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# Generative Naming in Spanish-English Bilingual Speakers

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# Generative Naming in Spanish-English Bilingual Speakers

**by**

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**Thesis**

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

**Master of Arts**

**The University of Texas at Austin**

**August 2015**

# Dedication

This thesis is dedicated to my daughter, Isabella, whose compassion, patience, and adaptability, have allowed me to complete this degree.

I would also like to dedicate this work to my friends and family for their encouragement and support through this journey. Especially to my mother, Blanca, for her unconditional love and for inspiring me to conquer my goals.

## Acknowledgements

I would like to thank my supervisors, Dr. Thomas P. Marquardt and Elizabeth D. Peña, for their support and encouragement during the process of this project and throughout my graduate career. I would also like to thank the CSD professors and clinical staff for their time and valuable lessons.

# Abstract

## Generative Naming in Spanish-English Bilingual Speakers

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This study evaluated generative naming in Spanish English bilingual adults with three specific objectives: 1) to compare the total number of items generated by Spanish-English speakers in each language in the categories of *food, clothes,* and *animals.* 2) to examine the relationship between language proficiency levels on the translational equivalents in each category and across categories , and 3) to evaluate the relationship between the categories and the number of translational equivalents. Thirty seven Spanish-English bilingual adult speakers were given 60 seconds to name as many items as possible in Spanish and English in three categories (*food, clothes,* and *animals).* Results reveal that participants generated more items in English than in Spanish for all categories. They produced the least number of items in the *clothes* category in both languages, but significantly more items for *clothes* and *animals* in English. Participants generated the least number of translational equivalents in the *food* category in both languages. Additionally, there was a negative effect of translational equivalents in the *food* category and proficiency levels. Finally, results indicate that participants generated significantly less translational equivalents for *food* than for *clothes* and *animals,* suggesting that

balanced bilinguals will produce more unique items in highly salient categories. Future studies may consider using more sensitive language proficiency measure, as well as categories that are equally salient in both of the cultures of Spanish-English bilingual speakers.

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# INTRODUCTION

There is a need for creating appropriate assessment and treatment options in speech and language for a large population of Spanish-English bilingual speakers. The U.S. census (2014) reported that the Hispanic population in the United States is 55, 387, 539, which represents about 17.4% of the population. The Hispanic population was 53 million in 2012, a 50% increase since 2000, and is expected to grow by nearly 30 million by 2050. About 60.5 million people in the U.S speak a language other than English at home, of those 60.5 million, 62% are five years of age and older and speak Spanish or Spanish Creole at home (*U.S. Census,* 2014).

Approximately 3.4 million people are expected to have a stroke by 2030, which represents a 20.5% increase from 2012 (Oybiagele, Goldstein, Higashida, Howard, Johnston, Khavjou, Lackland, Lichtman, Mohl, Sacco, Save, & Trogdon, 2013). The combination of the population increase and incidence of strokes create a significant number of Spanish-English speaking adults with aphasia in the U.S. Valid assessment and treatments option are needed for this population.

Each year, there is a need for communication disorders services for over 45,000 bilingual speakers (Paradis, 2001). Given the large numbers of people immigrating to the U.S., the demand for bilingual and multilingual services by speech language pathologists is likely to increase (Amberber & Cohen, 2012). The combination of increased numbers of bilingual speakers and the increased prevalence of cerebrovascular incidents resulted in a significant number of adults with aphasia in the U.S who require assessment and treatment services appropriate to the languages they speak.

Aphasia is a neurological disorder caused by injuries to parts of the brain that control expressive and receptive language. The location and severity of the lesion will determine the degree to which language functions are affected. All individuals with aphasia have naming problems that will affect expressive and receptive language (Abhieshek & Rao, 2013). The way we understand the world around us is represented by words. Words are organized semantically in different ways such as theme and phonological similarity. Lexical retrieval is the process used to access semantic organization (Hillis, 2001). Individuals with aphasia may also have difficulties finding words because of problems with semantic and lexical processing affected by aphasia.

Bilingual individuals with aphasia face many challenges in terms of assessment, treatment, and prognosis. Numerous factors need to be considered including, varying language profiles (i.e., proficiency, age of acquisition, and frequency of use and exposure), as well as varying severity and types of aphasia. Research investigating adult Spanish-English speakers with language impairment is limited. Though some of the differences between monolinguals and bilinguals apply to both children and adults, there are crucial differences, especially in lexical access.

**Bilingual lexicon development**

Research shows that early bilingual speakers have a bilateral dominance for language (Marian, Faroqi-Shan, Kaushanskaya, Blumenfeld, and Sheng, 2009). Additionally, Bialystok (2011) noted that since both languages are always active, bilinguals must use executive control and suppress the non-target language in order to use

the selected language during rapid verbal and non-verbal linguistic processing. This type of control is also impacted by the age of language acquisition (Bialystock, 2011).

Pre-school-age children begin to build vocabulary and group words through experience with objects and functions (slot-fillers). By the age of eight, although children develop a taxonomic lexicon where they continue to focus on the function of objects, their categorization has less to do with experience and more with a relationship among the words they already know (Lucariello, et al., 1992; Nelson, 1988, 1998; Nelson & Nelson, 1990). Bilingual speakers must develop a taxonomic lexicon relatively early compared to their monolingual peers because they have to know more words (Peña, et al., 2002).

The age when bilinguals are exposed to their second language may have a role on the way they organize their lexicon. Most of the child research agrees that children usually learn different words in each language because of their different experiences in each language (Peña, et al., 2002). However, researchers are attempting to understand how bilinguals add the same words (*doublets*) to each of their lexicons, and how they add different words in each language for which they have no equivalent in the other language (*singlets*) (Pearson, Fernandez, et al., 1993, 1995).

Word frequency is language specific. Thus, words that are typically used in one language, may not be used in another language or cultural group (Yu & Nelson; Lin, Schwanenflugel, and Wisenbaker, 1990) (e.g., a dog might be part of the category *farm animals* in Spanish, but not in English where the word might be placed in the *pets* category). Schwanengflugel and Rey (1986) asked monolingual adult English-speaking

and Spanish-speaking participants living in the same geographic area to rate items from the same categories. While there was a large overlap in the items that were rated as prototypical, there were differences in the ordering of the items. Thus, a variety of experiences and the items that bilingual children are exposed to, influence the generation of items in slot-filler and taxonomic circumstances (Schwanenflugel, & Rey, M., 1986).

Peña, Bedore and Zlatic-Giunta (2002) explored the phenomenon of *slot-filler* versus *taxonomic* strategies by analyzing the results from a generative naming task using the categories of *food,* clothes, *animals,* and subcategories for each taxonomic category. The study included 44 bilingual participants between the ages of 4;5 and 7;1. Their results highlight the role of experience on taxonomic lexical development. Children in this study generated more *food* items than *animal* and *clothes* items in the slot-filler (subcategory) condition, which suggests that experience with *foods* is more salient because of their everyday experiences. Some children in the study mentioned they had never been to a zoo after being asked to list as many *zoo animals* as they could, but they generated more *animals* than items in any other category during the taxonomic condition. The children may have only been able to relate to the slot-filler task using personal and direct experiences, while relating to the taxonomic task more generally through indirect and general experiences such as television, video games, and books (Peña, et al., 2002).

Roberts & LeDorze (1997) used the category generation tasks developed by Nelson and Nelson (1990) with French-English bilingual adult speakers, and found that they used semantic associations to name about as many items in French as they did in English. However, they did not evaluate the specific items that were more frequently

produced, which does not address the role of culturally specific influences with adults on this type of task. A more detailed analysis of the items that adults produce in taxonomic and slot-filler conditions is warranted.

The present study explored the types of associations and processing that adults make in comparing the same categories as Peña et. al. (2002) (*foods, clothes*, and *animals*) in both languages (*Spanish* and *English*). Distinguishing the influence of *cultural* or *direct* experiences versus *semantic* or *general* experiences in accessing lexicon across languages is difficult to do with bilinguals. With adult bilinguals it is difficult to distinguish the influence of *cultural* or *direct* experiences versus *semantic* or *general* experiences in accessing lexicon across languages. Although the same type of associations may also influence responses, they have developed learning skills (e.g., executive functions) that are not yet available to children.

**Assessment tools for bilinguals with aphasia**

There are very few assessment tools available for evaluating bilinguals with aphasia. One of the most commonly used is the *Bilingual Aphasia Test* (BAT; Paradis, 1987). While it was designed for non-impaired bilingual individuals to score without errors on each of four subtests, a study by Manuel-Dupont, Adrila, Rosselli, and Puente (1992) showed that 17 non-impaired Spanish-English bilingual participants ranging in age from 17-35 years old demonstrated significantly different scores on all four subtests. Additionally, Muñoz and Marquardt (2008), in a study of 22 Spanish-English bilinguals ranging from 51-77 years of age, found that the participants performed better in English,

and 54 items had a correct response rate lower than 70%. They suggested that the performance of the participants might have been influenced by their academic experience in Spanish and the influence of English on Spanish.

Generative naming is an important function as assessed in aphasia, and is driven by language proficiency and use (Kohnert, Hernandez & Bates, 1998). Research has revealed that generative naming tasks are a sensitive measure when used to evaluate deficits and improvements in aphasia (Wertz, Collings, Weiss, Kurtzke, Freiden, & Brookshire, 1981; Roberts & LeDorze, 1998). Additionally, Roberts and LeDorze (1998) claimed that generative naming tasks are sensitive enough to measure changes in early stages of dementia, and that including categories would increase its sensitivity. Furthermore, generative naming is used in several assessment batteries including the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass, Kaply, & Barresi, 2001), the Arizona Battery for Communication Disorders in Dementia (ABCD) (Bayles & Tomoeda, 1991), and the Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI) (Adamovich & Henderson, 1992). A baseline for generative naming in non-impaired bilingual speakers is needed as a framework to assess severity and monitor progress in bilingual speakers with aphasia.

**Purpose**

The goal of this study is to investigate lexical processing in Spanish-English bilingual adults. Establishing a generative database could eventually be used as a diagnostic tool for neurologically impaired Spanish-English bilingual adults. Using the

same categories as Peña, et al. (2002) in a taxonomic task, this study used generative naming in non-impaired Spanish-English bilingual adult speakers. There were three specific objectives of this study. The first objective was to compare the total number of items generated in each language (*Spanish* and *English*) for three categories (*food, clothes*, and *animals*). The second objective was to examine the relationship between language proficiency and the translational equivalents (A doublet, or translational equivalent, is an item that was named in Spanish and also as a translational equivalent in English). Translational equivalents label the same semantic concept. For example, if a participant named "apple, taco, beans" in Spanish and "soup, taco, pasta" in English, there is a single doublet because they named "taco" in both languages). The third objective was to evaluate the relationship between the categories and the number of translational equivalents.

The first purpose of the study was to investigate the effects of language and category on the number of items produced. We expected that participants could name more concepts for all categories in the language in which proficiency is greater. Given that the task used here is timed generative naming in separate languages with adults, we do not expect differences between the categories. Adults have had more experiences with all categories, thus, balancing their culturally related access.

The second purpose was to investigate the relation between language proficiency and the number of items produced (described as the difference in proficiency between the two languages correlated with the number of translational equivalents). Although the participants have cultural experience across all three categories, we expect that high

language proficiency, coupled with strong executive control, will aid in suppressing the non-target language. This would indicate that translation equivalents would be related negatively to language proficiency because participants will name more unique items.

The third purpose was to investigate differences in the number of translational equivalents as a function of word category. Previous research (Peña et al., 2002) found that cultural experience and age of acquisition have an impact on the recall of items across languages spoken by bilingual children and that with more proficiency, the recall becomes more semantically driven. This study's participants are proficient bilingual, thus, we expect that recall within categories should be similar.

# METHODS

## Participants

Language proficiency and category generation data for thirty-seven Spanish-English bilinguals (22 females and 15 males) were obtained from two separate studies. Participants ranged between 18 and 59 years of age (Mean=23.43, SD=6.64). The first set of participants included 27 Spanish-English bilingual adults (17 females and 10 males). The second set of participants included 10 Spanish-English bilingual adults (five females and five males). All 37 subjects were fluent in both languages, were exposed to English for more than 10 years, and reported no history of cognitive language disorders, brain damage, or neurological deficits. Most participants (29) reported more than 15 year of education and the mean years of education was 16.89 years (SD=1.56). (See Table 1)

| ID | Age | Gender | English Proficiency | Spanish Proficiency | Exposure to English > 10 yrs | Yrs of Education |
|---|---|---|---|---|---|---|
| 1 | 22 | F | 4 | 4 | Yes | 16 |
| 2 | 19 | M | 5 | 4 | Yes | 16 |
| 3 | 18 | F | 5 | 4 | Yes | 13 |
| 4 | 22 | M | 4 | 5 | Yes | 16 |
| 5 | 59 | F | 5 | 4 | Yes | 16 |
| 6 | 21 | F | 5 | 4 | Yes | 18 |
| 7 | 21 | F | 5 | 5 | Yes | 17 |
| 8 | 19 | F | 5 | 5 | Yes | 16 |
| 9 | 21 | F | 4 | 4 | Yes | 16 |
| 10 | 22 | M | 4 | 5 | Yes | 16 |
| 11 | 28 | F | 5 | 4 | Yes | 18 |
| 12 | 20 | M | 5 | 4 | Yes | 14 |
| 13 | 22 | F | 5 | 5 | Yes | 16 |
| 14 | 25 | F | 5 | 4 | Yes | 18 |
| 15 | 22 | M | 5 | 4 | Yes | 15 |
| 16 | 22 | F | 5 | 4 | Yes | 18 |
| 17 | 25 | M | 5 | 4 | Yes | 19 |
| 18 | 21 | F | 4 | 5 | Yes | 16 |
| 19 | 19 | M | 5 | 4 | Yes | 16 |
| 20 | 28 | F | 5 | 4 | Yes | 17 |
| 21 | 21 | F | 5 | 4 | Yes | 16 |
| 22 | 25 | F | 5 | 5 | Yes | 16 |
| 23 | 23 | M | 5 | 4 | Yes | 16 |
| 24 | 29 | M | 5 | 4 | Yes | 17 |
| 25 | 23 | F | 5 | 4 | Yes | 17 |
| 26 | 28 | F | 5 | 4 | Yes | 18 |
| 27 | 28 | M | 5 | 4 | Yes | 17 |
| 28 | 21 | M | 4 | 5 | Yes | 16 |
| 29 | 24 | M | 3 | 5 | Yes | 18 |
| 30 | 22 | F | 5 | 5 | Yes | 19 |
| 31 | 21 | F | 5 | 5 | Yes | 18 |
| 32 | 20 | F | 4 | 5 | Yes | 17 |
| 33 | 20 | M | 5 | 5 | Yes | 15 |
| 34 | 20 | M | 5 | 5 | Yes | 20 |
| 35 | 22 | F | 5 | 4 | Yes | 19 |
| 36 | 23 | F | 4 | 5 | Yes | 20 |
| 37 | 21 | M | 5 | 5 | Yes | 19 |

***Table 1. Demographic and language proficiency data for Spanish-English bilingual participants.***

**Participant Language Proficiency**

Bilingual status and language proficiency levels in Spanish and English were based on results from the 37 participants' responses on the Language Use Questionnaire developed by Muñoz, Marquardt, & Copeland (1999) (See Appendix A). The questionnaire includes questions about language acquisition, language use, and education history. The language proficiency section on the questionnaire required the participants to rate their overall language ability/fluency in each language using a 5-point scale. (See Table 2). A rating of 1 signified non-fluency and a rating of 5 signified native fluency in the language. The fluency ratings also included specific contexts such as speaking and listening in formal and informal settings, reading, and writing.

Table 2 shows the mean language proficiency ratings for English and Spanish for the total 37 participants included in the project.

***Table 2. Mean Language Proficiency for Total Participants (N=37)***

| | Listening and Speaking in Casual Conversation | Listening and Speaking in Formal Conversation | Literacy (Writing and Reading ) |
|---|---|---|---|
| English | 4.88 (0.37) | 4.79 (0.47) | 4.85 (0.36) |
| Spanish | 4.62 (0.51) | 4.23 (0.83) | 4.11 (0.87) |

The results show that the majority of participants were slightly more fluent in English than Spanish in all situations, including speaking and listening in both casual and formal conversation, and in reading and writing.

**Procedures**

Each participant was asked to complete rapid taxonomic category generation tasks. Participants were asked to name as many items as possible for each of three

categories (*food, clothes, and animals*) using Spanish or English during a 60 second trial (See Table 3). The categories and languages were counterbalanced over two sessions to control for order effects and the sessions were spaced six to 14 days apart. The instructions were given in the language of the task (i.e., Spanish naming of animals, instructions for task presented in Spanish). Testers administered a practice task using *colors* as the category. The responses were transcribed, translated, and tabulated for each category. If the participants stopped producing items before the 60 seconds were completed, they were encouraged to keep going by using phrases such as "You have more time" or "Keep going". Testers were allowed to repeat the instructions if the participants needed to hear them again. Participants were compensated 30 dollars after they completed the tasks. The data were collected by Spanish-English bilingual graduate students in the Master's program at the University of Texas at Austin.

***Table 3. Items of the category fluency task***

| **Category** | **English** | **Spanish** |
|---|---|---|
| Food | Tell me all the *foods* you can think of.<br>Are you ready?<br>Start now. | Dime los nombres de todas las *comidas* que sepas. Tienes un minuto<br>¿Estás listo/lista?<br>Empieza ahora. |
| Clothes | Tell me all of the *clothes* you can think of. You have one minute.<br>Are you ready?<br>Start now. | Dime los nombres de toda la *ropa* que sepas. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. |
| Animals | Tell me all of the *animals* you can think of. You have one minute.<br>Are you ready?<br>Start now. | Dime los nombres de todos los *animales* que conoces. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. |

## DATA ANALYSIS

### Word Category Assignments

Rules for data coding were adapted from Kim (2010) and used to analyze this Spanish-English data (See Table 4). The Spanish data were translated into English for direct comparison of items produced for each category. Online dictionaries and a database of 500 words (Izura, Hernández-Muñoz & Ellis, 2005) were used for translations of Spanish items into English. Repeated or irrelevant words were deleted. The author coded all participant responses. Like in previous studies (Kim, 2010; Kwon, 2014), the adjective reduction rule, which only accepts nouns, was removed. In Spanish, many food and clothing names are often described with adjectives and are separate semantic concepts. For example, *grilled fish* is different from *fried fish.*

Exclusionary rules and errors in category assignments were determined. Selezneva's (2008) codes for inaccuracy and redundancy were adopted. They included language error, non-word error, and category error. A word was considered in error if the participants code-switched, named non-existent words, or provided non-category items. The rules are described in Table 4 and the error codes are listed in Table 5. Table 6 shows the words that were omitted from the data set for the 37 participants.

***Table 4. Summary of the rules for translation, homogenization, and category membership (Kim 2010)***

| **Rule** | **Description** | **Examples** |
|---|---|---|
| *Translation* | | |
| Spanish to English language | All translations were made based on the researcher's judgment of common American-English labels for all semantic concepts taken from the above listed sources. | In Spanish: "*pantalones de mesclilla*" was translated as "*jeans*" (American-English dialect). |
| *Homogenization* | | |
| Plurality marking | All subordinate lexical items that were named in plural form(s) were changed into their singular form(s). This rule did not apply to the superordinate items named. | In English: "*birds*" became "*bird*"<br>In Spanish: this rule was applied after the items named in Spanish were translated to English language, thus it did not apply to the Spanish items. |
| Gender marking | ANIMALS: Items in English were transcribed as male, female, or genderless animal labels. Items in Spanish were transcribed as male or female, but translated as male, female, or genderless<br>FOOD: Items in Spanish were transcribed and translated as genderless.<br>CLOTHES: Items in Spanish were transcribed and translated as genderless. | ANIMALS:<br>In English: form-"*rooster*" (male), "*hen*" (female), "*chicken*" (neutral label).<br>In Spanish: "*gallo*" (rooster), "*gallina*" (hen), "*pollo*" (chicken).<br>FOOD:<br>*A naranja/orange*<br>CLOTHES:<br>*A blusa/blouse* |
| Diminutive reduction | All items containing diminutive forms were reduced to their uninflected noun form. | "*Kitties*" was reduced to "*cat*" and "*gatitos, perritos*" (*kitties, doggies*) were reduced to "*cat, dog.*" |

Table 4 (continued)

| | | |
|---|---|---|
| Word order | Items that were longer than one word and contained qualitative descriptions of the whole item itself, were transcribed with (1) the description of the item, then (2) the main item; additionally, if the descriptor words were describing a part of the main item, the word order was transcribed (1) the descriptor words, (2) the part of the main item the description was attributed to, (3) main item. | Main item description: The item "*mini skirt*" was transcribed as "*mini skirt*" because the word "*mini*" describes the main item- "*skirt*." A part of the main item description: the item "*long sleeve shirt*" was transcribed as *"long sleeve shirt"*. |
| Word variants | Lexical items, named in either language, that portrayed a clear semantic concept but did not match the common term for that concept, were given a commonly used lexical label for the corresponding semantic concept. | In English: "*training wear*" was changed to "*sports wear*". |
| Semantic completion | If an item, named in either language, was followed by one or more feature descriptions of that item (without stating the main item along with the descriptions), all descriptions were attributed to the item named immediately before the stated features. The named features were then transcribed with the initial item label added to the feature description. | In English: "*long, short pants*" were changed to "*long pants, short pants*." |
| Reduction of non-content words | Utterances accompanying the main items (content word) that did not contribute to the meaning or description of the main item were deleted. | In English: "*all kinds of vegetables*" was reduced to "*vegetables*." In Spanish: "*todo tipo de comida frita*" (all kinds of fried food) was changed to "*comida frita*" (fried food). |
| | | |

Table 4 (continued)

| *Category Membership* | | |
|---|---|---|
| | **Examples of Included Items** | **Examples of Excluded Items** |
| Food | All raw and cooked food items (e.g. potato, mashed potato), recipe ingredients (e.g. baking soda), names of prepared dishes (e.g. mixed vegetables and rice), and superordinate food category labels (e.g. deli) were accepted. | Chinese buffet |
| Clothes | Categories of undergarments, outerwear, casual wear, formal wear, and shoes were included. This category also included clothing garments from any time period, cultural clothing items, belts, and headwear. Active wear and swimwear such as bathing suits, swim trunks, and flip-flops were accepted. | Accessories such as glasses, jewelry, hair care, and bags. Gear such as space gear, diving gear (including footwear), beach accessories (e.g. towel, sunscreen), and specific weather related accessories (e.g. umbrella, sunglasses) were excluded. |
| Animals | All animal labels (including "*people*" and "*apes*"). Adult and child forms of the same animal type (*cat, kitten or cow, calf*) were counted as separate semantic concepts. | Mythological creatures (e.g. "*dragon*") and proper names (e.g. "*Shamu*") were excluded. |

***Table 5. Summary of error codes***

| **Error Codes** | **Description** | **Example** |
|---|---|---|
| *Inaccuracy Codes* | | |
| Language error (LE) | Use of the wrong language in a category (code-switching) | Naming Spanish items when asked to name items in English and vice versa. |
| Non-Word error (NE) | A non-existent word (neologism) | "*kost*" in the food category. |
| Category error (CE) | An item in the target language that does not belong in the target category. | "*Dragon*" (a mythological creature) as an animal. |
| *Redundancy Codes* | | |
| Repeated Word (RW) | Repetitions of an already named item within a category. | "C*at, dog, horse, cat.*" The repetition of the word "*cat*" is a repeated word error. |
| Superordinate Category (SC) | The superordinate category named to trigger the subordinate items in that category. An item is assumed to be a trigger only if that item is a superordinate category name; and it is followed by a string of subordinate items belonging to that superordinate category within the next 2 item names. | In the string "*vegetables, carrot, cucumber, squash,"* the word "*vegetables*" is considered an error; however if the order was "*vegetables, fish, meat, carrot, cucumber,"* the word "*vegetables*" was not followed by the subordinate items in that category within the next two words, thus it is not an error and is counted as correct. |

*Table 6. Omitted words after the rules were applied*

| Participant | English | Spanish |
|---|---|---|
| 1 | Salad (RW), Mouse (RW) | Soup (RW) |
| 3 | T-shirt (RW), Tiger (RW) | n/a |
| 4 | Shoes (RW), Fried chicken (RW) | Stuffed tortilla (RW) |
| 5 | Shoes (SC), Lizard (RW) | Vegetables (SC), Parrot (RW) |
| 6 | Skirt (RW), Sunglasses (CE), | Bird (SC) |
| 7 | Earmuffs (CE) | Fruit (SC), Apple (RW) |
| 8 | Earmuffs (CE), Chinese food (CE), Mexican food (CE), Italian food (CE), Bear (SC), Bird (CE) | Shoes (SC), Bear (SC), Fish (CE), |
| 9 | Elephant (RW) | n/a |
| 10 | Pants (SC), Shoes (SC), Skirt (SC), Mexican food (CE) | n/a |
| 11 | Tiger (RW) | n/a |
| 12 | Shirt (SC) | T-shirt (RW) |
| 13 | Jeans (RW) | Vegetable (SC) |
| 14 | Grain (SC), Bean (SC) | Coat (RW), Glasses (CE) |
| 15 | Shirt (SC) | n/a |
| 16 | Shirt (RW) | n/a |
| 17 | Shoes (SC) | Tiger (RW) |
| 18 | Horse (RW) | Pants (LE), Pants de vestir (LE), Shoes (SE) |
| 19 | Bird (SC) | n/a |
| 20 | Horse (RW) | Necklace (CE), Glasses (CE) |
| 21 | Fruit (SC) | Wash (CE), Over shirt (CE), Gym Clothes (CE) |
| 22 | Pizza (RW), Chinese food (CE), Greek food (CE), Junk food (CE), Shark (RW) | Bra (RW), Skirt (SC), Rabbit (RW) |
| 23 | Shoes (SC), Earmuffs (CE), Chicken (RW) | n/a |
| 24 | Hose (CE) | Fruit (SC) |
| 25 | Hat (RW), Sock (RW), Underwear (RW), Bra (RW), Cereal (RW), Eggs (RW), | Pantalones de jeans (LE), Earrings (CE) |
| 26 | n/a | Earrings (CE), Vegetable (SC) |
| 27 | Earrings (CE), Necklace (CE), Healthy choice (CE), Snake (SC), Bird (SC) | Bracelet (CE), Ring (CE), Necklace (CE), Footwear (SC), Fruit (SC) |

Table 6 (continued)

| | | |
|---|---|---|
| 28 | Shoes (SC) | n/a |
| 29 | Earrings (CE), Bracelet (CE), Necklace (CE) | Bird (RW) |
| 30 | n/a | Smoking (CE), Watermelon (RW), Rat (RW) |
| 31 | n/a | Fish (CE), Lion (RW), Elephant (RW) |
| 32 | n/a | Blouse (RW), Bread (RW) |
| 33 | n/a | Pants (SC), Shoes (SC), Cut (CE), Gorilla (RW) |
| 34 | n/a | Shirt (RW), Fruit (SC), Elephant (RW) |
| 35 | n/a | Blouse (RW) |
| 36 | Snake (RW) | Bracelet (CE), Fish (CE) |
| 37 | n/a | Shoe (RW), Fish (CE) |

## RESULTS

The total number of items produced in the categories of *food*, *clothes* and *animals* in Spanish and English by the participants is shown in Table 7.

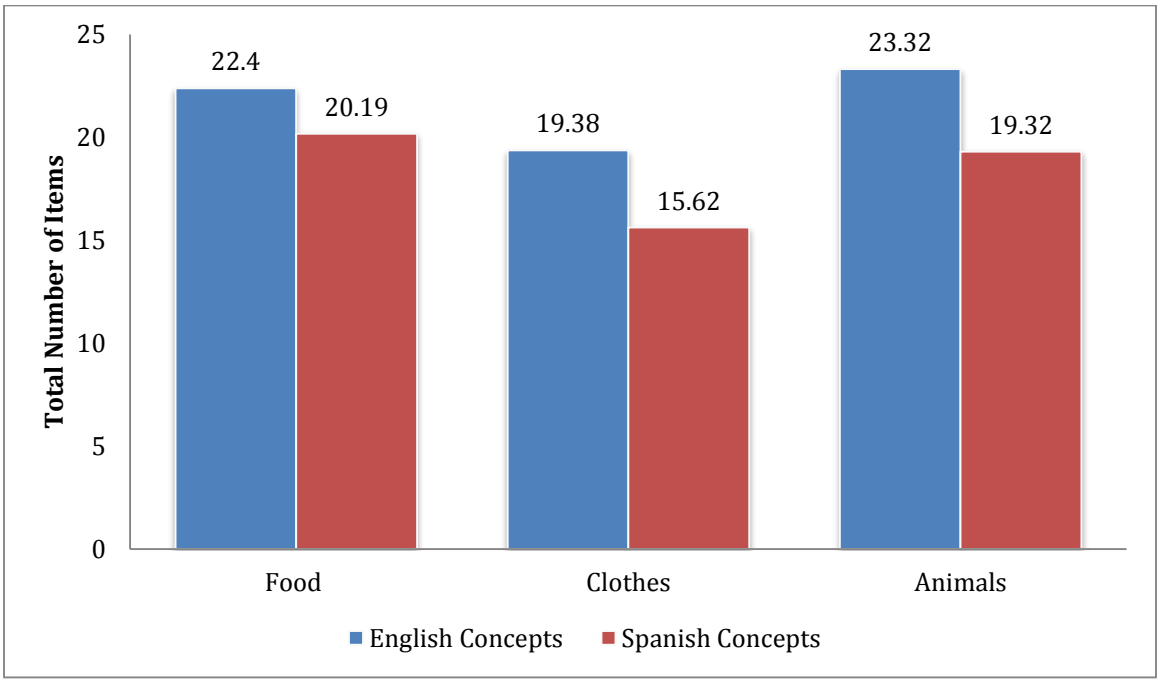
***Table 7. Total number of items named by participants for categories and languages***

| | English | | | | Spanish | | | |
|---|---|---|---|---|---|---|---|---|
| ID | Food | Clothes | Animals | Total | Food | Clothes | Animals | Total |
| 1 | 16 | 16 | 24 | 56 | 24 | 19 | 19 | 62 |
| 2 | 17 | 20 | 20 | 57 | 18 | 13 | 13 | 44 |
| 3 | 18 | 17 | 25 | 60 | 15 | 9 | 20 | 44 |
| 4 | 21 | 18 | 8 | 47 | 23 | 11 | 31 | 65 |
| 5 | 36 | 31 | 35 | 102 | 20 | 19 | 29 | 68 |
| 6 | 17 | 17 | 24 | 58 | 19 | 16 | 21 | 56 |
| 7 | 23 | 21 | 23 | 67 | 19 | 10 | 20 | 49 |
| 8 | 23 | 24 | 23 | 70 | 18 | 10 | 25 | 53 |
| 9 | 23 | 18 | 23 | 64 | 19 | 13 | 19 | 51 |
| 10 | 14 | 23 | 25 | 62 | 18 | 19 | 24 | 61 |
| 11 | 20 | 23 | 23 | 66 | 16 | 11 | 9 | 36 |
| 12 | 12 | 16 | 17 | 45 | 14 | 14 | 11 | 39 |
| 13 | 19 | 20 | 21 | 60 | 13 | 9 | 12 | 34 |
| 14 | 22 | 26 | 29 | 77 | 20 | 18 | 11 | 49 |
| 15 | 20 | 19 | 24 | 63 | 12 | 10 | 19 | 41 |
| 16 | 23 | 14 | 22 | 59 | 20 | 21 | 10 | 51 |
| 17 | 17 | 14 | 25 | 56 | 12 | 15 | 20 | 47 |
| 18 | 29 | 18 | 24 | 71 | 31 | 23 | 19 | 73 |
| 19 | 20 | 13 | 15 | 48 | 16 | 12 | 10 | 38 |
| 20 | 31 | 25 | 26 | 82 | 19 | 14 | 19 | 52 |
| 21 | 22 | 21 | 24 | 67 | 19 | 15 | 17 | 51 |
| 22 | 16 | 21 | 23 | 60 | 22 | 15 | 15 | 52 |
| 23 | 26 | 20 | 40 | 86 | 17 | 9 | 19 | 45 |
| 24 | 22 | 16 | 24 | 62 | 22 | 15 | 15 | 52 |
| 25 | 25 | 23 | 24 | 72 | 18 | 18 | 17 | 53 |
| 26 | 37 | 25 | 34 | 96 | 21 | 15 | 24 | 60 |
| 27 | 23 | 18 | 29 | 70 | 34 | 21 | 33 | 88 |
| 28 | 17 | 20 | 16 | 53 | 22 | 16 | 19 | 57 |
| 29 | 19 | 18 | 13 | 50 | 25 | 17 | 18 | 60 |
| 30 | 28 | 23 | 31 | 82 | 27 | 22 | 27 | 76 |
| 31 | 29 | 20 | 25 | 74 | 27 | 18 | 23 | 68 |
| 32 | 25 | 17 | 14 | 56 | 24 | 13 | 13 | 50 |
| 33 | 16 | 7 | 25 | 48 | 17 | 22 | 33 | 72 |
| 34 | 21 | 20 | 26 | 67 | 19 | 19 | 25 | 63 |
| 35 | 32 | 19 | 23 | 74 | 18 | 18 | 20 | 56 |
| 36 | 27 | 18 | 15 | 60 | 26 | 17 | 15 | 58 |
| 37 | 23 | 18 | 21 | 62 | 23 | 22 | 21 | 66 |
| Mean | 22.41 | 19.38 | 23.32 | 65.11 | 20.19 | 15.62 | 19.32 | 55.14 |
| SD | 5.81 | 4.23 | 6.16 | 12.91 | 4.86 | 4.14 | 6.27 | 11.84 |

Participants produced more items in English than Spanish across all categories. The mean number of total items produced in Spanish was 55.1 and the total mean number of total items produced in English was 65.11.

The average number of concepts for each category produced by all 37 participants is presented in Figure 1. *Clothes* had the least number of items (Mean = 17.5) and the largest number of overlapping items (Mean = 3.59). The *food* category (Mean = 21.3) had a similar number of items as *animals* (Mean = 21.32), but slightly less overlapping items (Mean = 3.2) than the *animals* category (Mean = 3.56).

***Figure 1. Mean number of items named in each category for English and Spanish***




## Effects of language and category on the number of items produced

Analysis of variance yielded a significant difference between languages (English or Spanish) for the number of items produced ($F= 21.69$, $p <.05$). Participants produced

significantly more words in English than in Spanish. There also was a significant difference between the categories (F= 12.69, p <.05). Participants produced the least amount of items in the *clothes* category, but just as many *foods* and *animals*. However, the interaction of categories and languages was not statistically significant (F=.612, p >.05).

As expected, the total number of words in English was greater than the total number of words in Spanish. The self-rated overall language proficiencies revealed that participants scored slightly higher in English (M=4.75) than Spanish (M=4.40) and, as predicted, they produced more words in English (65.11) than in Spanish (55.14).

A post-hoc paired-sample t-tests were used to examine the differences in the number of items named for each category in English and Spanish, corrected using Bonferonni (See Table 8).

There was a significant difference in the number of items produced for *clothes* in English (M=19.38, SD=4.23) versus Spanish (M=15.62, SD=4.14); t(36)=3.70, p=.009. The difference between the number of items produced for *animals* in English (M=23.32, SD=6.16) and Spanish (M=19.32, SD=6.27) was also significant; t(36)=3.29, p=0.018. There was not a significant difference in the number of items produced for *food* across languages.

***Table 8. T-test Results for Food, Clothes, and Animals in Spanish and English***

| Category | 95% CI for Mean Difference | r | t | df |
|---|---|---|---|---|
| Food | 0.16, 4.24 | .34 | 2.18 | 36 |
| Clothes | 1.70, 5.82 | -.09 | 3.70* | 36 |
| Animals | 1.53, 6.47 | .29 | 3.29* | 36 |

* p < .05.

Paired sample t-tests were also used to compare the number of items produced between word categories (*food, clothes*, and *animals*) within language (*Spanish* and *English*) (See Table 9). In Spanish, there was a significant difference between the *clothes* (M=15.62, SD=4.14) and *animals* (M= 19.32, SD= 6.27); t(36)= -3.58, p=.009, and between the *food* (M=20.19, SD= 4.86) and *clothes* (M= 15.62, SD= 4.14); t(36)= 6.64, p= .000. However, no significant difference was found for the number of *food* and *animals*.

***Table 9. T-test Results for the Word Category comparisons in Spanish.***

| Category Pairs | 95% CI for Mean Difference | r | t | df |
|---|---|---|---|---|
| Clothes/Animals | -5.80, -1.61 | .33 | -3.58* | 36 |
| Food/Animals | 1.32, 3.05 | .33 | .80 | 36 |
| Food/Clothes | 3.17, 5.96 | .58* | 6.64* | 36 |

* p < .05

Similarly, in English there was a significant difference between *clothes* (M=19.38, SD=4.23) and *animals* (M= 23.32, SD= 6.16); t(36)= -4.11, p=.000, and between *food* (M=22.41, SD= 5.81) and *clothes* (M= 19.38, SD=4.23)); t(36)= 3.56, p= .009 but not *food* and *animals* (See Table 10).

***Table 10. T-test results for the Category Pairs in English.***

| Category Pairs | 95% CI for Mean Difference | r | t | df |
|---|---|---|---|---|
| Clothes/Animals | -5.89, -2.00 | .42* | -.4.11* | 36 |
| Food/Animals | -3.06, 1.23 | .42 | -.87 | 36 |
| Food/Clothes | 1.30, 4.75 | .51* | 3.56* | 36 |

* p < .05

**Correlations of language proficiency and the number of items produced**

Pearson product moment correlation coefficients were computed between the language proficiency in Spanish and the total number of items produced for the three

categories (*food, clothes*, and *animals*), (See Table 11). Results show that self-reported Spanish proficiency was not significantly correlated to the number of items produced in the categories: *food, clothes, and animals* (r=0.056, 0.139, 0.108). The same analysis was utilized to investigate the relationship between the participants' self-reported overall language proficiency in English and the total number of items generated in English for all three categories: *food, clothes* and *animals*. There is also no significant relationship between the participants' self-reported English proficiency and the number of items produced in the three categories: *food, clothes* and *animals* (r=0.046, -0.056, -0.053).

***Table 11. Pearson product moment correlation coefficients for language proficiency and the number of items produced in each category***

| Proficiency | Food | Clothes | Animals |
|---|---|---|---|
| Spanish | 0.056 ($p > 0.05$) | 0.139 ($p > 0.05$) | 0.108 ($p > 0.05$) |
| English | 0.046 ($p > 0.05$) | -0.056 ($p > 0.05$) | -0.053 ($p > 0.05$) |

The differences in proficiency might be too small in this group of participants to produce a language proficiency effect on the number of items generated for each category in each language. However, a correlation analysis revealed that there was a significant correlation between proficiency ratings in each language as a group (r= -0.400, p = 0.015).

A different approach to measure the difference between proficiency across language was adapted from Kwon (2014). This new measure was used to study the correlation of proficiency on category generation. The score between the Spanish and English overall proficiency was calculated for each participant by subtracting the Spanish overall proficiency score from the English overall proficiency score. Because some

participants rated themselves higher in Spanish than English and vice versa, some of the differences were positive and some were negative. The larger the difference indicated less of a balance in bilingualism and the smaller the difference indicated more of a balance in bilingualism. A negative value indicated higher proficiency in Spanish than English and a positive value indicated higher proficiency in English.

Using this language difference we investigated the relationship between proficiency balance and the total number of translational equivalents named in each category was investigated. If participants have a small difference in language proficiency (more balanced bilinguals), they are expected to generate a similar number of doublets because they know more words in both languages and they could use executive functions to semantically inhibit doublets across all categories. The same value of doublets was used for each category, and was determined by adding the number of translation equivalents (See Table 12).

***Table 12. Number of doublets in each category.***

| ID | Food | Clothes | Animals | Total |
|---|---|---|---|---|
| 1 | 6 | 11 | 10 | 27 |
| 2 | 1 | 11 | 7 | 19 |
| 3 | 3 | 4 | 7 | 14 |
| 4 | 6 | 7 | 15 | 28 |
| 5 | 9 | 10 | 22 | 41 |
| 6 | 7 | 8 | 10 | 25 |
| 7 | 10 | 15 | 11 | 36 |
| 8 | 5 | 22 | 10 | 37 |
| 9 | 5 | 7 | 12 | 24 |
| 10 | 9 | 10 | 11 | 30 |
| 11 | 8 | 6 | 7 | 21 |
| 12 | 4 | 10 | 7 | 21 |
| 13 | 3 | 5 | 7 | 15 |
| 14 | 4 | 9 | 4 | 17 |
| 15 | 3 | 5 | 11 | 19 |
| 16 | 2 | 3 | 6 | 11 |
| 17 | 4 | 7 | 13 | 24 |
| 18 | 7 | 12 | 8 | 27 |
| 19 | 2 | 6 | 4 | 12 |
| 20 | 5 | 8 | 12 | 25 |
| 21 | 9 | 6 | 14 | 29 |
| 22 | 4 | 6 | 6 | 16 |
| 23 | 3 | 5 | 6 | 14 |
| 24 | 7 | 11 | 8 | 26 |
| 25 | 11 | 11 | 8 | 30 |
| 26 | 9 | 13 | 13 | 35 |
| 27 | 3 | 8 | 5 | 16 |
| 28 | 6 | 9 | 9 | 24 |
| 29 | 10 | 12 | 8 | 30 |
| 30 | 7 | 12 | 11 | 30 |
| 31 | 11 | 12 | 13 | 36 |
| 32 | 9 | 9 | 10 | 28 |
| 33 | 5 | 5 | 12 | 22 |
| 34 | 8 | 12 | 13 | 33 |
| 35 | 6 | 10 | 12 | 28 |
| 36 | 16 | 10 | 7 | 33 |
| 37 | 10 | 9 | 8 | 27 |
| Mean | 6.41 | 9.081 | 9.65 | 25.14 |
| SD | 3.21 | 3.59 | 3.56 | 7.59 |

Pearson product moment correlation coefficients were calculated to examine the relationship between the new "proficiency difference" score and the total number of doublets produced in each category and for the combined categories (See Table 13). Contrary to expectations, the correlational analysis revealed a significant negative correlation between proficiency difference scores and the total number of doublets produced in the *food* category (r= -.445, P= < .05). The correlations for the other two categories (*clothes* and *animals*) were not significantly different but were in the same direction (negative). Therefore, less balanced bilinguals are more likely to have more doublets. It seems that relative proficiency is not related to producing words in both languages.

***Table 13. Pearson product moment correlation coefficients for the participants' proficiency differences and the number of category doublets***

| | Food | Clothes | Animals | Total |
|---|---|---|---|---|
| Proficiency | -0.445(p<0 .05) | -0.274 (p >0.05) | -0.057 (p>0.05) | -.344 (p>0.05) |

**Differences in the number of translational equivalents as a function of word category**

In order to explore whether there was an effect of language and category on the number of items produced, one-way ANOVA with language and translation equivalents as the independent variables and number of items produced as the independent variable, was conducted. ANOVA results revealed that there was a significant difference in the total number of equivalents produced between the categories (F=6.86, p <0 .05).

First, a post-hoc analysis, paired-sample t-tests were used to compare the total number of translational equivalents, and the word category pairs (See Table 14) Participants produced significantly less translational equivalents for *food* (M=6.4, SD=3.31) than *clothes* (M=9.08, SD=3.59); t(36)= -4.38, p=.000. Additionally, participants produced significantly less translational equivalents for the *food* (M=6.41, SD= 3.21) than *animals* (M=9.65, SD=3.56); t(36)= -5.03, p<001. No significant difference in the translational equivalents produced for the *clothes* and *animals* was found.

***Table 14. T-test results for the category pairs of translational equivalents.***

| Category Pairs | 95% CI for Mean Difference | r | t | df |
|---|---|---|---|---|
| Clothes/Animals | -2.08, 0.95 | .19 | -.760 | 36 |
| Food/Animals | -4.55, -1.93 | .33* | -5.025* | 36 |
| Food/Clothes | -3.92, -1.44 | .41* | -4.375* | 36 |

* p < .05

# DISCUSSION

The purpose of this study was to create a category generation normative database to use as a reference in order to assess and monitor progress for Spanish-English bilingual speakers with aphasia. Findings from this study show that higher language proficiency was related to the number of words produced across all categories. There was also a significant difference in the number of words generated between the categories. The advantage of adults in naming unique items for each category was partially confirmed in that there was a difference in the number of doublets produced by categories (*foods* versus *clothes* and *animals*). There was also a significant difference in the number of translation equivalents generated between the categories.

## Effects of language and category on the number of items produced

The first goal of this study was to examine the relationship between the total number of items generated by Spanish-English bilingual adults in each language in three categories (*food, clothes,* and *animals*). Results revealed that participants produce slightly more items in English in all three categories, likely as a result of greater proficiency in English due to living in the United States for many years. It was more difficult to name clothing items than naming different kinds of foods and animals, because they produced the least number of items in the *clothes* category for both languages. There was a significant difference in the number of overlapping items generated *foods* compared to *animals* and *clothes*. Participants produced significantly more items for *clothes* and *animals* in English than in Spanish.

**Correlations of language proficiency and the number of items produced**

The second aim of this project was to analyze the relationship between language proficiency and the participants' performance on the category generation tasks. The participants reported higher language proficiency in English than in Spanish and produced more items in English than Spanish across all categories. Therefore the self-rated proficiency scales on the questionnaire completed by each participant seem to be valid. However, the correlations between Spanish language proficiency and the total number of items named in Spanish were not significant. Additionally, the correlation between the English language proficiency and the total number of items named in English was not significant.

This study evaluated the difference between Spanish and English language proficiency on the total number of translational equivalents (doublet) to further investigate the question of the effect of proficiency on category generation. The correlation analysis revealed a significant negative relationship between the proficiency difference scores and the total number of doublets produced in *food* and no significant relationship between the proficiency difference score and the total number of doublets produced in the other two categories (*clothes* and *animals*). This finding suggests, that for the most salient category (*food*), participants were able to suppress the non-target language in order to generate different types of foods in each language. While language tasks were performed on different days in order to account for interference of the non-target language, the same condition was applied to all categories, and the translation

equivalents for only one category was found to be negatively affected by proficiency difference scores.

### Differences in the number of translational equivalents as a function of word category

The third aim of this study was to examine the differences between the categories and the number of translational equivalents. The data analysis reveals that the correlations between the number of translational equivalents for *animals* and *clothes* were not significant. However, there is a high correlation between *foods* and *clothes* equivalents. There also was a smaller correlation for *food* and *animals* equivalents. The findings suggest that proficiency difference scores may be a reliable reflection of the actual difference between two languages' proficiency levels, depending on the saliency of the categories.

## CONCLUSIONS

The relationship found in this study between language proficiency and number of doublets across categories contributed new information to our understanding of semantic knowledge in Spanish and English of bilingual adults in the United States. The results of the study provide valuable information about the semantic knowledge of neurologically normal adults who speak Spanish and English. We found that in both languages, participants produced fewer doublets in the *food* category, compared to *clothes* and *animals.* Translation equivalents for the *food* category could be a good measure to include in future generative naming studies to control for the effect of language proficiency. It may be also a good proxy for measuring inhibitory control in adults with different proficiency levels.

The study's major limitation was the use of proficiency measures that lacked enough sensitivity. For the most part, the self-rating scales of the Language Use Questionnaire that was used may not have been sensitive enough to show the performance differences in generative naming tasks, except for overlaps in the *foods* category. Future studies should incorporate more detailed rating scales, which could provide a better measure of language proficiency. Additionally, while the categories chosen for this project are reliable for measuring semantic knowledge, they may not have been similar enough with regards to saliency in to show significant performance differences in generative naming tasks for this particular population. Future studies should explore categories that are equally engrained and salient in both of the cultures of Spanish-English bilingual speaker.

The findings of this study can be extended to other studies related to bilingual Spanish-English speakers and generative naming tasks. More research focused on individuals with aphasia and neurologically normal individuals with similar language acquisition history is needed in order to learn how language history affects language loss in bilinguals (Muñoz & Marquardt, 2003). In sum, further research on generative naming in Spanish-English bilinguals with aphasia is warranted in order to expand our understanding of semantic processing in Spanish-English bilinguals.

# APPENDIX A: LANGUAGE USE QUESTIONNAIRE

## Language Use Questionnaire

This questionnaire is related to the amount of English and your other language (specify) _____ you have been exposed in your life. Please cross the box that best describe the percentage of the other language or English you have been exposed in the given age range. If you were exposed only to one language in a specific age range, please select the 100% box for that language.

**Directions:** From the following age ranges please select which language you heard, spoke and read the most. For example, if you indicate you heard English 75% of the times between the age range 6-9, it means that you heard the other language the remaining 25% of the times.

| | LANGUAGE YOU HEARD THE MOST | | | | |
|---|---|---|---|---|---|
| | Other language 100% | 25 English/75 other | 50/50 | 75 English/25 other | English 100% |
| **Age** | | | | | |
| 0-3 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3-6 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6-9 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9-12 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12-15 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15-18 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18-21 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21-24 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24-27 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27-30 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 and up | ☐ | ☐ | ☐ | ☐ | ☐ |

| | LANGUAGE YOU SPOKE THE MOST | | | | |
|---|---|---|---|---|---|
| | Other language 100% | 25 English/75 other | 50/50 | 75 English/25 other | English 100% |
| **Age** | | | | | |
| 3-6 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6-9 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9-12 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12-15 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15-18 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18-21 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21-24 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24-27 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27-30 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 and up | ☐ | ☐ | ☐ | ☐ | ☐ |

| | LANGUAGE YOU READ THE MOST | | | | |
|---|---|---|---|---|---|
| | Other language 100% | 25 English/75 other | 50/50 | 75 English/25 other | English 100% |
| **Age** | | | | | |
| 3-6 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6-9 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9-12 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12-15 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15-18 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18-21 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21-24 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24-27 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27-30 | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 and up | ☐ | ☐ | ☐ | ☐ | ☐ |

**Directions:** . From the following age ranges please indicate which language gave you the most confidence when speaking, hearing and reading it. Confidence does not mean the language you used the most. It means the language that gave you the most self-confidence when speaking, listening or reading. For example, it might be possible that between 9-12 years of age you heard English at school and your other language at home. However, you felt more self-confident when hearing your other language than English. If you were exposed to only one language in a specific age, answer for the exposed language only.

| | | CONFIDENCE IN HEARING | | | | |
|---|---|---|---|---|---|---|
| | | Not confident | 25% confident | 50% confident | 75% confident | Strong confident |
| **Age** | **Language** | | | | | |
| 3-6 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6-9 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9-12 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12-15 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15-18 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18-21 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21-24 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24-27 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27-30 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 and up | English | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | CONFIDENCE IN SPEAKING | | | | |
|---|---|---|---|---|---|---|
| | | Not confident | 25% confident | 50% confident | 75% confident | Strong confident |
| **Age** | **Language** | | | | | |
| **3-6** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **6-9** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **9-12** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **12-15** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **15-18** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **18-21** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **21-24** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **24-27** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **27-30** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **30 and up** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | CONFIDENCE IN READING | | | | |
|---|---|---|---|---|---|---|
| | | Not confident | 25% confident | 50% confident | 75% confident | Strong confident |
| **Age** | **Language** | | | | | |
| 6-9 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9-12 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12-15 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15-18 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18-21 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21-24 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24-27 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27-30 | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 and up | English | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other | ☐ | ☐ | ☐ | ☐ | ☐ |

‘**Directions:** For activity, include what you are engaged in (e.g., breakfast, work, etc). For partners, include who is interacting with you in the given activity (e.g., mother, grandfather, siblings, etc.). For language(s), use **O** for Other language, **E** for English, **B** for both.

Home Language Profile/Routine: During Week

| Time | Activity | Conversation Partner(s) | Language(s) | |
|---|---|---|---|---|
| | | | Partner | Participant |
| 7am | | | O E B | O E B |
| 8am | | | O E B | O E B |
| 9am | | | O E B | O E B |
| 10am | | | O E B | O E B |
| 11am | | | O E B | O E B |
| 12pm | | | O E B | O E B |
| 1pm | | | O E B | O E B |
| 2pm | | | O E B | O E B |
| 3pm | | | O E B | O E B |
| 4pm | | | O E B | O E B |
| 5pm | | | O E B | O E B |
| 6pm | | | O E B | O E B |
| 7pm | | | O E B | O E B |
| 8pm | | | O E B | O E B |
| 9pm | | | O E B | O E B |
| 10pm | | | O E B | O E B |
| 11pm | | | O E B | O E B |

**Directions:** For activity, include what you are engaged in (e.g., breakfast, work, etc). For partners, include who is interacting with you in the given activity (e.g., mother, grandfather, siblings, etc.). For language(s), use **O** for Other language, **E** for English, **B** for both.

Home Language Profile/Routine: Weekend

| Time | Activity | Conversation Partner(s) | Language(s) | |
|---|---|---|---|---|
| | | | Partner | Participant |
| 7am | | | O E B | O E B |
| 8am | | | O E B | O E B |
| 9am | | | O E B | O E B |
| 10am | | | O E B | O E B |
| 11am | | | O E B | O E B |
| 12pm | | | O E B | O E B |
| 1pm | | | O E B | O E B |
| 2pm | | | O E B | O E B |
| 3pm | | | O E B | O E B |
| 4pm | | | O E B | O E B |
| 5pm | | | O E B | O E B |
| 6pm | | | O E B | O E B |
| 7pm | | | O E B | O E B |
| 8pm | | | O E B | O E B |
| 9pm | | | O E B | O E B |
| 10pm | | | O E B | O E B |
| 11pm | | | O E B | O E B |

**Directions:** Write the age intervals (in years) when your parents have lived in the countries stated below. If they have lived all their life in one country please indicate which country.

| | **Father** | **Mother** |
|---|---|---|
| **United States** | | |
| **Other country** (specify the country)_____ | | |
| **All their life in** (specify the country)_____ | | |
| **Not applicable** | | |

Please rate the ability of the following people in each language. Specify the other language_____.

| | | Proficiency rating | | | | |
|---|---|---|---|---|---|---|
| | | Not confident | 25% confident | 50% confident | 75% confident | Strong confident |
| | **Language** | | | | | |
| **Mother** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Father** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Siblings** | **English** | ☐ | ☐ | ☐ | ☐ | ☐ |
| | **Other** | ☐ | ☐ | ☐ | ☐ | ☐ |

**II. Educational History:**

How many years of education have you had? _____

| ***What was the language you used at school during:*** | **Other** | **English** | **Both** |
|---|---|---|---|
| Elementary? | 1 | 2 | 3 |
| High school? | 1 | 2 | 3 |
| College? | 1 | 2 | 3 |
| ***Which language did you prefer to speak at school during:*** | | | |
| Elementary? | 1 | 2 | 3 |
| High school? | 1 | 2 | 3 |
| College? | 1 | 2 | 3 |
| ***What language did other students speak at school during:*** | | | |
| Elementary? | 1 | 2 | 3 |
| High school? | 1 | 2 | 3 |
| College? | 1 | 2 | 3 |

Were you taught in any additional languages? YES NO

If so, which language(s)?

Have your language use patterns changed in the last five years? If yes, How?

## Language Ability Rating

I would like to understand how comfortable you are in English and your other language. Please circle the number that best represents your ability to communicate in each speaking and listening situation. Numbers range from **1** (non-fluent, only know several words or a few simple sentences) to **5** (fluent, completely comfortable with skills like a native speaker).

| **English** | Non-fluent | | | | Native Fluency |
|---|---|---|---|---|---|
| Overall ability | 1 | 2 | 3 | 4 | 5 |
| Speaking in casual conversations | 1 | 2 | 3 | 4 | 5 |
| Listening in casual conversations | 1 | 2 | 3 | 4 | 5 |
| Speaking in formal situations | 1 | 2 | 3 | 4 | 5 |
| Listening in formal situations | 1 | 2 | 3 | 4 | 5 |
| Reading | 1 | 2 | 3 | 4 | 5 |
| Writing | 1 | 2 | 3 | 4 | 5 |

| **Other language** | Non-fluent | | | | Native Fluency |
|---|---|---|---|---|---|
| Overall ability | 1 | 2 | 3 | 4 | 5 |
| Speaking in casual conversations | 1 | 2 | 3 | 4 | 5 |
| Listening in casual conversations | 1 | 2 | 3 | 4 | 5 |
| Speaking in formal situations | 1 | 2 | 3 | 4 | 5 |
| Listening in formal situations | 1 | 2 | 3 | 4 | 5 |
| Reading | 1 | 2 | 3 | 4 | 5 |
| Writing | 1 | 2 | 3 | 4 | 5 |

## APPENDIX B: NORMAL QUESTIONNAIRE

## NORMAL QUESTIONAIRE

Name:_____ Date:_____

Age_____ Sex:_____ Handedness: L. R. Birth date: _____

Address:_____

Phone number: Home _____Other: _____

Native language:_____

Highest Degree Attained Occupation_____

Do you wear glasses? Y N. If yes corrected to normal? Y N

Do you have a hearing impairment? Y N. If yes, are you using a hearing aid. Y N

Do you have a history of any of the following :

| | | | | | |
|---|---|---|---|---|---|
| Stroke | Yes | No | Heart Problems | Yes | No |
| Arthritis | Yes | No | Pick's Disease | Yes | No |
| Alzheimer's Disease | Yes | No | Depression | Yes | No |
| Memory Problems | Yes | No | Tumor | Yes | No |
| Learning Disability | Yes | No | Seizures | Yes | No |
| Parkinson's Disease | Yes | No | | | |

## APPENDIX C: EXAMPLE OF TASK PROCEDURES

### Track 1 – Session 1

Thanks for volunteering for our study. This is the first session and it will take about an hour and a half.

I'm going to ask you to do several things in English and then you'll switch to Spanish with someone else. We're studying vocabulary and language and so the tasks include vocabulary tasks and story telling. All your responses will be audiotaped. Do you have any questions?

The first task is to name all of the items you can think of in a certain category. You will have one minute for each one. Let's go through an example first.

Name all of the colors you can think of. You will have one minute. Are you ready*? (Wait for response.)* Start now.

Do you have any questions? Now let's begin.

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Tell me all of the clothes you can think of. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all of the animals you would find at the zoo. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all the foods you know. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all of the animals you could find at a farm. You have one minute.<br>Are you ready?<br>Start now. | | |

Now, I'm going to ask you to read and tell two short stories. Let's begin.

| **Task** | **Date** | **Examiner** |
|---|---|---|
| *Give Participant the* Frog Goes To Dinner *script.*<br>Please read this story out loud. You will need to tell me this story again later. Please begin now.<br>Frog Goes to Dinner (English) | | |
| *Take script and give participant* Frog, Where Are You? *picture book.*<br>Look at all of these pictures. I want you to think of a story using this book.<br>*Once they have looked at the book:*<br>Now, tell me a story using these pictures. You can look at the book while you tell the story. Please begin now. | | |
| *Take book.*<br>Remember the story you read to me? Please tell me that story again from memory.<br>Frog Goes to Dinner (English)<br>*Prompt:* Do the best you can. | | |

Now, I'm going to ask you to look at a group of pictures. I want you to tell me the name of each picture. Are you ready?

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Picture test (English, 30 words, normative data) | | |

Ok, now we're done with the English portion of this session. Do you need a break? *Take break if needed.*

Ahora vamos a empezar la parte en español. La primera tarea es nombrar todos los artículos en los cuales puedas pensar en cada categoría. Tienes un minuto para cada una. Vamos a empezar.

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Dime todas las comidas que se comen para el lonche/almuerzo. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |
| Dime toda la ropa que se usa cuando hace calor. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |

| | | |
|---|---|---|
| Dime los nombres de todos los animales que conoces. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |
| Dime toda la ropa que se usa cuando hace frío. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |
| Dime todas las comidas que se pueden comer en una fiesta de cumpleaños. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |

Place holder for Age of Acquisition Task

| **Task** | **Date** | **Examiner** |
|---|---|---|
| AOA | | |

The last thing I'm going to ask you to do today is fill out this questionnaire. Please read and answer all questions. If you have any questions, please let me know.

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Questionnaire | | |

**Track 1 – Session 2**

Gracias por su participación en nuestro estudio. Está sesión no debe tomar más de media hora. Haremos muchas de las mismas cosas que la vez pasada.

La primera tarea es nombrar todos los artículos en los cuales puedas pensar en cada categoría. Tienes un minuto para cada una. Vamos a empezar.

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Dime todos los animales que se encuentran en el zoo/zoológico. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |
| Dime los nombres de todas las comidas que sepas. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |
| Dime los nombres de toda la ropa que sepas. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |
| Dime todos los animales que se encuentran en la granja. Tienes un minuto.<br>¿Estás listo/lista?<br>Empieza ahora. | | |

Ahora te voy a preguntar que leas y cuentes dos cuentos cortos. Vamos a empezar.

| **Task** | **Date** | **Examiner** |
|---|---|---|
| *Dar al participante el guión de* La Rana Solitaria.<br>Por favor, lee este cuento en voz alta. Me lo va a contar después.<br>La Rana Solitaria (Spanish) | | |
| *Toma el guión y dales el libro Una Rana de Más.*<br>Mira todos los dibujos. Quiero que inventes un cuento que vaya con los dibujos.<br>Una Rana de Más (Spanish)<br>*Una vez que han visto el libro:*<br>Ahora, cuéntame un cuento. Puedes ver el libro mientras que me lo cuentas. Por favor empieza ahora. | | |
| *Toma el libro*<br>¿Recuerdas el cuento que acabas de leer? Ahora cuéntamelo de memoria.<br>La Rana Solitaria (Spanish) | | |

Ahora te voy a pedir que mires a un grupo de fotografías/retratos y dibujos. Quiero que me digas el nombre de cada uno. ¿Estás listo/a?

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Picture test (Spanish, 30 words, normative data) | | |

Ya se acabo la parte en español. ¿Necesitas un descanso breve? *Toma uno si es necesario.*

We are now going to begin the English portion of this session. The first task is to name all of the items you can think of in a certain category. You will have one minute. Let's begin

| **Task** | **Date** | **Examiner** |
|---|---|---|
| Tell me all the clothes you wear when it is cold outside. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all the foods you can eat for lunch. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all the clothes you wear when it is hot outside. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all the foods you can eat at a birthday party. You have one minute.<br>Are you ready?<br>Start now. | | |
| Tell me all the animals you can think of. You have one minute.<br>Are you ready?<br>Start now. | | |

Those are all the tasks for today. Thanks again for your participation.
*Pay them*

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