

Evidence Based Systematic Review of Aphasia Therapy for Bilingual Individuals

Abstract

Relatively little is known about the best practices for language therapy in bilingual aphasia. This systematic review examined three crucial questions faced by speech-language pathologists during clinical decision making: outcomes when language therapy is provided in the secondary language (L2), extent of cross-language transfer (CLT) and variables that influence CLT, and outcomes when language therapy is mediated by a language broker. Data from 14 studies (N=45 aphasic individuals) indicate that treatment in L2 leads to positive outcomes (akin to L1 treatment); CLT occurred in about half of the studies, especially when L1 was the language of treatment.

1. Introduction

More than half the world (and a rapidly growing US demographic) is bilingual. Hence the occurrence of bilingual aphasia is more common than what can be gleaned from the literature. A recent survey of SLPs who worked with adults in the United States revealed that a majority felt that their academic and clinical training left them inadequately prepared for assessment and treatment of bilingual aphasic clients (Centeno, 2009). Further, SLPs expressed dissatisfaction with the amount of information available to guide treatment decisions. Centeno's (2009) survey presents the rather disturbing possibility that a significant proportion of the world's aphasic clients' communicative needs may be compromised due to a limited knowledge base.

Providing language treatment to bilingual clients poses unique challenges, such as, access to bilingual assessment and treatment materials and availability of bilingual SLPs. There is also an important and largely unresolved conceptual challenge in the

treatment of bilingual aphasia — *whether to include both languages in treatment, or focus on a single language. If unilingual therapy is used, should one use the first or second language?* From a neurolinguistic perspective, bilinguals possess an intermixed lexical and morphosyntactic organization (Golestani et al., 2006; Gollan et al., 2005; Kroll & Stewart, 1994). The intermixed neurolinguistic organization is not only used to make the case for bilingual therapy, but can also be used to argue that unilingual therapy will automatically transfer to the untrained language (henceforth cross-language transfer, CLT) because of stimulation of shared neural networks (Kohnert, 2009; Watamori & Sasanuma, 1978). Discussions of variables that influence success of CLT have questioned whether the first (L1) and second (L2) languages are equipotent in their prospects for language gains. Another unresolved question is *whether any factors (demographic, linguistic, aphasia-related, or otherwise) help predict success with L2 therapy and CLT?*

This paper describes the findings of an evidence-based systematic review (EBSR) conducted by the American Speech-Language-Hearing Association's (ASHA's) National Center for Evidence-based Practice in Communication Disorders. The primary aim of this review is to synthesize and analyze the existing data on aphasia treatment for bilingual individuals. Knowledge of the current evidence is likely to assist SLPs in therapeutic decision making. In addition, it is hoped that this review will serve to highlight the empirical strength of the current evidence (or lack thereof) and identify unresolved questions in need of further research.

Prior to initiating the systematic review of the literature, clinical questions were formulated under three broad focus areas: (a) the effect of L2 therapy; the impact of L1 therapy on L1 outcomes in bilingual individuals was not a crucial issue because this is

analogous to examining the efficacy of aphasia therapy in the native language of monolingual clients; (b) the occurrence of CLT in both directions (L1 to L2 and L2 to L1); and (c) the effect of therapy that was mediated by a language broker when the therapist and client spoke different languages. Given that receptive and expressive language abilities can be relatively independent and treatment does not always generalize across both modalities, we decided to examine treatment effects on expressive and receptive language in separate analyses. Finally, we synthesized pertinent variables such as age of participant, age of L2 acquisition, pre-morbid proficiency in each language, language of the environment, aphasia characteristics, and time post onset to determine factors that might impact outcomes.

2. Method

2.1. Literature search

A literature search was conducted during July and August 2009. Research studies were identified from 29 electronic databases using keywords pertaining to bilingualism or multilingualism and aphasia. Inclusionary criteria used to determine eligibility were: research studies published in peer-reviewed English journals from 1980 to August 2009 with original data pertaining to the EBSR question(s), studies that included bilingual adults (ages 18 years or older) with neurologically-induced aphasia, and described outcomes of language intervention. Interventions included any SLP treatment conducted in primary (L1) or secondary (L2) language targeting receptive and/or expressive language skills. Exclusion criteria were studies that described individuals with cognitive deficits, studies that included participants with heterogeneous etiologies (unless data could be separated), and interventions that were pharmacological, or utilized

augmentative and alternative communication. Two authors (RM and TF) independently reviewed all citations for relevance based on the predetermined inclusion criteria. Inter-rater reliability between the two authors for study inclusion was good, $K = .852$ (kappa statistic; Cohen, 1960). Figure 1 schematizes the literature search. Of the 174 citations reviewed, 14 were identified for inclusion.

2.2. Data extraction and coding

Methodological quality of included studies was independently appraised by RM and TF on six indicators identified by ASHA's levels of evidence scheme (ASHA, 2007). Each study was examined for the question(s) which it addressed and relevant pre- and post-therapy data were extracted. We computed statistical significance for the pre and post-treatment scores using the McNemar's change test ($p < 0.05$, Seigel & Castellan, 1988). Broad categories of treatment types were coded on the basis of the focus of the intervention. Categories included auditory-comprehension, word-semantic, word-phonology, sentence-syntax, and non-specific. Finally, demographic, neurological, linguistic, and aphasia-related variables were coded.

3. Results and Discussion

The results include data from 45 bilingual aphasic participants, with most participants (N=30) contributed by a single group study (Junque, Vendrell, Vendrell-Brucet, & Tobena, 1989). A majority of studies provided data pertaining to unilingual treatment in L2 on expressive language outcomes (N = 12). There was also a preponderance of studies of acutely aphasic patients. No study investigated outcomes with language brokers and hence this aspect could not be evaluated.

Table 1 summarizes the questions addressed, quality markers, study design and number of participants for each of the studies included in this review; all of which were in the exploratory stage of research (ASHA, 2007). Appraisal of methodological quality revealed that most (13/14) described individual participant data as part of a case study or single subject design and had adequate description of the study protocol. However, studies lacked in other quality markers such as random sampling, blinding of assessors, and evaluation of treatment fidelity. With a few exceptions, the overall methodological rigor of bilingual treatment studies reviewed in this EBSR was below that of monolingual treatment studies of aphasia (e.g., compared to Cherney, Patterson, Raymer, Frymark, & Schooling, T., 2008). Studies differed considerably in the extensiveness of language scores provided, and some studies listed only those pre- post- scores that differed significantly (e.g., Miertsch et al., 2009), while other studies provided a more complete listing of scores (e.g., Abutelabi et al., 2009). The limited number and methodological quality of the included studies warrants caution when interpreting the results of this EBSR. The first clinically relevant finding is that all studies investigating the direct impact of unilingual treatment in L2 showed improvement across receptive and expressive language modalities even in chronic bilingual aphasia (see Table 2). Secondly, CLT occurred in over half the participants (see Tables 3 and 4): some unilingual therapy studies found no generalization to the untrained language (Meinzer et al., 2007) while others reported generalization (Edmonds & Kiran, 2006; Gil & Goral, 2004; Miertsch et al., 2008). This is consistent with another recent review of 12 studies of bilingual aphasia treatment by Kohnert (2009). Interestingly, studies addressing receptive language appeared to show more positive cross linguistic effects. The implications for clinical decision making purposes are that the current state of evidence does not provide

any strong basis for SLPs to predict if CLT will occur after unilingual treatment. The final finding is that no systematic relationship could be gleaned from outcomes based on aphasia type, severity, time post onset, age of L2 acquisition, L2 proficiency, or language typology.

Until further data on bilingual treatment emerge, treatment decisions can be made based on the findings of this EBSR complemented with clinical expertise, client preferences, and consideration of sociocultural variables. It is evident from limited number of published bilingual aphasia treatment studies that this research enterprise is still in its infancy and in need of considerable systematic research.

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* *Studies that were included in the EBSR*

Table 1. Studies Included in EBSR by Questions Addressed, Quality Markers, and Number of Participants.

Citation	Question(s)	N	Study Design	Quality indicators				
				Protocol Description	Sampling	Treatment Fidelity	Significance	Precision
Abutalebi, et al., 2009	1,2,3,5	1	Case study	+	Convenience	-	-	-
Ansaldo & Ghazi Saidi, 2009	6	1	Case study	+	Convenience	-	+	-
Edmonds & Kiran, 2006	2,5,6	3	Single subject	+	Convenience	+	+	+
Faroqi & Chengappa, 1996	1-3,5	1	Case study	+	Convenience	-	-	-
Gil & Goral, 2004	1-6	1	Case study	+	Convenience	-	-	-
Goral, et al., 2009	2,5	1	Case study	+	Convenience	-	-	+/-
Junqué et al., 1989	4,6	30	Case series	+	Convenience	-	+	-
Khamis et al., 1996	1,2,3,5	1	Case study	+	Convenience	-	-	-
Laganaro et al., 2003	2	2	Single subject	+	Convenience	+	+	-
Maragnolo et al., 2009 (Study 1)	2,5	1	Case study	+	Convenience	-	+	-
Maragnolo et al., 2009 (Study 2)	2,5	1	Case study	+	Convenience	-	+	+
Meinzer et al., 2007	2,5	1	Case study	+	Convenience	-	-	-
Miertsch et al., 2009	1,2,3,5	1	Case study	-	Convenience	-	+	+
Penn & Beecham, 1992	2,5	1	Case study	+	Convenience	-	-	-

Note. + = Present; - = Absent

Table 2a. Outcomes of SLP Treatment in L2 on Receptive Language in L2

Citation	Intervention	Treatment Schedule	Outcome(s) Measured	Pre	Post
Abutalebi et al., 2009	Word-phonology during Phase 1	Phase 1: 60 minute sessions 7 times weekly 6 weeks	BAT		
			Pointing	9/10	10/10
	Word- phonology + Word-semantics during Phase 2	Phase 2: 60 minute sessions 4 times weekly 16 weeks	Commands	5/10	10/10
			Verbal-auditory discrimination	9/18	18/18*
			Syntactic comprehension	76/86	85/86*
Lexical decision	24/30	30/30*			
Listening comprehension	4/5	5/5			
Faroqi & Chengappa 1996	Sentence-syntax	60 minute sessions 32 sessions	Grammatical judgment:		
			Active sentences	64%	100%*
			Passive sentences	60%	100%*
			Object-clefts	60%	98%*
			Wh-questions	72%	100%*
			Relative clauses	52%	96%*
			Comprehension:		
			Active sentences	75%	100%*
			Passive sentences	46%	98%*
			Object-clefts	40%	88%*
Wh-questions	62%	100%*			
Relative clauses	66%	90%*			
Gil & Goral 2004	Auditory-comprehension	45 minute sessions 5 times weekly 4 weeks	ILAT		
			Answering questions	NR	NR
			Picture identification	42%	87%*
Commands	40%	55%*			
Khamis et al., 1996	Multiple: auditory- comprehension + word + discourse strategies	8 weeks	ILAT		
			Picture identification	92%	100%*
Commands	99%	100%			
Miertsch et al., 2009 ¹	Word-semantic	45 minute sessions 2 hours daily	BAT		
			Syntactic comprehension of	50%	100%*

22 sessions

reversible noun phrases

Note. AAT=Aechan Aphasia Test; BAT=Bilingual Aphasia Test; ILAT= Israeli Lowenstein Aphasia Test; *McNemar's change test, $p < 0.05$

¹This study examined the effect of L3 treatment on L1, L2, and L3

Table 2b. Outcomes of SLP Treatment in L2 on Expressive Language in L2

Citation	Intervention	Treatment Schedule	Outcome(s) Measured	Pre	Post
Abutalebi et al., 2009	Word-phonology during Phase 1	Phase 1: 60 minute sessions 7 times weekly 6 weeks	BAT		
			Synonyms	8/20	19/20*
	Word- phonology + Word-semantics during Phase 2	Phase 2: 60 minute sessions 4 times weekly 16 weeks	Antonyms	8/10	10/10
			Word repetition	30/30	30/30
			Sentence repetition	7/7	7/7
			Series	0/3	3/3
			Naming	8/20	19/20*
Semantic opposites	8/10	10/10			
SNB	57/144	122/144*			
Edmonds & Kiran, 2006 Participant 2	Word-semantic	2 hour sessions 2 times weekly	BNT	2/60	35/60*
			BAT		
			Naming	0%	43%*
			Word Repetition	77%	73%
			Semantic Categories	60%	80%*
			Semantic opposites	0%	70%*
			Synonyms	20%	100%*
			Antonyms I	20%	60%*
			Antonyms II	20%	40%*
Faroqi & Chengappa, 1996	Sentence-syntax	60 minute sessions 32 sessions	Wh-marker production		
			Who	40%	100%*
			What	30%	100%*
			When	40%	100%*
			Where	20%	100%*
Gil & Goral, 2004	Auditory-comprehension	45 minute sessions 5 times weekly 1 month	ILAT		
			Spontaneous speech	30%	30%
			Elicited speech	0%	0%
			Repetition	51%	69%*
Goral et al., 2009	Sentence-syntax	60 minute sessions	Treatment A		

		3 times weekly 9 sessions	Noun-verb agr Person-gender agr Tense consistency Preposition use Syllables per minute	57% 91% 85% 90% 38	73%* 100% 88% 93% 46
			Treatment B Noun-verb agreement Person-gender agreement Tense consistency Preposition use Syllables per minute	72% 95% 83% 72% 39	67% 93% 80% 85%* 40
Khamis et al., 1996	Multiple: auditory-comprehension + word + discourse strategies	8 weeks	ILAT Spontaneous speech Automatic speech Naming	80% 100% 50%	90%* 100% 70%*
Lagarno et al., 2003	Word-phonology	Daily sessions 2 week intervals 6 weeks	Naming Participant 7 Computerized treatment items Behavioral treatment items Control items Participant 10 Computerized treatment items Behavioral treatment items Control items	4% 14% 20% 53% 73% 62%	40%* 24%* 45%* 70%* 83%* 66%*
Marangolo et al., 2009 (Study 1)	Word-phonology	60 minute sessions 5 times weekly 6 months	AAT Repetition Naming	46% 60%	52%* 69%*
Marangolo et al., 2009 (Study 2)	Word-phonology	2 hour sessions 5 times weekly 2 weeks	Naming	35/48	47/48*

Meinzer et al., 2007	Word-semantic	3 hours daily 10 consecutive days	Naming	38/80	54/80*
Miertsch et al., 2009 ¹	Word-semantic	45 minute sessions 2 hours daily 22 sessions	BAT Repetition of sentences	1/8	7/8*
Penn & Beecham 1992	Sentence-syntax	9 sessions 14 weeks	Words per minute Compensatory strategy use:	130	115
			Circumlocution	-	+
			Fluency place holder	-	+
			Turn taking	-	+
			Prenominalization	-	+

Note. AAT=Aechan Aphasia Test; BAT=Bilingual Aphasia Test; BNT=Boston Naming Test; ILAT= Israeli Lowenstein Aphasia Test; SNB=Snodgrass Naming Battery; * McNemar's change test, $p < 0.05$; + = Present; - = Absent

¹This study examined the effect of L3 treatment on L1, L2, and L3.

Table 3a. CLT of SLP Treatment in L2 on Receptive Language in L1

Citation	Intervention	Treatment Schedule	Outcome(s) Measured	Pre	Post
Abutalebi et al., 2009	Word-phonology during Phase 1	Phase 1: 60 minute sessions 7 times weekly 6 weeks	BAT		
			Pointing	9/10	8/10
	Word- phonology + Word- semantics during Phase 2	Phase 2: 60 minute sessions 4 times weekly 16 weeks	Commands	10/10	10/10
			Verbal-auditory discrimination	8/18	10/18
			Syntactic comprehension	85/86	80/86
Faroqi & Chengappa, 1996	Sentence-syntax	60 minute sessions 32 sessions	Lexical decision	28/30	26/30
			Listening comprehension	5/5	5/5
			Grammatical judgment:		
			Active sentences	70%	100%*
			Passive sentences	54%	100%*
			Object-clefts	46%	92%*
			Wh-questions	64%	92%*
			Relative clauses	46%	84%*
			Comprehension:		
			Active sentences	56%	92%*
			Passive sentences	54%	90%*
Gil & Goral, 2004	Auditory-comprehension	45 minute sessions 5 times weekly 4 weeks	Object-clefts	44%	82%*
			Wh-questions	65%	88%*
			Relative clauses	54%	78%*
			ILAT		
			Answering questions	20%	53%*
Khamis et al., 1996	Multiple: auditory-comprehension + word + discourse strategies	8 weeks	Picture Identification	44%	98%*
			Commands	48%	65%*
			Reading	13%	48%*
			ILAT		
Miertsch et al., 2009 ¹	Word-semantic	45 minute sessions 2 hours daily	Picture identification	93%	100%*
			Commands	92%	100%*
			BAT		
			Syntactic comprehension of	80%	60%*

22 sessions

reversible noun phrases

Note. BAT=Bilingual Aphasia Test; ILAT=Israeli Lowenstein Aphasia Test; *McNemar's change test, $p < 0.05$

¹This study examined the effect of L3 treatment on L1, L2, and L3.

Table 3b. CLT of SLP Treatment in L1 on Receptive Language in L2

Citation	Intervention	Treatment Schedule	Outcome(s) Measured	Pre	Post
Gil & Goral, 2004	Auditory-comprehension	45 minutes	ILAT:		
		5 times weekly	Commands	95%	92%
		6 weeks	Picture identification	80%	95%*
			Reading	60%	75%*
Junque et al., 1989	Unspecified	NR	Object identification	19.97%	22.47%#

Note. ILAT=Israeli Lowenstein Aphasia Test; * McNemar's change test, $p < 0.05$; # t-test as reported by study authors (N=30)

Table 4a. CLT of SLP Treatment in L2 on Expressive Language in L1

Citation	Intervention	Treatment Schedule	Outcome(s) Measured	Pre	Post
Abutalebi et al., 2009	Word-phonology during Phase 1	Phase 1: 60 minute sessions 7 times weekly 6 weeks	BAT		
			Synonyms	4/5	4/5
			Antonyms	4/5	3/5
	Word- phonology + Word- semantics during Phase 2	Phase 2: 60 minute sessions 4 times weekly 16 weeks	Word repetition	30/30	30/30
			Sentence repetition	7/7	7/7
			Series	3/3	3/3
			Naming	9/20	8/20
		Semantic opposites	7/10	7/10	
		SNB	35/90	34/90	
Edmonds & Kiran, 2006 Participant 2	Word-semantic	2 hour sessions 2 times weekly	BNT	0/60	0/60
			BAT		
			Naming	0%	0%
			Word repetition	67%	67%
			Semantic categories	100%	100%
			Semantic opposites	10%	10%
			Synonyms	20%	20%
			Antonyms I	0%	0%
Antonyms II	60%	60%			
Faroqi & Chengappa, 1996	Sentence- syntax	60 minute sessions 32 sessions	Wh-marker production		
			who	30%	100%*
			what	30%	100%*
			when	40%	100%*
			where	20%	90%*
Gil & Goral, 2004	Auditory- comprehension	45 minute sessions 5 times weekly 1 month	ILAT		
			Spontaneous speech	0%	0%
			Elicited speech	51%	51%
			Repetition	4%	4%
			Naming	19%	19%
Goral et al., 2009	Sentence-syntax	60 minute sessions	Treatment A		

		3 times weekly 9 sessions	Noun-verb agr Person-gender agr Tense consistency Preposition use Syllables per minute	97% 100% 99% 93% 74	97% 100% 99% 96% 76
			Treatment B Noun-verb agr Person-gender agr Tense consistency Preposition use Syllables per minute	97% 100% 97% 97% 78	98% 100% 98% 96% 73
Khamis et al., 1996	Multiple: auditory- comprehension + word + discourse strategies	8 weeks	ILAT Spontaneous speech Automatic speech Naming	80% 100% 53%	90%* 100% 79%*
Marangolo et al., 2009 (Study 1)	Word-phonology	60 minute sessions 5 times weekly 6 months	AAT Repetition Naming	44 61	49 67*
Marangolo et al., 2009 (Study 2)	Word-phonology	2 hour sessions 5 times weekly 2 weeks	Naming	27/48	46/48*
Meinzer et al., 2007	Word-semantic	3 hours daily 10 consecutive days	Naming	4/80	4/80
Miertsch et al., 2009 ¹	Word-semantics	45 minute sessions 2 hours daily 22 sessions	BAT Repetition of sentences	50%	80.8%*
Penn & Beecham, 1992	Sentence-syntax	9 sessions 14 weeks	Compensatory strategy use: Circumlocution	- - -	- - -

Fluency place holder	-	-
Turn taking	-	-
Prenominalization		

Note. AAT=Aechan Aphasia Test; BAT=Bilingual Aphasia Test; BNT=Boston Naming Test; ILAT= Israeli Lowenstein Aphasia Test; SNB=Snodgrass Naming Battery; *McNemar's change test, $p < 0.05$; + = Present; - = Absent

¹This study examined the effect of L3 treatment on L1, L2, and L3.

Table 4b. CLT of SLP Treatment in L1 on Expressive Language in L2

Citation	Intervention	Treatment Schedule	Outcome(s) Measured	Pre	Post
Ansaldo & Ghazi Saidi, 2009	Discourse strategies + Word-semantic	1 hour sessions 2 times weekly 3 months	WAB		
			Repetition	84/100	90/100*
			Object naming	30/60	47/60*
			Sentence completion	6/10	7/10
			Responsive speech	4/10	7/10
Gil & Goral, 2004	Auditory-comprehension	45 minute sessions 5 times weekly 1 month	ILAT		
			Repetition	74%	96%*
			Elicited speech	5%	40%*
			Naming	31%	51%*
			Writing	20%	50%*
Edmonds & Kiran, 2006 Participant 1	Word-semantic	2 hour sessions 2 times weekly	BNT	41/60	48/60*
			BAT		
			Naming	60%	62%
			Word repetition	93%	97%
			Semantic categories	100%	80%*
			Semantic opposites	20%	40%*
			Synonyms	80%	80%
			Antonyms I	80%	80%
Antonyms II	60%	100%*			
Participant 2	Word-semantic	2 hour sessions 2 times weekly	BNT	2/60	35/60*
			BAT		
			Naming	0%	41%*
			Word repetition	77%	73%
			Semantic categories	60%	80%*
			Semantic opposites	0%	70%*
			Synonyms	20%	100%*
			Antonyms I	20%	60%*
Antonyms II	20%	40%*			
Participant 3	Word-semantic	2 hour sessions	BNT	23/60	33/60*

2 times weekly	BAT		
	Naming	88%	95%*
	Word repetition	57%	77%*
	Semantic categories	100%	60%*
	Semantic opposites	30%	20%*
	Synonyms	20%	0%*
	Antonyms I	40%	60%*
	Antonyms II	40%	0%*

Junque et al., 1989	Unspecified	NR	Naming	9.70	13.67 [#]
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Note. AAT=Aechan Aphasia Test; BAT=Bilingual Aphasia Test; BNT=Boston Naming Test; ILAT=Israeli Lowenstein Aphasia Test ; WAB=Western Aphasia Battery (Kertesz, 1982); *McNemar's change test, $p < 0.05$

Figure. 1 Flowchart of study identification process

