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Dual language intervention in a case of severe speech sound disorder

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Resumen

En este estudio de caso único se presenta el caso e intervención en una niña bilingüe portugués-inglés con un trastorno fonológico grave. Se examina si la transferencia en la mejora del lenguaje se produce cuando se proporciona tratamiento en la primera lengua o en la segunda lengua, y si es más eficaz la intervención monolingüe o bilingüe. Esta niña bilingüe (con un bilingüismo secuencial) de 6 años 5 meses, recibió intervención en 3 etapas distintas con una duración de aproximadamente 2 meses cada una. Se consideraron cuatro procesos fonológicos comunes a ambas lenguas durante las condiciones monolingües y bilingües en cada etapa. La niña fue examinada con tests formales y un análisis de habla espontánea después de cada etapa. Los resultados indicaron que la transferencia ocurrió en ambas direcciones (L1 a L2 y L2 a L1) para algunos procesos, pero en general que la L1 se tuvo que abordar específicamente para lograr una mejoría significativa. Para ambas lenguas la condición bilingüe fue más eficaz. Una evaluación de seguimiento un año después de interrumpir el tratamiento en portugués reveló que la niña continuó presentando algún progreso únicamente en inglés (la única lengua tratada durante todo el año) y su fonología portuguesa aún mostraba los mismos errores que durante el año anterior. Este estudio proporciona evidencia adicional de que la intervención bilingüe es la opción óptima para los niños bilingües. Se discuten las implicaciones de la elección de la lengua utilizada en el tratamiento y se proponen futuros estudios.
Palabras clave: Bilingüismo; Intervención bilingüe; Trastorno del lenguaje.

Abstract

This single case study of a bilingual child with a severe speech sound disorder examined whether language transference occurs when treatment is provided in L1 or L2 and whether monolingual or bilingual intervention is most effective. A 6-year 5-month old sequential Portuguese/English bilingual female was seen for 3 separate intervention phases lasting about 2 months each. Four phonological processes common to both languages were targeted in either monolingual or bilingual conditions in each phase. The child's speech was examined with formal tests and analyses of spontaneous speech after each phase. Results indicated that transference occurred in both directions for some processes (L1 to L2 and L2 to L1), but in general L1 had to be specifically targeted for significant improvement to occur. For both languages, the bilingual condition was most effective. A follow-up assessment one year after Portuguese treatment was interrupted revealed that the child continued to make progress in English only (the only language treated for the entire year) and her Portuguese phonology still showed the same errors as in the previous year. This case study provides further evidence that bilingual intervention is the preferred choice for bilingual children. Implications for language choice and future studies are discussed.
Key words: Bilingual intervention; Bilingualism; Language disorders.

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Introduction

To date, not much is known about phonological intervention with bilingual children. Most research dealing with bilingualism in children focuses on the difficult issue of separating disorders from differences in this population (e.g., Anderson, 2012; Goldstein, 2012; Goldstein, 2006; Goldstein, Fabiano, & Washington, 2005; Preston & Seki, 2011), so that more precise and fair diagnostic decisions can be made. However, once a bilingual child has been diagnosed with a disorder, clinicians have very little guidance on what language to use for intervention, what targets to treat in each language if a bilingual approach is selected, and what treatment procedures to use (e.g., Gutierrez-Clellen, 1999; Kohnert, 2007; Thordardottir, 2010).

Some studies are available on language of intervention for language domains other than phonology. Perozzi and Sanchez (1992) examined learning of English prepositions and pronouns when treatment was provided in Spanish and English, versus English only. This is one of the few studies with a relatively large number of participants. There were 38 Spanish/English bilingual first graders with language impairments who were randomly assigned to two treatment conditions that targeted learning of English prepositions and pronouns: one group received treatment in Spanish first, followed by treatment in English and the other group received treatment in English only. The group who received treatment in Spanish and English took fewer trials to learn the targets in English.

Thordardottir, Weismer, and Smith (1997) examined vocabulary acquisition in monolingual versus bilingual intervention in a bilingual Icelandic/English child. In this single case study of a 4 year-11 month child with a language impairment, treatment was alternated from an English monolingual condition to an Icelandic/English bilingual condition. The child showed improvement in both conditions, with slightly better improvement in the bilingual condition. Because this was a single study design, it is impossible to eliminate the order effect, but it is clear that the bilingual condition did not have any negative consequence.

Tsybina and Eriks-Brophy (2010) also studied vocabulary acquisition in English/Spanish bilinguals. In this study of 12 participants with expressive vocabulary delays aged 22-42 months, half of the participants were assigned to a bilingual treatment group and the other half to a no treatment (delayed treatment) group. The participants in the treatment group received intervention for a period of six weeks in English by the primary investigator and concurrently in Spanish from their mothers, who received

specialized training to do so. There was no monolingual control group, therefore this study did not examine whether a bilingual or monolingual approach works best, but the children in the treatment group learned significantly more words than the children in the no treatment group. This result shows that bilingual intervention does not hinder development and that at least in the case of expressive vocabulary, when the speech therapist is not bilingual, parents can be successfully trained to supplement intervention being provided in L2 with vocabulary intervention in L1.

Seung, Siddiqi, and Elder (2006) examined language acquisition in a 3-year-old bilingual Korean/English child with autism. Intervention progressively moved from Korean only to English only in a two year period. In this study, the goal was to transition into English only and use the native Korean as a foundation language, so again there was no comparison between monolingual and bilingual conditions. The slow transition from the bilingual mode to the monolingual mode seemed to help this child improve English language skills, even though no attempt was made to monitor acquisition and maintenance of Korean.

Schoenbrodt, Kerins, and Gesell (2003) compared results of narrative intervention in English versus Spanish in a group of bilingual 6- to 11-year olds. Twelve children were assigned to either a group receiving monolingual intervention in English or a group receiving monolingual intervention in Spanish. No differences were found between the two groups, but because there was no control group with no treatment provided, it is difficult to say whether the improvement seen in both groups was due to the intervention.

Currently, there is only sparse evidence for the superiority of bilingual over monolingual intervention for language disorders. Kohnert, Yim, Nett, Kan, and Duran (2005) and Gutierrez-Clellen (1999) make strong cases for the use of both languages in language intervention. However, there is no evidence that bilingual intervention is inferior and given that most bilingual children need to communicate with their families and in their communities in their native language, it only makes sense that bilingual intervention be provided whenever possible. As seen in the study by Tsybina and Eriks-Brophy (2010), when the speech therapist is not able to provide bilingual intervention for expressive vocabulary, parents can be successfully trained to help fill that gap.

All the studies reviewed above investigated the effect of bilingual intervention in non-phonological areas of language (e.g., vocabulary, prepositions, and narratives), therefore it is difficult to draw any conclusions pertaining to phonology and speech sound

disorders. Speech sound disorders in bilingual children show unique characteristics because exposure to more than one language usually causes cross-linguistic influences from one language to the other (Fabiano-Smith & Goldstein, 2010; Goldstein & Kohnert, 2005; Goldstein, 2001). In general, bilingual children who are either normally developing or have speech sound disorders produce sounds that are shared by both of their languages more accurately than those that are unique to each language (Goldstein, 2004). It is unclear how intervention in one language affects the other language. More transference may be expected in languages that are phonologically more similar (many shared sounds), and the more unshared sounds the two languages have, the more likely it is that intervention will need to take place in each language separately for those unshared sounds. Some sparse evidence suggests that for some shared sounds, intervention provided in one language will transfer to the other. Holm and Dodd (2001) examined 2 case studies. One was a 5-year 2-month Cantonese-English bilingual. This child received therapy for a distorted /s/ (lisp) in English only and improved production generalized to the untreated Cantonese as well. However, when phonological treatment was provided in English only for Consonant Cluster Reduction and gliding, improvement was only seen in English, with no transference to Cantonese. The authors argued that an articulation only deficit such as a lisp (a motor deficit) is not language specific and therefore, it is not surprising that transference occurred. The lack of transference in phonological processes was attributed to its linguistic nature, which is language specific. However, since the same processes occurred in both languages, it is not clear how this specificity applies. Their second case study was a 4-year 8-month Punjabi-English bilingual. This child's main difficulty was that his speech production was highly inconsistent. Intervention in one language (English) improved production in both languages. However, this study focused on improving consistency of production only and not necessarily correct production. The authors attributed this 'intervention transfer' to the fact that 'the ability to assemble a phonological plan for word production is not language-specific' (p.171).

Another study that focused on one language only was done by Pihko et al. (2007) on a group of bilingual Swedish-Finnish children with Specific Language Impairment (SLI) aged 6 to 7 years old. However, this study only measured improvement in phonological discrimination in Finnish as it related to changes in brain activity. It is unknown, whether there was any effect on L1 (Swedish) or whether intervention in L1 would have hindered or increased improvement.

Speech-Language Pathologists in the United States usually provide therapy in English to bilingual children and hope that skills will transfer to the other language. In a survey of speech-language pathologists who work with bilingual children, Kritikos (2003) found that the overwhelming majority of them feel unprepared to work with this population. Ideally, there should be enough bilingual speech-language pathologists to work on the hundreds of different languages that children may speak in particular communities. Realistically, most bilingual children will receive services in L2. Case studies can provide valuable information for speech-language pathologists who take Evidence-Based Practice seriously (Kohnert, 2007).

This case study examined the intervention progression of a Portuguese/English bilingual child with a severe speech sound disorder to determine whether:

1) Intervention in L2 (English) transfers to L1 (Portuguese) production;
2) Intervention in L1 (Portuguese) transfers to L2 (English) production; and
3) Bilingual intervention is more effective than monolingual intervention.

Method

The child (AZ) was a 6-year 9-month old sequential Portuguese/English bilingual female at the time the study started. Her mother reported that AZ was born in Brazil where she spoke only Portuguese and moved to the US with the family at 4 years and 2 months. She started attending pre-school in the US at age 4;4, when English was first introduced. Both parents continued to speak only Portuguese to AZ. AZ's sister, who is 4 years older, speaks only English to her. While still in Brazil, AZ received speech therapy in Portuguese from ages 3;6 to 4;2. In the US, she has been receiving speech therapy in English twice a week since she started preschool at age 4;4. Currently, English is AZ's dominant language. She can have a conversation in Portuguese, but often has difficulty finding words and prefers to switch to English. At the time the study started, AZ was beginning 2nd grade. Both her parents and teachers reported that her speech was highly unintelligible in both languages even to familiar listeners. The following formal and informal assessments were administered prior to intervention:

a. Hearing screening at 25 dB HL in the frequencies 500, 1K, 2K, and 4K Hz to rule out a hearing loss.

b. Screening of non-verbal intelligence with the Matrices subtest of the Kaufman. Brief Intelligence Test (K-BIT, Kaufman & Kaufman, 1990).
c. Kaufman Speech Praxis Test for Children (KSPT, Kaufman, 1995) to rule out Childhood Apraxia of Speech.
d. Goldman-Fristoe Test of Articulation -2 (GFTA-2, Goldman & Fristoe, 2000)
e. Phonological subtest of the Andrade-BefiLopes-Fernandes-Wertzner (ABFW): Teste de Linguagem Infantil nas Areas de Fonologia, Vocabulario, Fluencia, e Pragmatica (Test of Child Language in the Areas of Phonology, Vocabulary, Fluency, and Pragmatics) (Andrade, Befi-Lopes, Fernandes, & Wertzner, 2004).
f. Spontaneous speech sample in English and Portuguese.

AZ passed the hearing screening and scored at the average level on the K-BIT and KSPT, denoting normal hearing, at least average non-verbal intelligence and no overt signs of apraxia of speech. She scored below the 1st percentile on the GFTA-2 (standard score = 43; age-equivalent = 2;3). No standard scores are available for the ABFW. An examination of her errors in both the GFTA-2 in English and the ABFW in Portuguese revealed that most of her errors in both languages could be accounted for with the following phonological processes:

Backing of alveolar stops (t and d → k)
Consonant cluster reduction (pl → p; br → b)
Devoicing (of all fricatives and stops except /b/)
Fronting of palatal fricatives (ʃ and ʒ→ s)

These processes were therefore selected for intervention and all results from elicited single word testing and spontaneous speech are reported in the Results section as percentage of occurrence of these processes in possible environments. Three intervention phases lasting approximately 2 months each were provided in this sequence:

1. English intervention by the second author targeting backing of alveolar stops and consonant cluster reduction in 1 hour sessions twice a week, and Portuguese intervention by the first author targeting pre-vocalic devoicing

and fronting of palatal fricatives in 1 hour sessions twice a week (for a total of 4 hours/week).

2. English and Portuguese intervention by the first author (1 hour/week in Portuguese and in 1 hour/week in English) targeting backing of alveolar stops, consonant cluster reduction, fronting of palatal fricatives and pre-vocalic devoicing in both languages. (during this period, AZ was also receiving English only intervention at school in a group setting, which mostly targeted backing of alveolar stops and consonant cluster reduction in spontaneous speech. The second author was also the provider for the school, so she made sure to address those targets only indirectly in spontaneous production. The individual sessions with the first author were highly structured and focused exclusively on the above mentioned targets in controlled productions.).
3. English only interventioby the second author in 1-hour sessions twice a week targeting backing of alveolar stops, consonant cluster reduction, pre-vocalic devoicing, and fronting of palatal fricatives.

This sequence was chosen to allow single language intervention for two processes in the first phase (backing of alveolar stops and consonant cluster reduction in English, and pre-vocalic devoicing and fronting of palatal fricatives in Portuguese), followed by intervention of all processes in both languages in the second phase, and intervention of all processes in English only in the final phase. It is important to note that even though in phase 2 different processes were targeted in each language, there was no phase in which the child received intervention exclusively in Portuguese, while she received intervention exclusively in English in phases 1 and 3. This serious limitation was unavoidable as the language of the school was English and intervention in English could not be stopped. Given the time limitations for this study, the authors aimed to obtain a picture of the child's performance after intervention in each of the languages separately, as compared to both languages at the same time in the first and second phases. Phase three and one-year post intervention assessment aimed at checking the effects of dropping the child's first language from intervention, which is the most common intervention method used in the United States. Table 1 summarizes the processes and language(s) targeted in each phase.

Table 1. Processes and language(s) targeted in each treatment phase

Processes	**Phase 1**	**Phase 2**	**Phase 3**
Backing	English	Eng/*Port*	English
CCR	English	Eng/*Port*	English
Deviocing	*Portuguese*	Eng/*Port*	English
Palatal fronting	*Portuguese*	Eng/*Port*	English

Treatment procedures included auditory discrimination training in isolation and words; and production training in isolation, syllables, words, and phrases. Minimal pairs were often used in drill-play sessions to emphasize meaning differences (e.g., /si/ versus /ʃi/, as in "sea-she"; /ti/ versus /ki/ as in "tea-key"; /zu/ versus /su/ as in "zoo-Sue"; and /stɛɻ/ versus /tɛɻ/ as in "stair-tear"). At the end of each phase, AZ was re-evaluated with the GFTA, ABFW, and spontaneous speech production was recorded, transcribed and analyzed to measure progress in each language. In addition, one year after completion of this study, the child was re-assessed with the GFTA and ABFW to check for phonological errors in single word productions and new speech samples were collected to check for the same errors in spontaneous speech. During this period, the child had continued to receive speech therapy in English only at her elementary school. No treatment was provided in Portuguese. According to her speech therapist, treatment focused on generalizing the use of alveolars, consonant clusters, palatal fricatives, and voicing in spontaneous conversation.

Results

Backing

Prior to the start of intervention, AZ used backing in single word productions 85% of the time in English and 83% of the time in Portuguese. In spontaneous speech, the percentages were 73% for English and 93% for Portuguese. After phase 1 of intervention (English only), English single word productions were at 62% and spontaneous speech at 86.6%. In Portuguese (not treated), single word productions were at 75% and spontaneous speech at 85.5%. After phase 2 (English and Portuguese intervention), English single word productions were at 38% and spontaneous speech at 55.8%. In Portuguese, single word productions were at 8% and spontaneous speech at 43%. After the final phase (English treatment only), English single word production and spontaneous production

were both at .08%. In Portuguese, single word productions were at 0% and spontaneous speech at 38%. Figure 1 summarizes the results for use of backing.

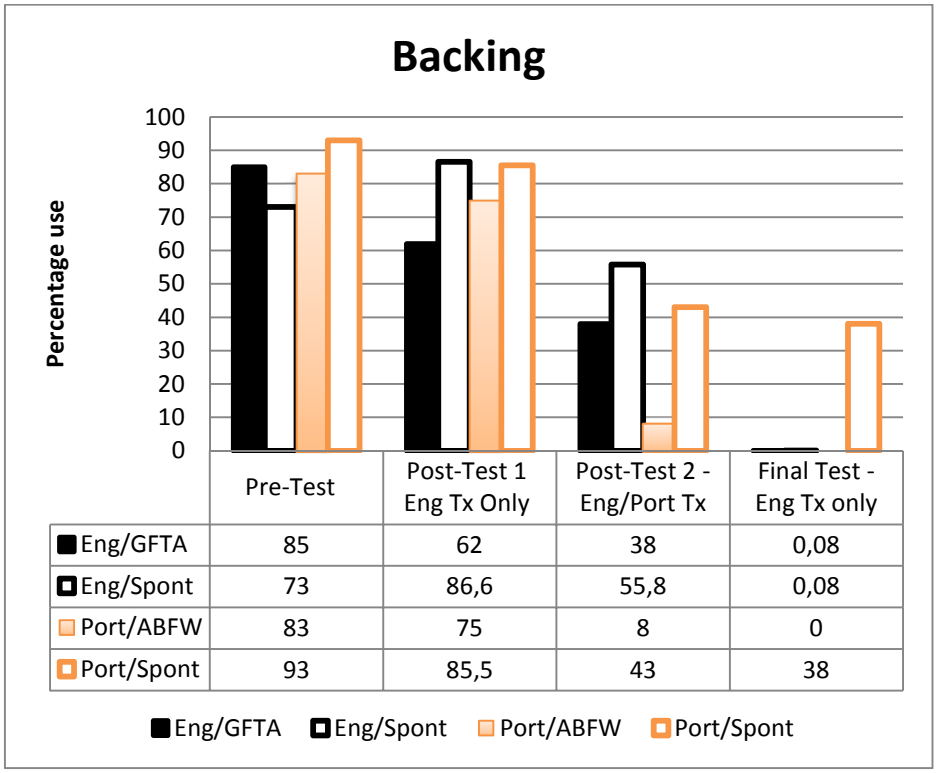
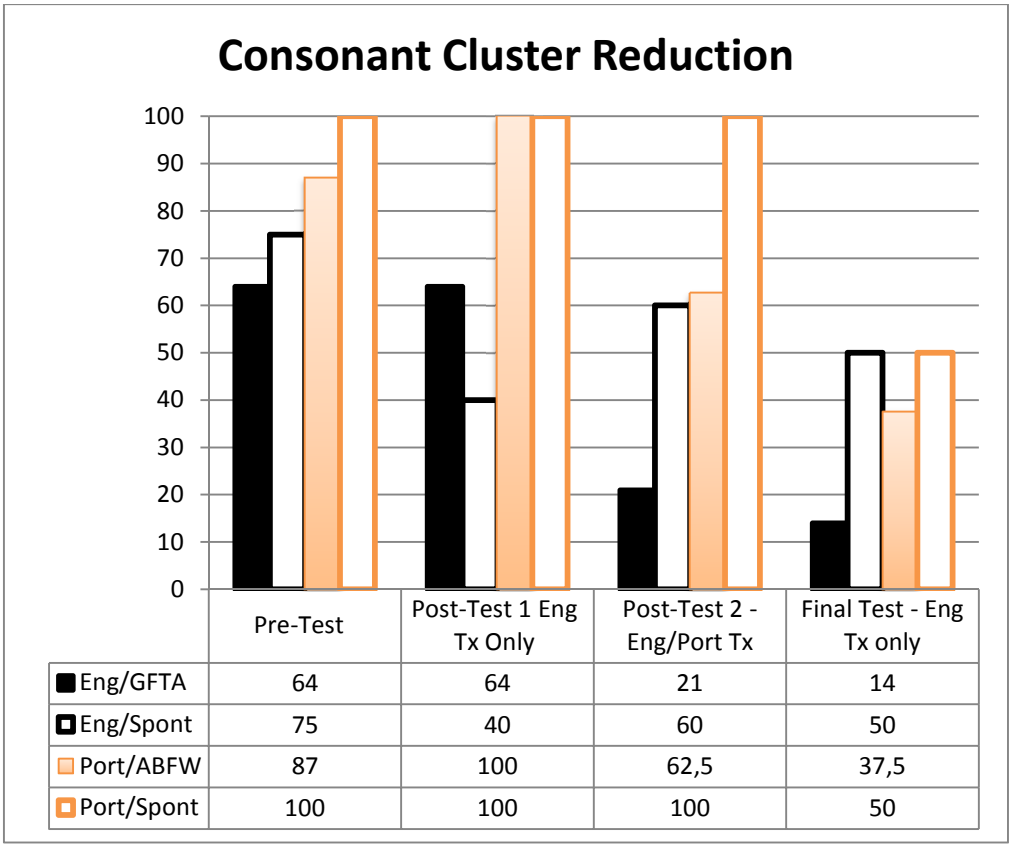


Figure 1. Percentage use of Backing across time for single-word and spontaneous speech in each language.

Consonant Cluster Reduction

Prior to the start of intervention, AZ used consonant cluster reduction in single word productions 64% of the time in English and 87% of the time in Portuguese. In spontaneous speech, the percentages were 75% for English and 100% for Portuguese. After phase 1 of intervention (English only), English single word productions were at 64% and spontaneous speech at 40%. In Portuguese (not treated), single word productions and spontaneous speech were both at 100%. After phase 2 (English and Portuguese intervention), English single word productions were at 21% and spontaneous production at 60%. In Portuguese, single word productions were at 37.5% and spontaneous speech at 50%. After the final phase (English treatment only), English single word productions were at 14% and spontaneous production at 50%. In Portuguese, single word productions were at 37.5% and spontaneous speech at 50%. Figure 2 summarizes the results for use of Consonant Cluster Reduction.



	Pre-Test	Post-Test 1 Eng Tx Only	Post-Test 2 - Eng/Port Tx	Final Test - Eng Tx only
Eng/GFTA	64	64	21	14
Eng/Spont	75	40	60	50
Port/ABFW	87	100	62,5	37,5
Port/Spont	100	100	100	50

Figure 2. Percentage use of Consonant Cluster Reduction across time for single-word and spontaneous speech in each language.

Devoicing

Prior to the start of intervention, AZ used devoicing in single word productions 59% of the time in English and 48% of the time in Portuguese. In spontaneous production, the percentages were 83% for English and 80% for Portuguese. After phase 1 of intervention (intervention in Portuguese only), English single word productions were at 18% and spontaneous production at 59.5%. In Portuguese, single word productions were at 30% and spontaneous speech at 71.4%. After phase 2 (English and Portuguese intervention), English single word productions were at 0% and spontaneous production at 57.4.8%. In Portuguese, single word productions were at 0% and spontaneous speech at 88.5%. After the final phase (English treatment only), English single word production and spontaneous production were at .03 and .06% respectively. In Portuguese, single word productions were at 0% and spontaneous speech at 30%. Figure 3 summarizes the results for use of Devoicing.

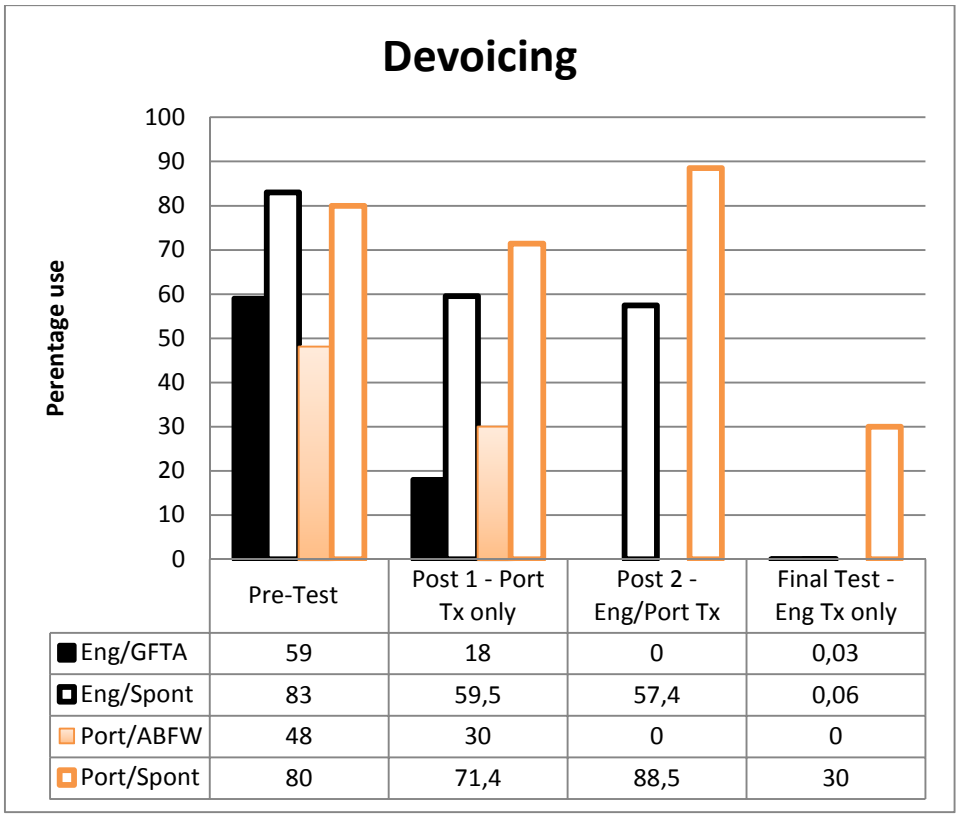
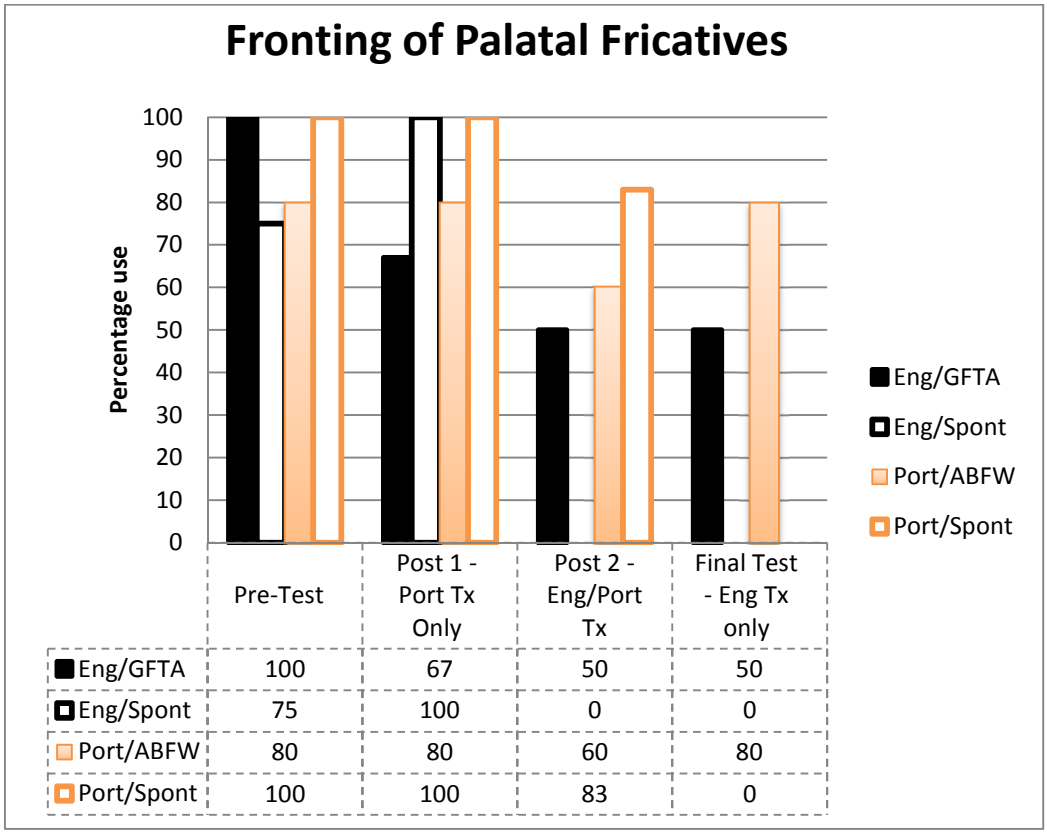


Figure 3. Percentage use of Devoicing across time for single-word and spontaneous production in each language.

Fronting of Palatal Fricatives

Prior to the start of intervention, AZ used fronting of palatal fricatives in single word productions 100% of the time in English and 80% of the time in Portuguese. In spontaneous production, the percentages were 75% for English and 100% for Portuguese. After phase 1 of intervention (intervention in Portuguese only), English single word productions were at 67% and spontaneous production at 100%. In Portuguese, single word productions were at 80% and spontaneous speech at 100%. After phase 2 (English and Portuguese intervention), English single word productions were at 50% and spontaneous production at 0% . In Portuguese, single word productions were at 60% and spontaneous speech at 83%. After the final phase (English treatment only), English single word productions were at 50% and spontaneous production at 0%. In Portuguese, single word productions were at 80%, but unfortunately there were no opportunities for AZ to use these sounds in spontaneous speech in either Portuguese or English after the final phase and in English after phase 2, therefore no data was collected at these times. Please note that these missing data are reported as zero in the graph because the graphing

program interprets "no data" as zeros. Figure 4 summarizes the results for use of Fronting of Palatal Fricatives.



	Pre-Test	Post 1 - Port Tx Only	Post 2 - Eng/Port Tx	Final Test - Eng Tx only
Eng/GFTA	100	67	50	50
Eng/Spont	75	100	0	0
Port/ABFW	80	80	60	80
Port/Spont	100	100	83	0

Figure 4. Percentage use of Fronting of Palatal Fricatives across time for single-word and spontaneous production in each language.

Follow-up after one year

Table 2 shows percentage usage of phonological processes in English and Portuguese single word productions (GFTA and ABFW) right after treatment was completed as compared to one year later, when treatment was being provided in English only. Table 3 shows the same in spontaneous productions.

As can be seen in Tables 2 and 3, English phonology continued to improve and phonological processes are mostly eliminated in single words and spontaneous speech (except depalatalization). On the other hand, Portuguese phonology remained stable with slight improvement in single word production and slight worsening or no improvement seen in spontaneous speech, thus confirming that processes must be treated in each language.

Table 2. Percentage use of phonological processes in single-word testing immediately after treatment and after 1 year.

Single-Word Testing	**Post treatment**		**Follow-up 1 year**	
	English	Portuguese	English	Portuguese
Backing	8%	0%	0%	0%
Devoicing	3%	6%	0%	0%
Palatal fronting	*50%*	*80%*	0%	65%
Cons. cluster reductio	*14%*	*37%*	0%	35%

Table 3. Percentage use of processes in spontaneous speech immediately after treatment and after 1 year

Single-Word Testing	**Post treatment**		**Follow-up 1 year**	
	English	Portuguese	English	Portuguese
Backing	8%	38%	0%	31%
Devoicing	6%	30%	0%	34%
Palatal fronting	*No data*	*0%*	18%	0%
Cons. cluster reduction	*50%*	*50%*	0%	69%

Discussion

In trying to determine how language transference occurred during treatment and whether mononlingual or bilingual intervention was more effective, we must look at the results of this study separately for the different phonological processes targeted. The process of backing had many more opportunities for occurrence than any others. Alveolars are some of the most common sounds in both English and Portuguese. Therefore, we would expect more transference to occur for this process. On the other hand, this was also the process that was most consistently used in both languages, and therefore most resistant to change in a child who has been using it for so many years (the child was close to 7 years old at the start of the study).

In accordance with this transference hypothesis, Portuguese production of alveolars improved slightly after English only treatment (after phase 1, use of backing in single word production went from 83 to 75% and in spontaneous speech from 93 to

85.5%). However, the greatest improvement occurred when bilingual Portuguese-English intervention was provided (8% in single words and 43% in spontaneous speech). A similar picture was true for English. When English only intervention was provided, there was some improvement in English (from 85 to 62% in single words, but no improvement in spontaneous speech). Bilingual intervention provided more pronounced improvement in English as well (38% use in single words and 55.8% in spontaneous speech). After the second English only intervention (phase 3), Portuguese production was maintained, but not improved to the same level as English, especially in spontaneous speech, which showed no improvement from phase 2 to 3. The results from intervention for backing clearly suggest that even though transference occurred from English to Portuguese, results were better for Portuguese in the bilingual condition. English performance also seemed most improved under the bilingual condition, but we cannot discount that the improvement seen after phase 2 may also be due to more time spent working on English (phase 1 and 2, as opposed to just phase 2 for Portuguese).

Similarly to backing, Portuguese production of consonant clusters showed no improvement after English only treatment (after phase 1). Single word production in Portuguese improved only when Portuguese intervention was provided (phase 2), though this improvement did not generalize to spontaneous speech. After the second English only intervention (phase 3), Portuguese production continued to improve and was at comparable levels to English in spontaneous speech. English production in single words also seemed to improve the most under the bilingual condition, and continued to improve after Portuguese intervention was discontinued. In spontaneous speech, improvement was limited under all conditions. Again, it seemed that Portuguese clusters had to be specifically targeted for improvement to occur, but the progress continued even after Portuguese was withdrawn. English has more clusters than Portuguese, which may explain this transference from English to Portuguese.

For devoicing, English production showed marked improvement in both single words and spontaneous speech after Portuguese only treatment (after phase 1). When both languages were treated (phase 2), there was marked improved for both languages in single word production, but spontaneous speech did not improve. Both languages showed marked improvement in spontaneous speech after English only intervention was provided (phase 3). English and Portuguese have similar voicing contrasts and rules, which may explain why transference occurred in both directions.

For fronting of palatal fricatives: English production showed improvement in single words after Portuguese only treatment, but Portuguese showed no improvement at all in either single words or spontaneous speech. When both languages were treated (phase 2), Portuguese single word productions and spontaneous speech showed some improvement and so did English single word production. Spontaneous speech in English after phase 2 and in Portuguese and English after phase 3 could not be measured because of lack of opportunities to use palatal fricatives. When English-only intervention was provided, single word production remained unchanged in English and worsened in Portuguese. It seems that for fronting of palatal fricatives, Portuguese had to be specifically targeted for any improvement to occur. One phenomenon often observed by the first author was AZ's struggle to remember which sound to use in Portuguese words (e.g. /s/ vs /ʃ/). Because Portuguese is her weaker language, some of this difficulty may be due to a weakened phonological memory for Portuguese words.

Most strikingly, after Portuguese treatment was discontinued and English became more established as the child's dominant language, there was no further improvement in her Portuguese phonology. Although this child is now predominantly an English speaker and has become highly intelligible in English, the language of her parents and extended family is still Portuguese, a language in which the child in still highly unintelligible. Moreover, when speaking to the Portuguese speaking first author, this child expressed much pride in being able to speak to her in Portuguese and clearly stated a desire to continue speaking Portuguese to her family. Due to her highly unintelligible speech in Portuguese, communication breakdowns with the first author were common and must be so with her family as well.

In summary, this study found that even though some transference occurred between languages in both directions (L1 to L2 and L2 to L1), bilingual intervention seems to be most effective. Though not ideal, providing intervention in English only was effective in promoting English improvement. Therefore, it seems that monolingual English intervention may be adequate for a bilingual child whose dominant language is English. However, considering that it is important for this child to be fully intelligible in Portuguese, so that she can effectively communicate with her family, and the fact that very little improvement was seen in Portuguese when only English was treated, every effort should be made to provide intervention in the L1 as well. If the therapist does not speak the language, perhaps a parent or sibling can be instructed to provide instruction in the L1.

There are several limitations with this study that must be taken into account. First and foremost, this is a single child and the results may not generalize to other bilingual children. However, this single case concurs with some studies that compared monolingual and bilingual intervention for language disorders and also found that a bilingual approach was superior to a monolingual one (e.g. Perozzi & Sanchez, 1992; Tsybina &Eriks-Brophy, 2010). There is still a lack of evidence for intervention in cases of speech sound disorders, so this case study is only a small step towards determining whether a monolingual or bilingual approach works best.

Another limitation of this study is that this child had a particularly severe speech sound disorder at an older age than is commonly seen in other children. This severity may have affected the results of the study. The advanced age may also add a confound of lexical representation and phonological memory. This child seemed to have internalized some of her error productions as part of the lexical items, particularly for her weaker language. For this reason, in addition to learning the correct productions, she may have had to relearn the phonetic shape of each word. Finally, because some sounds were targeted in a monolingual condition and then again in the bilingual condition, the additional time spent on intervention may have been responsible for some results. There was also additional time spent on English intervention because the school mandated therapy was provided in English during portions of this study. As mentioned in the Methods section, the second author was also the provider for the school, so during the bilingual phase of the study, she made sure to address those targets only indirectly in spontaneous production. The individual sessions with the first author were highly structured and focused exclusively on the above mentioned targets in controlled productions. However, it is important to note that even though the child was receiving more therapy in English than in Portuguese during this bilingual condition, both her English and her Portuguese showed more progress in this condition. This result can be interpreted as further evidence that a bilingual approach was better for her Portuguese performance even when more time was spent in English than in Portuguese. Future research should focus on eliminating theses type of confounding variable as well as examining the effects of severity level in groups of participants.

The authors would also like to direct the readers' attention to an important methodological limitation of this study. As explained in the Methods section, there was one intervention phase (phase 2) when different processes were targeted in each language separately, however, there was no phase in which the child received intervention

exclusively in Portuguese, while she received intervention exclusively in English in the other 2 phases. This serious limitation was unavoidable as the language of the school was English and intervention in English could not be stopped. It is quite possible that different results would be obtained if this child had the opportunity to truly receive intervention in Portuguese only.

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