THE APPLICATION OF PROCESSING INSTRUCTION AS THERAPY FOR APHASIA IN SPANISH SPEAKERS

By

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Literature Review

Introduction.

Aphasia is a neurological disorder in which a person has "impaired comprehension and production of language, usually caused by damage in the language-competent brain hemisphere" (Brookshire, 2007, p. 2). A majority of therapy for individuals with aphasia is based on Schuell's Unideficit Theory that aphasia is a general reduction of language access; therefore, the language processes need to be more accessible (Mitchum, 1994; Schuell, 1974). Therapy moves through hierarchies of cues and contexts from simple to more complex activities (Brookshire, 2007).

Therapy techniques have been developed to improve syntactic processing for individuals with aphasia who exhibit agrammatic speech, "a deficit in language production primarily characterized by the omission of grammatical functors and inflections and by a marked reduction in syntactic complexity" (Benedet, Christianson, & Goodglass, 1998, p. 309). Therapy techniques that have been developed to target syntax include Melodic Intonation Therapy, Reduced Syntax Therapy, functional and positional-level syntactic training, Syntax Stimulation Training, Response Elaboration Training (RET), and Treatment of Underlying Forms (Norton, Zipse, Marchina, & Schlaug, 2009; Springer, Huber, Schlenck, & Schlenck, 2000; Peach & Wong, 2004; Marina, Caltagirone, Pasqualetti, & Carlomagno, 2007; Wambaugh, Martinez, & Alegre, 2001; Murray, Timberlake, & Eberle, 2007). While some treatments use certain characteristics such as melody and rhythm memory and utilizing a meaningful context, these various treatments all involve using instruction and practice to improve syntax production and/or comprehension.

Adults with agrammatic aphasia are unable to comprehend and produce certain grammatical forms in a manner consistent with pre-morbid functioning (Brookshire, 2007). Similarly, second language learners lack the ability to comprehend and produce certain grammatical forms. However, their limitations are due to proficiency rather than impairment (VanPatten, 2002). Given that both populations have gaps in syntax, strategies developed to teach syntactic constructs to second language learners may be useful in re-teaching the same constructs to individuals with aphasia.

One form of instruction that is used to teach syntax to second language learners is processing instruction (PI; VanPatten, 2002). This instructional method, which focuses on providing meaningful structured input to increase comprehension and production, has been shown to be effective with second language learners (VanPatten & Cadierno, 1993a; VanPatten & Cadierno, 1993b; VanPatten & Sanz, 1995; VanPatten, 2002; Morgan-Short & Bowden, 2006; Cadierno, 1995). Specifically, PI has been shown effective "for object pronouns and word order in Spanish, for complex verbal morphology in Spanish (the preterit) and Italian (future tense), for lexical-aspectual choice (copular verbs in Spanish), for agent-dative relations and word order in French, for mood selection in subordinate clauses in Spanish, and for the present continuous . . . in English" (VanPatten, 2002, p. 775). Meaningful structured input is built in such a way to push learners to depend on the syntactic form and structure of the target to grasp meaning from the stimuli (VanPatten, 2002). Meaningful input is also important in therapy with individuals with aphasia. Treatments utilizing meaningful stimuli, such as functional and positional-level syntactic training and RET, have been shown to be effective with populations with aphasia (Peach & Wong, 2004; Wambaugh, Martinez, & Alegre, 2001). Meaningful stimuli is more easily grasped by the learner, giving the information a greater opportunity of being stored in the

individual's working memory. Since meaningful stimuli have been shown effective in aphasia therapy, it makes sense to look to an instructional method that uses meaningful stimuli as input, such as PI, for a new approach in aphasia therapy. PI is successful with second language learners, but it has not been tested on individuals with aphasia who have syntactic deficits.

The purpose of this study was to use a PI protocol to re-teach the Spanish preposition '*a*' to Spanish speaking adults with aphasia who had syntactic deficits. This study used a single subject experimental design to test the effectiveness of a PI protocol with three bilingual Spanish-English speakers with aphasia. Effectiveness was measured via accuracy measures on pre- and post- tests as well as accuracy measures on referential activities during treatment.

Processing Instruction.

PI is a type of foreign language instruction which views learning a second language as a process of transitioning between four steps: (1) input, (2) intake, (3) developing system, and (4) output (VanPatten & Cadierno, 1993a). The instruction itself focuses on the process of transferring input to intake (VanPatten & Cadierno, 1993a; VanPatten & Cadierno, 1993b; VanPatten & Sanz, 1995; Morgan-Short & Bowden, 2006; Cadierno, 1995). It gives the learner meaningful input to aid in comprehension (VanPatten & Cadierno, 1993b). If the input is meaningful, then it will be taken into the working memory for further processing. Transitioning from meaningful input to working memory is the process of transition from input to intake (VanPatten, 2002).

PI differs from traditional second language instruction in that it does not focus on the output of the learner (VanPatten & Cadierno, 1993b). Traditional instruction is structured so that a learner must produce a certain structure or form in both oral and written exercises (VanPatten & Cadierno, 1993b). However, this traditional approach overlooks the steps of intake and

developing system. It only encompasses a process of input straight to output; therefore, the learning process is not as effective with traditional instruction since two steps in the cycle of learning a second language are not being stimulated (VanPatten & Cadierno, 1993b).

Starting with input, PI's primary focus is to provide the learner with meaningful input. VanPatten (2002) measures meaningfulness by calculating the communicative value of the grammatical forms within the input. A form with a high communicative value is more likely to be processed in the working memory, allowing the learner to focus on that grammatical form (VanPatten, 2002). A form will have high communicative value if meaning can only be gained from that specific grammatical form (VanPatten, 2002). For example, in the sentence *"Ella fue a la tienda ayer"* [She went to the store yesterday], both the word *ayer* [yesterday] and past tense of the verb *fue* [went] encode the idea of the past. The learner does not need to focus on the verb tense to understand the event took place in the past; therefore, the verb tense in this sentence has a lower communicative value than a sentence in which only the verb tense encodes the idea of the past. Aside from communicative value, it is also important to analyze the word order of the input. Meaningfulness is affected by word order because the listener is more likely to grasp the words in a sentence in any language in the following order: initial, final, and then medial (VanPatten, 2002; VanPatten, 1999). PI uses the communicative value and word order to create meaningful input for the learner, so the learner is able to process and comprehend the sentences within the input (VanPatten, 2002).

Before structured input is given to a learner in PI, explicit instruction about the targeted grammatical structure is provided. The learner is then given opportunities to process that structure through activities containing structured input (VanPatten, 2002). Referential and affective activities with structured input are utilized (VanPatten, 2002). Problem strategies for

processing the targeted grammatical form are identified in PI, and activities are structured in such a way to push learners away from using these problematic strategies when processing (VanPatten, 2002). The structured input given to the learner is transferred to the working memory through the step of intake. The information then becomes part of the learner's developing system for the new language. The learner uses information from his/her developing system to construct output words and phrases (VanPatten, 2002).

PI has been shown effective in teaching a variety of grammatical forms to second language learners in a variety of languages (VanPatten & Cadierno, 1993a; Morgan-Short & Bowden, 2006; VanPatten & Sanz, 1995; Cadierno, 1995). VanPatten and Cadierno (1993a) compared the methods of PI, traditional instruction, and no instruction for teaching object pronouns in Spanish by studying three groups of 26-27 participants who were adults learning Spanish as a second language. Results comparing pre- and post-test measures indicated that the PI group scored significantly higher in comprehension of the grammatical form than the other two groups. The PI and traditional instruction groups rated similarly on production, and both were significantly higher than the no instruction group in production (VanPatten & Cadierno, 1993a). This study demonstrated that PI was successful in teaching the comprehension and production of a grammatical form, and this form of teaching was more effective than traditional instruction for facilitating comprehension.

Cadierno (1995) replicated the study by VanPatten and Cadierno (1993a) with three groups of 19-22 participants who were Spanish learning adults. Instead of teaching object pronouns, Cadierno (1995) taught past tense verb morphology in Spanish. Results were very similar to those of VanPatten and Cadierno (1993a), showing gains with PI in both comprehension and production while traditional instruction showed only increases in production

with no significant gains in comprehension (Cadierno, 1995). These results further confirmed the success of increases in comprehension and production when using PI. They also showed that PI could be successful with another construction besides Spanish object pronouns, Spanish past tense verb morphology.

VanPatten and Sanz (1995) identified Spanish object pronouns as the teaching target for a PI group and a no instruction group. The types of tasks the groups had to complete were expanded in this study. In the previous studies by VanPatten and Cadierno (1993a) and Cadierno (1995), only sentence level tasks were used. In this study, sentence level tasks were used in conjunction with structured question-answer interviews and video narration tasks. Results indicated improvements in both comprehension and production in both oral and written tasks with the PI group. Also, instruction had a significant effect across all test types (VanPatten & Sanz, 1995), demonstrating that PI is successful in more tasks than just sentence-level tasks.

In addition to the research providing the evidence of success of PI in effectively teaching a grammatical form, research has been completed to test if the explicit instruction component of PI is necessary for successful outcomes (VanPatten & Oikkenon, 1996; Fernández, 2008). VanPatten and Oikkenon (1996) conducted a study of three groups with 17-22 participants consisting of adult Spanish language learners to test the effects of explicit instruction with PI to teach object pronouns and word order. One group received the entire PI protocol in replication of VanPatten and Cadierno (1993a). The second group received explicit instructions only without any structured input practice, and the third group received only activities with structured input and no direct explicit instructions. Data showed significant increases in the PI and the structured-input only groups, but few gains were observed in the explicit instruction-only group (VanPatten & Oikkenon, 1996). These results suggest that the explicit instruction is not crucial

to the success of PI, and that meaningful structured input is the component of PI that allows for improved learning.

Fernández (2008) looked further into the importance of explicit instruction by completing a study comparing a group of Spanish learners receiving PI and a group receiving structured input only. Both groups were learning object-verb-subject word order and the subjunctive tense. On the word order tasks, both groups performed similarly. On the subjunctive tasks, the PI group performed significantly faster (Fernández, 2008). These results suggest explicit instruction is beneficial with certain grammatical structures such as the Spanish subjunctive tense.

In sum, PI works with a variety of grammatical structures and tasks. The explicit instruction given in PI has been shown to be beneficial with some non-salient sentence forms and to have a null effect with other grammatical forms. Explicit instruction is necessary for some grammatical structures, and research has yet to be completed to identify all of the structures for which explicit instruction is needed. Therefore, explicit instruction should be included in a PI protocol if structured input alone has not been proven effective for the targeted grammatical structure.

PI teaches a grammatical form via the process of learning language as outlined by VanPatten and Cadierno (1993a). PI has not been used with other populations besides second language learners. Adults with agrammatic aphasia have lost the ability to comprehend and produce certain grammatical forms; therefore, PI may provide a means to re-teach a missing grammatical form to this population. Both second language learners and individuals with aphasia share a similar objective, to learn the syntax and semantics of a given language. Second language learners are developing proficiency in a language while speakers of that language with

aphasia have an impaired proficiency. Second language learners and individuals with aphasia are both adults who can benefit from learning language form and content to increase proficiency. PI takes advantage of cognitive resources of adult second language learners (VanPatten, 2002). Adults with aphasia may be able to tap into the same resources to relearn a language. PI and established aphasia treatments share characteristics such as meaningful stimuli and auditory bombardment (VanPatten, 2002; Schuell, 1974; Peach & Wong, 2004; Wambaugh, Martinez, & Alegre, 2001). The similarities between the purpose and structure of PI and aphasia treatments suggest this instructional technique may be effective for individuals with aphasia. When considering the application of PI to Spanish speakers with agrammatic aphasia, it is important to consider both the grammatical construction of Spanish and the nature of aphasia.

Spanish Preposition '*a*' and Aphasia.

Spanish syntactic comprehension requires a low dependence on word order and a high dependence on morphology (Ardila et al., 2000; Ostrosky-Solis, Marcos-Ortega, Ardila, Rosselli, & Palacios, 1999), partly due to the frequency and saliency of morpho-syntactic cues in Spanish and the highly flexible word order (Ostrosky-Solis et al., 1999). Language cues occur within grammatical constraints of a language to support an individual's comprehension. Since comprehension is supported by cues of language, cues should be explored to understand therapy implications and their role in facilitating therapy outcomes.

When understanding the relevance of specific syntactic structures as cues to comprehending meaning within a given language, the ideas of cue validity and cue cost should be explored. Cue validity, as explained within the Competition Model, is dependent on the reliability and availability of a particular morpheme (MacWhinney, 1987). A morpheme which indicates a single grammatical idea in every possible context (reliability) and is consistently

present (availability) has high cue validity. For examples, the bound morpheme '-s' in Spanish only indicates the grammatical idea of plural tense (high reliability) and is consistently present on nouns and pronouns (high availability). The bound morpheme '-s' in English indicates the grammatical ideas of plural tense and possessive tense (low reliability) and the third person singular inflection is only available for present tense and regular verbs (low availability; Benedet et al., 1998). Cue cost refers to the ease of perceptual clarity of a morpheme (perceivability) and the amount of information that must be retained to use a particular morpheme (assignability). Examples of perceivability factors include syllable structure and prosodic stress, and an example of a high assignability cost is noun-adjective agreement since this grammatical feature requires morpheme information to be retained across multiple words. Cue costs also account for extraneous factors that affect speech perceivability (MacWhinney, 1987; Benedet et al., 1998). Together, the cue validity and the cue costs determine the accessibility of a grammatical structure. Specifically, the cue validity of a morpheme dictates the level of importance that morpheme has in comprehension (MacWhinney, 1987; Benedet et al., 1998).

One morpheme in Spanish that has been shown to contain relatively high cue validity is the preposition '*a*' (Ostrosky-Solis et al., 1999; Ardila et al., 2000; Kail & Charvillat, 1988). The preposition '*a*' is used in Spanish immediately preceding the object in order to signal the accusative role; for example, *María llama a él* [Maria calls him]. However, it is not always present before the object. The presence of the '*a*' is dependent on the nature of the object, but it is required before animate objects and is referred to as the personal '*a*' when used in this grammatical construction. The preposition '*a*' is also a marker of the infinitive tense (e.g., *voy a jugar* [I'm going to play]), a marker of the dative (e.g., *Pedro le da la regla a Victoria* [Pedro gave the present to Victoria]), and can be used as a locative (e.g., *Pedro caminó a México* [Pedro

walked to Mexico]; Kail & Charvillat, 1988). Studies by Ardila et al. (2000), Kail and Charvillat (1988), and Ostrosky-Solis et al. (1999) demonstrate the high cue validity of this grammatical structure.

Because the preposition '*a*' has high cue validity, it is able to strengthen comprehension. Ardila et al. (2000) tested the Spanish syntax comprehension skills of 50 Spanish-English bilingual adults. All participants were given the Spanish Syntactic Comprehension Test and the data were compared to normative data of Spanish monolingual speakers. These comparisons indicated that monolingual performance was greater than bilingual performance. Differences were most evident on the sentences with a pseudo-cleft agent and active reversible sentences without a preposition. Sentences with a pseudo-cleft agent are those that contain a relative subordinate clause and were preceded by the words 'lo que' ['what'] in this study. In active reversible sentences, word order can change, and both subject and object are animate nouns (e.g., *'El mono golpeó un gato'* ['the monkey hit a cat'] is the same as 'Golpeó el mono un gato' ['hit the monkey a cat']). In general, the passive sentences were easiest for the bilingual group followed by active reversible sentences with a preposition. The preposition '*a*' aided in the ability of the bilingual group to correctly interpret the sentences, supporting the role of this grammatical form to strengthen comprehension.

The high cue validity of the Spanish preposition '*a*' makes it play an essential role in sentence interpretation. This role in sentence interpretation is demonstrated in Kail and Charvillat's (1988) study that investigated the development of cue validity and cue cost within processing of sentences in French speaking children and Spanish speaking children. The cues that were examined in this study were word order, object clitic pronouns, verbal agreement, and the Spanish preposition '*a*.' Results indicated that, in French, word order played the biggest role

in interpretation. In Spanish, the preposition '*a*' played the biggest role in interpretation. Even in the four year old group, a strong reliance was observed on the preposition '*a*.' This reliance became stronger with age as observed on results of the five and six year old groups. When reaction latencies were analyzed, the Spanish results were always shorter than the French results. Also, Spanish latencies were significantly shorter when the preposition '*a*' was in the sentence. These latencies were shorter because the preposition '*a*' plays an essential role in sentence interpretation in Spanish

Ostrosky-Solis et al. (1999) used Spanish-speakers with agrammatic aphasia as well as a control group to validate the cue validity of the Spanish preposition '*a*' and to demonstrate its diminished presence in Spanish-speakers with aphasia. This study examined how thematic-role order and syntactic morphology interact and are manifested in the comprehension of individuals with aphasia. Specifically, the effects of sentence type, thematic role, prepositions, and the use of definite or indefinite article were examined. Characteristics were combined within sentences to look at active reversible sentences (sentences with animate nouns as subject and object and flexible word orders) without a preposition, active reversible sentences with a preposition, passive reversible sentences (sentences in which the subject is receiving the action and contain flexible word orders), and pseudocleft-agent reversible sentences (sentences with relative subordinate clause starting with 'lo que'). In the active reversible sentences without a preposition, the control group tended to give the role of agent to the noun proceeded by the definite article '*el*.' The aphasic group had very low percentages correct on these sentences. In the active reversible sentences with a preposition, the control group was able to correctly identify the picture with close to 100% accuracy. The presence of the preposition '*a*' aided the aphasic group in sentences with agent-verb-agent and verb-agent-agent orders. However, it did not aid

the aphasic group in agent-agent-verb sentences. On passive reversible sentences, the control grouped performed close to 100% while the aphasic group performed poorly. On the pseudocleft-agent reversible sentences, the control group performed differently depending on the structure, which did not correlate with canonical order (most frequent word order). In the aphasic group, the best predictor for success on comprehending the sentences in this study was the presence of the preposition '*a*' as evidenced by their results on the active reversible sentences with a preposition. However, it should also be noted that even with the presence of the preposition '*a*,' performance in the aphasic group was significantly lower than performance in the control group.

Research has been conducted to show that the preposition '*a*' is diminished in romance language besides Spanish in speakers with aphasia. The Italian language is a romance language with a similar structure to Spanish. Mondini, Luzzatti, Saletta, Allamano, and Semenza (2005) conducted a study of Italian speakers with agrammatic aphasia and found that their main error was a substitution of the preposition. The speakers were unable to retrieve the preposition link between the modifying noun and the prepositional compound head in the sentence; therefore, the preposition '*a*' was diminished. This pattern is similar to the deficits seen in Spanish, a similar language (Ostrosky-Solis et al., 1999).

In sum, the Spanish preposition '*a*' has high cue validity and is important for comprehension in Spanish. A Spanish speaker with aphasia has diminished access to the grammatical form of the preposition '*a*.' Since the preposition '*a*' has a high strength for comprehension, the question remains as to whether strengthening the preposition in aphasia therapy would aid in the comprehension of Spanish speakers with aphasia.

Current Study.

The presence of the Spanish preposition '*a*' can greatly aid in the comprehension of Spanish speakers with agrammatic aphasia. The preposition is especially helpful because of the flexible word order of the Spanish language (Montrul, 2010). Because this grammatical structure affects comprehension, it makes an ideal target in language treatment for Spanish speakers with aphasia. The question that can now be asked is how to re-teach the preposition '*a*' to Spanish speakers with aphasia.

PI has been shown to successfully teach many grammatical features to second language learners acquiring Spanish. Second language learners and adults with aphasia both have gaps in their language system. If PI can teach a grammatical structure to second language learners, can it re-teach a grammatical structure to an adult with aphasia? The current study attempts to answer that question by re-teaching the Spanish preposition '*a*' to Spanish speakers with aphasia. Specifically, this study will answer the following:

- Does the comprehension of the Spanish preposition '*a*' improve for Spanish-speakers with aphasia following PI?
- Does the production of the Spanish preposition '*a*' increase for Spanish-speakers with aphasia following PI?

The purpose of this study was to re-teach the Spanish preposition '*a*' using a PI protocol to Spanish speaking adults with aphasia. It was hypothesized that a Spanish speaking adult with aphasia would increase his/her comprehension and expression of the Spanish preposition '*a*' after completing a PI protocol.

Chapter II

Methodology

Participants.

Three Spanish-speaking individuals with aphasia participated in this study. Participants were native speakers of Spanish and had been conversationally fluent in Spanish prior to injury. All participants were pre-morbidly bilingual in Spanish and English with varying degrees of proficiency in both languages. Two participants had high proficiencies in Spanish at the time of the study while the third participant had a weaker proficiency in Spanish.

Participants were pre-morbidly right-handed and exhibited aphasia secondary to a single left hemisphere cerebrovascular accident confirmed by neurological examination and computerized tomography. Participants were identified through TCU's Miller Speech and Hearing Clinic (MSHC). Incentive was provided in the form of free assessment and treatment while participating in the protocol. Individuals with severe cognitive-linguistic impairments, severe apraxia, severe dysarthria, significant visual or auditory deficits that impact communication and could not be aided, or dementia were not considered for participation. Additionally, potential participants had to score an accuracy rate of 55% or lower on the pretest to receive PI for '*a*.' A description of the test is provided in the procedures section. Further background information about individual participants is provided in the results section.

Procedure.

Each participant completed the following tasks: initial screening, processing instruction, and pretest/posttest measures.

Initial Screening.

Informed consent was obtained from each participant. The Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) was administered to each

participant. Language history and language use questionnaires (Muñoz, Marquardt, & Copeland, 1999) were administered to investigate language acquisition patterns, and pre- and post- morbid patterns of language use in selected contexts (Muñoz, Marquardt, & Copeland, 1999; Paradis, 1987). Results from the Boston Diagnostic Aphasia Examination (3rd ed.) (BDAE-3; Goodglass, Kaplan, & Barresi, 2001) were used to measure type and severity of aphasia. The BDAE-3 had been administered by clinicians at the MSHC within six months of the beginning of this study and scores are listed for each participant in the results section.

Processing Instruction.

Participants received PI to use '*a*' to comprehend subject and object roles in a variety of word orders. '*A*' comprehension was assessed and taught using proper nouns and pronouns as subjects and objects. PI instruction was conducted 60 minutes a day for four days over two weeks. The primary investigator (L1-English, L2-Spanish) administered the protocol in a quiet atmosphere with minimal distractions. Only the instructor and the participant were in the room during the instruction.

PI included explicit instruction (see Appendix A), referential activities (see Appendix B), and affective activities (see Appendix C). An instructional packet was provided and included explicit instruction related to flexible word order in Spanish, use of pronouns, and use of the preposition '*a*' in identifying the subject and the object of the sentence. Participants received five to ten minutes of explicit instruction at the beginning of the first and third sessions. Instructions were provided in a written format using text and pictures as well as reviewed verbally by the instructor. In accordance with the guidelines in VanPatten and Cadierno (1993), participants received information on inefficient processing strategies that Spanish learners typically use: learners are more likely to process non-redundant meaningful grammatical forms

(nouns or adjectives) before they process redundant meaningful forms (the preposition '*a'*), and they tend to process the first noun or pronoun they encounter in a sentence as the subject or agent. Participants were then taught the strategies for identifying the thematic roles in the sentence: nouns and pronouns in relation to the '*a*.' Nouns were used on the first and second day while pronouns were used the third and fourth day to represent the people in the sentences.

Participants received structured input activities for 50-60 minutes on each of the four days. The structured input activities contained sentences that gave learners practice interpreting sentences with the preposition '*a.*' These activities included referential activities (see Appendix B) and affective activities (see Appendix C) and followed the guidelines laid out in Lee and VanPatten (2003). Referential activities had only one possible answer while affective activities had more than one possible answer and encouraged participants to use the content in the sentence or question to determine which answer best applied. The affective activities were designed so that the preposition was in a prominent position, and participants would notice it when determining the meaning of the sentence. Two referential and two affective activities were administered each day.

Pretest/Posttest Measures.

Participants were given tests of syntactic comprehension (see Appendix D) and production prior to and immediately following a two week segment of PI treatment and a four to seven week segment of no treatment. Participants also were given these measures six to seven weeks post treatment.

Auditory comprehension of flexible word order and pronouns were assessed using a picture identification task. Fifty target sentences were presented, 15 of both the verb-object-subject (VOS) and object-verb-subject (OVS) word orders as well as 10 of both the subject-verb-

object (SVO) word order and distracter word order (Ostrosky-Solis et al., 1999). SVO sentences are the canonical word order in Spanish, occurring more frequently than OVS and VOS sentences (Ostrosky-Solis et al., 1999). Two versions of this 50 question test were used so that two participants completed version A as a pretest and version B as a posttest surrounding treatment while the other participant completed version B as a pretest and version A as a posttest surrounding treatment. The target sentence was digitally recorded with a 49-year-old male native speaker of Spanish who spent the first 40 years of his life living in Peru. Participants heard the target and saw four pictures: one target and three foils. Participants were instructed to point to the picture that corresponded with the meaning of the sentence. Two training items were presented to ensure that participants understood the task. Performance on the comprehension task was analyzed for the dependent variable of accuracy.

Production of the preposition 'a' was assessed using a story generation task. Participants were shown a picture sequence from the Bilingual Aphasia Test and asked to tell a story about the pictures. The stories were recorded, transcribed, and then copied into Systematic Analysis of Language Transcription (SALT; Miller & Iglesias, 2006) for analysis. Narrative samples were analyzed for the following dependent variable: percent correct use of '*a*.'

Data Analysis and Reliability.

Participants are presented as individual case studies, with immediate and delayed treatment balanced across participants. Descriptive statistics were used to examine performance on the '*a*' test and the picture description task pre- and post- treatment, as well as on referential activities administered during each treatment session. Frequency counts and percent correct were calculated for the following variables: correct responses on the '*a*' test and correct responses on the referential activities. Difference scores were calculated on the responses on the

‘*a*’ test and referential activities ([Score 1 – Score 2]/ Score 1). That number was then multiplied by 100 to calculate a percentage. On the production tasks, a frequency count of the number of ‘*a*’ produced was calculated then divided by the number of ‘*a*’ opportunities to obtain percentages of ‘*a*’ produced out of ‘*a*’ required. On the referential activities, a correct response was determined on the basis of the initial response prior to any correction or support. On the ‘*a*’ test, a correct response was determined on the basis of the patient’s final response.

Discourse samples were transcribed into SALT. A reliability check was completed between two transcribers as a measurement of interrater reliability. The primary investigator, a bilingual English/Spanish speaker, transcribed all of the discourse samples. Another transcriber, a native Spanish speaker, transcribed three (30%) randomly selected transcripts (one from each participant) and conducted an analysis of ‘*a*’ occurrence. Reliability for accuracy in word transcription was calculated by subtracting the number of mismatched words from the number of matched words and dividing this number by the total number of words in the transcript. That number was then multiplied by 100 to calculate a percentage. Reliability for transcription was 83%. Reliability for accuracy of ‘*a*’ codes was calculated by subtracting the number of mismatched ‘*a*’ codes from the number of matched ‘*a*’ codes and dividing by the total number of ‘*a*’ codes in the transcript. That number was then multiplied by 100 to calculate a percentage. The reliability for identifying present and required ‘*a*’ was 100%.

Chapter III

Results

Participant 1 (CA).

CA was a 44-year-old Spanish/English bilingual male who suffered a left cerebrovascular accident (CVA) 21 months before the beginning of this study. Following the stroke, CA was hospitalized at Baylor Medical Center for 20 days. He received outpatient speech and language therapy in Spanish from Baylor Medical Center for the following month. CA began receiving speech and language therapy in Spanish at the MSHC 14 months before the start of this study. He remained in therapy prior to and after the completion of this project.

CA was premorbidly bilingual in Spanish and English. He was born and educated through high school in Mexico. He spoke only Spanish for the first 34 years of his life. During the eight years prior to his stroke, CA began speaking English. He used English primarily while communicating with coworkers in his job as a construction worker. He communicated in Spanish with the other people in his life prior to his stroke. Since the CVA, CA has spoken primarily Spanish.

Initial Screening.

CA was provided information about the study and signed the consent forms to participate. CA obtained a score of 22 on the MMSE at the beginning of this study, which indicated a mild cognitive deficit. He scored the maximum points possible in the areas of orientation to place, registration, recall, naming, reading, writing, and drawing. The areas in which he missed items were on orientation to time, attention and calculation, repetition, and comprehension. His errors in these sections were most likely due to naming difficulties. CA's score indicated that his mental status was intact relative to the severity of his anomia (as determined by CA's BDAE-3 results), and he was able to participate in the treatment.

In addition, CA completed the Spanish version of the BDAE-3 and parts of the English version of the BDAE-3 two months prior to his participation in this study. His results indicated that he had a moderate mixed receptive and expressive aphasia with severe anomia (see Table 1). CA's strengths on the Spanish version of the test were in the areas of simple conversational speech, repetition of words, matching words and numbers, free grammatical morphemes, form and motor facility of writing, and writing primer words. His weaknesses were in the areas of auditory comprehension of commands and complex ideational material, verbal agility, saying automatic sequences, repetition of sentences, naming, reading words and sentences, comprehension of sentences and paragraphs, and writing regular and irregular words. CA's strongest area on the English version of the test was basic word discrimination. His weaknesses were in the areas of conversational speech, auditory comprehension, and naming. Overall, CA's score indicated that he had stronger language abilities in Spanish than in English.

Table 1

Performance of CA on the BDAE-3

BDAE Subtest	Spanish Version Results	English Version Results
Conversational and Expository Speech		
A. Simple Social Responses	A. 6/7 (86%)	A. 2/7 (29%)
B. Total Complexity Index	B. 1.2	B. –*
Auditory Comprehension		
A. Basic Word Discrimination	A. 28/37 (76%)	A. 20.5/37 (55%)
B. Commands	B. 8/15 (53%)	B. 4/15 (27%)
C. Complex Ideational Material	C. 6/12 (50%)	C. 3/12 (25%)
Oral Expression		
A. Nonverbal Agility	A. 10/12 (83%)	A. –
B. Verbal Agility	B. 5/14 (36%)	B. –
C. Automatic Sequences	C. 2/8 (25%)	C. –
D. Repetition of Words	D. 8/10 (80%)	D. –
E. Repetition of Sentences	E. 2/10 (20%)	E. –
F. Responsive Naming	F. 8/20 (40%)	F. –
G. Screening of Special Categories	G. 9/12 (75%)	G. –
Reading		
A. Matching Across Cases and Scripts	A. 8/8 (100%)	A. –
B. Number Matching	B. 11/12 (92%)	B. –
C. Picture-word Match	C. 8/10 (80%)	C. –
D. Lexical Decision	D. 3/5 (60%)	D. –
E. Homophone Matching	E. 4/5 (80%)	E. –
F. Free Grammatical Morphemes	F. 8/10 (80%)	F. –
G. Oral Word Reading	G. 9/30 (30%)	G. –
H. Oral Sentence Reading	H. 2/10 (20%)	H. –
I. Oral Sentence Comprehension	I. 3/5 (60%)	I. –
J. Sentence/Paragraph Comprehension	J. 5/10 (50%)	J. –
Writing		
A. Form	A. 17/18 (95%)	A. –
B. Letter Choice	B. 17/27 (63%)	B. –
C. Motor Facility	C. 18/18 (100%)	C. –
D. Primer Words	D. 5/6 (83%)	D. –
E. Regular Phonics	E. 2/5 (40%)	E. –
F. Common Irregular Words	F. 0/5 (0%)	F. –
G. Written Picture Naming	G. 2/12 (17%)	G. –
Boston Naming Test		
A. Total Score	A. 9/60 (15%)	A. 0/15 (0%)

***** – not administered

'a' Comprehension.

To measure CA's syntactic comprehension before treatment began, he completed version A of the '*a*' test. CA's total score was 27/50 (54%; see Figure 1). When performance on the pretest was analyzed by sentence type (see Figure 2), CA demonstrated the highest scores for SVO sentences (8/10; 80%) followed by distracter sentences (7/10; 70%) and VOS sentences (10/15; 67%). CA's score for OVS sentences was substantially lower (2/15; 13%).

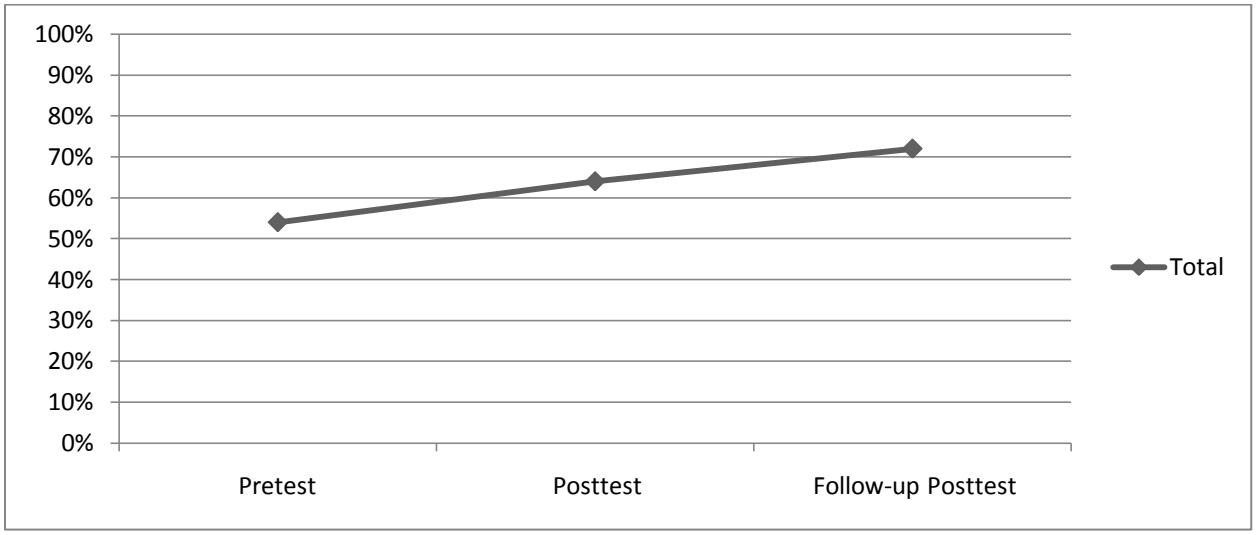

Figure 1. Percentage of total items correct on the pretest, posttest, and follow-up posttest for CA.

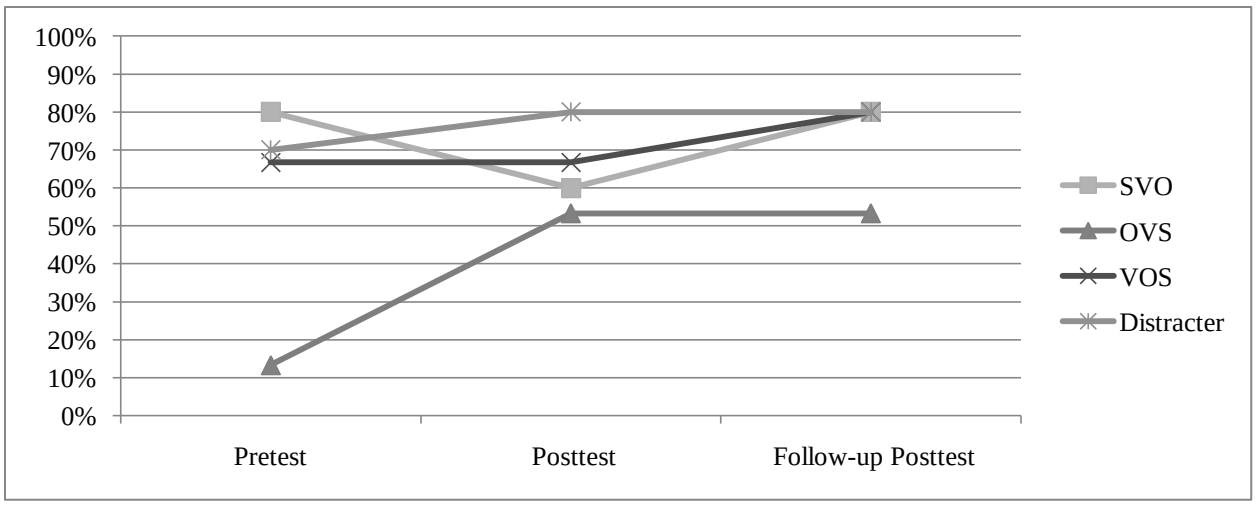

Figure 2. Percentage correct of SVO, OVS, VOS, and distracter sentences on pretest, posttest, and follow-up posttest for CA.

Version B of the ‘a’ test was administered to CA after treatment to measure his syntactic comprehension. His total score showed improvement following treatment (19% increase). In the posttest, CA highest scoring sentence type changed from SVO sentences to distracter sentences (8/10; 80% correct). His lowest percentage remained to be on OVS sentences (8/15; 53% correct). From the pretest to the posttest, CA’s accuracy increased on OVS sentences (300% increase) and distracter sentences (14% increase). His accuracy stayed the same on VOS sentences (10/15; 67% correct) and decreased on SVO sentences (25% decrease). Overall, CA’s score increased in accuracy from the pretest to the posttest and indicated great improvement on OVS sentences.

CA’s syntactic comprehension was measured a third time seven weeks after he completed treatment with the administration of version A of the ‘*a*’ test. During this period of seven weeks, CA was not receiving any SLP therapy services. His total score increased from his scores on the pretest and posttest (36/50; 72% correct; 13% increase). As in the posttest, CA’s scored high on distracter sentences (8/10; 80% correct). In the follow-up posttest, he scored the same high score on SVO (8/10; 80% correct) and VOS sentences (12/15; 80% correct). CA scored the lowest in OVS sentences (8/15; 53% correct). From the posttest to the follow-up posttest, CA’s accuracy increased the most on SVO sentences (33% increase). His accuracy on VOS sentences also showed improvement (20% increase). CA’s accuracy on OVS and distracter sentences stayed the same.

Overall, the results on the ‘*a*’ test indicate that CA’s comprehension of the personal ‘*a*’ to signal the object of the sentence improved with treatment. CA’s total score on the posttest was higher than his score on the pretest, which demonstrated improvement. CA’s accuracy on the less frequently occurring sentence type of OVS sentences greatly increased from pretest to

posttest which demonstrates an increased reliance on the '*a*' to comprehend the sentence. CA's total score increased again from the posttest to the follow-up posttest. He was also able to maintain his improved score on OVS sentences that was observed on the posttest. The increases on the follow-up posttest affirm that CA retained knowledge acquired during treatment, and he improved on his processing abilities after receiving treatment. CA learned to use the personal '*a*' as a cue to identify the object of the sentence.

Additional data on response to treatment was collected using a frequency count of accuracy on referential tasks during treatment. CA's total score increased across the first three days of treatment from 7/18 (39%) to 15/18 (83% correct; 114% increase) and remained at the same high score of 15/18 (83%) correct on day four (see Figure 3). His percentages correct on the individual sentence types demonstrated improvement as well (see Figure 4). VOS and OVS sentences increased the most (150% increase) while SVO sentences had the smallest improvement (67% increase) from day 1 to day 4 during treatment. These results indicate that CA's use of the personal '*a*' to identify the object greatly increased during treatment with all sentence types. These results are consistent with the increase demonstrated in the pretest and posttest results on the '*a*' test and provide additional support that treatment improved CA's comprehension of the personal '*a*.'

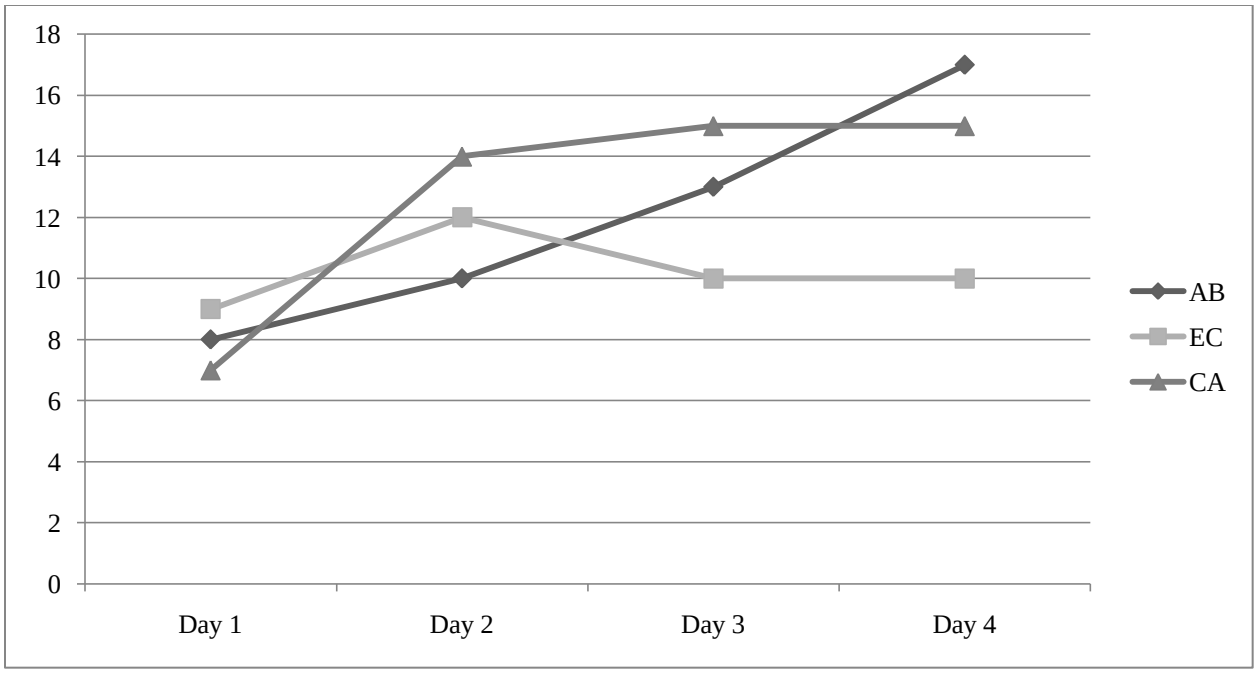

Figure 3. Total number of items correct on the referential activities for all participants: CA, EC, and AB.

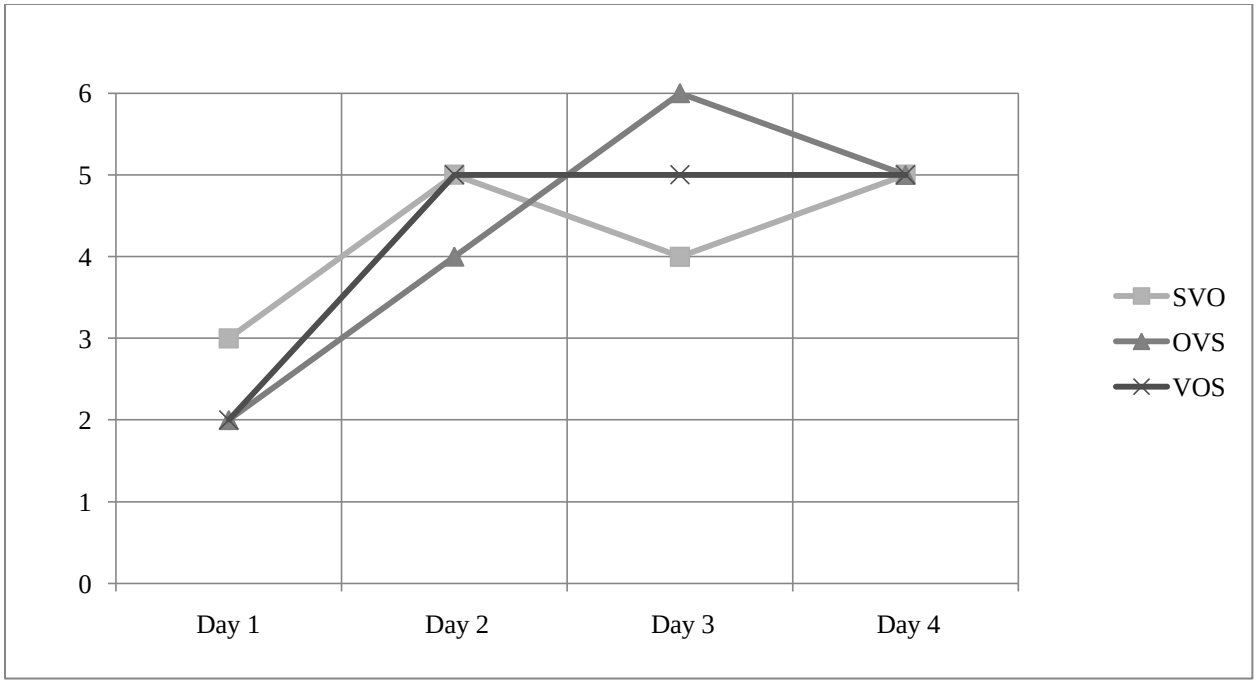

Figure 4. Number of items correct on SVO, OVS, and VOS sentences during referential activities for CA.

'a' Expression.

CA completed the story generation task to measure his syntactic expression of the preposition 'a' as a pretest before treatment (see Table 2). In his story, he had 15 opportunities to use the personal '*a*,' and he used it correctly ten times (67% accuracy). CA completed this task again after treatment as a posttest in which his opportunity to use the personal '*a*' decreased (6 opportunities; 9 opportunity decrease) and his accuracy stayed the same (4/6; 67% accuracy). Therefore, CA's accuracy did not change after treatment and he used fewer grammatical constructions requiring the personal '*a*.' CA completed the story generation task a third time in the follow-up posttest after seven weeks of no treatment. In his third story, he had an increased amount of opportunities (8 opportunities; 2 opportunity increase) from the posttest to use the personal '*a*' and an increased accuracy of using it correctly (6/8; 75% accuracy; 12% increase). He used the personal '*a*' with an increased accuracy from his first two stories, and he was using more constructions requiring the use of the personal '*a*' than in the posttest. These results indicate CA's expression of the personal '*a*,' as measured on a picture description task, demonstrated minimal change following treatment.

Table 2

CA's Use of Personal 'a' in Story Generation Tasks

Test	# Correct Use/# Opportunities of Personal '*a*' (Percentage Correct)
Pretest	10/15 (67%)
Posttest	4/6 (67%)
Follow-up Posttest	6/8 (75%)

Discussion.

CA's demonstrated an increase in accuracy in '*a*' comprehension on both the '*a*' test and the daily referential activities. Additionally, the higher comprehension score was maintained at follow-up testing conducted seven weeks after the completion of the treatment. CA's production of the personal '*a*' did not increase on the story generation task. CA's increased accuracy on comprehension tasks was, in large part, attributable to increased comprehension of OVS sentences. Though a less common construction, OVS requires the '*a*' to be the first word in the sentence. The position of the '*a*' in an OVS sentence may make it more salient.

Participant 2 (EC).

EC was a 67-year-old Hispanic male who suffered a cerebrovascular accident (CVA) following bypass surgery 16 months prior to the beginning of this study. Following the stroke, EC was hospitalized at Texas Health Harris Methodist Hospital for 44 days. He then received outpatient speech and language therapy at the same facility three times a week for approximately one year in Spanish. Two months before the beginning of this study, EC began receiving speech and language therapy in Spanish twice a week at MSHC. He remained in therapy at MSHC prior to and after the completion of this study.

EC was premorbidly bilingual in Spanish and English. He was born and educated through high school in Mexico. He spoke only Spanish for the first 33 years of his life. He has lived continuously in the United States since the age of 33. EC was exposed to English at various times during the 32 years of his life before the stroke while he worked as a chef. Before his stroke, EC was able to speak with a low proficiency in English. He could understand a greater amount of the language than he could produce. Spanish was the language he used for

almost all of his interactions before his stroke. Since the CVA, EC has spoken primarily Spanish as well.

Initial Screening.

EC was provided information about the study and signed the consent forms to participate prior to beginning initial screening procedures. When accepting multiple modes for expression, EC obtained a score of 20 on the MMSE. This score indicated a moderate cognitive deficit. Because of the severity of EC's aphasia and apraxia, verbal answers, written answers, and gestural answers in response to two options given were accepted as correct when scoring the MMSE. He scored the maximum points possible in the areas of orientation to place, registration, naming, comprehension, reading, and drawing. EC missed items in the areas of orientation to time, attention and calculation, recall, repetition, and writing. These errors were most likely due to naming difficulties and the severity of his apraxia. EC's score indicated that his mental status was adequate for participation in this study. EC completed an informal Spanish version of the Quick Assessment for Apraxia of Speech (Tanner & Culbertson, 1999) to assess for apraxia. His performance was consistence with moderate apraxia of speech as demonstrated by inconsistent errors, increased frequency of errors with longer items, misarticulations, and visible groping behaviors.

In addition, EC completed the Spanish version of the BDAE-3 two months prior to his participation in this study. His results (see Table 3) indicated that he had a moderate to severe expressive aphasia and mild to moderate receptive aphasia. EC's strengths on the test were in the areas of simple conversational speech, auditory comprehension of simple words and commands, repetition of words, matching numbers and letters, and reading words. His weaknesses were in the areas of comprehension of complex ideational material, nonverbal and verbal agility, expression of automatic sequences, repetition of sentences, naming, picture-word

matching, homophone matching, oral sentence reading and comprehension, sentence/paragraph comprehension, and writing. Overall, EC's scores indicated that his receptive skills were more intact than his expressive skills.

Table 3

Performance of EC on the BDAE-3

BDAE Subtest	Spanish Version Results
Conversational and Expository Speech	
A. Simple Social Responses	A. 6/7 (86%)
Auditory Comprehension	
A. Basic Word Discrimination	A. 33.5/37 (91%)
B. Commands	B. 12/15 (80%)
C. Complex Ideational Material	C. 8/12 (67%)
Oral Expression	
A. Nonverbal Agility	A. 8/12 (67%)
B. Verbal Agility	B. 9/14 (64%)
C. Automatic Sequences	C. 3/8 (38%)
D. Repetition of Words	D. 9/10 (90%)
E. Repetition of Sentences	E. 2/10 (20%)
F. Responsive Naming	F. 6/20 (30%)
Reading	
A. Matching Across Cases and Scripts	A. 8/8 (100%)
B. Number Matching	B. 12/12 (100%)
C. Picture-word Match	C. 3/10 (30%)
D. Lexical Decision	D. 3/5 (60%)
E. Homophone Matching	E. 3/5 (60%)
F. Free Grammatical Morphemes	F. 6/10 (60%)
G. Oral Word Reading	G. 21/30 (70%)
H. Oral Sentence Reading	H. 0/10 (0%)
I. Oral Sentence Comprehension	I. 3/6 (60%)
J. Sentence/Paragraph Comprehension	J. 5/10 (50%)
Writing	
A. Form	A. 4/18 (22%)
B. Letter Choice	B. 6/27 (22%)
C. Motor Facility	C. 2/18 (11%)
Boston Naming Test	
A. Total Score	A. 33/60 (55%)

'a' Comprehension.

To measure EC's syntactic comprehension before treatment began, he completed version A and B of the '*a*' test. A delayed treatment was administered with EC completing the '*a*' test (version A) four weeks prior to taking a second '*a*' test (version B) immediately prior to the initiation of treatment. During the four week period between completing the tests, EC was receiving treatment to improve single word and number writing but did not receive any treatment targeting syntactic comprehension or production. EC's total score on version A for the delayed pretest was 27/50 (54% correct; see Figure 5). When performance on the delayed pretest was analyzed by sentence type (see Figure 6), he demonstrated the highest scores on SVO (6/10; 60%) and distracter sentences (6/10; 60%). These scores were followed closely by OVS sentences (8/15; 53%) and VOS sentences (7/15; 47%). On the pretest (Version B), minimal change in EC's total score was evident (4% decrease) in comparison to the delayed pretest. Distracter sentences remained the highest scoring sentence type and had the same percentage correct (6/10; 60%) as in the delayed pretest. VOS sentences slightly increased in accuracy (14% increase) while OVS and SVO sentences slightly decreased in accuracy (13% decrease; 17% decrease). These scores indicate that EC's comprehension of the personal '*a*' to signal the object of the sentence did not change during a period of no treatment.

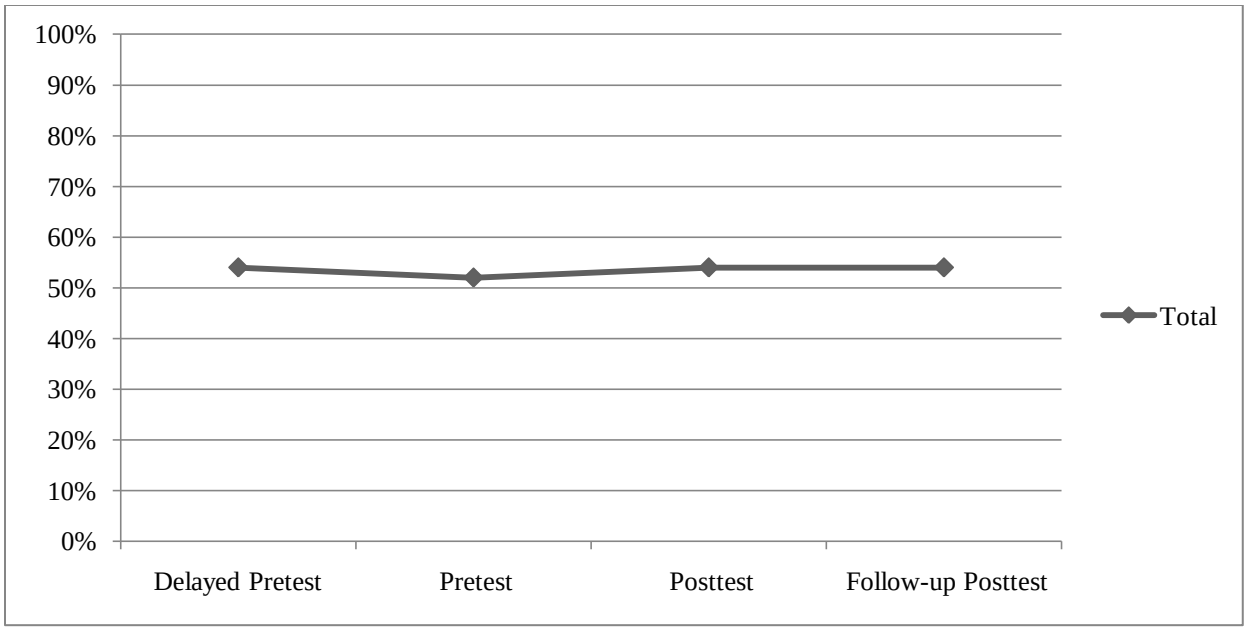

Figure 5. Percentage of total items correct on the delayed pretest, pretest, posttest, and follow-up posttest for EC.

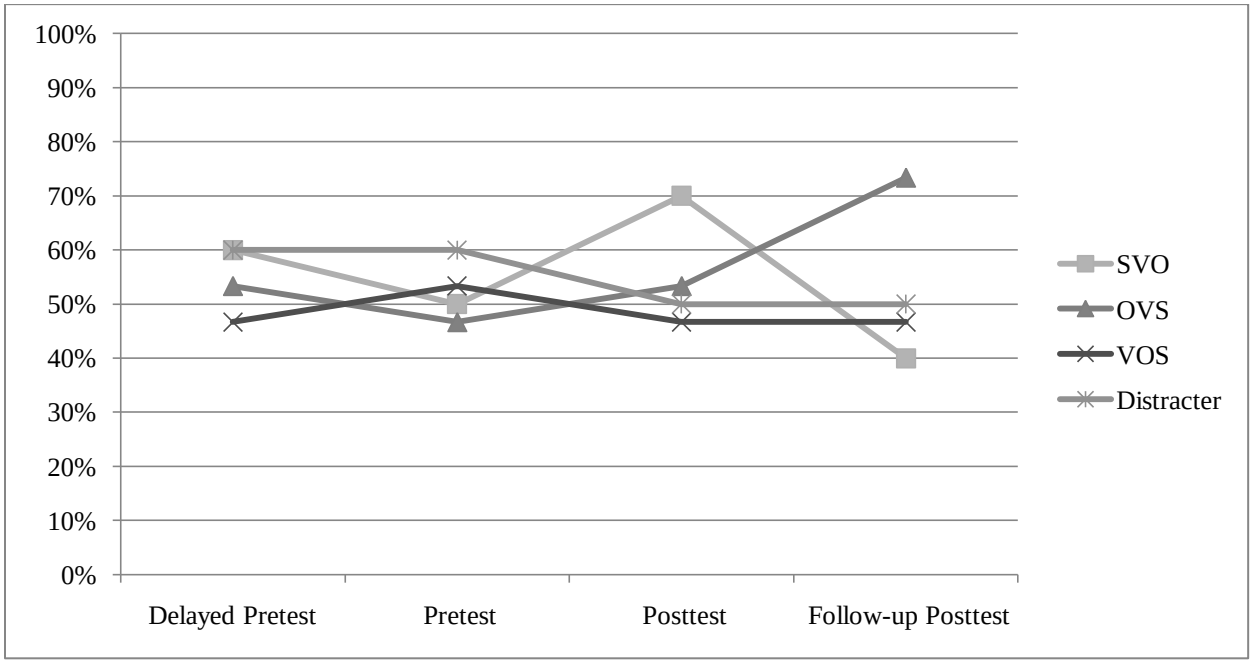

Figure 6. Percentage correct for SVO, OVS, VOS, and distracter sentences on the delayed pretest, pretest, posttest, and follow-up posttest for EC.

Version A of the 'a' test was administered to EC after two weeks of treatment to measure his syntactic comprehension. His total score evidenced minimal change (4% increase). On the posttest, EC's highest scoring word order sentence type was SVO sentences (7/10; 70% correct) and the lowest scoring was VOS sentences (7/15; 47% correct). In the posttest, OVS sentences (8/15; 53% correct) and distracter sentences (5/10; 50% correct) fell in the middle. From the pretest to the posttest, EC's accuracy increased on SVO sentences (40% increase) and OVS sentences (14% increase). His accuracy decreased on distracter sentences (17% decrease) and VOS sentences (13% decrease).

EC's syntactic comprehension was measured a fourth time seven weeks after treatment with the administration of version B of the '*a*' test. During this period of seven weeks, EC did not receive any SLP therapy services. His total score was the same as his score on the posttest (27/50; 54% correct). In the follow-up posttest, EC had the highest accuracy on the word order of OVS sentences (11/15; 73% correct). SVO sentences dropped from the highest scoring word order sentence type to the lowest scoring (4/10; 40% correct). The percentage correct on VOS (7/15; 47% correct) and distracter sentences (5/10; 50% correct) did not change from the posttest to the follow-up posttest. EC's accuracy increased on OVS sentences (38% increase) while his accuracy decreased on SVO sentences (43% decrease).

Additional data on response to treatment was collected using a frequency count of accuracy on referential tasks during treatment. EC's total score increased from day 1 to day 2 (33% increase; see Figure 3). His total scored then decreased on day 3 (17% decrease) and stayed at that lower percentage on day 4. When examining the individual word orders (see Figure 7), EC's percentage steadily increased across the four days on OVS sentences (400% increase). His accuracy on VOS sentences stayed the same across the four days (3/6; 50%

correct) while his accuracy on SVO sentence increased from day 1 to day 2 and then decreased across the final two days.

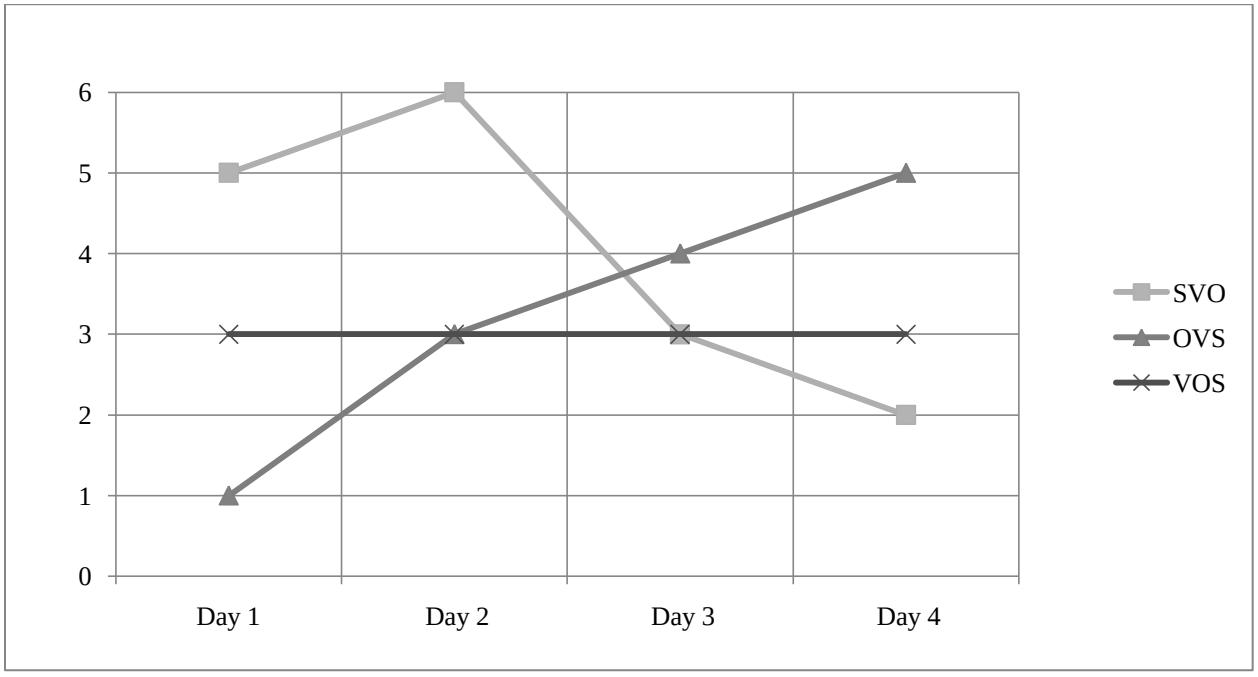

Figure 7. Number of items correct on SVO, OVS, and VOS sentences during the referential activities for EC.

'a' Expression.

EC completed the story generation task to measure his syntactic expression of the personal 'a' as a delayed pretest, pretest, posttest, and follow-up posttest surrounding treatment. In all four of his stories, he did not produce a grammatical construction requiring the personal '*a*.' Production of the personal '*a*' was not evident on the story generation task.

Discussion.

EC demonstrated response to treatment that was inconsistent. EC's improvement in comprehension was inconsistent and highly dependent on sentence type. Overall scores indicate that EC did not learn to use '*a*' to identify the subject and object of the target sentences as his score on the posttest changed minimally relative to his score on the pretest. Additionally, EC's

overall accuracy did not increase consistently across treatment. However, learning was suggested for some sentence types, particularly OVS sentences. Learning was evidenced by EC's steady linear progression increase in accuracy on this less occurring word order on items in the referential activities throughout the four treatment days as well as on the posttest of the '*a*' test after treatment. The increase in comprehension of the personal '*a*' on OVS sentences was retained in the follow-up posttest, indicating that his comprehension of the personal '*a*' to signal the object increased after treatment and was retained seven weeks after treatment ended. As with CA, the placement of the personal '*a*' at the start of the sentence may have enhanced the cue saliency in OVS sentences. EC also demonstrated improvement with SVO sentences as evidenced by an increased accuracy on the posttest from the pretest; however, his accuracy significantly decreased on this sentence type during treatment activities. The increased accuracy on SVO sentences also was not maintained in the follow-up posttest. While EC's comprehension of the personal '*a*' demonstrated some improvement, EC's expression of the personal '*a*' did not change through the duration of this study. He did not produce the targeted grammatical form during any of the story generation tasks.

EC's response to treatment may have been impacted by the type and severity of his communication impairment. He demonstrated a moderate to severe expressive aphasia, mild to moderate receptive aphasia, and moderate apraxia. The severity of EC's aphasia and apraxia most likely interfered with his learning during the treatment. EC's moderate to severe expressive aphasia prevented him from planning and sequencing motor movements needed to produce speech. This interfered with his ability to produce words and sentences that would contain the targeted preposition. His mild to moderate receptive aphasia interfered with his ability to comprehend the instructions and input given during treatment. Cognitive deficits demonstrated

on the MMSE may also have impacted his ability to comprehend instructions and input. EC's moderate apraxia made it difficult for him to initiate words and phrases. This interfered with his ability to talk and participate in treatment and testing tasks.

More improvement may have been seen with treatment for EC with some modifications. For example, an expanded treatment protocol would have given EC more time and exposure to the targeted preposition in varying word orders. A lack of comprehension increasing in word orders besides OVS sentences could have been due to a lack of sufficient opportunities to work on the different word orders during treatment.

Participant 3 (AB).

AB was a 52-year-old Hispanic female who suffered a cerebrovascular accident (CVA) 16 months prior to the beginning of this study. Following the stroke, AB was hospitalized at Texas Health Harris Methodist Hospital for five days. She then received outpatient speech and language therapy in English at the same facility for approximately one year. She went to therapy twice a week for the first six months and once a week for the remaining six months. Two months before the beginning of this study, AB began receiving speech and language therapy in English twice a week at MSHC. She remained in therapy at MSHC prior to and after the completion of this study.

AB was premorbidly bilingual in English and Spanish. AB was born and educated through high school in the United States. She spoke English to her parents and at school while growing up. She spoke Spanish with her grandmother. Both of her parents were bilingual in English and Spanish but spoke mainly English to her. Since the CVA, AB has spoken primarily English.

Initial Screening.

AB was provided information about the study and signed the consent forms to participate. AB obtained a score of 26 on the MMSE, which indicated her cognitive skills to be within normal limits. AB's score indicated that her mental status was intact and she was able to participate in the treatment.

In addition, AB completed the English version of the BDAE-3 and parts of the Spanish version of the BDAE-3 two months prior to her participation in this study. Her results (see Table 4) indicated that she had a mild expressive aphasia. AB's strengths on the English test were in the areas of auditory comprehension, repetition of words and sentences, responsive naming, reading letters and words, reading comprehension, and writing letters and simple words. Her weaknesses were in the areas of conversational speech, comprehension of complex ideational material, nonverbal and verbal agility, reading sentences, naming, and writing picture descriptions. AB's strengths on the Spanish test were in the areas of auditory comprehension and repetition of words. Her weaknesses were in the areas of repetition of sentences, automatic sequences, writing words, and naming. Overall, AB's score indicated that she had strong comprehension in both languages.

Table 4

Performance of AB on the BDAE-3

BDAE Subtest	English Version Results	Spanish Version Results
Conversational and Expository Speech	A. 7/7 (100%)	A. 6/7 (86%)
A. Simple Social Responses	B. 1.32	B. 1.6
B. Complexity Index		
Auditory Comprehension		
A. Basic Word Discrimination	A. 36.5/37 (99%)	A. 31/37 (84%)
B. Commands	B. 15/15 (100%)	B. 13/15 (87%)
C. Complex Ideational Material	C. 7/12 (58%)	C. –*
Oral Expression		
A. Nonverbal Agility	A. 6/12 (50%)	A. –
B. Verbal Agility	B. 9/14 (64%)	B. –
C. Automatic Sequences	C. 7/8 (88%)	C. 4/8 (50%)
D. Repetition of Words	D. 10/10 (100%)	D. 8/10 (80%)
E. Repetition of Sentences	E. 7/10 (70%)	E. 4/10 (40%)
F. Responsive Naming	F. 19/20 (95%)	F. –
G. Screening of Special Categories	G. 12/12 (100%)	G. –
Reading		
A. Matching Across Cases and Scripts	A. 8/8 (100%)	A. –
B. Number Matching	B. 12/12 (100%)	B. –
C. Picture-word Match	C. 10/10 (100%)	C. –
D. Lexical Decision	D. 5/5 (100%)	D. –
E. Homophone Matching	E. 4/5 (80%)	E. –
F. Free Grammatical Morphemes	F. 10/10 (100%)	F. –
G. Oral Word Reading	G. 27/30 (90%)	G. –
H. Oral Sentence Reading	H. 3/10 (30%)	H. –
I. Oral Sentence Comprehension	I. 5/5 (100%)	I. –
J. Sentence/Paragraph Comprehension	J. 10/10 (100%)	J. –
Writing		
A. Form	A. 16/18 (89%)	A. –
B. Letter Choice	B. 25/27 (93%)	B. –
C. Motor Facility	C. 17/18 (94%)	C. –
D. Primer Words	D. 6/6 (100%)	D. 3/6 (50%)
E. Regular Phonics	E. 4/5 (80%)	E. 1/5 (20%)
F. Common Irregular Words	F. 4/5 (80%)	F. –
G. Written Picture Naming	G. 8/12 (67%)	G. –
H. Narrative Writing	H. 6/11 (55%)	H. –
Boston Naming Test		
A. Total Score	A. 45/60 (75%)	A. 6/15 (40%)

* – not administered

'a' Comprehension.

To measure AB's syntactic comprehension before treatment began, she completed version A of the '*a*' test. AB's total score was 26/50 (52%; see Figure 8). When performance on the pretest was analyzed by sentence type (see Figure 9), AB demonstrated the highest scores for SVO sentences (8/10; 80%) followed by distracter sentences (7/10; 70%) and VOS sentences (8/15; 53%). AB's score for OVS sentences was substantially lower (3/15; 20%).

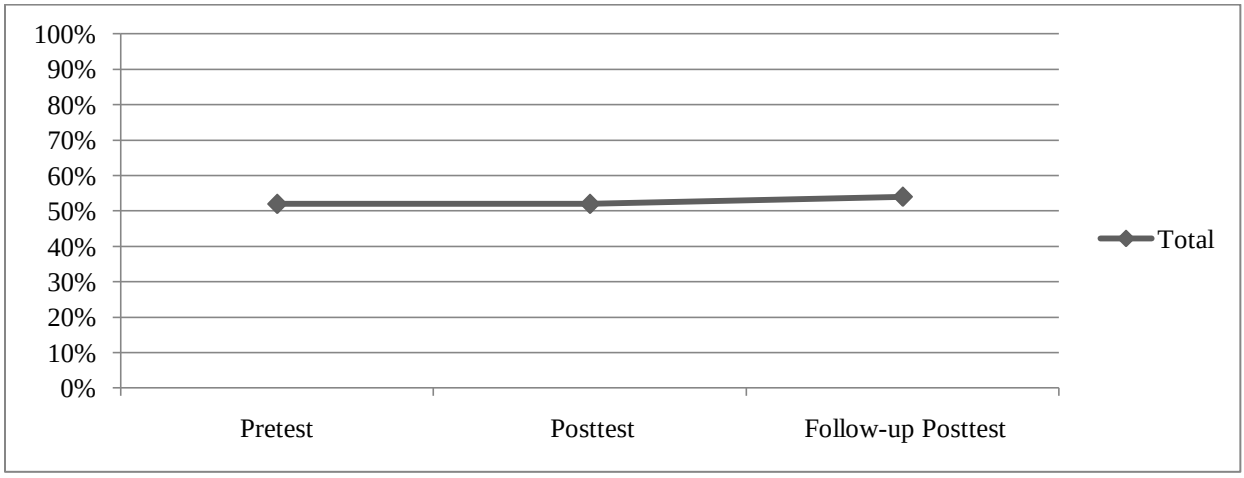

Figure 8. Percentage total items correct on the pretest, posttest, and follow-up posttest for AB.

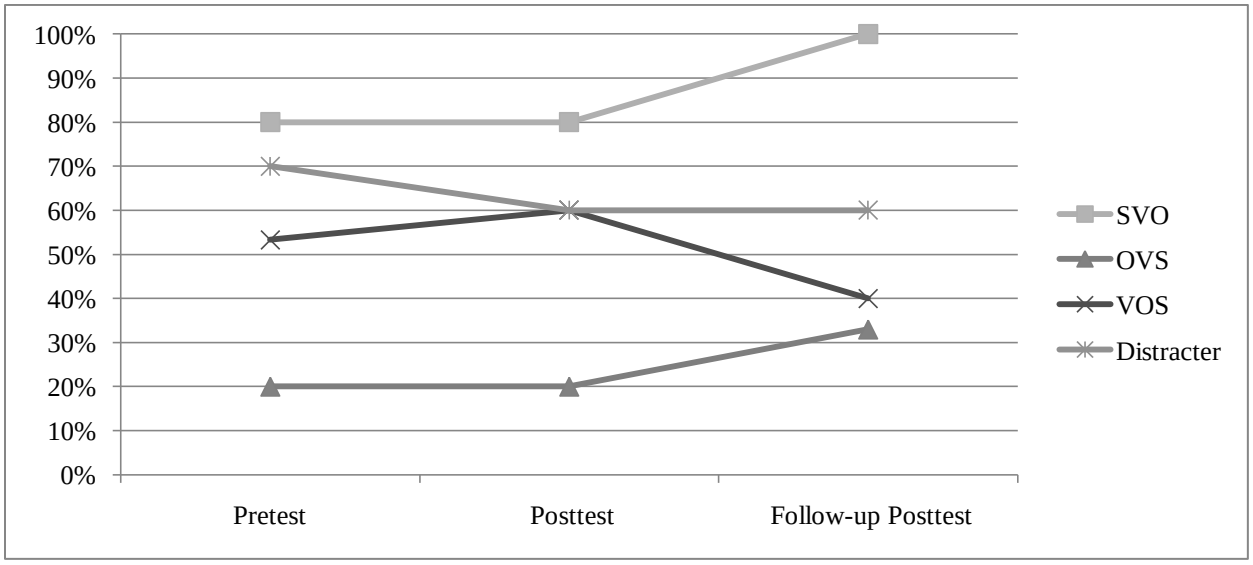

Figure 9. Percentage correct of SVO, OVS, VOS, and distracter sentences on the pretest, posttest, and follow-up posttest for AB.

Version B of the 'a' test was administered to AB after treatment to measure her syntactic comprehension. Her total score did not change following treatment (26/50; 52% correct). As in the pretest, AB scored the highest on SVO sentences (8/10; 80% correct) and the lowest on OVS sentences (3/15; 20% correct). This time her accuracy on VOS (9/15; 60% correct) and distracter sentences were the same (6/10; 60% correct). From the pretest to the posttest, AB's accuracy increased on VOS sentences (13% increase), stayed the same on OVS and SVO sentences, and decreased on distracter sentences (14% decrease). Overall, the scores on the pretest are equivocal to the scores on the posttest; however, some increase on the less frequently occurring VOS sentences was observed.

AB's syntactic comprehension was measured a third time six weeks after treatment with the administration of version A of the '*a*' test. During this period of six weeks, AB did not receive any SLP therapy services. Her total score was slightly higher than her scores on the pretest and posttest (27/50; 54% correct; 4% increase). As in the previous two tests, AB's highest score was on SVO sentences (10/10; 100% correct) followed by distracter sentences (6/10; 60% correct), VOS sentences (6/15; 40% correct), and then OVS sentences (5/15; 33% correct). From the posttest to the follow-up posttest, AB's accuracy increased the most on OVS sentences (67% increase). Her accuracy on SVO sentences also showed improvement (25% increase). AB's accuracy on distracter sentences stayed the same, and her accuracy on VOS sentences showed a decline (33% decrease).

During the referential activities, AB's total score steadily increased across the four days from 44% to 94% correct (113% increase; see Figure 3). Her percentages correct on the individual sentence types increased as well (see Figure 10). VOS sentences increased the most (500% increase) followed by OVS sentences (150% increase) and SVO sentences (20%

increase). These results indicate that AB's use of the personal '*a*' to identify the object greatly increased during treatment with all sentence types. The pretest and posttest measures did not show as large of an increase in comprehension.

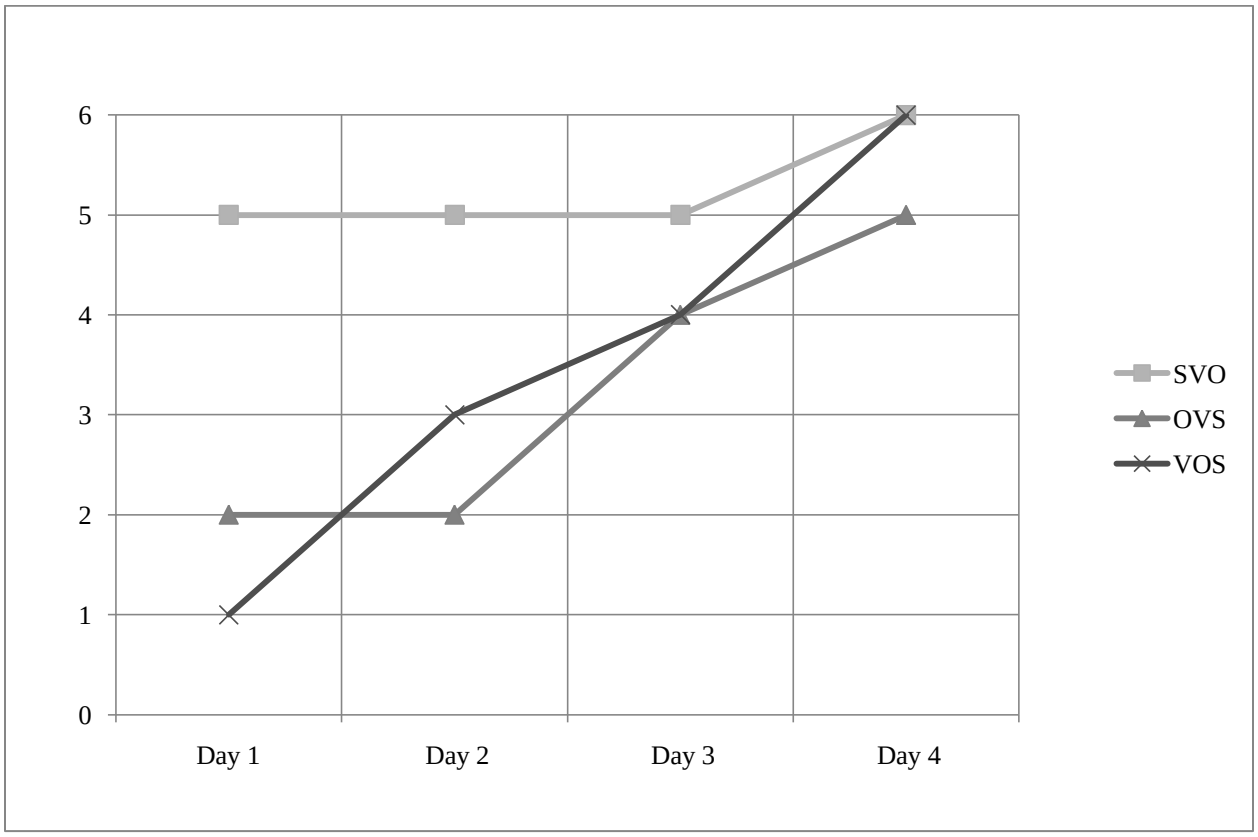

Figure 10. Number of items correct on SVO, OVS, and VOS sentences during referential activities for AB.

'a' Expression.

AB completed the story generation task to measure her syntactic expression of the preposition 'a' as a pretest before treatment (see Table 5). In her story, she had one opportunity to use the personal '*a*,' and she used it correctly in that opportunity (100% accuracy). AB completed this task again after treatment as a posttest. In her second story, she had an additional opportunity (2) to use the personal '*a*' and used it correctly one time (50% accuracy). In her third story during the follow-up posttest, AB had an increased amount of opportunities (5) to use

the personal '*a*' and a decreased accuracy of using it correctly (40% accuracy). She used it with less accuracy than in her first two stories; however, there was an increased amount of opportunities for the use of the personal '*a*' in this third story. There were too few opportunities for the '*a*' within these discourse samples to make any conclusions about AB's expression of the personal '*a*.'

Table 5

AB's Use of Personal 'a' in Story Generation Tasks

Test	# Correct Use/# Opportunities of Personal '*a*' (Percentage Correct)
Pretest	1/1 (100%)
Posttest	1/2 (50%)
Follow-up Posttest	2/5 (40%)

Discussion.

Measures of change in AB's comprehension of the personal '*a*' were inconsistent. Minimal change was evident on the pretest and posttest comparisons, but increased accuracy on referential activities from day 1 to day 4 was evident. AB's total scores on the pretest and posttest were the same, showing no improvement. However, AB's accuracy on the less frequently occurring sentence type of VOS sentences improved from pretest to posttest. This higher accuracy was not retained in the follow-up posttest, but the increased accuracy on a harder sentence type on the posttest indicates that AB comprehension increased. She was able to identify the object in the sentence with the cue of the personal '*a*.' Even though AB's accuracy on VOS sentences decreased in the follow-up posttest, her accuracy on OVS sentences increased. OVS is also a less frequently occurring sentence type and an increased accuracy indicates that

AB was using personal '*a*' to identify the object during the follow-up posttest. Therefore, there is evidence that AB learned to use the personal '*a*' as a cue to identify the object and she retained a portion of that knowledge. During the referential activities, AB's total score consistently increased as well as her accuracy on each word order sentence type, providing evidence that treatment caused an increase in comprehension of the personal '*a*.' AB's expression of the personal '*a*' changed with treatment. While her accuracy decreased, she was using more word orders requiring the '*a*' after treatment. The number of times she used the '*a*' in each discourse sample is too small to make any judgments about her expression of this grammatical structure.

AB's response to treatment may be due in part to her Spanish proficiency. AB's L1 is English and she used this for all of her daily interactions at the time of the study. English was also the only language she had spoken since the time of her stroke. She began learning her L2 Spanish as a child and only spoke it with her grandmother while growing up. Since this treatment was conducted in Spanish and AB had not spoken Spanish for the 16 months preceding this study, she was not conversationally fluent in Spanish at the time of the study. Her decreased proficiency in the language made comprehension of the instructions and treatment tasks more difficult. She also may not have been familiar with all of the vocabulary used in the treatment and testing materials. Unfamiliar vocabulary could have drawn her attention away from the targeted syntactic structure. Evidence suggests that therapy with bilinguals individuals in one language can generalize to the other language (Watamori & Sasanuma, 1976), and treatment in the weaker language can generalize to the stronger language (Hinckley, 2003). Therefore, therapy in AB's weaker language of Spanish could generalize to her stronger language of English and validates administering treatment in her weaker language.

It should be noted that AB used aspects of the explicit instruction to talk herself through the process of comprehending the target sentence. She routinely talked herself through the process (find the '*a*', what follows is the one receiving the action). Given this process, it is unclear why she still chose the incorrect answer. Possibly, the issue was an inadequate understanding of subject versus object. Additional instruction may have improved her understanding of the distinction. Her attempts at using the cueing hierarchy during the posttest suggest that her awareness of '*a*' as a comprehension cue increased during treatment. The amount in which AB verbally attempted to use the cueing hierarchy decreased in the follow-up posttest. However, comprehension of the '*a*' was not entirely lost in the follow-up posttest either as evidenced by the increased accuracy on the less frequently occurring word order of OVS sentences.

Chapter IV

General Discussion

A PI protocol teaching the personal '*a*' was administered to three bilingual Spanish-English speakers with aphasia who all showed differing responses to the instruction. Overall, improved responsiveness to '*a*' was most evident on the referential activities. CA and AB showed greater improvement on the referential activities than EC. Overall change on the '*a*' test administered pre- and post-treatment was demonstrated by CA. CA and EC demonstrated an increase in scores from pre- to post-test for OVS sentences. The results, though limited, suggest that PI may show promise as a treatment for improving syntactic comprehension in individuals with aphasia. In particular the following issues will be discussed: the aspects of the protocol that appeared to benefit individuals with aphasia, ways in which the protocol might be modified to improve outcomes (including limitations in the methodology), and the possible impact of patient specific characteristics (such as type and severity of impairment and language proficiency) on treatment outcomes.

Aspects of PI that Benefit Individuals with Aphasia.

PI is a type of instruction that uses the steps of (1) input, (2) intake, (3) developing system, and (4) output to teach language (VanPatten & Cadierno, 1993a). In particular, PI provides meaningful input to go to the working memory for further processing in the steps of transferring from input to intake (VanPatten, 2002). These four steps can be used to re-teach language to people with aphasia. PI as well as many established syntactic treatments for aphasia use meaningful input (Peach & Wong, 2004; Wambaugh, Martinez, & Alegre, 2001). The meaningful input was used in the referential activities during treatment, which showed steady increases across the four treatments days for CA and AB. These outcomes suggest the meaningful input from PI can be beneficial for treatment for individuals with aphasia.

Explicit instruction is another aspect of PI that can be beneficial for individuals with aphasia. An important aspect of therapy is to explain targets of treatment to the client. The explicit instruction component of PI explains the target for treatment. During the explicit instruction administered during this study, visual and tactile supports were utilized to aid in comprehension of the individuals with aphasia.

Modifications to PI to Improve Outcomes.

While the PI protocol shows promise to improve syntactic comprehension for Spanish speakers with aphasia, positive outcomes from this study were limited. Modifications could be made from the established second language learner version to help people with aphasia. The results of this study showed trends toward improved 'a' comprehension for two participants with improvements on the individual OVS sentence type for the third participant. Now the question can be asked as to how the PI protocol needs to be changed to maximize the possible benefits from this treatment.

The treatment took place in four one hour sessions. One possible modification to increase learning would be to extend the number of treatment sessions. This modification would grant the participant more time to practice and master the targeted grammatical structure. However, how much should be allotted in therapy to focus on one grammatical structure such as the personal '*a*?' Four hours of therapy time is a generous amount to be spending on one structure. Would the benefits gained from additional time focused on one target be worth the amount of time needed for those benefits to occur? The answer to that question lies within the structure being targeted. If the targeted grammatical structure has a high communicative value (VanPatten, 2002), then it seems it would be worth exploring how additional therapy time affected the acquisition of the structure within a PI protocol.

The targeted grammatical structure in this study was the Spanish personal '*a.*' The '*a*' was chosen because of its high cue validity that enables it to strengthen comprehension (Ardila et al., 2000; Kail & Charvillat, 1988; Ostrosky-Solis et al., 1999). It has a high communicative value and is more likely to be processed in working memory (VanPatten, 2002). This means it is more likely to move from input to intake, allowing the structure to then become a part of the learner's developing system. The results of this study suggest that training of the personal '*a*' would take more than four hours. Should more time be spent in therapy to train this grammatical structure? The Spanish personal '*a*' is a free function morpheme that signals the object of the sentence (Ostrosky-Solis et al., 1999). Since Spanish is a language with flexible word order (Ostrosky-Solis et al., 1999), the '*a*' is important for comprehension. This clinical implication of the importance of the '*a*' in comprehension is that it would be a beneficial target to teach in therapy to individuals with aphasia who have receptive deficits. Because of the importance of the '*a*' in comprehension, it is worth exploring how much time it takes to teach this morpheme to Spanish-speakers with aphasia with additional research.

The personal '*a*' needs a training period of more than four hours within a PI protocol. While adding more therapy time is one way to allow the learner increased exposure to this grammatical structure, the modification of adding homework may also be a possible solution to provide the learner with more time with the target. Homework would enable the participants to acquire practice of the targeted grammatical structure outside of the four hours of therapy. Neurons in the brain are damaged in a stroke to cause the loss of language observed in aphasia. Rehabilitation of the neurons and functions they serve requires repeated activation of the pathways (Kleim & Jones, 2008). The intensity to which the pathways are activated has been studied and positive outcomes have been shown for increased intensity within aphasia treatment

(Kleim & Jones, 2008; Cherney, Patterson, Raymer, Frymark, & Schooling, 2008). The addition of homework to the PI protocol would be a way in which to increase the intensity of this treatment by taking advantage of time outside of the therapy setting and is worth exploring with additional research.

In this study, both CA and EC showed improvements in comprehension on OVS sentences from the pretest to the posttest. This evidence suggests that there is a characteristic about OVS sentences that lend them to learning. OVS sentences are constructed in such a way that the '*a*' is required to be the first word of the sentence. According to the recency effect, listeners are more likely to recall the first and last parts of given content, such as a sentence, than the middle part (Talmi & Goshen-Gottstein, 2006). This is consistent with research on the relationship between meaningful input and word order which finds that listeners tune into the first word of a sentence before any other words (VanPatten, 2002; VanPatten, 1999). With the '*a*' placed in the initial position of OVS sentences, the '*a*' is more salient than in other word orders in which the '*a*' is placed in a medial or final position within the sentence. Therefore, the PI protocol could be modified to take advantage of the apparent better response to salient OVS sentences. Such modifications might include introducing one sentence type at a time within the protocol, starting with OVS sentences. In the current study, referential activity contained three items of each of the three targeted sentence types that were mixed together in a random order. An equal amount of time was spent on all three sentences types. It might be beneficial to divide the time according to the difficulty level of the sentence type and spend a lower percentage of time on the salient OVS sentences. Additional research is needed to identify beneficial modifications.

Mastery in expression of the personal '*a*' was not observed in any of the participants during the testing sessions. The most likely cause for this unobserved change is the method in which expression was tested. Stimuli for expression testing tasks could be altered to encourage more productions of personal '*a*' sentence constructions. More discourse samples could also be taken during testing sessions. These modifications would increase the likelihood of being able to measure the participants' expression of the targeted grammatical structure.

A person with aphasia may have different errors than second language learners. The explicit instruction of this PI protocol was created with teaching problem strategies for errors of second language learners (VanPatten, 2002). The explicit instruction could be modified to be more consistent with kinds of errors seen in aphasia. This would allow for optimal learning of individuals with aphasia. The inclusion of explicit instruction in a PI protocol has been debated and shown inconclusive results with second language learners (VanPatten & Oikkenon, 1996; Fernández, 2008). However, the nature of the disorder of aphasia implies a need for explicit instruction. Modifications should be explored with additional research to identify how explicit instruction can be manipulated to best benefit populations with aphasia.

While changes on the pretest and posttest scores were limited, it is also important to consider the participants' scores on the comprehension pretest. All three participants were around 50% accuracy on the comprehension pretest. This is a high score and lies at the upper end of inclusion criteria for the study. If the pretest scores had been lower, there would have been a larger range of possible improved scores. The relatively high pretest scores may limit the range for improvement. However, given that no ceiling effects were evident and a non-impaired Spanish speaker would likely score 100% on this task, the test could have captured improvement in comprehension if evident.

With modifications such as the ones listed, greater improvement on '*a*' comprehension and production could be observed when using a PI treatment with populations with aphasia. The improvements in comprehension that were demonstrated in this study indicate that PI is an instructional method worth pursuing for treatment in populations with aphasia.

Possible Impact of Patient Specific Characteristics.

The three individuals who participated in this study had varying types and degrees of aphasia. They also had varying outcomes in response to the PI protocol. The type and degree of aphasia most likely had an impact on outcomes.

Out of the three participants, EC had the most severe aphasia (moderate to severe expressive aphasia and mild to moderate receptive aphasia). He also demonstrated the poorest outcomes on both comprehension and expression of the '*a*.' Along with aphasia, EC also presented with a moderate apraxia and was 15-23 years older than the other participants. These factors might have affected treatment. Due to EC's severity of aphasia and apraxia, he may have needed more time to learn the targeted morpheme. His increased age may also have indicated he needed more time to learn the targeted morpheme. Given more time, the difficult tasks that EC completed during the protocol may have resulted in improvement in related grammatical forms (Thompson & Shapiro, 2007). The testing procedure used in this study did not examine possible improvements in underlying and related grammatical forms that might have occurred within the treatment. Conversely, a clinical implication form EC's results is that using PI to train a cue that is both reliable and valid, and potentially easier, might be a better place to start with someone with more severe aphasia (Benedet et al., 1998; MacWhinney, 1987). Additional research is needed in syntactic treatment targets for speakers with severe aphasia.

AB had the least severe aphasia (mild expressive aphasia) out of the three participants. She also had the best outcomes on the referential activities during treatment. However her pretest and posttest scores showed a null effect. Her lack of generalization from treatment tasks to testing tasks may be due to her proficiency level in Spanish. AB is the only participant whose weaker language was Spanish, the language of the treatment. Because AB's proficiency level in Spanish was lower than the other participants, her outcomes to treatment cannot be compared to the other participants. English has a different grammatical construction than Spanish, and AB's high proficiency in English may have affected her outcomes on the Spanish treatment. For instance, English has a very rigid SVO word order while Spanish allows for flexible word orders (Ostrosky-Solis et al., 1999). Comprehension was targeted using flexible word orders in the PI protocol and pre-/post-test measures, and the tasks may have been more difficult for AB since she was more familiar with the rigid word order of English. Also, the Spanish personal '*a*' does not exist in English. Research shows that words and structures that are shared by languages (such as cognates) are more robust (Kohnert, 2004; Muñoz, 2007). The '*a*' being only in Spanish may have been more difficult for AB to access. Therefore, AB may have more success in a PI protocol that targets a grammatical structure that is shared by English and Spanish.

CA had a moderate aphasia (moderate mixed receptive and expressive aphasia with severe anomia), and Spanish was his dominant language. He had a high proficiency of Spanish premorbidly. Since his stroke, CA has only communicated in Spanish. Out of the three participants, he had the best outcomes in comprehension of the '*a*.' His accuracy increased on both testing and treatment tasks. CA's severity level of aphasia may have allowed him to have positive outcomes from the treatment. CA had decreased access to language due to his stroke; however, the moderate aphasia level he was at allowed him to be able to access enough language

to benefit from PI. CA's high premorbid proficiency in Spanish may also have allowed him to have positive outcomes in the treatment. Spanish was his dominant language, and increased comprehension of a grammatical structure with high cue validity (personal '*a*') had the potential to increase his understanding in daily living routines (MacWhinney, 1987; Benedet et al., 1998). Also, his high premorbid proficiency suggests he was able to comprehend the personal '*a*' before his stroke. Therefore, treatment was restoring a lost language component. These results suggest a PI protocol may yield higher outcomes for participants with mild to moderate aphasia, little to no deficits in cognitive abilities, little to no apraxia, and a high premorbid proficiency in the targeted language. With modifications to the PI protocol, it may benefit a wider range of individuals. Further research is needed in this area.

When looking at using a PI protocol with individuals with aphasia, it is important to identify an important target as well as to consider the nature of aphasia. This study suggests that PI is worth pursuing with individuals with aphasia, and modifications to this protocol should be considered. Additional research is needed to determine what modifications to PI would be beneficial for populations with aphasia. Research is also needed to determine characteristics of individuals with aphasia that indicate the person would benefit from PI.

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Appendix A

Explicit Instruction for Day 1

Durante esta sesión nos enfocaremos en '*a.*' '*A*' es una preposición que le dice que o quien es quien recibe la acción de un verbo. El objeto de la oración siempre sigue a la preposición '*a.*' Trate de identificar el sujeto o el objeto en la siguiente oración:

Example 1: La niña busca a Juan.

Si usted dijo que *la niña* es el sujeto y *Juan* es el objeto, está en lo correcto.

Intente con la siguiente oración:

Example 2: Marcos ve a la mujer.

Tiene razón si usted dijo que *Marcos* es el sujeto y *la mujer* es el objeto.

En español el sujeto, verbo, y objeto pueden aparecer en diferente orden. El orden más común es el de sujeto, verbo, y objeto:

Example 3: El niño ayuda a la niña.

En esta oración El niño es el sujeto, ayuda es el verbo, y la niña es el objeto.

Aquí hay ejemplos de otras maneras de poner en orden las palabras:

Example 4: Ayuda a la niña el niño. Verbo, Objeto, Sujeto

Example 5: A la niña ayuda el niño. Objeto, Verbo, Sujeto

Example 6: Ayuda el niño a la niña. Verbo, Sujeto, Objeto

Note que el objeto siempre aparece después de la preposición '*a.*' La persona o el objeto que recibe la acción del verbo siempre sigue esta forma. Por ejemplo, Juan es el objeto en cada una de las siguientes oraciones:

Example 7: María ama <u>a</u> Juan.

Example 8: <u>A</u> Juan golpea Maria.

Example 9: María <u>a</u> Juan llama.

En las siguientes actividades usted va poder practicar entender variedad de oraciones.

Appendix B

Referential Activity (Day 1: Activity 1) Example

Instructions.

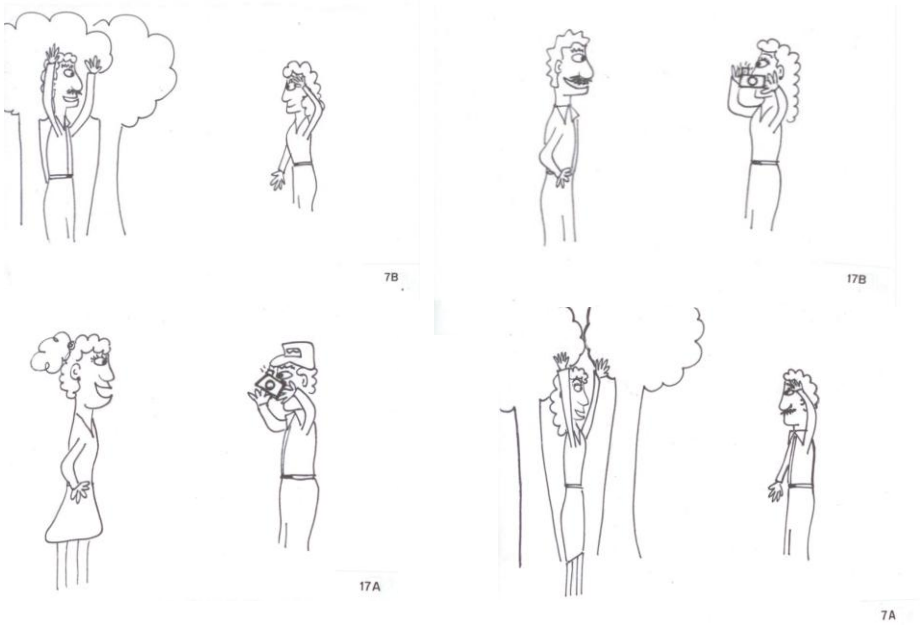
¿Cuál dibujo es? Lea cada oración y escoja el dibujo que corresponda a la oración. ¡Recuerde que en español puede varear el orden de las palabras!

Sentence Stimuli.

1. Jorge busca a Maria.
2. A Marcos agarra Rosa.
3. A Carlos arresta Barbará.
4. Paga a Alejandro Teresa.
5. Cobija a Barbará Juan.
6. Nicolás ve a María.
7. A Pedro saluda Yolanda.
8. Abraza a Carmen Julio.
9. Verónica oye a Gabriel.

Picture Stimuli.

1.



Appendix C

Affective Activity (Day 1: Activity 4) Example

Instructions.

Escuche las siguientes oraciones y marque la situación que sea más probable que ocurra. ¿Qué es más probable?

Sentence Stimuli.

1. ___ a. Mi perro muerde a mi vecino.

   ___ b. Mi vecino muerde a mi perro.

2. ___a. A mi madre busca mi hermano menor.

   ___b. A mi hermano menor busca mi madre.

3. ___a. Un policía arresta a un ladrón.

   ___b. Un ladrón arresta a un policía.

4. ___a. Visita a mi madre mi abuela.

   ___b. Visita a mi abuela mi madre.

5. ___ a. Asusta a un hombre viejo la chica.

   ___b. Asusta a la chica un hombre viejo.

6. ___a. Mi pastor da un regalo a mi padre.

   ___b. Mi padre da un regalo a mi pastor.

7. ___a. A un doctor toca un paciente.

   ___b. A un paciente toca un doctor.

8. _____ retrata a _____.

Compare sus respuestas con las de alguien más. ¿Tienen las mismas respuestas?

Appendix D

Pretest/Posttest A Example

Instructions.

Usted va a oír una seria de frases. Quiero que indique el dibujo que va con la frase. Ahora vamos a practicar. Oirá la frase una vez y luego indique el dibujo que corresponde a la frase. Por favor responda a cada pregunta con la mayor exactitud y velocidad que le sea posible. ¿Listo?

Key with Sentence Stimuli.

1. a. Matilde abrasa a Alejandro.
   b. Matilde saluda a Alejandro.
   c. Alejandro abrasa a Matilde.
   d. Alejandro saluda a Matilde.

2. a. Pablo espera a Clarinda.
   b. A Pablo espera Clarinda.
   c. Clarinda cobija a Pablo.
   d. A Clarinda cobija Pablo.

3. a. Él besa a ella.
   b. Ella besa a él.
   c. Él habla con ella.
   d. Ella habla con él.

4. a. A Francisco paga María.
   b. A María llama Francisco.
   c. A Francisco llama María.
   d. A María paga Francisco.

5. a. Pega a Juan, Verónica.
   b. Pega a Verónica, Juan.
   c. Asusta a Juan, Verónica.
   d. Asusta a Verónica, Juan.

6. a. Besa a ella, el.
   b. Besa a él, ella.
   c. Espera a ella, el.
   d. Espera a él, ella.

7. a. Ella muerde a él.
   b. El toca a ella.
   c. Ella toca a él.
   d. El muerde a ella.

8. a. Paga a Nicolás, Clarinda.
   b. Paga a Clarinda, Nicolás.
   c. Espera a Clarinda, Nicolás.
   d. Espera a Nicolás, Clarinda.

9. a. A él retrata ella.
   b. A ella retrata él.
   c. A ella ayuda él.
   d. A él ayuda ella.

10. a. Verónica ayuda a Juan.
    b. Juan ayuda a Verónica.
    c. Verónica se pelea con Juan.
    d. Juan se pelea con Verónica.

11. a. Busca a él, ella.
    b. Busca a ella, él.
    c. Agarra a él, ella.
    d. Agarra a ella, él.

12. a. A él cobija, ella.
    b. A ella cobija él.
    c. A él oye, ella.
    d. A ella oye él.

13. a. A Nicolás retrata Bárbara.
    b. A Nicolás abrasa Bárbara.
    c. A Bárbara retrata Nicolás.
    d. A Bárbara abrasa Nicolás.

14. a. A él ve ella.
    b. A ella asusto él.
    c. A él asusto ella.
    d. A ella ve el.

15. a. Besa a ella, el.
    b. Besa a él, ella.
    c. Agarra a ella, el.
    d. Agarra a él, ella.

16. a. Rosa pega a Pedro.
    b. Rosa oye a Pedro.
    c. Pedro pega a Rosa.
    d. Pedro oye a Rosa.

17. a. A Pablo quiere Rosa.
    b. A Rosa ve Pablo.
    c. A Pablo ve Rosa.
    d. A Rosa quiere Pablo.

18. a. Él se enamora con ella.
    b. Él espera a ella.
    c. Ella espera a él.
    d. Ella se enamora con él.

19. a. A ella saluda él.
    b. A el saludo ella.
    c. A ella arresta él.
    d. A él arresta ella.

20. a. Ayuda a Carlos, Pilar.
    b. Busca a Carlos, Pilar.
    c. Ayuda a Pilar, Carlos.
    d. Busca a Pilar, Carlos.

21. a. A ella llamo él.
    b. A él toca ella.
    c. A ella toca el.
    d. A él llama ella.

22. a. Matilde abrasa a Pablo.
    b. Matilde habla con Pablo.
    c. Pablo abrasa a Matilde.
    d. Pablo habla con Matilde.

23. a. Muerde a él, ella.
b. Muerde a ella, el.
c. Ayuda a él, ella.
d. Ayuda a ella, el.

24. a. Alejandro ve a Verónica.
b. Verónica ve a Alejandro.
c. Verónica paga a Alejandro.
d. Alejandro paga a Verónica.

25. a. A él saluda ella.
b. A ella saluda él.
c. A él asusta ella.
d. A ella asusta él.

26. a. A Francisco paga María.
b. María canta para Francisco.
c. Francisco canta para María.
d. A María paga Francisco.

27. a. Pega a ella, el.
b. Pega a él, ella.
c. Sigue a él, ella.
d. Sigue a ella, el.

28. a. Ella canta para él.
b. Él canta para ella.
c. Ella ayuda a él.
d. Él ayuda a ella.

29. a. Quiere a Jorge, María.
b. Espera a Jorge, María.
c. Quiere a María, Jorge.
d. Espera a María, Jorge.

30. a. El arresta a ella.
b. Ella arresta a él.
c. Ella abrasa a él.
d. El abrasa a ella.

31. a. Ella paga a él.
b. Él paga a ella.
c. Él sonría para ella.
d. Ella sonría para él.

32. a. A Tomas oye María.
b. A María oye Tomas.
c. A María besa Tomas.
d. A Tomas besa María.

33. a. Ella busca a él.
b. Ella agarra a él.
c. El agarra a ella.
d. El busca a ella.

34. a. Espera a él, ella.
b. Espera a ella, el.
c. Muerde a él, ella.
d. Muerde a ella, el.

35. a. Ella arresta a él.
b. Él se pelea con ella.
c. Ella se pelea con él.
d. Él arresta a ella.

36. a. A Gabriel cobija Verónica.
b. A Verónica cobija Gabriel.
c. A Verónica espera Gabriel.
d. A Gabriel espera Verónica.

37. a. Toca a Nicolás, Verónica.
b. Oye a Verónica, Nicolás.
c. Oye a Nicolás, Verónica.
d. Toca a Verónica, Nicolás.

38. a. Él llama a ella.
b. Ella llama a él.
c. El sigue a ella.
d. Ella sigue a él.

39. a. A Pilar agarra Pablo.
b. A Pilar pega Pablo.
c. A Pablo agarra Pilar.
d. A Pablo pega Pilar.

40. a. Alejandro se enamora con Clarinda.
b. Clarinda se enamora con Alejandro.
c. Clarinda cobija a Alejandro.
d. Alejandro cobija a Clarinda.

41. a. A ella abrasa él.
b. A él abrasa ella.
c. A él ve ella.
d. A ella ve el.

42. a. El muerde a ella.
b. Ella muerde a él.
c. El besa a ella.
d. Ella besa a él.

43. a. Pablo asusta a Pilar.
b. Pilar ayuda a Pablo.
c. Pilar asusta a Pablo.
d. Pablo ayuda a Pilar.

44. a. Arresta a Yolanda, Juan.
b. Arresta a Juan, Yolanda.
c. Busca a Yolanda, Juan.
d. Busca a Juan, Yolanda.

45. a. Espera a Gabriel, Carmen.
b. Quiere a Carmen, Gabriel.
c. Quiere a Gabriel, Carmen.
d. Espera a Carmen, Gabriel.

46. a. Pedro sonría para Carmen.
b. Carmen sigue a Pedro.
c. Pedro sigue a Carmen.
d. Carmen sonría para Pedro.

47. a. Retrata a él, ella.
b. Retrata a ella, el.
c. Saluda a ella, el
d. Saluda a él, ella.

48. a. A él cobija ella.
b. A ella cobija él.
c. A él espera ella.
d. A ella espera el.

49. a. Pedro besa a Verónica.
    b. Verónica besa a Pedro.
    c. Verónica ve a Pedro.
    d. Pedro ve a Verónica.

50. a. Cobija a Jorge, Matilde.
    b. Cobija a Matilde, Jorge.
    c. Sigue a Jorge, Matilde.
    d. Sigue a Matilde, Jorge.

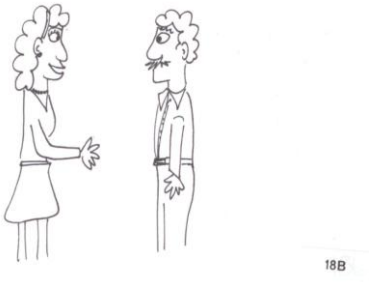
Picture Stimuli.

#1

A

C

B



D

ABSTRACT

THE APPLICATION OF PROCESSING INSTRUCTION AS THERAPY FOR APHASIA IN SPANISH SPEAKERS

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The purpose of this study was to examine the changes in comprehension and expression of the Spanish personal '*a'* for Spanish-speakers with aphasia following a processing instruction (PI) protocol. Three Spanish/English bilingual adults with aphasia participated in a PI treatment that focused on teaching the personal '*a'* within subject-verb-object, object-verb-subject (OVS), and verb-object-subject sentences. All three participants demonstrated gains in comprehension during referential treatment tasks. Gains in expression of the personal '*a'* were not observed in any of the participants. In conclusion, PI shows promise for increasing syntactic comprehension in people with aphasia, and more research is needed into successful modifications of PI for use with populations with aphasia.