heard a total of 10 exposures to target items in English and five exposures of the Vietnamese words in the BI condition.

Experimental design and conditions—Study 2 used AATD to compare the rate of learning across BI and EO conditions. Similar to Study 1, a session consisted of both conditions (BI and EO) separated by a 30-s musical and visual distracter. The order of conditions was counterbalanced across sessions to control for sequence effects. The dependent measures were the percentage of items correctly identified in each treatment condition (BI, EO) as well as in the untreated VO condition. Treatment conditions were probed at school by Nam's teacher; the VO condition was probed at home by the first author before and after treatment.

Procedure—The procedure was the same as Study 1, with the exception of the use of corrective feedback (see General Method section for details).

Procedural fidelity and reliability—Before and after treatment, procedural fidelity scoring was based on four steps in which Nam's teacher (a) waited 3 s for his response, (b) either clicked to the next slide within 1 s of his response or repeated the audio file upon no response and waited an additional 3 s, (c) did not look at the target picture, and (d) did not provide feedback. During treatment, procedural fidelity scoring was based on four steps in which Nam's teacher (a) waited 3 s for his response; (b) if correct, provided feedback (e.g., "that's right"); or (c) if incorrect, repeated the audio file; and (d) modeled the correct response (i.e., pointed to the correct picture). Procedural fidelity was calculated as 98% correct during baseline, 95% during treatment, and 98% following treatment. Procedural

reliability was 98% agreement at baseline, 97% during treatment, and 99% following treatment. Response reliability was 97% agreement in baseline, 100% during treatment, and 100% following treatment.

RESULTS AND DISCUSSION

Figure 2 displays the percentage of items Nam correctly identified across baseline, treatment, and posttreatment phases. Baseline data consisted of two repeated measures of all 10 items probed in BI, EO, and VO conditions and verified that the target words were known in Vietnamese (L1) and unknown in English (L2). Baselines for BI and EO conditions were low, stable, or declining before treatment, with accuracy at 20% or less. The VO condition was probed in the home 5 days later, at which time Nam performed at or above 90% accuracy. It was noted that before treatment, Nam's performance in the BI and EO conditions did not differ. That is, he did not appear to spontaneously use his L1 knowledge in the BI condition before treatment.

Results revealed no difference in Nam's rates of learning for BI and EO conditions, as demonstrated by overlapping lines in nine of 10 sessions. Starting in Session 8, Nam performed at 100% accuracy in both conditions. Note that the vocabulary targets were different in each condition. That is, Nam learned five English words in the EO condition and five different English words in the BI condition. Probes immediately following treatment as well as 2 and 3 months later showed that Nam maintained comprehension of L1 and L2 vocabulary (see Figure 2). Within this relatively brief period of time, Nam did not show loss in his L1 while he gained labels in his L2.

Findings indicated that BI presentation did not slow down the rate of Nam's new word learning in English. Nam learned words in his L2 just as rapidly via BI input versus EO presentations. This finding was consistent with a previous intervention study of an Icelandic–English child with language impairment who made equal gains in English across BI and EO conditions (Thordardottir et al., 1997). Our study showed that Nam was able to learn English words quickly and maintain his L1 and L2 receptive vocabulary months after treatment was completed.

In contrast to previous studies (e.g., Perozzi, 1985; Perozzi & Sanchez, 1992), the BI condition in this study, which included words that were known in the L1 and unknown in the L2, did not contribute to faster L2 learning. Contrastive findings may be due to differences in the learning context. Perozzi (1985) and Perozzi and Sanchez (1992) conducted treatment within a BI classroom by BI educators, whereas intervention in this project was implemented by an EO speaker in an EO classroom. This strong bias toward English may have limited opportunities for cross-linguistic transfer and the potential facilitative role of a BI approach. As shown in Figure 2, Session 3, Nam initially performed at 90% accuracy in the BI condition and 40% accuracy in English, which suggested that he used his Vietnamese knowledge to perform more accurately in the BI condition during the first treatment session. However, Nam's accuracy in the BI condition quickly decreased to 20% in the following session, which mirrored his performance in English. Nam may have (intentionally or unintentionally) stopped using his Vietnamese knowledge to his advantage given that the learning context was specific to English.

STUDY 3

Findings from Study 2 indicated that BI presentation did not interfere or slow down Nam's English (L2) learning, at least for words that were already known in his L1. Finally, we addressed the main question of whether an EO clinician could directly promote *new* learning in Nam's two languages. The main difference in this study was the selection of target vocabulary that was *unknown* to Nam in his L1 *and* L2. Because Nam's vocabulary inventory consisted of primarily nouns and verbs, this study focused on adjectives. At the start of this study, Nam was age 4;4. This study was completed in 12 sessions over 3 weeks.

METHOD

Experimental stimuli—Target words consisted of eight adjectives to describe physical characteristics (e.g., long), physical states (e.g., empty), and concepts (e.g., different) that were *unknown* to Nam in Vietnamese (L1) *and* English (L2) as per mother and teacher report. We divided the eight target words into four words in the BI condition and four words in the EO condition. Opposites were targeted in separate conditions (e.g., *full* in the BI condition and *empty* in the EO condition). To equate for difficulty, each condition consisted of two relatively earlier acquired words and two later acquired words (see Appendix B for full list). Age of acquisition was based on developmental norms for lexical acquisition among English-speaking infants and toddlers (Dale & Fenson, 1996).

Experimental design and conditions—Similar to Studies 1 and 2, Study 3 consisted of two treatment times per day. However, unlike the previous studies in which each treatment time consisted of one BI session and one EO session, in this study, each treatment time consisted of either two BI sessions or two EO sessions, separated by a 30-s distracter. Given that all targets were unfamiliar to Nam, we wanted to clearly separate conditions and provide a greater concentration of each condition per treatment time. We alternated the order of conditions across days (i.e., two BI sessions then two EO sessions in one day, followed by two EO sessions then two BI sessions the next day). Similar to previous studies, each target word was presented in two consecutive trials (i.e., Item 1, Item 1, Item 2, Item 2) for a total of eight trials per session (4 words $\times$ 2 trials each). The order of pictures differed between Trials 1 and 2 to control for location bias. The BI condition consisted of two Vietnamese–English trials for each target word. The VO condition was probed before and after treatment in the home.

Procedure—The procedure was the same as that used in Study 2.

Procedural fidelity and reliability—We used the same scoring system for procedural fidelity as the one used in Study 2. Procedural fidelity was 95% correct during baseline, 98% during treatment, and 98% following treatment. Procedural reliability was 98% agreement at baseline, 99% during treatment, and 98% following treatment. Response reliability was 96% agreement at baseline, 98% during treatment, and 100% following treatment.

RESULTS AND DISCUSSION

The top of Figure 3 displays the percentage of items Nam correctly identified across baseline, intervention, and post-intervention phases. Baseline data verified that target words were *unknown* to Nam in Vietnamese and English, as demonstrated by 0% correct in BI, EO, and VO conditions across two sessions before treatment. During treatment, the BI condition appeared to progress in a step-wise fashion, and there was relatively greater fluctuation in accuracy in the EO condition. However, there did not appear to be a difference in the overall rates of learning between BI and EO conditions, as demonstrated by nearly completely overlapping lines during treatment. Following treatment, Nam performed at 75% correct (3 of 4 targets) to 100% correct in the BI and EO conditions. In addition, he performed at 75% correct (6 of 8 targets) to 88% correct (7 of 8 targets) in the untreated VO condition (see Figure 3, top, Sessions 13 and 14). Results indicated an increase in Nam's ability to identify eight new descriptive words in both languages. Given that Nam was exposed to only four of eight words in Vietnamese in the BI condition, we anticipated a possible increase to 50% accuracy in the untreated VO condition. The higher rate of 75% or greater accuracy in the untreated VO condition was an unanticipated result, which we aimed to replicate in the next study (Study 4).

Results of this study showed that an EO-speaking interventionist could promote growth in a child's L1 and L2. When provided with repeated systematic input in both languages and corrective feedback, Nam was able to establish picture–word mappings for new receptive vocabulary. Given that vocabulary targets were relatively more abstract in this study (i.e., adjectives vs. concrete nouns), we conducted a study replication with additional picture exemplars (Study 4).

STUDY 4

Findings from Study 3 indicated increased vocabulary comprehension of eight new descriptive words in the L1 and L2. However, it was unlikely that Nam would have a complete understanding of these words with solely one pictorial exemplar for each item. In this study, we examined whether Nam could map his target vocabulary onto a different set of pictures, thereby demonstrating a certain degree of generalization, operationally defined as the use of newly learned receptive vocabulary to novel exemplars. Nam was age 4;5 at the start of Study 4, and the study was completed in 11 sessions over 2½ weeks.

METHOD

Experimental stimuli—We paired the same eight adjectives from Study 3 with a different set of picture exemplars. The pictures in this study were semantically unrelated to the pictures in Study 3. For instance, *small* was targeted in Study 3 using pictures of coins of different sizes, whereas in this study, *small* was targeted using balls of different sizes.

Experimental design and conditions—We used the same design and conditions as those used in Study 3 for the purpose of replication.

Procedure—We used the same procedure as that used in Studies 2 and 3 with one modification to respond to Nam’s difficulty with mapping the same concepts to different pictures. This modification involved the pairing of pictures from Studies 3 and 4 to help Nam make the connection between familiar and unfamiliar picture stimuli.

Procedural fidelity and reliability—We used the same scoring system for procedural fidelity as the one used in Studies 2 and 3. Procedural fidelity was 100% correct during baseline and 98% during treatment. Procedural reliability was 99% agreement during treatment. (Due to scheduling conflicts, no procedural reliability was calculated for baseline.) Response reliability was 100% agreement in baseline and 100% during treatment.

RESULTS AND DISCUSSION

The bottom of Figure 3 displays the percentage of items Nam correctly identified across baseline and intervention phases. Baseline data were 40% correct or less and ranged from 13% correct (1 of 8 items) to 38% correct (3 of 8 items) in the BI and EO conditions and 0% to 13% correct in the VO condition. Low baselines indicated that Nam had difficulty mapping his recently learned words to a new set of pictures, which suggested incomplete receptive vocabulary learning. During treatment, there was no difference in Nam’s rate of learning across the BI and EO conditions. However, there were large fluctuations in performance from session to session, with 50% to 70% discrepancies in accuracy between most of the first five treatment sessions (see Figure 3, bottom, Sessions 15 to 19). Large fluctuations in performance differed from the relatively step-wise increases found in Study 3 and suggested that Nam had difficulty mapping new pictures onto previously introduced target words.

We examined Nam’s fluctuation in performance by probing his maintenance in identifying picture stimuli from Study 3 (see Figure 3, top, Session 19). He responded correctly to 100% of the items in the EO condition but only 50% in the BI condition. This probe indicated that the emerging picture–word mappings may have been interfering with his previous mappings, at least in the BI condition. Not only was Nam ineffective in mapping target words onto new picture stimuli, previously acquired picture–word associations may have been weakening.

We decided to implement a modification during treatment so as to incorporate pictures from Study 3. We paired pictures from Studies 3 and 4 in Trials 1 and 2, respectively, for each target word to explicitly connect Nam’s prior knowledge (old picture) to new learning (new picture). Immediately within the sixth treatment session (see Figure 3, bottom, Session 20), Nam’s performance increased to 75% or greater accuracy across BI and EO conditions. In contrast to the large fluctuations in performance before this modification, Nam’s performance after the modification stabilized and ranged from 75% correct (3 of 4 items) to 100% correct for both sets of picture stimuli from Studies 3 and 4 (see Figure 3, top and bottom, Sessions 20 to 23). On the last day of treatment, Nam was probed in the VO condition, in which he demonstrated 88% accuracy (7 of 8 items) in Study 3 and 100% accuracy in Study 4 (Figure 3, top and bottom, Sessions 22 and 23).

Results of this study indicated that Nam did not spontaneously generalize his comprehension of newly learned words to a new set of pictures. Instead, he needed explicit pairing of old

and new pictures to strengthen the recently acquired picture–word mappings as well as to learn new mappings. Although not explicitly tested beyond two picture exemplars per target item, this study suggested that Nam may need additional picture exemplars to generalize his receptive vocabulary in order to begin to establish the link between word form and meaning.

Finally, this study replicated the finding from Study 3 of high generalization to the untreated Vietnamese condition. There are several possible explanations for this result. One explanation could be maturation. However, maturation as a sole explanation is unlikely given that each study was completed within a short period of time (3–4 weeks). Another explanation could be methodological in nature: Nam could have memorized all of the pictures and target words. However, great care was taken to rearrange the order of pictures for each trial. In addition, Nam had few opportunities to interact with stimuli as treatment was implemented for 10 min per session, and teachers and parents did not use picture stimuli outside of treatment. A final explanation could be that treatment contributed to Nam’s ability to attend to words that were already present in his home and school environments. Target items were developmentally appropriate for preschool-age children and may have frequently occurred in the natural environment. Completing intensive listening activities during treatment that mapped target words to pictorial representations may have heightened Nam’s awareness of these words and how they are used in context so that his performance increased during treatment and generalized to the untreated Vietnamese language. That is, what generalized across languages was Nam’s ability to take advantage of environmental input. This finding needs to be replicated with additional participants to continue to investigate cross-linguistic generalization patterns among BI children with language impairment.

GENERAL DISCUSSION

This project consisted of a series of four brief treatment studies that examined L1 and L2 receptive vocabulary learning in a Vietnamese–English BI preschooler with language impairment. Results replicated main findings from previous treatment studies (i.e., Perozzi, 1985; Perozzi & Sanchez, 1992; Thordardottir et al., 1997); namely, that BI approaches to vocabulary learning are just as effective as EO approaches for English (L2) word learning *and* have the additional benefit of promoting continued growth in a child’s L1. These findings with children with language impairment are consistent with mounting evidence with typical learners showing that BI support does not interfere with English learning and has the important advantage of developing a child’s two languages (Rolstad et al., 2005).

We also found that Nam’s social communication increased in the educational setting. Although not explicitly targeted in this project, parents and school staff noted a clear increase in the number of spontaneous “check-in” gazes Nam initiated with his teacher, which had been an initial area of concern related to his social communication. At the start of the project, Nam did not look at his teacher after pointing to pictures. When his teacher provided him with corrective feedback (e.g., modeling the correct response), Nam began to spontaneously look to her for feedback after nearly every response. By the end of the project, Nam’s teachers and therapists reported that he seemed more “tuned in” to others during classroom activities—a generalized skill they largely attributed to the intensive practice he received during treatment to listen and respond to feedback. This type of

intervention in combination with more context-embedded vocabulary learning activities can highlight new word forms in conjunction with connecting word forms to function using multiple exemplars embedded in meaningful L1 and L2 contexts.

This project uniquely contributes to the literature by focusing on the practical issue of clinician–client language mismatch. Due to the shortage of BI SLPs (in number and languages represented), the vast majority of BI children with communication disorders receive intervention in English by clinicians who do not speak the child’s L1 (ASHA, 2009, 2010; Kohnert et al., 2003). This project was an initial investigation of the feasibility of promoting L1 and L2 development in a fairly representative real-life setting (i.e., no school staff who spoke the child’s L1, limited educational materials available in the L1). The success of this project highlights key components that can be applied to future treatment studies with BI children, particularly when the clinician is *not* BI: (a) collaboration with BI SLPs, school staff, and the child’s family; (b) creation of therapy materials that include BI audio recordings; (c) use of computer technology; and (d) repeated measurement of a child’s two languages. Incorporating L1 computer-based activities in therapy is a concrete way to demonstrate that the L1 is valued. Audio recordings of native L1 speakers also serve as accurate models of phonology and grammar. Ready-made computer-based activities, such as the PowerPoint slides in this project, are highly adaptable for both screening and intervention purposes. For instance, the same slides can be used with a different language or to target additional vocabulary. PowerPoint slides and audio recordings from this project, as well as further information on Vietnamese language and culture and Vietnamese SLPs, are available at www.vnspeechtherapy.com.

Although this project was preliminary in nature, results of this participant can be representative of how other BI children may respond to BI approaches to language intervention (i.e., increased attention to task, motivation to complete computer-based activities). Dividing the complex task of vocabulary learning into smaller steps such as picture–word fast mapping, as was targeted in this project, provides increased opportunities to listen intensively and respond to the L1 and L2 as well as receive immediate feedback. This project also underscores the value of using SSED to measure treatment outcomes for real-life clinical cases, which can contribute to the knowledge base concerning intervention with BI children. Replication is needed to generalize these initial findings to other participants, BI groups, and language areas.

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APPENDIX A. EXAMPLE OF EXPERIMENTAL STIMULI FROM STUDY 2

Note. Experimental stimuli are presented in a 2 × 2 array of pictures on a Microsoft PowerPoint slide. An audio file is embedded into the slide to play automatically. Audio is represented by a speaker icon in the center of the slide on which you click for repeated play. In the bilingual condition, the child would hear *Chỉ áo. Point to shirt.*

APPENDIX B. LIST OF TARGET VOCABULARY

Study	Bilingual condition	English-only condition
2	Gối - Pillow	Blanket
	Áo - Shirt	Eye
	Mì - Noodles	Refrigerator
	Ôm - Hug	Talk
	Nút - Button	Tickle
3 and 4	Khác nhau - Different	Same
	Dài - Long	Short
	Ầy - Full	Empty
	Nhỏ- Small	Tall

Note. Target words for Studies 3 and 4 consisted of contrasting pairs of descriptive words. Within each word pair, one word was acquired relatively earlier than the other. Each treatment condition consisted of two relatively earlier acquired words (in boldface) and two later acquired words. Age of acquisition was based on developmental norms for English-speaking young children (Dale & Fenson, 1996).

Figure 1.

Two outcome measures for Study 1: (a) number of items correctly identified (top), and (b) attention to task (bottom) measured as the number of total responses, both correct and incorrect. The participant was not provided corrective feedback in this study. Procedural fidelity was calculated for all sessions (98% accurate). Underlined session numbers indicate sessions in which procedural reliability was calculated (98% agreement between first and second raters).

Figure 2.

Percentage of items correctly identified in Study 2 in which target vocabulary words were *known* in the participant's first language and *unknown* in his second language. Dotted lines separate (a) baseline from treatment phases between Sessions 2 and 3 and (b) treatment from posttreatment phases between Sessions 12 and 13. Procedural fidelity was calculated for all sessions (average of 97% correct across phases). Underlined session numbers indicate sessions in which procedural reliability was calculated (average of 98% agreement across phases).

Figure 3.

Percentage of items correctly identified in Study 3 (top) and Study 4 (bottom). In Study 3, dotted lines separate (a) baseline and treatment phases between Sessions 2 and 3 and (b) treatment and posttreatment phases between Sessions 12 and 13. In Study 4, dotted lines separate (a) baseline and treatment phases between Sessions 14 and 15 and (b) a modification to the treatment protocol between Sessions 19 and 20. The modification in Study 4 consisted of pairing pictures that were previously used in Study 3 with pictures from Study 4 to strengthen the connection between known and unknown picture stimuli and reinforce how a target vocabulary item can be represented with different picture stimuli. Procedural fidelity was calculated for all sessions (average of 98% correct across phases). Underlined session numbers indicate sessions in which procedural reliability was calculated (average of 98% agreement across phases).