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A COMPARATIVE ANALYSIS OF SPANISH AND ENGLISH SEMANTIC FEATURES
AND THEIR ROLE IN APHASIA TREATMENT

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ABSTRACT

With the expanding bilingual population in the United States, therapy materials must take into account cultural and linguistic differences. This study examined the verification of semantic features among native English and Spanish speakers to help inform semantic feature selection in therapy. Spanish and English speakers were tasked with selecting whether a feature applied to a concrete word. The frequency of selection for the features was calculated for English and Spanish speakers. The results were converted into percent agreements and compared for disagreement amongst English and Spanish speakers. Words and features with 50% or greater instances of disagreement were analyzed in the study. Results indicated that language, cultural and geographical differences combined with the subjectivity of the features may be the cause of disagreement amongst English and Spanish speakers.

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Chapter 1

Introduction

In the United States, 60.6 million Americans' dominant language is one other than English. The percentage of the population who speaks Spanish continues to rapidly increase and is currently at 12.9% (Ryan, 2013). In the United States, 17.8% of the population is Hispanic or Latino and this percentage is estimated to reach 28.6% by 2060 (Colby & Ortman, 2015). This growing statistic emphasizes the importance of culturally appropriate therapy for people with language deficits, as many Americans do not identify English as their native language. The future of a dominant Spanish population has direct implications on language therapy for patients with aphasia. The purpose of this study is to help inform bilingual word finding therapy.

Aphasia, an acquired language disorder following brain damage, affects expressive and receptive language. Semantic therapy is often used to treat individuals with aphasia who have deficits in word finding. Patients are trained to link a word's label with its description, which is called a semantic feature. For example, the word dog could be described with the semantic feature *has four legs*. In regards to semantic feature therapy, patients' spontaneous production of features is linked to their previous exposure and interactions with the specific object (McRae, 2005). An individual's exposure and interaction with an object may be culturally bound. Treatment would be best suited to address these cultural differences, which permeate across languages and could enhance therapy outcomes. The remainder of this review will first define semantic features, the

role they play in word production, and their application for word finding; next, models of word finding will be discussed; and finally, specific word therapies that have been used for bilinguals, which utilize semantic features will be presented.

Semantic features generated to describe aspects of any particular word can be grouped into various categories. McRae (1999) categorized semantic features in his production norm study, and those of interest to this analysis include: functional properties (an object's use), classification (where the object is found) and people's related cognition (general facts known about the object). Additionally pertinent is Sajin's inclusion of the feature categorizations of physical properties (sensory details) and taxonomy (definition). Semantic features are of importance when studying aphasia and their subsequent use in therapy because they explain the creation and retention of semantic representations, which directly influence word production (Sajin, 2014; Boyle, 2004).

A couple of semantic effects that pose considerations are: increased recognition, preferentially favored production, and lexical prediction. On lexical decision tasks, words with higher number of features are recognized faster (Pexman, 2003). During word production, highly imaginable words with many features provide more feedback from the semantic to lexical level (Yap, 2012). During a visual world paradigm eye-tracking task, words with a higher number of features are preferentially favored over words with a lower number of features when provided with ambiguous input. When a listener hears inconclusive auditory input, for example /kap/, a number-of-feature effect is seen at the onset of a word, with the listener preferring the word with more semantic features. The correct selection of a target word is aided when it has many distant semantic neighbors and impeded by overlapping semantic features (Sajin, 2014). Lexical prediction is

directly influenced by differences in semantic richness. Words with higher number of features are recognized faster in semantic classification tasks (living vs. nonliving, concrete vs. abstract) (Pexman, 2008). Semantic richness effects are even evident in speeded pronunciation tasks in which word meaning is not specifically assessed (Yap, 2012). These semantic effects pose important considerations when conducting word recognition therapy.

Semantic feature treatment is used to address an aphasia patient's naming difficulties. In a sample semantic feature treatment, patients are given a list of semantic features and asked to select which applies to the target word. Patients are also asked yes and no questions utilizing the features. Then patients are presented with a picture of the target and asked to generate the name (Edmonds & Kiran, 2006). The treatment is deigned to aid retrieval of the target word by strengthening the connections between the semantic and lexical networks (Papathanasiou and Coppens, 2017). Semantic feature treatment for individuals with aphasia is shown to increase naming accuracy for words directly treated and additionally shows some generalization to untreated words (Boyle, 2004). Most of the work to date has focused on English monolinguals; however, many patients' proficient language is not English and so therapy materials must address this difference.

Edmonds and Kiran performed semantic feature treatment with bilingual patients with aphasia. They found that bilingual patients exhibited greater improvements when treatment was conducted in their native Spanish language as compared to English (Edmonds & Kiran, 2006). Costa and Roelofs also demonstrated that semantic treatment therapy was more beneficial when conducted in the L1 language than when in the L2

(Costa et al., 1999; Roelofs, 2003). When bilingual patients with aphasia received therapy in Spanish, improvements were also witnessed for the untrained English translations. However, when treatment was conducted in the less proficient language for bilinguals, generalization in the treatment language to untrained items was not seen. So treatment targeting semantic connections appears to favor the more proficient language (Kroll & Stewart, 1994).This discrepancy can be explained using Kroll's Revised Hierarchical Model, with the L1 having stronger connections between the conceptual system than the less proficient L2.

In aphasia, word retrieval is commonly impaired and is the cause of communication breakdowns. Word production models allow for the understanding and representation of word retrieval patterns in aphasia (Schwartz et al., 2006). In a discrete-stage model, word retrieval begins with the activation of the relevant semantic features of the word. Next, words are chosen in the lexical stage that corresponds to the same semantic features and a word is spoken through phonological encoding. In Dell's interactive activation model of speech production, interaction is said to occur between stages, allowing for feedback activation (Dell, 2000). A significant difference in this model, is that the target word is selected through activation from the semantic feature network and the phonological network simultaneously. These word production models help explain the effectiveness of semantic feature treatment. By increasing the number and types of features a client associates with a target word, this strengthens the semantic-lexical connection allowing for greater activation during word naming.

When considering bilingualism, the Revised Hierarchical Model allows for a system that considers the effects of an additional language. Since a bilingual individual

has a vocabulary for each language, the Revised Hierarchical Model takes this into account with two separate lexicons at the lexical level. Thus the strength of connection from the semantic level to the lexical level for the L1 and the L2 can differ, with regards to fluency and relative dominance. The L1 is said to have stronger semantic-lexical connections, as it is often developed earlier and to a greater mastery (Kroll & Stewart, 1994). The Revised Hierarchical Model has crucial implications for therapy in regards to bilinguals, as semantic feature therapy may yield better results when performed in the client's proficient language.

With the growing Hispanic and bilingual population in the United States, it is imperative that materials used in therapy are culturally relevant for the client, in order to provide the optimal services. Therapy materials cannot solely be translated from one language to another, but must be adapted to be appropriate for speakers of the target language. Semantic features are utilized during semantic feature therapy to aid word finding for patients with aphasia. Therefore this study examined the percent agreement and disagreement during verification of semantic features among native English and Spanish speakers to help inform semantic feature selection in therapy and determine which semantic features should be used in therapy and when direct translations cannot be utilized.

In this research project it is hypothesized that certain types of features will have a greater occurrence of disagreement. Semantic features classified as sensory properties will have a high percent agreement across Spanish and English speakers. Sensory properties are generally considered universal and can be detected objectively. Meanwhile, it is hypothesized that abstract properties will have the highest degree of disagreement

since abstract properties are influenced by one's views and culture and different environment expose individuals to unique experiences. Furthermore, I propose functional properties will have a mild degree of variability between Spanish and English speakers, since an object's use is generally stable across cultures.

The results of this study will help inform and uncover potential ramifications when creating future therapy for bilingual individuals or non-English speakers.

Chapter 2

Methods

Participants

Amazon Mechanical Turk workers were recruited for this study. MTurk is a crowd-sourcing platform for gathering tasks. Participants are able to complete tasks for which they meet eligibility requirements and are compensated. MTurk, on which the task was hosted, only provides the location (via geographic coordinates) and reported language of the participant. The number of Spanish speakers who completed a survey set ranged from 10 to 25 participants with a mode of 21. For the English surveys, the range was 7 to 24 participants with a mode of 20. A total of 698 individual survey responses were submitted by Spanish speaking participants. Of the 698 responses, the majority was completed in the Americas: 15.90% from North America, 12.04% from Central America and 61.60% from South America. A total of 697 individual survey responses were submitted by English speaking participants. Of the 697 responses, 62.84% were from North America, 27.40% from Asia-Pacific and 5.15% from Western Europe. The data from the individual countries are listed in Tables 1 and 2.

Table 1 – Spanish Survey Location Date from Qualtrics

	Number of Responses	Percent of Total Responses
North America		
Canada	1	0.14%
United States	110	15.76%
Central America		
El Salvador	3	0.43%
Guatemala	8	1.15%
Honduras	3	0.43%
Mexico	69	9.89%
Nicaragua	1	0.14%
South America		
Argentina	18	2.58%
Bolivia	4	0.57%
Brazil	2	0.29%
Chile	3	0.43%
Colombia	91	13.04%
Ecuador	3	0.43%
Paraguay	1	0.14%
Peru	27	3.87%
Uruguay	1	0.14%
Venezuela	280	40.11%
Caribbean		
Dominican Rep.	5	0.72%
Puerto Rico	7	1.00%
Europe		
Albania	1	0.14%
Czech Rep.	1	0.14%
France	3	0.43%
Italy	1	0.14%
Portugal	1	0.14%
Spain	20	2.87%
Turkey	2	0.29%
Asia		
India	31	4.44%
Indonesia	1	0.14%
Australia	1	0.14%

Table 2 - English Survey Location Data from Qualtrics

	Number of Responses	Percent of Total Responses
North America		
Canada	20	2.87%
United States	418	59.97%
Central America		
Mexico	4	0.57%
South America		
Argentina	1	0.14%
Brazil	2	0.29%
Colombia	1	0.14%
Venezuela	3	0.43%
Caribbean		
Trinidad and Tobago	2	0.29%
Eastern Europe		
Albania	1	0.14%
Czech Republic	1	0.14%
Poland	1	0.14%
Romania	2	0.29%
Russia	2	0.29%
Serbia	1	0.14%
Western Europe		
England	12	1.72%
Finland	1	0.14%
France	2	0.29%
Germany	3	0.43%
Greece	6	0.86%
Ireland	3	0.43%
Italy	3	0.43%
Portugal	1	0.14%
Scotland	1	0.14%
Spain	2	0.29%
Sweden	1	0.14%
Switzerland	1	0.14%
Middle East		
Bahrain	1	0.14%
Qatar	1	0.14%
Saudi Arabia	1	0.14%
Turkey	5	0.72%
United Arab Emirates	1	0.14%
Asia-Pacific		
China	1	0.14%
India	186	26.69%
Kazakhstan	1	0.14%

New Zealand	1	0.14%
Vietnam	2	0.29%
Africa		
Nigeria	1	0.14%
Tunisia	1	0.14%

Stimuli

The stimuli included a set of 644 concrete (pictureable) words and 430 features adapted from the work of Kiran and colleagues (Edmonds & Kiran, 2006). In order to verify the appropriateness of the semantic features for the concepts, surveys were created in which respondents could indicate whether a feature applied to a concept. Thirty-four distinct surveys were created, each listing approximately 20 concrete words each with approximately 24 features. Of the 24 features chosen to be tested for each word, 12 features could apply and 12 could not apply to the word. However, due to the lack of features for certain words, some had less than 12. The selected 24 features were chosen based off of expert opinion, from native English speakers. Participants taking the survey were shown a picture and its corresponding word label. Participants were then asked whether the word matched the picture, and if it did not they were able to provide a better suiting word. Next, participants were asked to determine which features applied to the word, selecting either 'yes, this feature applies to the concept' or 'no, this feature does not apply to the concept.' See Appendix A for a sample survey question.

Procedure

Once the surveys were created in English they were translated into Spanish and a native speaker verified the translation. The surveys were hosted on Amazon Mechanical Turk, a website in which participants can complete tasks. Spanish speakers completed the Spanish surveys and English speakers completed the English surveys.

Data Analysis

A secondary analysis of data was performed for this study. From the survey data gathered from MTurk, the number of English and Spanish speakers who answered, 'yes, this feature applies' and 'no, this feature does not apply' was tallied for each word. The tallies were converted to percentages, to find the percent agreement for each feature of each word for English and Spanish. If the percent yes agreement for a feature was greater than 60%, the feature was considered a majority yes and coded with a 1. If the percent yes agreement was less than 40%, the feature was considered majority no and coded with a 0. If the percent yes agreement was between 60 and 40%, the feature was considered indecisive, with no clear majority, and coded 'false'. This calculation was performed separately for the English and Spanish survey data.

Next, words and their features were identified in which the two languages had contrasting percent agreements. For this analysis, agreement amongst the speakers is considered consistency. Agreement can be seen in three separate instances in this study. The first, Agreement-Yes occurs when 61% or more of both Spanish and English participants respond 'yes, this feature applies'. The second instance is Agreement-No. Agreement-No occurs when 61% or more of both Spanish and English participants respond 'no, the feature does not apply.' While the participants reached a majority that the feature does not apply, it is considered agreement because both languages had a majority no and thus there is consensus. The last instance of agreement is Agreement-Indecisive. In Agreement-Indecisive, both languages have yes and no feature selections between 40 and 60%.

In this analysis, disagreement amongst the speakers is considered inconsistency. Disagreement can be seen in three possible instances. The first, English-Indecisive occurs when 61% or more of Spanish speakers answer either 'yes, the feature applies' or 'no, the feature does not apply' and English speakers' yes and no feature selection is between 40 and 60%. This classification is called English-Indecisive because English speakers were unable to reach a majority. The second classification is Spanish-Indecisive. In Spanish-Indecisive, 61% or more of English speakers select either 'yes, the feature applies' or 'no, the feature does not apply' and Spanish speakers' yes and no feature selection is between 40 and 60%. The last type of disagreement is Opposing. Opposing can occur if Spanish speakers reach a 61% or more selection of yes and English speakers reach a 61% or more selection of no; or, Spanish speakers reach a 61% or more selection of no and English speakers reach a 61% or more selection of yes. The classification is called Opposing because English and Spanish speakers have contrasting majorities.

In this study, words and their related features which had a discrepancy across English and Spanish were of interest, so the words and the related features in which there was agreement (between English and Spanish) were dropped from the remaining analysis, leaving 1,031 words and their related features with disagreement in English and Spanish speakers.

With the condensed data, words and features with a high frequency of disagreement were examined. There existed 467 unique words and 350 features with disagreement amongst Spanish and English participants. Words and features with three or fewer instances (this number was chosen arbitrarily but signified that disagreement was only occurring three times out of the total number of appearances) of disagreement were

eliminated from the analysis. This narrowed the data to 97 unique words and 79 features with four or more total instances of opposition across Spanish and English speakers.

A percent of occurrence was calculated for the words, which took the number of features for a unique word that were contested divided by the total number of times the word appeared in the surveys. A similar percent occurrence was calculated for the features, which took the number of words with disagreement for a unique feature divided by the total number of time a feature occurred in the surveys. Only the words and features with 50% or greater instances of disagreement were kept for further analysis. The words included *chain* and *ant*. The features included *delivered*, *stands*, *is a garnish*, *used to commute*, *grows in the tropics* and *is a side dish*.

Table 3 - Disagreement Data for Words and Features

	Instances	Total	Percent Occurrence	English Indecisive	Spanish Indecisive	Opposing
Word						
Chain	10	18	56%	9	1	0
Ant	11	22	50%	0	7	4
Feature						
Delivered	5	8	63%	0	2	3
Stands	8	13	62%	0	2	6
Is a garnish	6	10	60%	0	4	2
Used to commute	8	15	53%	1	1	6
Grows in the tropics	20	38	53%	4	7	9
Is a side dish	9	18	50%	4	4	1

Table 4 – Classifications of Disagreement for Words and Features

	Words		Features					
	Chain	Ant	Delivered	Stands	Is a garnish	Used to commute	Grows in the tropics	Is a side dish
English Indecisive	9	0	0	0	0	1	4	4
Spanish Yes	9	0	0	0	0	0	4	2
Spanish No	0	0	0	0	0	1	0	2
Spanish Indecisive	1	7	2	2	4	0	7	4
English Yes	0	7	1	1	1	1	1	0
English No	1	0	1	1	3	0	6	4
Opposing	0	4	3	6	2	6	9	1
English Yes and Spanish No	0	4	3	6	2	6	0	0
English No and Spanish Yes	0	0	0	0	0	0	9	1

Table 5 – Average Number of Flagged Words and Features

	English Inconclusive	Spanish Inconclusive	Opposing	Total Disagreement	Percent of disagreement amongst flagged
Average number of words per features for which a feature is discrepant	0.787	1.422	0.756	2.963	20%
Average number of features per words for which a word is discrepant	0.582	1.049	0.558	2.189	10%
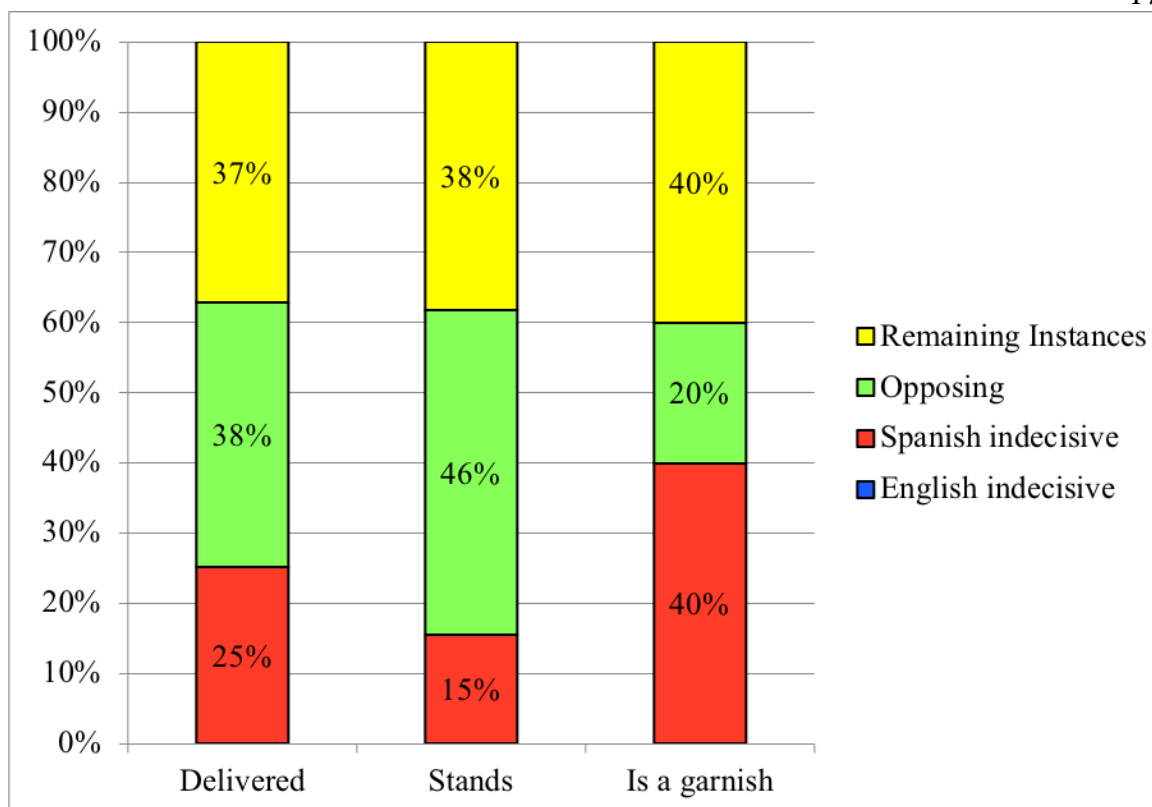
Figure 2.1 - Percent occurrence of disagreement for flagged features
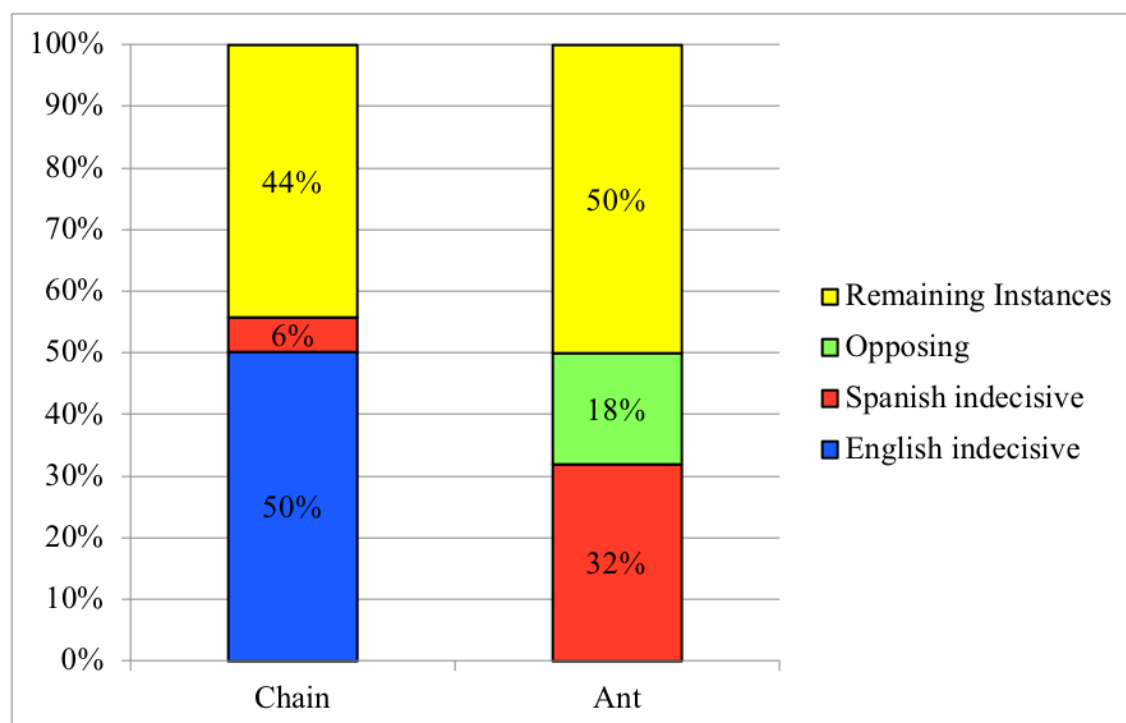
Figure 2.2 - Percent occurrence of disagreement for flagged words
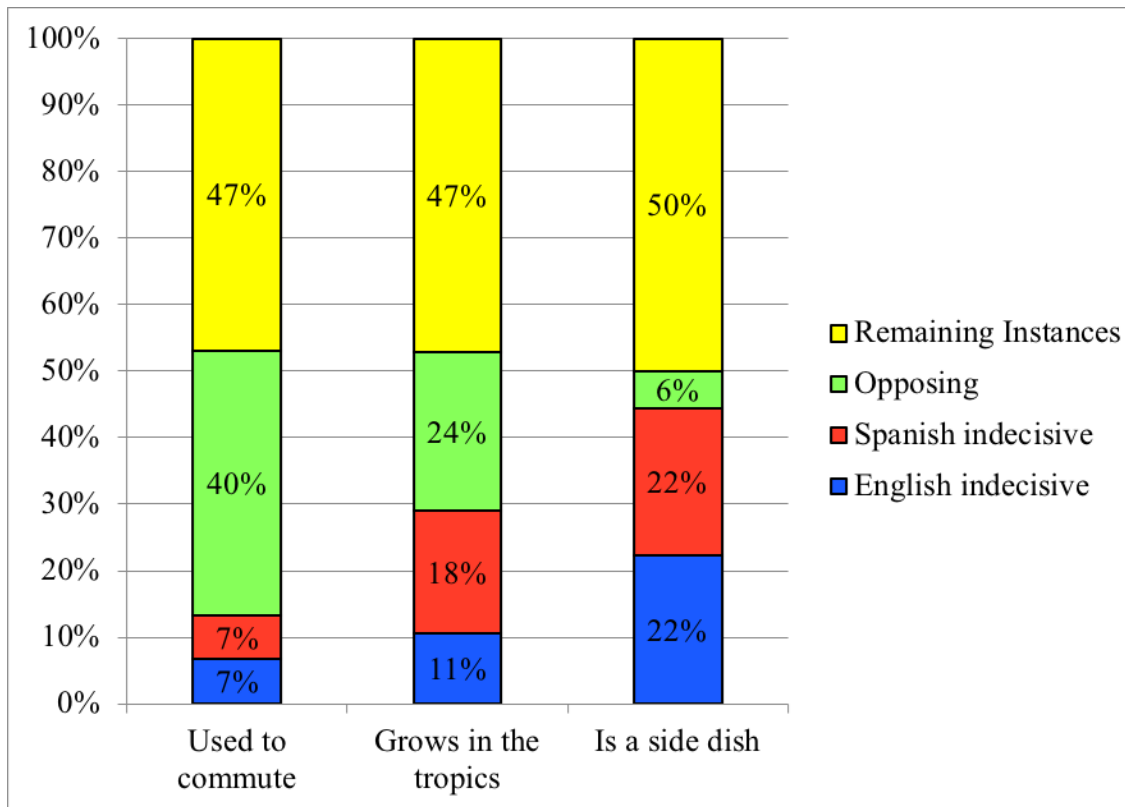
Figure 2.3 - Percent occurrence of disagreement for flagged features

Chapter 3

Results

Words and features were analyzed which had a 50% or greater instance of disagreement among their total instances of occurrence (see percent occurrence in Table 1). The words included *chain* and *ant* and the features included *delivered, stands, is a garnish, used to commute, grows in the tropics* and *is a side dish*. Of the 14,495 unique pairings of words and features, there were 1,031 instances of disagreement for a feature decision. This meant that disagreement amongst Spanish and English speakers was present in 7.11% of the data. The

features *delivered*, *stands*, and *is a garnish* had remarkably high percent occurrences with a corresponding five out of eight, eight out of thirteen, and six out of ten instances.

Features

For the feature *delivered*, disagreement between English and Spanish speakers was seen in five out of the eight total instances of the feature. Of these five instances of disagreement, three of them were classified as Opposing. The words with opposing disagreement included: *bathtub*, *foot stool* and *furnace*. For these words, a majority of English speakers selected that 'yes the feature *delivered* applies' while Spanish speakers had a majority 'no the feature *delivered* does not apply'. The other two instances of disagreement were classified as Spanish-Indecisive and the concepts were *sandwich* and *bottle*. The three instances of agreement between English and Spanish speakers for *delivered* included the words: *letter*, *pizza*, and *fly*.

For the feature *stands*, disagreement between English and Spanish speakers was seen in eight out of the thirteen total instances of the feature. Of the eight instances of disagreement, six were classified as Opposing. The words with opposing disagreement included: *bug, crab, emu, heron, ladybug* and *priest*. For these words, a majority of Spanish speakers selected that the feature *stands* did not apply while a majority of English speakers said that the feature did apply. For the word *emu*, 100% of Spanish speakers answered that the feature *stands* does not apply to emus, while 100% of English speakers answered that the feature does apply.

The geographical breakdown and corresponding number of the Spanish speaking participants who answered that the feature *stands* does not apply to *emu* includes: Australia, Colombia, El Salvador, Guatemala, India (2 participants), Nicaragua, United States (6) and Venezuela (5). The geographical breakdown and corresponding number of the English speaking

participants who answered that the feature *stands* does apply to *emu* includes: Canada (2), India (3), Italy, Scotland, Trinidad and Tobago and United States (10). Spanish speakers from the United States answering that *stands* does not apply were from the states California, South Carolina, Ohio, Virginia, Texas and Florida; while English speakers from the United States answering that *stands* does apply were from Pennsylvania (5), Louisiana, Colorado, Georgia and Massachusetts (2). Spanish speakers from India selecting that *stands* does not apply to *emu* were from the state Telangana and Kerala while the English participants selecting that *stands* applies to *emus* were from the Indian states Kerala (2) and Tamil Nadu.

For the concept *priest*, 94% of Spanish speakers selected that feature *stands* does not apply to a *priest*, while 84% of English speakers answered yes the feature did apply. The remaining two instances of disagreement were classified as Spanish-Indecisive and the corresponding concepts were *lizard* and *chain*. The five instances of agreement between English and Spanish speakers for *stands* included the words: *beaver, bee, dentist, fish* and *pillar*. For the word *dentist*, Spanish and English speakers both agreed that the feature *stands* applies to *dentists* with 88% majority for Spanish speakers and 90% for English speakers.

For the feature *is a garnish*, disagreement between English and Spanish speakers was seen in six out of the ten total instances of the feature. Of the six instances of disagreement, four were classified as Spanish-Indecisive. Spanish speakers could not reach a majority on the words *lettuce, onion, peas,* and *yams*. The other two instances of disagreement were classified as Opposing and the concepts were *chives* and *parsley*. For the words *chives* and *parsley*, Spanish speakers answered a majority 'no, the feature does not apply', while English speakers answered a majority 'yes, the feature does apply'.

For the feature *is a garnish* 100% of English speakers answered that the feature applied to *parsley*. The geographic locations of these English speakers included: India (9), Canada, France, United Arab Emirates, and the United States (8). For Spanish speakers, 32% answered that the feature applied to *parsley* and their geographical information was Mexico (2), United States (2), Peru and France. 68% of Spanish speakers said the feature did not apply to *parsley* and their geographic locations included: United States (3), Colombia, Venezuela (7), Guatemala, and Argentina. It is notable that an English speaker and a Spanish speaker both from France answered that the feature applied. The English speaker answered the survey in the Aix-en-Provence in western France while the Spanish speaker was in Gironde on the southern border of France. These two cities are approximately 700 km apart.

Of the respondents from the United States of America, those answering that the feature applied who were English speaking were from the states: Ohio, Georgia, Pennsylvania (3), New York, California and Massachusetts. Spanish speakers from the United States answering that the feature applied were from the sates Texas and Florida. And Spanish speakers from the United States answering that the feature did not apply were from Florida (2) and Arizona. Within the Spanish speaking participants, two of the participants from Florida chose that the feature does not apply while one participant said that the feature did apply. Two of the Spanish speaking surveys completed in Florida were taken in the town of Davie, Florida approximately 5 miles apart. These two surveys taken in the same town had differing answers for if the feature *is a garnish* applies to *parsley* — one answering yes and one answering no. The other participant from Florida choosing that the feature does not apply was from Tampa, a 258 mile distance from the other two survey responses.

The four instances with agreement for the feature *is a garnish* included the words: *crabapple, mushroom, seal* and *squash*. For these four words with agreement, English and Spanish speakers selected 'no, the feature *is a garnish* does not apply'. Notably, Spanish speakers did not reach a majority yes for any of the concepts paired with the feature is a *garnish*.

For the feature *used to commute*, disagreement between English and Spanish speakers was seen in eight out of the fifteen total instances of the feature. Of the eight instances of disagreement, six were classified as Opposing. The words with Opposing disagreement included: *car, gas, helicopter, moped, road* and *subway*. For these words, Spanish speakers had a majority selection of no while English speakers had a majority selection of yes. There was agreement between Spanish and English speakers for five concepts that were all agreed not to have the feature *used to commute*: *bat, chandelier, hand, neck, nose*, and *shell*. The only concept that Spanish speakers selected could be *used to commute* was *bus* and they reached a 95% majority yes.

The data for the feature *grows in the tropics* was quite scattered. Disagreement between English and Spanish speakers was seen in 20 out of the total 38 instances of the feature. Of the twenty instances of disagreement, there were nine instances of Opposing, seven instances of Spanish-Indecisive and four instances of English-Indecisive. The concepts classified as Opposing include: *alfalfa, blackberry, blueberry, boysenberry, carrot, celery, cherry, green pepper* and *kidney beans*. For these nine concepts, Spanish speakers reaches a majority yes for the feature *grows in the tropics*, while English speakers reached a majority no for all nine. The four instances of English-Indecisive consisted of the words: *corn, cucumber, eggplant* and *seaweed*. There were eighteen instances of agreement for the feature *grows in the tropics*.

For the feature *is a side dish* disagreement was seen in nine out of the total 18 instances of the feature. Of the nine instances of disagreement, four were English-Indecisive, one was Opposing and four were Spanish-Indecisive. The concepts with English-Indecisive included: *kiwi, onion, currant,* and *nectarine*. The concepts with Spanish-Indecisive were: *clementine, crabapple, kumquat*, and *passion fruit*. For the word *parsley*, Spanish speakers reached a majority yes while English speakers reached a majority no.

Words

For the word *chain*, disagreement between English and Spanish speakers was seen in ten out of the 18 total instances of the word. Of these ten instances of disagreement, nine were classified as English-Indecisive: *bought at a home improvement store*, *found in the workshop*, *has segments*, *holds things together*, *long*, *made of metal*, *reusable*, *shiny*, *strong* and *stands*. For these nine features, the Spanish speakers reached a majority yes while English speakers were indecisive. Seven of the nine concepts had a 60% majority amongst English speakers; however, it was still coded as indecisive. The English-Indecisive results show the effect of our 61% cutoff for agreement. Since seven of the percent agreements were negligibly close to the 61% cutoff, the seven features coded English indecisive were withheld from further analysis, leaving the word *chain* with only a 11.11% frequency of disagreement and thus omitted.

For the word *ant*, disagreement between English and Spanish speakers was seen in eleven out of the 22 total instances of the word. Of the eleven instances of disagreement, seven were classified as Spanish-Indecisive: *alive, common, found in the wild, grows, has eyes, moves*, and *small*. For these 7 features, English speakers reached a majority yes, with three instances of 100% majority yes. The four remaining instances of disagreement were Opposing and included

the features: *eats seeds or plants, has six legs, is an insect* and *lightweight*. Spanish speakers reached a majority no for the four features while English speakers reached a majority yes.

For the word *ant*, the disagreement seen in the data is explained by a technical error. The word *ant* was part of the stimuli in survey two and no image was displayed under the word for the Spanish speaking participants. Because of this error, only 10 out of the 19 Spanish speakers selected features for *ant* and a significant number of the participants who did answer, selected 'no, this feature does not apply' for all twenty-two features. Because of this, the data for the word *ant* from the Spanish speaking participants is invalid.

Chapter 4

Discussion

It was hypothesized that certain types of features will have a greater occurrence of disagreement. The study found that four of six features flagged for analysis were classified as functional: *stands, is a side dish, is a garnish, used to commute*. So the original hypothesis was supported; however, the prediction that features classified as abstract would have the highest occurrence of disagreement was not supported.

It is important to note that although disagreement was found between English and Spanish speakers, only 7.11% of the words and correlated features had disagreement. This shows that the majority of words and features that are suitable for English speakers are also suitable for Spanish speakers. The remainder of this discussion will address how this 7.11% of disagreement may be due to translational differences, a lack of cultural relevance, or the ambiguity of certain features.

Features

For the feature *delivered*, the data show that Spanish speakers differ in their opinion as to the deliverability of certain concepts. Spanish speakers' indecisiveness on the feature *delivered* may be due to the delivery of different items in the countries of native Spanish speakers. This would explain the Spanish-Indecisive results for the words *sandwich* and *bottle*. Meanwhile, the concepts *letter* and *pizza*, which had agreement for English and Spanish speakers, seem to be more universally recognized items that can be *delivered*, while the word *fly* had Agreement-No

in both languages, suggesting that this item is universally recognized to be undeliverable. Thus, when using semantic feature therapy for Spanish speaking individuals, the feature *delivered* might be best used only with these concepts that are obviously delivered or not .

For the feature *stands,* Spanish speakers were inconsistent in determining if the feature applied. Out of the total thirteen instances, Spanish speakers answered majority no for seven words, majority yes for three, and indecisive for three words. In contrast, English speakers appeared to be more consistent in determining if *stands* applied as they answered majority yes for ten words, majority no for two and indecisive for one word. The six instances of Opposing disagreement for the feature *stands* may be due to the subjective nature of some of the animals used as the stimuli. It could be argued that *bugs, crabs*, and *ladybugs* do not have distinctive legs, like other mammals, which may be the reason for the opposing selections by English and Spanish speakers. Even English speakers were inconsistent in determining if the feature applied to *bees*, with a 50:50 distribution, which was coded as indecisive. Spanish speakers had contradicting choices, as they answered a majority yes that *stands* applies to a *dentist* but answered a majority no for a *priest*. It is important to note that it is impossible to know whether the same participants were responding to these two items, and therefore these differences could be due to individual differences. The concepts with agreement for English and Spanish for the feature *stands* were *beaver*, *dentist*, *pillar* (Agreement-Yes) and *fish* (Agreement-No), suggesting that these concepts are universally thought to stand or not. Because of the inconsistency among similar concepts within Spanish speakers, the feature *stands* appears to be unclear for Spanish speakers. The ambiguous nature of the feature means that it may be best to limit the feature's use in therapy for Spanish speakers.

Stands was the only one feature for *emu* out of the total 24 that had disagreement between English and Spanish speakers, which may confirm that the translation of *emu* was accurate for Spanish speakers. Thus, we can conclude it is the feature *stands* not the word *emu* caused inconsistency in Spanish speakers' responses. There were six Spanish-speaking participants and ten English-speaking participants from the United States with disagreement for the feature *stands* when applied to *emu*. However, since the Spanish and English respondents were from different states in the US, it is difficult to isolate if location or language difference is causing the contrasting selections of the feature *stands* for *emu*. Nevertheless, there were Spanish and English speakers from the same Indian state Kerala, whose answers differed for whether the feature applied to *emus*. This suggests that cultural differences may not solely be affecting the contrasting feature selection, since two participants with disagreement were from the same Indian state but spoke different languages.

For the feature *is a garnish*, Spanish participants did not reach a majority yes for any of the concepts paired with the feature. Thus, Spanish speakers are indecisive in determining which concepts the feature *is a garnish* applies to. This shows that either none of the concepts were culturally relevant for Spanish speakers or the translation for *is a garnish* is inappropriate. However, when the feature was paired with the word *seal*, 93% of Spanish speakers answered 'no the feature does not apply'. This was a greater majority than English participants who had a 90% majority no for the word *seal*. The Spanish speakers' strong 93% majority no for the word *seal* may suggest that the translation for the feature *is a garnish* is appropriate. Another explanation for Spanish participants inability to reach a majority yes for any of the concepts is that the feature *is a garnish* is highly subjective and culturally contingent. Therefore, it may be

best to omit the feature *is a garnish* from stimuli for Spanish speakers or to use it as a negative

feature for concepts that are obviously not garnishes.

When assessing the location data connected to the word *parsley*, it is notable that an

English speaker and a Spanish speaker both from France answered that the feature *is a garnish*

applied. This may suggest that although respondents speak different languages, they may have

the same answer due to geographical or cultural influences. Additionally, two Spanish responses

from the town of Davie, Florida had opposing feature selections for if the feature *is a garnish*

applied to parsley. It is unknown if the two surveys were completed by the same participant. If

these two surveys were in fact taken from two different participants, this suggests that another

influence other than language or geographical location (possibly culture) is causing the differing

selection.

For the feature *used to commute,* Spanish speakers reached a majority no for thirteen out

of the total fifteen instances of the feature. Even for universal concepts such as *taxi, car*, and

road, Spanish speakers did not reach a majority yes. This possibly suggests that the translation

used to commute does not capture the same meaning for Spanish speakers as it does for English

speakers. It is difficult to decipher whether the translation of *used to commute* prompted a 'no'

response for each concept or if Spanish speakers believed that the feature *used to commute* did

not apply to any of the concepts. The only concept that Spanish speakers selected yes to the

feature *used to commute* was *bus*. Because Spanish speakers reached a 95% majority yes for the

concept *bus*, perhaps the translation for the feature relates more to public than private

transportation. However, Spanish speakers responded 'no' for *subway*. While it is unclear why

the translation *utilizado / a para conmutar* does not show agreement between English and

Spanish respondents, the inconsistency in these results suggest it should not be used for Spanish

speakers in semantic feature therapy. If one wishes to use the feature, an accurate representation of the feature must be found in the Spanish language.

For the feature *grows in the tropics* nine of the instances of disagreement were classified as Opposing (Spanish yes, English no). This may be due to English speakers' lack of direct knowledge of what can be cultivated in a tropical climate, since they reached a majority no for all nine words. In contrast, many of the Spanish speakers in the study were from Latin and South America, a more tropical climate. Specifically, 75.36% of the Spanish participants were from Central America, South America or the Caribbean islands — a notably tropical climate. In contrast, 69.15% of English participants were from North America and Europe, a more arid climate in comparison. Thus, Spanish participants would have direct knowledge of food that could be cultivated in the tropics and this may explain why Spanish speakers reached a majority yes for all nine words. The four instances of English-Indecisive may also be attributed to English speakers' lack of awareness of crops that can be grown in the tropics. For the eighteen concepts with agreement, specifically Agreement-Yes, the concepts were items typically considered tropical such as *papaya, palm tree, coconut, kiwi* and *guava*. The two words with Agreement-No were *igloo* and *moon*, concepts clearly not related to the feature. This suggests that the feature *grows in the tropics* is highly subjective to the geographic location of the respondents. So when using semantic feature therapy for Spanish and English speakers, it may be best to use concepts that either obviously grow in the tropics or do not. And if pairing the feature with less typically tropical items, to be aware of the influence of geographical location on the patient's answer.

The feature *is a side dish* appears to be more subjective and resulted in inconsistent responses for both English and Spanish speakers. Interestingly, seven out of the nine words with disagreement were over fruits. For the seven different fruits matched with the feature *is a side*

dish, one of the languages was indecisive in their choice of feature selection. Two of the words with agreements *papaya* and *peach*, were coded Agreement-Indecisive as both English and Spanish speakers were indecisive on the concepts. This shows that both Spanish and English speakers have differing opinions as to whether fruits are side dishes. This suggests that when conducting semantic feature therapy for Spanish and English speakers, the feature *is a side dish* would not be best used with fruits.

Limitations and Future Directions

One of the limitations in this study is the small sample size as some of the surveys were only answered by seven participants. An improvement to the study would be to include a larger sample size. As with any data collected though surveys, there is the possibility of respondents not answering the questions accurately. Additionally, the participants are only given two options 'yes, the feature applies' or 'no, the feature does not apply'. This makes it difficult to determine if the participant actually believed that the feature did not apply or if they were simply confused by the feature or the translation and chose 'no, the feature does not apply' as a result. Perhaps including an 'unsure' category could mitigate this limitation. A final limitation is the inability to determine whether the same participant took multiple surveys. As a result, differences within a language may be caused by individual differences.

Future research may include isolating a population by location. A sample of participants could be gathered from the same geographic location who speak different languages and analyzing the different feature selections. Future directions may also include comparing those who speak the same language but reside in different geographical locations to see how this

impacts feature selection. The results could be analyzed for similarities and differences and determine if the disagreement is due to language, cultural or geographical factors.

Conclusions

Since only 7.11% of the words and correlated features had disagreement, this shows that the majority of words and features are suitable for Spanish speakers' use in semantic feature therapy. Many of the features that were in disagreement seem to be highly subjective and ambiguous, and thus not ideal for use in therapy. Additionally, a high percent of the features with disagreement were classified as functional features.

The features *delivered* and *stands* might be best utilized in semantic feature therapy for Spanish speakers with concepts that are either obviously related to the features *delivered* and *stands* or obviously not related. When using the feature *grows in the tropics* for English or Spanish speakers, it may be best to use the feature with concepts either obviously grown in the tropic or obviously not. Additionally, clinicians should take into account the patient's geographic location, which may explain their feature selection. Spanish speakers' lack of majority 'yes' for *is a garnish* suggests either the omission of the feature from therapy or its limited use to only a negative feature for concepts that are obviously not garnishes. The translation for *used to commute* as *utilizado / a para conmutar* appeared to be not exactly equivalent for Spanish speakers and must be further addressed before utilizing in therapy. The results also caution from pairing the feature *is a side dish* with fruits for both Spanish and English speakers in semantic feature therapy.

Overall, the data show that language, cultural and geographical differences combined with the subjectivity of the features may be the cause of disagreement amongst Spanish and

English speakers. But, it is not possible to conclude which factors are affecting the contrasting

feature selections and to what extent, with the current information.

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Appendix A

Sample Question from Survey

Q19.1.

Does this picture = <u>bag</u> (EnW177)?

⦿ Yes
○ No

Q19.2. If no, what is a better word for the item pictured above?

Q19.3. Drag each feature on the left below into the column to indicate whether or not the feature is a descriptor of the word pictured above.

Items	Yes		No	
	Purchased (EnF15)	1	Made of wood (EnF286)	1
	Reusable (EnF301)	2	Dangerous (EnF6)	2
	Can ignite (EnF67)	3	Loud (EnF12)	3
	Found in a home (EnF233)	4	Contains glass (EnF85)	4
	Used to store or organize things (EnF337)	5	Is a toy (EnF191)	5
	Made of plastic (EnF283)	6		
	For hunting (EnF223)	7		
	Common (EnF209)	8		
	Is a container (EnF171)	9		

Appendix B

Agreement and Disagreement Data for the Eight Flagged Words and Features

Chain

	Spanish		English		
Features with Disagreement	% Yes	% No	% Yes	% No	Code
Bought at a home improvement store	76%	24%	60%	40%	English Indecisive, Spanish Yes
Found in the workshop	100%	0%	60%	40%	English Indecisive, Spanish Yes
Has segments	86%	14%	60%	40%	English Indecisive, Spanish Yes
Holds things together	100%	0%	60%	40%	English Indecisive, Spanish Yes
Long	90%	10%	47%	53%	English Indecisive, Spanish Yes
Made of metal	95%	5%	60%	40%	English Indecisive, Spanish Yes
Reusable	90%	10%	60%	40%	English Indecisive, Spanish Yes
Shiny	67%	33%	47%	53%	English Indecisive, Spanish Yes
Strong	100%	0%	60%	40%	English Indecisive, Spanish Yes
Stands	57%	43%	0%	100%	Spanish Indecisive, English No
Features with Agreement					
Found in an office	0%	100%	7%	93%	Agreement No
Has a light or lights	0%	100%	20%	80%	Agreement No
Has propellers	5%	95%	0%	100%	Agreement No
Has windows	5%	95%	0%	100%	Agreement No
Is a toy	0%	100%	0%	100%	Agreement No
Is money	0%	100%	0%	100%	Agreement No
Made of fabric	0%	100%	7%	93%	Agreement No
Soft	0%	100%	0%	100%	Agreement No

Ant

	Spanish		English		
Features with Disagreement	% Yes	% No	% Yes	% No	Code
Alive	60%	40%	100%	0%	Spanish Indecisive, English Yes
Common	50%	50%	94%	6%	Spanish Indecisive, English Yes
Found in the wild	55%	45%	94%	6%	Spanish Indecisive, English Yes
Grows	40%	60%	78%	22%	Spanish Indecisive, English Yes
Has eyes	40%	60%	94%	6%	Spanish Indecisive, English Yes
Moves	45%	55%	100%	0%	Spanish Indecisive, English Yes
Small	45%	55%	100%	0%	Spanish Indecisive, English Yes
Eats seeds or plants	18%	82%	94%	6%	Spanish No, English Yes
Has six legs	10%	90%	94%	6%	Spanish No, English Yes
Is an insect	30%	70%	94%	6%	Spanish No, English Yes
Lightweight	30%	70%	94%	6%	Spanish No, English Yes

Features with Agreement

	Spanish		English		
Can fly	10%	90%	22%	78%	Agreement No
Can sing	20%	80%	0%	100%	Agreement No
Can talk	20%	80%	0%	100%	Agreement No
Eats fish	27%	73%	6%	94%	Agreement No
Has fur	36%	64%	0%	100%	Agreement No
Is a household item	0%	100%	11%	89%	Agreement No
Is a predator	30%	70%	22%	78%	Agreement No
Is an amphibian	20%	80%	0%	100%	Agreement No
Large in size	9%	91%	0%	100%	Agreement No
Powerful	36%	64%	28%	72%	Agreement No
Swims	30%	70%	6%	94%	Agreement No

Delivered

	Spanish		English		
Words with Disagreement	% Yes	% No	% Yes	% No	Code
Sandwich	55%	45%	95%	5%	Spanish Indecisive, English Yes
Bottle	60%	40%	38%	63%	Spanish Indecisive, English No
Bathtub	33%	67%	80%	20%	Spanish No, English Yes
Foot stool	30%	70%	64%	36%	Spanish No, English Yes
Furnace	10%	90%	71%	29%	Spanish No, English Yes
Words with Agreement					
Fly	4%	96%	0%	100%	Agreement No
Letter	95%	5%	100%	0%	Agreement Yes
Pizza	83%	17%	100%	0%	Agreement Yes

Stands

	Spanish		English		
Words with Disagreement	% Yes	% No	% Yes	% No	Code
Lizard	59%	41%	69%	31%	Spanish Indecisive, English Yes
Chain	57%	43%	0%	100%	Spanish Indecisive, English No
Bug	33%	67%	89%	11%	Spanish No, English Yes
Crab	9%	91%	63%	37%	Spanish No, English Yes
Emu	0%	100%	100%	0%	Spanish No, English Yes
Heron	0%	100%	87%	13%	Spanish No, English Yes
Ladybug	12%	88%	71%	29%	Spanish No, English Yes
Priest	6%	94%	84%	16%	Spanish No, English Yes
Words with Agreement					
Beaver	84%	16%	75%	25%	Agreement Yes
Bee	58%	42%	50%	50%	Agreement Indecisive
Dentist	88%	12%	90%	10%	Agreement Yes
Fish	0%	100%	0%	100%	Agreement No

Pillar	90%	10%	100%	0%	Agreement Yes

Is a garnish

	Spanish		English		
Words with Disagreement	% Yes	% No	% Yes	% No	Code
Lettuce	47%	53%	69%	31%	Spanish Indecisive, English Yes
Onion	40%	60%	33%	67%	Spanish Indecisive, English No
Peas	45%	55%	21%	79%	Spanish Indecisive, English No
Yam	41%	59%	30%	70%	Spanish Indecisive, English No
Chives	35%	65%	78%	22%	Spanish No, English Yes
Parsley	32%	68%	100%	0%	Spanish No, English Yes
Words with Agreement					
Crabapple	14%	86%	15%	85%	Agreement No
Mushroom	29%	71%	33%	67%	Agreement No
Seal	7%	93%	10%	90%	Agreement No
Squash	35%	65%	11%	89%	Agreement No

Used to commute

	Spanish		English		
Words with Disagreement	% Yes	% No	% Yes	% No	Code
Paw	29%	71%	40%	60%	English Indecisive, Spanish No
Taxi	45%	55%	92%	8%	Spanish Indecisive, English Yes
Car	26%	74%	88%	12%	Spanish No, English Yes
Gas	24%	76%	78%	22%	Spanish No, English Yes
Helicopter	19%	81%	71%	29%	Spanish No, English Yes
Moped	25%	75%	80%	20%	Spanish No, English Yes
Road	35%	65%	78%	22%	Spanish No, English Yes
Subway	29%	71%	80%	20%	Spanish No, English Yes
Words with Agreement					
Bat	0%	100%	0%	100%	Agreement No
Bus	95%	5%	89%	11%	Agreement Yes
Chandelier	0%	100%	0%	100%	Agreement No
Hand	19%	81%	20%	80%	Agreement No
Neck	5%	95%	0%	100%	Agreement No
Nose	0%	100%	0%	100%	Agreement No
Shell	0%	100%	0%	100%	Agreement No

Grows in the tropics

	Spanish		English		
Word with Disagreement	% Yes	% No	% Yes	% No	Code

Corn	65%	35%	45%	55%	English Indecisive, Spanish Yes
Cucumber	82%	18%	52%	48%	English Indecisive, Spanish Yes
Eggplant	82%	18%	40%	60%	English Indecisive, Spanish Yes
Seaweed	65%	35%	47%	53%	English Indecisive, Spanish Yes
Raisin	60%	40%	69%	31%	Spanish Indecisive, English Yes
Broccoli	50%	50%	16%	84%	Spanish Indecisive, English No
Cabbage	60%	40%	16%	84%	Spanish Indecisive, English No
Chives	53%	47%	28%	72%	Spanish Indecisive, English No
Dill	59%	41%	35%	65%	Spanish Indecisive, English No
Endives	50%	50%	31%	69%	Spanish Indecisive, English No
Wheat	53%	47%	33%	67%	Spanish Indecisive, English No
Alfalfa	62%	38%	20%	80%	Spanish Yes, English No
Blackberry	70%	30%	22%	78%	Spanish Yes, English No
Blueberry	74%	26%	33%	67%	Spanish Yes, English No
Boysenberry	63%	38%	31%	69%	Spanish Yes, English No
Carrot	74%	26%	27%	73%	Spanish Yes, English No
Celery	70%	30%	7%	93%	Spanish Yes, English No
Cherry	67%	33%	38%	62%	Spanish Yes, English No
Green pepper	71%	29%	25%	75%	Spanish Yes, English No
Kidney beans	87%	13%	24%	76%	Spanish Yes, English No

Words with Agreement

Acai	95%	5%	89%	11%	Agreement Yes
Bamboo shoots	75%	25%	93%	7%	Agreement Yes
Banana	100%	0%	93%	7%	Agreement Yes
Coconut	100%	0%	93%	7%	Agreement Yes
Guava	95%	5%	75%	25%	Agreement Yes
Igloo	0%	100%	10%	90%	Agreement No
Kiwi	75%	25%	79%	21%	Agreement Yes
Kumquat	76%	24%	89%	11%	Agreement Yes
Mango	95%	5%	100%	0%	Agreement Yes
Moon	0%	100%	0%	100%	Agreement No
Palm tree	100%	0%	100%	0%	Agreement Yes
Papaya	95%	5%	95%	5%	Agreement Yes
Passion fruit	95%	5%	88%	13%	Agreement Yes
Pineapple	96%	4%	81%	19%	Agreement Yes
Plantain	100%	0%	89%	11%	Agreement Yes
Star fruit	95%	5%	94%	6%	Agreement Yes
Vanilla	90%	10%	74%	26%	Agreement Yes
Watermelon	85%	15%	79%	21%	Agreement Yes

Is a side dish

	Spanish		English		
Words with Disagreement	% Yes	% No	% Yes	% No	Code
Kiwi	65%	35%	50%	50%	English Indecisive, Spanish Yes

Onion	80%	20%	60%	40%	English Indecisive, Spanish Yes
Currant	35%	65%	43%	57%	English Indecisive, Spanish No
Nectarine	35%	65%	45%	55%	English Indecisive, Spanish No
Clementine	45%	55%	29%	71%	Spanish Indecisive, English No
Crabapple	41%	59%	35%	65%	Spanish Indecisive, English No
Kumquat	44%	56%	30%	70%	Spanish Indecisive, English No
Passion fruit	43%	57%	13%	88%	Spanish Indecisive, English No
Parsley	74%	26%	36%	64%	Spanish Yes, English No
Words with Agreement					
Broccoli	75%	25%	79%	21%	Agreement Yes
Brussel sprouts	91%	9%	84%	16%	Agreement Yes
Kidney beans	96%	4%	88%	12%	Agreement Yes
Lima beans	86%	14%	88%	13%	Agreement Yes
Paint	0%	100%	0%	100%	Agreement No
Papaya	48%	52%	58%	42%	Agreement Indecisive
Peach	47%	53%	56%	44%	Agreement Indecisive
Snowpeas	89%	11%	68%	32%	Agreement Yes
Yam	82%	18%	80%	20%	Agreement Yes

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