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The Impact of Vocabulary Knowledge on Nonword Judgments in Spanish-English Bilinguals

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by

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ABSTRACT

This thesis suggests that the range of vocabulary in an individual's lexicon has an influence on in their assessment of nonword wordlikeness. The study included thirteen Spanish-English bilinguals who participated in a language dominance questionnaire, standardized assessments of Spanish and English vocabulary knowledge, and Spanish and English wordlikeness judgment tasks. Resulting data demonstrated moderate correlations between vocabulary knowledge and performance on nonword wordlikeness judgement tasks in Spanish and English. Participants with larger lexicons appeared more tolerant of less probable nonwords, those with low phonotactic probability, while those with smaller lexicons were less accepting of nonwords with low phonotactic probability. The results suggest that an individual's processing of low probability phonological constituents is influenced by the diversity and complexity of their linguistic knowledge and specifically, their vocabulary acquisition.

INTRODUCTION

Vocabulary learning is influenced by a variety of language parameters including the amount of experience with the language, level of development of the linguistic system, and metalinguistic knowledge about the language. With relative ease, adults are able to learn both infrequently occurring words as well as jargon such as medical terminologies (Bartolotti & Marian, 2017). Efficiency in novel word acquisition in adulthood is the result of language-specific specialization for processing sound sequences that occurs in infants, as evidenced by the remarkable decline in non-native speech perception before 12 months of age. For the bilingual child, this development would involve two differentiated, though interactive, linguistic systems which aid in the discrimination of phoneme sequences between the two languages (Betancourt, 2013).

As in monolinguals, it is hypothesized that bilinguals acquire phonological knowledge in a hierarchical fashion guided by markedness, where simple sounds are termed “unmarked” and are prevalent in many phonological systems and marked sounds are more difficult to produce and tend to be uncommonly found (Lleo, 2016). Under this assumption, unmarked sounds would be acquired first and the presence of a marked constituent in the phonetic inventory would imply mastery of specific unmarked constituents. Nevertheless, marked sounds may be acquired earlier if they are frequently occurring in the target language and unmarked sounds may be acquired late if they are low frequency. This suggests that frequency is an influential parameter in phonological development. For a bilingual child, input frequency may support phonological development, such that if a specific phoneme is utilized frequently in both languages, it will be acquired quickly regardless of markedness (Lleo, 2016). This bootstrapping effect, along with language transfer, may play a part in bilingual children's ability to acquire two distinct linguistic systems in the same amount of time as a monolingual's acquisition of one, an observation noted by Fabiano-Smith and Barlow (2010).

Phonotactics, Neighborhood Density, and Wordlikeness Judgments

Language specific specialization in development of the phonological system can pose problems in the acquisition and processing of nonwords when they contain infrequently occurring constituent combinations. There are several parameters of utmost importance in the task, two being phonotactic knowledge and phonological neighborhood density. Phonotactic knowledge refers to the understanding of legality and frequency of phonemes and constituent sequences in a language. Phonotactic knowledge develops very early, allowing infants to parse continuous streams of spoken language into individual words in their native language (Saffran, Newport, & Aslin, 1996). If presented the onset consonant cluster /sb-/, a speaker of English would deem the sequence phonotactically illegal, for it does not occur in any word of English; however, the same speaker would consider the onset cluster /skw-/ phonotactically legal as it occurs in words like "square" and "squeeze". In the same vein, the Spanish-English bilingual child would deem the onset consonant cluster /skw-/ unacceptable in Spanish, as the language does not permit syllables with onset /s/ to be followed by a consonant. In addition to judgments of adherence to phonotactic constraints, language speakers are able to use their linguistic knowledge to make judgments regarding phonotactic probability, which refers to the frequency of occurrence of a constituent combination in that language. For example, the onset /skw-/

would be deemed by the Spanish-English bilingual speaker to be least probable in Spanish, as it is prohibited, and infrequently occurring in English due to syllable-type frequency ratings of 0.1 and 1.4 respectively by Dewey (1923) and Sobkowiak (1990). This would contrast with one of the most common onset clusters in English /pr-/, which would be considered highly probable (Dewey, 1932). Phonological neighborhood density refers to the number of words that are highly similar to any particular word or nonword. It is commonly defined as the number of words present in the lexicon that deviate from the new word by a single sound. Phonological neighborhood density is correlated with phonotactic probability, in that constituent sequences with high phonotactic probability typically are found in dense neighborhoods, while low frequency sound sequences are associated with sparse neighborhoods. Phonological neighborhood density is generally only useful for short or high probability nonwords, as very long nonwords with any uncommon phonemes are not likely to have a lexical neighbor (Frisch, Large, & Pisoni, 2000).

Phonotactic probability and phonological neighborhood density are primary influencers of judgments of wordlikeness for the phonological processing of nonwords. When presented with a nonword, the listener utilizes knowledge of phonotactic probability and legality to determine two things, whether the constituent sequences are permitted in the specific language and how frequently such constituent patterns occur in the language. Additionally, the listener is influenced by the phonological neighborhood density of the nonword by the activation of similar representations in the lexicon. Studies have demonstrated this process by collecting judgments of wordlikeness on nonwords varying in degrees of phonotactic probability and neighborhood density. Bailey and Hahn (2001) found wordlikeness ratings of monosyllabic nonwords to be largely affected by lexical neighborhoods while Frisch, Large, and Pisoni (2000) found multisyllabic nonwords to be highly influenced by phonotactic probability. For the bilingual, this process could include activation of the linguistic systems of both languages in which the individual would attempt to process the novel word. In addition to studies of English, researchers have found a high correlation between wordlikeness ratings and phonotactic probability in studies of Brazilian Portuguese and Spanish-English bilingual populations (Gomes, do Couto Mendes, Silva, Esteves, & Gomes, 2015; Betancourt, 2013). Such findings support the notion that the role of phonological knowledge in processing novel words may be similar across languages.

Before more advanced metrics of word similarity through phonotactics were developed, early studies of wordlikeness attempted to relate wordlikeness judgments to the best known psychological dimension for real words, word frequency. For example, a study by Eukel (1980) investigated adults' sensitivity to phonotactics, by instructing participants to estimate the frequency of various real words and nonwords. The results of the study correlated with those of Greenberg and Jenkins (1964), demonstrating adults' sensitivity to phonotactic probabilities (Vitevitch, Luce, Charles-Luce, & Kemmerer, 1997).

Lexical Knowledge and Perception of Wordlikeness

In regards to the important role that phonotactic probability and phonological neighborhood density play in wordlikeness judgments, it has been hypothesized that the participants' inherent knowledge of these phonotactic probabilities and word frequencies is related to the extent of vocabulary knowledge that they possess. In other words, breadth of vocabulary knowledge is related to nonword processing. More specifically, Frisch, Large, Zawaydeh, & Pisoni (2001) proposed that participants with a larger lexicon would be more accepting of nonwords with low probability constituent sequences. This hypothesis is based upon the belief that knowledge of many words provides exposure to the diversity of constituent sequences occurring in a language. This hypothesis was tested by Frisch and Brea-Spahn in a 2010 study that collected wordlikeness judgments for novel words as well as familiarity ratings for real words. First, consistent with other studies of wordlikeness, their results demonstrated a strong impact of phonotactic probability on judgments of wordlikeness for multisyllabic nonwords. The strength of correlation between phonotactic probability and mean wordlikeness judgments was referred to as “probability predictiveness”. Second, Frisch & Brea-Spahn (2010) analyzed the relationship between probability predictiveness and breadth of vocabulary knowledge for individuals in the study, revealing a negative correlation in English monolinguals and in the bilingual participants in English tasks. These results compared with those of Frisch, Large, Zawaydeh, & Pisoni (2001), in which greater acceptance of low probability nonword stimuli by participants with larger lexicons was demonstrated. Surprisingly, no significant correlation between well-formedness judgments and vocabulary knowledge was observed for bilingual participants in Spanish tasks in the Frisch & Brea-Spahn (2010) study. The authors identified their measure for Spanish vocabulary assessment as a possible cause for discrepancy between groups, as it was a non-standardized measure derived specifically for the study. Further, it was not possible to construct a vocabulary measure for Spanish that was similar to the one used for English. In particular, the English measure depended on a set of word familiarity ratings for the English lexicon that does not exist for Spanish.

Purpose

The study at hand investigates the suggestion of Frisch and Brea-Spahn, that a methodological flaw may be culpable for the dichotomy between correlations of English and Spanish probability predictiveness and vocabulary knowledge in their experiments. The present study aims to replicate Frisch and Brea-Spahn (2010) with the goal of demonstrating similar trends between breadth of vocabulary knowledge and nonword wordlikeness judgments cross-linguistically in both English and Spanish. In order to correct the previous methodological limit of vocabulary testing, the present study uses a standardized vocabulary assessment, specifically, the English and Spanish-bilingual versions of the Receptive One-Word Vocabulary Test-4th Edition (ROWPVT-4). This vocabulary measure was developed with regard to the demographic characteristics of the United States, and standardization was performed on a normative sample of over 1,000 participants (2,394 for English & 1,260 for Spanish-bilingual version). Additionally, both versions of the ROWPVT-4 demonstrate moderate to high measurements of validity, with the exception of comparison to the Wechsler Intelligence Scale for Children -4th edition, and strong measures of reliability. Among other parameters, these measurements ensure a high level of homogeneity, consistent measurement from one evaluation date to another, and accurate assessment of a particular ability (Martin, 2013; Martin & Brownell, 2010).

With the inclusion of a standardized vocabulary assessment, it is believed that the predicted negative correlation between probability predictiveness and vocabulary knowledge will be found for both Spanish and English language experiments. Demonstrating that vocabulary effects on wordlikeness are found for participants in languages other than English is important in order to establish the general nature of the interaction between vocabulary and phonotactic knowledge in the development of phonological knowledge.

METHODS

Participants

Thirteen bilingual Spanish-English speakers were included in the study. Participants were recruited from the student population at the University of South Florida in Tampa, Florida. All participants were speakers of Spanish and English and varied in age from 20 to 30 years old. A language use questionnaire generated via Surveyplanet.com was used to gather demographic information about each participant and their language use. Demographic data was obtained from 12 of 13 participants. One participant declined to provide demographic data. Demographic information gathered included the length and types of exposure to Spanish and English and self-ratings of oral and written Spanish and English skills. Table 1 displays the self-rated Spanish and English language abilities for each participant. Participants provided a self-evaluation of Spanish and English frequency of use in various social contexts. Increments of the scale ranged from 1 (never) to 5 (always). With a similar scale, participants were also asked to rate Spanish and English reading and writing skills, from 1 (poor skills) to 5 (excellent skills). As can be observed in Table 1, ratings for English literacy skills fell at four-five, indicating above average skills, while those of Spanish literacy ranged from one end of the spectrum to the other. Lower ratings, ones and twos, were primarily provided in self-assessment of Spanish writing abilities, whereas the lowest self-rating of Spanish reading ability was 3. All participants were exposed to Spanish in the home. Six participants were simultaneous English learners, reporting Age of Inclusion (AOI) at birth. Six participants were sequential English language learners - five reported AOI in the English-speaking environment at 4-6 years of age, upon entering elementary, and one reported an AOI of 15. Each participant confirmed exclusive use of Spanish by family members in conversation with the participant. Only one participant reported Spanish language dominancy. No participants reported a history of disordered speech, language, hearing, or cognition.

Table 1. Adult Language Ratings

Participant	Oral Language								Literacy			
	Home		***School***		***Work***		***Social Events***		***Reading***		***Writing***	
	SP	*EN*	*SP*	*EN*	*SP*	*EN*	*SP*	*EN*	*SP*	*EN*	*SP*	*EN*
P1	4	5	2	5	3	5	4	5	5	5	4	5
P2	1	5	2	5	3	5	4	5	4	5	4	5
P3	5	5	4	5	1	5	4	5	5	5	5	4
P4	5	4	3	4	3	4	5	3	4	5	3	5
P5	-	-	-	-	-	-	-	-	-	-	-	-
P6	1	5	1	5	1	5	1	5	3	5	1	5
P7	4	5	1	5	1	5	4	5	3	5	2	5
P8	3	5	1	5	1	5	2	5	3	5	2	5
P9	1	5	1	5	1	5	3	4	1	5	1	5
P10	3	5	2	5	2	5	4	5	3	4	3	4
P11	1	5	3	3	4	3	3	3	5	5	5	4
P12	4	4	3	4	3	4	4	4	5	5	5	5
P13	4	5	1	5	1	5	2	5	4	5	1	5

Note: *Oral language use scale: 1 (never) – 5 (always); Literacy skills scale: 1 (poor) – 5 (excellent). (S*P= Spanish; EN= English)

Procedures

The experiment involved two types of tasks: Wordlikeness judgments of aurally presented novel Spanish and English nonwords and assessment of receptive vocabulary using the English and Spanish-bilingual versions of the ROWPVT-4. Order of task presentation was varied and an optional 5- minute break was allotted between the first and second half of the experiment.

Language Dominance Questionnaire

English and Spanish variations of an L1 survey were created for this study using an online survey generated from Surveyplanet.com. Participants were encouraged to complete the questionnaire in whichever language they preferred and the PI was available to answer any questions. Eleven participants elected to complete the English version of the questionnaire and one participant chose to complete the Spanish version. The questionnaire asked the participant's length of exposure to each language, the Spanish-speaking country of origin, and the language usage in the home and other settings. Frequency of Spanish listening and usage with various conversational partners was also included. Other aspects of the questionnaire were used to collect demographic information and data on educational background of the participants. Identification numbers were assigned to each participant to match questionnaire results with the wordlikeness and vocabulary task results.

Vocabulary Tasks- Spanish and English

The Spanish-bilingual version of the fourth edition of the ROWPVT-4 was administered to assess Spanish vocabulary knowledge and the English version of ROWPVT-4 was utilized in assessment of English vocabulary knowledge. Starting points for both measures were determined based upon the participant's age and evaluation was discontinued when ceilings were reached. The evaluation involved a picture flipbook from which participants were instructed to match the aurally presented word with its picture representation. While the English version was administered according to standard procedures, the Spanish-bilingual version was not. Stimuli on the Spanish-bilingual version were provided exclusively in Spanish, regardless of the participant's response accuracy, and participants were not afforded the opportunity to correct their answer in response to English stimuli. Such modification allowed for exclusive evaluation of receptive Spanish vocabulary.

Nonword Wordlikeness Task

Nonwords of varying phonotactic probability were selected to create distinct stimulus sets of Spanish nonwords and English nonwords. In administration of the task, nonwords were presented once after five milliseconds of silence via computer and headphones using the PRAAT software system (Boersma& Weenink, 2001). The participant was prompted to rate the wordlikeness of each nonword by clicking a numerically labeled button on the screen. Wordlikeness was determined by perception of well-formedness on a scale of 1-7 where 1 signified "not a possible word of that language" and 7 corresponded to "sounds very much like a word in that language."

Stimuli for Wordlikeness Tasks

Spanish Nonword Stimuli

The Spanish nonword task of 120 nonword stimuli, generated by Brea-Spahn (2009) and employed in the study by Frisch and Brea-Spahn (2010), was used in the present study. The stimuli were selected from a larger database of 238 nonwords, ranging in expected phonotactic probability, syllable length, and stress pattern. Construction of the nonword database was accomplished through random extraction and concatenation of onset and rime constituents of appropriate word and stress position. Nonwords were created based on the probabilistic grammar model of Coleman and Pierrehumbert (1997), which accounts for the impact of stress and word position on the probability distribution for onsets and rimes, and provides eight probabilistic distributions of constituents: word initial or medial stressed and unstressed onsets and word medial or final stressed and unstressed rimes. Derived nonwords containing categorical phonological violations across constituents were replaced by new random nonwords free from violations. For example, a randomly created stimulus with a medial rime ending with /n/ followed by a medial onset /n/ would be rejected as this sequence is not found in the parsed dictionary of Spanish words used to generate probabilities (Garrett, Morton, & McLemore, 1996). A log probability was determined for each nonword by taking the logarithm of the product of the probabilities of the constituents in the nonword. Constituent probabilities were derived from totaling the number of real words with that constituent in the same word and stress position. Cumulative probability was log-transformed to match perceived probability scales. In the log-transformed scale, items with large negative log probability were low in phonotactic probability and items with small negative log probability were higher in phonotactic probability (Frisch & Brea-Spahn, 2010).

The Spanish Callhome Lexicon was the source of lexical items used to generate constituent frequencies. Morphologically complex items were eliminated from the lexicon in order to create a selection of maximally underived forms comparable the stimuli used for the English nonword task in this study. The Spanish trill /r/ was also excluded from stimuli to control for articulatory difficulty for children (a population under study in Brea-Spahn, 2009). The nonwords were recorded digitally using clear speech by a male bilingual Spanish-English speaker. The speaker was provided orthographic transcriptions of the nonwords to read prior to recording. Recording occurred in a sound-treated lab at the University of South Florida with a SONY Digital Audio Tape Recorder (Model PCM-MI) at a sampling rate of 44.1 kHz. The speaker was orally presented with each nonword and asked to repeat the production until correct. After recording, all items were analyzed for accuracy and fluency. Recorded files were converted to .wav files and the most intelligible productions were selected. Each stimulus item was presented once to the listener.

English Nonword Stimuli

English nonword stimuli were utilized from the study by Frisch and Brea-Spahn (2010) and consisted of 120 nonwords (60 bisyllabic and 60 trisyllabic nonwords) with syllable initial stress. Onset and rime constitutes with appropriate word and stress positions were extracted randomly and concatenated from a computerized English lexicon. Phonotactic analysis of words Webster's dictionary of Nusbaum et al. (1984) was used to create the probability distributions. Log probabilities were derived from analysis of the probabilities of the constituents in each nonword. A cumulative probability was log-transformed so stimuli low in phonotactic probability equated to large negative log probability and vice versa. Nonwords were digitally recorded using clear speech by a male monolingual English speaker (Frisch & Brea-Spahn, 2010).

Analysis

Vocabulary Measure

Analysis of vocabulary knowledge was performed following standardized scoring of the Receptive One Word Picture Vocabulary Test. Raw scores from both versions of the ROWPVT-4 were selected to represent the participant's breadth of vocabulary knowledge as the raw score most directly reflects the diversity of vocabulary knowledge for the participant and it is the diversity of vocabulary knowledge that is hypothesized to affect nonword judgments. Scores from the English version ranged from 146 to 186, with a mean score of 172.3. Raw scores on the Spanish-bilingual version ranged from 124 to 172 with a mean raw score of 151.3.

Table 2. Raw scores from the Receptive One Word Picture Vocabulary Test- 4th Edition

ROWPVT-4 Raw Scores for each participant (P)		
	English version	***Spanish–bilingual version***
P1	163	124
P2	173	165
P3	171	155
P4	146	137
P5	175	166
P6	186	125
P7	176	145
P8	184	165
P9	177	159
P10	167	145
P11	167	143
P12	167	172
P13	173	166

Note: *Testing halted when ceilings were met for each assessment (4 incorrect out of 6 consecutive responses for the Spanish-bilingual version, 6 incorrect out of 8 consecutive responses for the English version.)*

Wordlikeness Judgments

Wordlikeness judgments for each nonword were correlated with the nonword's log probability using Pearson's *r* correlation coefficient. Previous studies have found lower wordlikeness ratings for low probability nonwords and high wordlikeness ratings for high probability nonwords (Gomes, do Couto Mendes, Silva, Esteves, & Gomes, 2015; Betancourt, 2013). This correlation was computed both for average ratings and for each individual participant's ratings. When measured as within an individual, this correlation is called "Probability predictiveness" - the impact of phonotactic probability on participant judgments of wordlikeness. Probability predictiveness is calculated via correlation between the numerical wordlikeness ratings provided by participants (1-7, where 1= “not a possible word” and 7 = “sounds very much like a word”) and the phonotactic probability of that nonword.

Probability Predictiveness

Raw scores for the ROWPVT-4 were analyzed against wordlikeness judgments of each language respectively. Analysis involved assessment of the individual’s nonword wordlikeness ratings and the measure of nonword stimuli based on its constituents, termed nonword “probability predictiveness.” Probability predictiveness demonstrates how one’s nonword rating is affected by the nonword probability. The probability predictiveness and vocabulary were then compared via Pearson’s *r* correlation analysis. Convergence between wordlikeness ratings of the participants with different sized lexicons would be anticipated at the upward limit of phonotactic probability (where all nonwords would be acceptable), while divergence would be expected for nonwords of low phonotactic probability (where only those with exposure to infrequent lexical patterns would find the nonwords acceptable). In Frisch and Brea-Spahn (2010) a negative correlation was revealed between lexical knowledge and phonotactic probability in English monolinguals and bilinguals on English tasks, thereby implying that participants with larger vocabularies were more accepting of less probable nonwords.

RESULTS

Probability Predictiveness

A mean well-formedness rating was computed for each nonword via wordlikeness ratings gathered from each participant. The mean ratings were analyzed against the log phonotactic probability of each nonword, yielding a correlation of $r=0.43$ ($p<0.01$) for English nonwords. An illustration of probability predictiveness for the English nonwords is depicted in Figure 1.

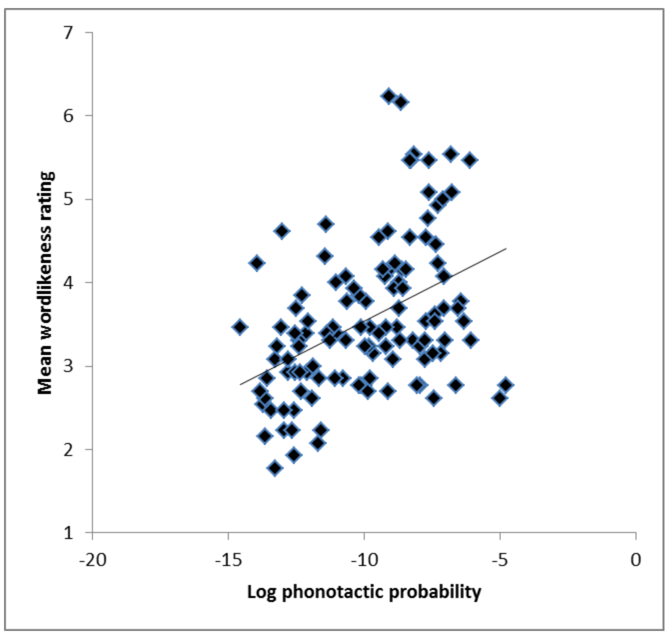

Figure 1: Probability predictiveness, or the correlation of average wordlikeness ratings and phonotactic probability, for English nonwords.

Similarly, overall probability predictiveness for Spanish nonwords was computed via analysis of the relationship between mean wordlikeness ratings and phonotactic probabilities of each Spanish nonword. The resulting probability predictiveness for Spanish nonwords, r= 0.24 ($p<0.01$) is illustrated in Figure 2.

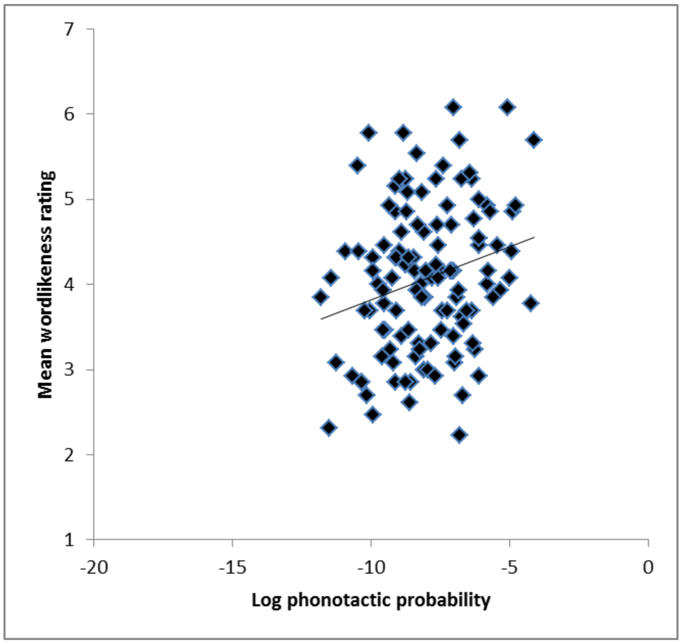

Figure 2: Probability predictiveness, or the correlation of average wordlikeness ratings and phonotactic probability, for Spanish nonwords.

Mean ratings in the present study for English nonwords were comparable to previous findings (e.g. r = 0.44 in Frisch & Brea-Spahn, 2010). The correlation in the present study for Spanish nonwords was somewhat lower (Frisch & Brea-Spahn, 2010, found r = 0.42); however, phonotactic probability still had a significant effect on nonword rating.

Vocabulary Effects

Raw scores from Spanish-bilingual and English versions of the ROWPVT-4 were utilized in analyzing the impact of lexical knowledge within a language on probability predictiveness. The hypothesis was that greater vocabulary knowledge would have an increased effect on wordlikeness judgments for low probability nonwords. Evidence to support this notion would surface as higher wordlikeness ratings on low probability stimuli for people with higher

ROWPVT-4 scores in the given language. Results of the present study, presented in Figure 3, demonstrate a negative correlation between lexical knowledge and probability predictiveness for bilinguals on English tasks (r = -0.17, non-significant), suggesting higher tolerance for low probability nonwords by participants with larger lexicons. This is a similar association but slightly stronger association than what was found in Frisch & Brea-Spahn (2010) where r values for the analysis were near -.1. The data for the bilinguals on the Spanish stimuli demonstrate a similar negative correlation (r = -0.18, non-significant). The correlation between vocabulary knowledge and probability predictiveness in Spanish is illustrated in Figure 4. Overall, this data implies that greater vocabulary knowledge corresponds with an increased acceptance of low probability nonwords.

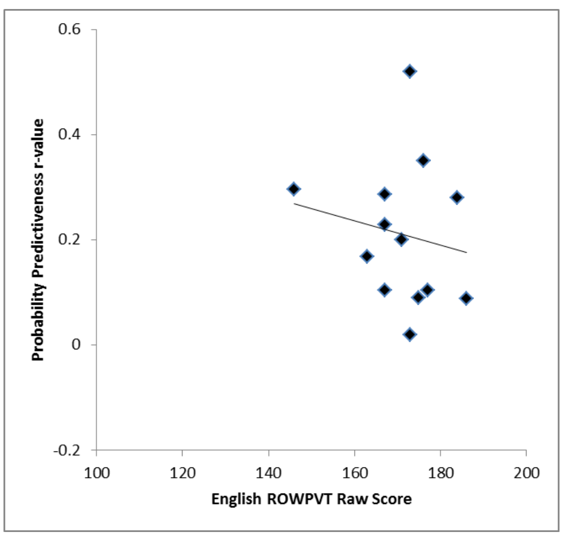

Figure 3: Correlation between probability predictiveness and English vocabulary

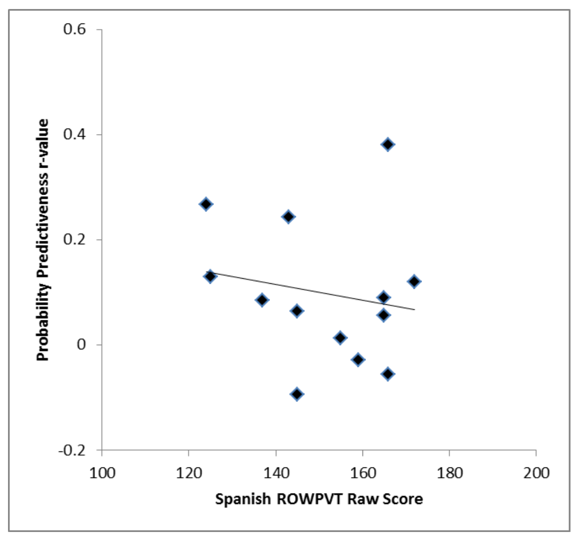

Figure 4: Correlation between probability predictiveness and Spanish vocabulary

DISCUSSION AND CONCLUSION

The purpose of the study was to evaluate the effect of lexical knowledge on judgments of wordlikeness in Spanish-English bilinguals and replicate the negative trend found in Frisch and Brea-Spahn (2010) for both Spanish and English data. With modification to the procedures set forth by Frisch and Brea-Spahn in the 2010 study, use of a standardized vocabulary assessment instead of a vocabulary familiarity task, the negative correlation between vocabulary knowledge and probability predictiveness found by Frisch and Brea-Spahn (2010) was replicated. More importantly, the current study succeeded in extending Frisch and Brea-Spahn's findings to Spanish nonword judgements, producing a negative correlation between vocabulary knowledge and probability predictiveness for bilinguals on both English and Spanish stimuli.

While the results in the current study were not statistically significant, a smaller number of participants were used - 13 bilingual Spanish-English speakers as compared to 30 in Frisch and Brea-Spahn (2010). Nevertheless, the findings from this study are in accordance with findings of Betancourt (2013), Frisch, Large & Pisoni (2000), and Gomes, do Couto Mendes, Silva, Esteves, & Gomes (2015), demonstrating a high correlation between wordlikeness ratings and phonotactic probability. More importantly, the data supports the hypotheses by Frisch and Brea-Spahn (2010), and Frisch, Large, Zawaydeh, and Pisoni (2001) that a more robust vocabulary and language experience results in increased exposure to a range of phonotactic patterns and therefore tolerance for less probable phonotactic patterns.

The resulting knowledge can be applied to considerations of lexical development in the bilingual child or L2 learner. When confronted with novel words, the L2 learner relies on existing vocabulary knowledge, as well as phonological knowledge of both languages, to make associations for accurate perception, acquisition, and reproduction of the novel word. This link between experience with vocabulary and the phonological knowledge appears synergetic, so that promoting one can promote the other and aid in processing novel words for L2 acquisition. The association between these parameters is apparent in both Spanish and English nonword processing, which is significant for it allows generalizations to be drawn with regard to phonological knowledge and the effect on vocabulary acquisition across the two languages. These generalizations can be helpful in understanding the manner of nonword processing in Spanish-English bilinguals, a major bilingual group of United States.

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APPENDIX A:
Institutional Review Board Approval

UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

August 24, 2017

Marisa Leyden
Communication Sciences and Disorders
Tampa, FL 33613

RE: **Exempt Certification**
IRB#: Pro00030318
Title: The impact of vocabulary knowledge on nonword judgments in Spanish-English bilinguals

Dear Ms. Leyden:

On 8/23/2017, the Institutional Review Board (IRB) determined that your research meets criteria for exemption from the federal regulations as outlined by 45CFR46.101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

As the principal investigator for this study, it is your responsibility to ensure that this research is conducted as outlined in your application and consistent with the ethical principles outlined in the Belmont Report and with USF HRPP policies and procedures.

Please note, as per USF HRPP Policy, once the Exempt determination is made, the application is closed in ARC. Any proposed or anticipated changes to the study design that was previously declared exempt from IRB review must be submitted to the IRB as a new study prior to initiation of the change. However, administrative changes, including changes in research personnel, do not warrant an amendment or new application.

Given the determination of exemption, this application is being closed in ARC. This does not limit your ability to conduct your research project.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board