INTRODUCTION

Evidence suggests that language therapy can be effective, even in chronic aphasia (Robey, 1998). Nonetheless, knowledge of the precise relationship between therapy and recovery, and how treatment-induced changes are instantiated in the brain, has remained somewhat elusive. Moreover, the lion's share of investigations into post-stroke language recovery has examined monolingual English speakers. Despite growing numbers of bilingual speakers, very little is known about the effects of bilingualism on a recovering brain.

What is known about bilingual aphasia is that recovery patterns are variable, and may involve selective, successive, or parallel recovery of the first and second languages (Meinzer et al., 2007). Cognates, i.e., word pairs that have the same meaning and similar phonological form in two languages, have been shown to improve lexical access and naming accuracy in persons with aphasia who had equal pre-morbid language proficiency (Roberts & Deslauriers, 1999). It has been suggested that use of cognates in naming treatment may facilitate cross-linguistic generalization and thus expedite the reacquisition of both lexica (Edmonds & Kiran, 2006).

Some investigators have recently demonstrated that administering massed verbal practice in a short, but intensive therapy schedule can significantly improve performance on tasks such as naming pictures, even in chronic aphasia (Pulvermuller et al., 2001). Whether constraint to the speech modality or intensity of therapy is responsible for such improvement is still under investigation, but evidence increasingly suggests that therapeutic gains are greater, and perhaps longer lasting, with intensive therapy schedules (Basso & Caporali, 2001; Bhogal, Teasel, & Speechley, 2003; Hinckley & Craig, 1998).

The purpose of this research study is to examine treatment effects, including potential cross-linguistic generalization, in a bilingual individual with severe expressive aphasia following intensive language treatment, first in Spanish and then in English. This study will also examine generalization of naming skills to untrained items within each language. Further, the effect of cognates on cross-linguistic generalization will be investigated. We predict that semantic naming treatment will improve the participant's word retrieval ability for trained and, to a lesser extent, untrained items within the same category within each language. We further expect cross-linguistic generalization to occur, especially on cognates, which may have a common semantic system and thus benefit from more indirect stimulation. We hope to learn more about the impact of bilingualism on language recovery following intensive language therapy in a bilingual individual with aphasia.

METHODS

Participant

The participant, GLP, is a 65-year old bilingual (Spanish/English) female, ten months post onset of a large left frontoparietal hemorrhagic CVA. She has been living for the last nine months in a long-term care facility where she receives no speech therapy, reportedly due to a lack of progress. She has severe expressive aphasia, characterized by a lack of propositional speech. Her output predominantly consists of one stereotypic utterance, in English: "*Can I say too much, forever?*" GLP's auditory comprehension is relatively preserved. Table 1 gives GLP's baseline

language performance on subtests of naming, auditory comprehension, and repetition in English and Spanish.

Two questionnaires were administered to GLP's husband from the Bilingual Aphasia Test (BAT; Paradis, 1987) in order to characterize language history including her pre-morbid language proficiency and patterns of use in Spanish and English. The History of Bilingualism and English Background questionnaires revealed the following information: GLP was born in El Salvador where she spoke solely Spanish in her home, at school, and with friends. Both parents' were monolingual Spanish speakers. GLP was 16 years old when she first learned to speak, read, and write in English. She and her husband moved to the United States 26 years ago, where she began taking English classes at a community college. Prior to her stroke, GLP's pre-morbid English speaking and reading skills were both classified as "good", and her English writing skills were classified as between "not good" and "good". Pre-stroke, GLP spoke English daily in her home, at work, and with friends. Based on the information reported on both questionnaires, GLP's pre-morbid language skills in English and Spanish were of relatively equal proficiency.

Procedures

At this time, GLP is participating in a two-week intensive language treatment program in Spanish (Phase I). Therapy consists of intensive practice in naming, reading names, matching words to pictures, categorizing, and other language tasks that are designed to induce spreading activation in lexical networks and to promote reacquisition of cognate and non-cognate object names. Following intensive language treatment in Spanish, and a washout period of several weeks that will include language testing, GLP will participate in Phase II, the second two-week intensive language treatment, this time in English. Intensity of treatment in both phases will be two and a half hours per day, five days a week for two weeks.

Outcomes Measures

Primary outcome measures include accuracy and response time in naming trained and untrained pictures. GLP was tested on three occasions to establish a stable baseline. Five sets of 16 black and white line drawings of common objects were selected from the International Picture Naming Project (IPNP; Szekely et al., 2005). One set included pictures that were correctly named on two or more occasions in English or Spanish (CORR); the other four sets were never correctly named. They were divided into categories, matched for visual complexity and randomly selected for treatment – Animals and Clothing in Spanish (SPAN) and Fruits/Vegetables and Household Items in English (ENGL). Half of all trained items in Spanish and in English are cognates. Two sets are not being treated – one set consisting of items from the trained categories (UNTR-REL) and the other consisting of items from unrelated categories (UNTR-UNREL). Half of all untrained items are cognates. Probes are administered daily on trained and untrained items following the treatment session.

Secondary outcome measures include the following: the Boston Naming Test (BNT; Kaplan et al., 2001), subtests of the Boston Diagnostic Aphasia Examination (BDAE; Goodglass, Kaplan, & Barresi, 2001), subtests from the Bilingual Aphasia Test (BAT; Paradis, 1987), and the Functional Outcomes Questionnaire for Aphasia (FOQ-A; Ketterson et al., 2008).

RESULTS

Preliminary results of probes administered during the first week of Phase I (Spanish) therapy have thus far demonstrated improvement in naming skills across conditions. Figure 1 illustrates GLP's improvement across time in trained and untrained conditions. A similar slope in increasing accuracy for naming cognates and non-cognates is shown in Figure 2. Figure 3 demonstrates GLP's greater naming improvement in Spanish than English.

DISCUSSION

With the number of bilingual people growing, a better understanding of how bilingualism affects aphasia recovery is increasingly important. The preliminary results of this study demonstrate that intensive language therapy using massed verbal practice in Spanish can have positive effects on the naming ability of an individual with severe expressive aphasia and relatively equal pre-morbid abilities in Spanish and English.

This study is still in an early stage; however, it will explore a number of pertinent topics surrounding bilingual aphasia, including the presence of generalization within and across languages, as well as effects of training cognates on retrieval of common words. Analyses will also examine the progression of errors in both languages over time, language mixing, and code-switching. We hope this study will contribute to a growing literature exploring best practices in the rehabilitation of bilingual persons with aphasia.

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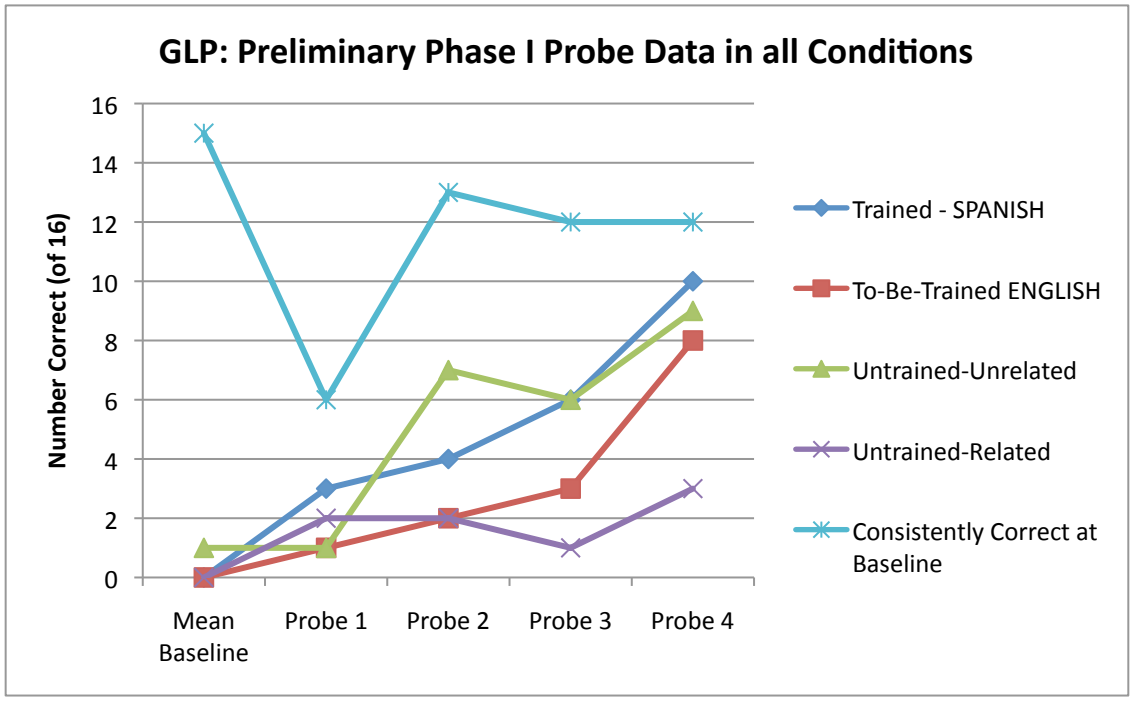

Figure 1. Naming accuracy during probes for trained and untrained stimuli including pictures that are: currently being trained in Spanish (Phase I); will be trained in English (Phase II); related and unrelated untrained controls; and those that were consistently correctly named at baseline. Each condition associated with a set of 16 black and white line drawings of common objects – half cognates, half non-cognates.

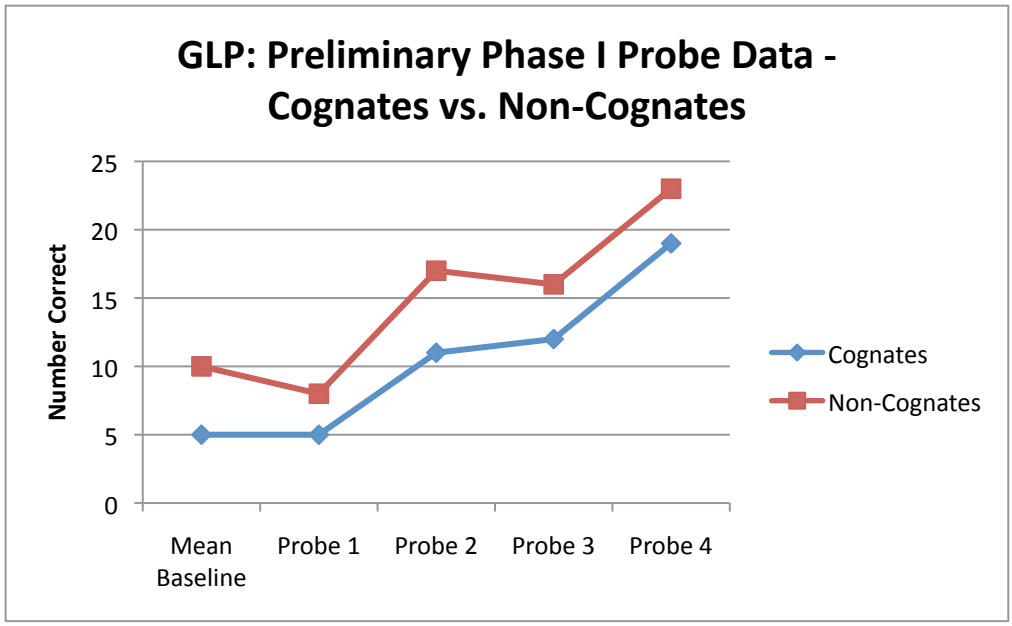

Figure 2. Naming accuracy for cognates vs. non-cognates during probes for trained and untrained stimuli collapsed across experimental conditions

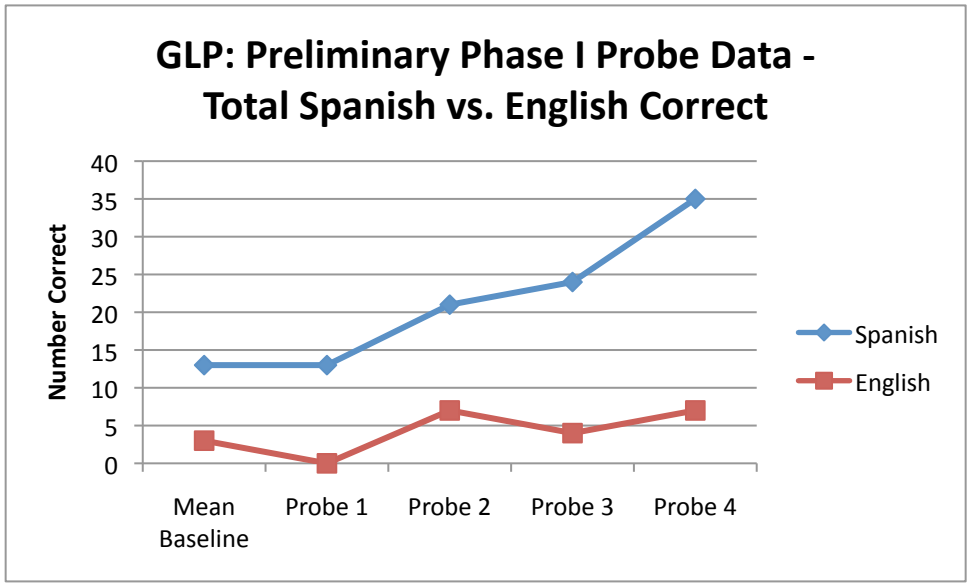

Figure 3. Naming accuracy in Spanish vs. English during probes for trained and untrained stimuli collapsed across treatment conditions

Test	English Scores	Spanish Scores
Boston Diagnostic Aphasia Examination (BDAE):		
Word Comprehension	24.5/37	DNT
Commands	2/15	DNT
Word Repetition	5/10	DNT
Lexical Decision	7/10	DNT
Boston Naming Test (BNT)	1/15	2/33
Bilingual Aphasia Test (BAT):		
Pointing	5/10	3/10
Simple and Semi-Complex Directions	0/10	3/10
Complex Directions	DNT	0/5
Verbal Auditory Discrimination	8/18	13/18
Naming Real Objects	DNT	3/20
Repetition (real words)	DNT	17/30
Repetition (nonwords)	DNT	2/10

Table 1. GLP's baseline language performance on tests administered in Spanish and English (BDAE; Goodglass et al., 2001) (BNT; Kaplan et al., 2001) (BAT; Paradis, 1987)