

THE DEVELOPMENT OF A WORD LIST FOR A MEXICAN SPANISH
PHONOLOGICAL ASSESSMENT

By

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Abstract

Speech-language pathologists (SLPs) encounter many Spanish-speaking children in their caseload; however, there exist few phonological assessments to date that can accurately assess the phonological capabilities of bilingual children. Because of the lack of assessments, many Spanish-English bilingual children are diagnosed with speech sound disorders when in fact they are typically-developing. Many children are misdiagnosed because the phonological features of their dialect of Spanish are not taken into account. The purpose of this study was to develop a word list for a phonological assessment of Mexican Spanish. This assessment will account for the dialect's unique phonological features that may otherwise be considered signals of speech sound disorders if SLPs are not aware of them. The literature was reviewed to develop a list of criteria essential to the development of a word list for an English phonological assessment, then the criteria was applied to the formation of a word list for a Spanish assessment. After considering the criteria, a word list was created in which all consonant phonemes of Mexican Spanish were included. Correlations were performed to examine the relationship between the test items and the frequency of occurrence of consonant phonemes in the Spanish language to provide a measure of validity.

Literature Review

Introduction

A major challenge in the field of speech-language pathology in the United States today is the ability of speech-language pathologists (SLPs) to properly serve the ever growing population of Spanish speakers in need of services. According to the U. S. Census Bureau (2011), the Latino population increased from over 35 to over 50 million between the years of 2000 and 2010, accounting for over half of the total population increase in the United States as a whole in that time frame (U.S. Census Bureau, 2011). The groups within the Latino population that contributed the most to this growth were people of Mexican, Puerto Rican, and Cuban origin (U.S. Census Bureau, 2011). The individuals of Mexican origin accounted for three quarters of the total growth in Latino population, increasing by a factor of 54 percent from 20.6 to 31.8 million people (U.S. Census Bureau, 2011). The group of Puerto Rican origin increased by 36% from 3.4 to 4.6 million, while the group of Cuban origin increased by 44 percent from 1.2 to 1.8 million (U.S. Census Bureau, 2011). On the other hand, as of 2009, only 5.1 percent of all SLPs in the United States considered themselves able to practice bilingually, and of that small percentage only 2.2 percent could practice in Spanish (ASHA Online, 2010). Because there are few SLPs who know the Spanish language, typically-developing Latino children are often misdiagnosed with speech and language disorders (De Valenzuela, Copeland, Qi, & Park, 2006). The misdiagnosis of Latino children leads to their overrepresentation in special education services in schools (De Valenzuela et al., 2006). This overrepresentation may in part be due to the lack of standardized tests that are able to properly assess and help diagnose children who are not monolingual English speakers (Westman, Korkman, Mickos, & Byring 2008; Peña, Gillam, Bedore, & Bohman, 2011). Among the different types of standardized tests are phonological

assessments, which analyze a child's ability to produce speech sounds correctly. Yavas and Goldstein (1998) report that there are not enough phonological assessments that can accurately describe the phonological abilities of Spanish-speaking children. Specifically, there are not enough assessments that will account for the phonological variations seen in the most common dialects of Spanish spoken in the United States: Mexican, Puerto Rican, and Cuban (Goldstein, 2001). When the dialect features of Latino children are not taken into account, typically-developing children are more likely to be diagnosed with a speech sound disorder and children with mild SSD are more likely to be diagnosed with a severe case (Goldstein & Iglesias, 2001). This particular paper is the first in a series that will contribute to the formulation of three phonological assessments that will account for the dialect features of Mexican, Puerto Rican, and Cuban Spanish in order to prevent the misdiagnosis typically-developing bilingual children and bilingual children with varying severity of SSD living in the United States. In particular, this first part will focus on the development of a word list to be used in a phonological assessment designed to account for the dialect features of Mexican Spanish.

Phonological Analysis of English and Spanish

In order to properly assess the phonological abilities of a Spanish-English bilingual child, it is necessary to understand the differences between English and Spanish phonology, and how the two phonologies may affect the development of a bilingual child. Goldstein (2001) reports on the differences in a typical phonemic inventory of both English and Spanish. Table 1 demonstrates his finding that there are several more phonemes present in English as compared to Spanish, particularly in the area of fricatives and vowels. Because there is a difference in the phonemic inventories of the two languages, typically-developing children of each language tend to acquire their phonemes in a different order (Fabiano-Smith & Goldstein, 2010a). In English,

children acquire sounds in three phases: the “early 8” /m, b, j, n, w, d, p, h/, the “middle 8” /t, η, k, g, f, v, tʃ, dz/, and the “late 8” /ʃ, ð, s, z, θ, l, ɪ/ (Shriberg, 1993). The order of acquisition is different for monolingual Spanish-speaking children: the “early 6” /ɲ, t, m, n, k, x/, the “middle 6” /s, f, p, tʃ, β, γ/, and the “late 4” /l, ð, r, ɾ/ (Fabiano-Smith & Goldstein, 2010a). Furthermore, children who simultaneously acquire Spanish and English will exemplify differences in the age they acquire certain phonemes of both languages (Fabiano-Smith & Goldstein, 2010a). This can be seen in how bilingual children typically acquire phonemes that are present in English but not Spanish at a younger age than their Spanish-speaking monolingual peers, yet they still acquire these same sounds at a later age than their monolingual English-speaking peers (Fabiano-Smith & Goldstein, 2010a). The differences seen between monolingual English-speaking children and Spanish-English bilingual children are manifested in how the bilingual children produce words in English. When performing evaluations in English, monolingual English-speaking SLPs must be careful to note the differences between English and Spanish phonologies so as not to mistake typically-developing bilingual children for children with SSD.

While it is obvious that English and Spanish demonstrate different phonologies, what may not be so obvious to SLPs is that there are major phonological differences between dialects of Spanish. Goldstein (2001) reports certain phonological differences between Mexican, Puerto Rican, and Cuban dialects. Table 2 exemplifies certain phonological processes he found that are common to the dialects most commonly seen in the United States. As can be seen, certain consonant phonemes may be pronounced differently in different dialects, such as the /tʃ/ pronounced as /ʃ/ and the final /n/ pronounced as /ŋ/ in Cuban and Puerto Rican Spanish. These phonological processes of deaffrication and backing among other processes seen in dialect variations should not be penalized as incorrect speech. When evaluating bilingual children of

different Spanish backgrounds in either English or Spanish, SLPs must be knowledgeable about the phonological processes that are acceptable in their prospective dialects. This particular task may prove to be difficult, as there are few standardized assessments that account for dialect features (Yavas & Goldstein, 1998).

Formation of a Word List

As previously mentioned, the purpose of this study is to formulate a word list to be used in a phonological assessment for Mexican Spanish-speaking children. In order to formulate our own word list, it was necessary to examine the means by which previously published phonological assessments developed their word lists. One such test was the Goldman Fristoe Test of Articulation 2 (Goldman & Fristoe, 2000). In this test, 53 target words were chosen in order to elicit 61 consonant sounds in the word initial, word medial, and word final positions. While ultimately the words were chosen based on what position the sounds occurred in within words in order to make results more understandable for a wider range of people, Goldman and Fristoe emphasized that the syllable structure in which sounds occurred needed to be considered (Goldman & Fristoe, 2000). This was because it is better to test “releasing” prevocalic consonants that occur before the syllable nucleus as opposed to “arresting” postvocalic consonants that occur after the syllable nucleus (Shriberg & Kent, 1995). The formation of releasing consonants is less likely to be influenced by the nucleus of the syllable as an arresting consonant, causing children to produce them more accurately. Although several studies (Weston, Shriberg, & Miller 1989; Bernhardt & Holdgrafer, 2001; Eisenberg & Hitchcock, 2010) suggest that word lists contain at least 90 words in order to collect an accurate phonological inventory, Goldman and Fristoe only included enough words to ensure that children had at least two opportunities to produce each phoneme in each word position (see also

Dinnsen, Chin, Elbert, & Powell, 1990). The length of an assessment has an impact on its results, and so they decided to keep their word list to a minimum (Mullen & Whitehead, 1977). Other standardized phonological assessments follow guideline similar to that of the GFTA-2. The Bankson-Bernthal Test of Phonology (BBTOP) constructed a word list of 80 words that provided at least two opportunities for each consonant to be produced twice in word initial and final positions (Bankson & Bernthal, 1990). They also suggested that nouns were better to test than verbs, as verbs may take longer for a child to produce. The articulation portion of the Diagnostic Evaluation of Articulation and Phonology (DEAP) tested 30 words in which phonemes were analyzed based on their syllable initial and final positions, not word positions (Dodd, Hua, Crosbie, Holm, & Ozanne, 2006). The creators of DEAP also adjusted their word list to ensure that the frequency of occurrence of the consonant phonemes in the assessment mirrored the frequency of occurrence of phonemes in the English language on the whole. The Mansoura Arabic Articulation Test (MAAT) contained 106 words in which all consonants could be produced at least twice in the word initial, medial and final positions (Abou-Elsaad, Baz, & El-Banna, 2009). Generally speaking, phonological assessments devise word lists to provide opportunity for each phonemic consonant of the language to be produced twice in the word initial, medial, and final positions.

Word List Criteria—English

Eisenberg and Hitchcock (2010) provided a cohesive list of criteria for formulating a word list to be used in an English phonological assessment. The scientists first designated that the word list should be 90-225 words in length. While they recognized that previous research does not indicate how many productions of a sound are necessary for it to be considered part of a child's phonetic inventory, they suggested that the sound can be included in the child's inventory

if he or she produces it twice in a given word position. They also suggested that when testing a particular consonant, the consonant should occur at the beginning or end of a stressed syllable. For example, a child is more likely to accurately produce the word-final /t/ in *cat* as compared to the word-final /t/ in *TRUMpet*. As far as syllable structure is concerned, the researchers recommend that mostly monosyllabic words be used, as children are more likely to produce the initial and final consonant of a CVC word correctly as compared to multisyllabic words. Additionally, they showed that bisyllabic words may be used as well because there is less difference between consonant production in mono- and bisyllabic words in comparison with multisyllabic ones. The authors also advise that the words in the word lists avoid the use of bound morphemes such as the plural –s and verb endings because children with a phonological deficit may also have a language deficit that does not permit the correct use of certain morphemes. It is also important to test CVC words that have different initial and final consonants because children are more likely to produce words with the same beginning and final sound correctly. Lastly, Eisenberg and Hitchcock (2010) proposed that words with the same initial consonant be followed by differing vowels and words with the same final consonant be preceded by differing vowels. The variation of the vowel in CV or VC components is important in order to avoid the effects of holistic word planning as opposed to a phoneme-based system, so by testing the consonant as an independent segment in the phonetic inventory, one can avoid testing the same CV or VC segment twice.

Word List Criteria—Spanish

Although there is currently not enough research on how to develop word lists in Spanish phonological assessments, certain suggestions made by Eisenberg and Hitchcock (2010) may be applied to the creation of a Spanish word list. It can be assumed that each phoneme should have

two opportunities to be produced in the word initial, medial, and final positions. However, the frequency of syllable structures in Spanish is much different than the syllable structures of words in English. The majority of syllables in Spanish are structured as CV, dominating 61.27% of all syllables in the language (Lloyd & Schnitzer, 1967). Syllables structured as CVC are the second most common syllable structure in Spanish, holding 21.42% of all syllables (Lloyd & Schnitzer, 1967). While syllables ending in a consonant are common to both English and Spanish, a high percentage of words in Spanish end in vowels, and not all consonants may appear at the end of a word (Lloyd & Schnitzer, 1967). Because not all consonants may appear at the end of a Spanish word, it is impossible for several consonants to appear in the word final position, prohibiting them from being tested in that particular word position on the assessment. While Eisenberg and Hitchcock (2010) suggested that monosyllabic words be used on an English assessment, the same does not hold true in Spanish. Bisyllabic and polysyllabic words are most common in the Spanish language, and so assessing mostly monosyllabic words in Spanish would not accurately mirror the high frequency of bi- and polysyllabic Spanish words (Fabiano-Smith & Crouse-Matlock, in preparation). Another advisement from Eisenberg and Hitchcock (2010) stating that bound morphemes should not be used because children with language disorder may not be able to properly produce them may also be taken into account. According to Bedore and Leonard (2001), Spanish-speaking children with SLI have the most trouble with noun plural inflections, direct object clitics, adjective agreement inflections, noun phrase-related morpheme types, and 3 of the 9 verb morpheme types (3rd plural present, 3rd singular present, infinitive—although errors were seen in all 9 categories). In the effort to accommodate for children with language disorder, these morphemes should be avoided on the assessment. It can also be assumed that Eisenberg and Hitchcock's suggestion that the word initial and word medial consonants tested in a CVC

syllable should not be the same consonant since children would be more likely to produce the phoneme correctly if it was at the beginning and end of the same syllable. Finally, the suggestion for the English word list that words with the same initial consonant should be followed by differing vowels and words with the same final consonant be preceded by differing vowels can also be made for the Spanish word list.

The last suggestion for the development of a word list comes from the Diagnostic Evaluation of Articulation and Phonology. As mentioned previously, this phonological assessment adjusted the frequency of occurrence of all consonant phonemes in test to mirror the frequency of occurrence of the phonemes in the English language as a whole (Dodd et al., 2006). This was an important aspect of the test because it made the word list more realistic when compared to the child's use of language in more naturalistic settings. The adjustment of the frequency of occurrence of phonemes in the word list should also be taken into account when creating a word list in Spanish.

Methodology

This study is the first part of three different studies that will be completed in the effort to create phonological assessments for the three most common Spanish dialects in the United States. This first part was meant to devise a word list for the phonological assessment of the Mexican Spanish dialect. To begin the construction of a word list for the assessment, the words used on the Goldman Fristoe Test of Articulation 2 were taken as a foundation for the Mexican word list. This is because the words used on the GFTA-2 were carefully selected to ensure that children of preschool age would know them and therefore be able to produce them easily during their evaluation. It was important to use the kinds of words as the ones presented on the GFTA-2 because they are all culturally neutral such that a child of any culture or gender would be able to

produce the words naturally without too much prompting from the examiner administering the test. The word list from the GFTA-2 was then given to seven native speakers of Mexican Spanish, who were asked to translate all the words from English to Spanish. After compiling all of the translated word lists, it was decided that the words that were translated identically across at least four of the native speakers could be included in the word list for the assessment. Words that were not translated identically across at least four subjects were not included in the final word list.

After deciding the words from the GFTA-2 that could be included in the Mexican Spanish assessment, all of those words were analyzed to ensure that there were at least two opportunities for each consonant phoneme to be produced in each of the word initial, medial, and final positions. The words taken from the GFTA-2 did not provide two opportunities in all word positions for several consonant phonemes. To provide sufficient opportunity, more preschool age appropriate words common to the Mexican dialect were selected based on the need for certain phonemes to occur in different word positions.

While it was ensured that all consonant phonemes had the opportunity to be produced twice in the word initial, medial, and final positions, it was also necessary to make certain that the frequency of occurrence of the consonant phonemes on the assessment mirrored the frequency of occurrence of consonant phonemes in the Spanish language. In order to calculate the frequency of occurrence of phonemes on the test, the total number of all consonant phonemes in the word list was tallied and from there the percent occurrence of each individual phoneme was calculated. The values of the percent occurrence of each phoneme were entered into SPSS, a program designed to complete statistical analyses. The frequencies of occurrence of each phoneme in the Spanish language as a whole were entered into SPSS as well. The frequency

values of all consonant phonemes were taken from Wilson (Wilson, 1984). From there, a Pearson correlation was run to ensure that there was a positive correlation between the percent occurrence of the phonemes on the test and their frequency of occurrence in the Spanish language.

In effort to ensure that all consonant phonemes correctly mirrored the frequency of occurrence of the phonemes in the Spanish language, words containing consonant clusters in the word initial position were not included in the statistical analyses. However, because clusters are an important part of speech and cannot go untested in a phonological assessment, a separate list of words was created so that they may be assessed. This separate list contains words with common consonant clusters to be tested in the word-initial position. Clusters with a frequency of occurrence in the Spanish language above 10% were provided two opportunities to be produced, while clusters with a frequency of occurrence less than 10% were only provided one. The frequencies of occurrence of word-initial consonant clusters were taken from Wilson (Wilson, 1984).

Results

Pearson correlations were performed to provide information on the criterion validity of the word list. In this analysis, the criterion variable was the value of the frequency of occurrence of a particular phoneme in the whole Spanish language (from Wilson, 1984). The predictor variable was the value of the percent occurrence of a phoneme on the assessment (Table 3). After running the correlation, it was found that there was a positive correlation between the frequency of occurrence of the phonemes on the assessment and the frequency of occurrence of phonemes in Spanish ($r = 0.793$, $p = .000$) (Table 4). The fact that the Pearson correlation was significant indicates that as the frequency of occurrence of a particular phoneme in the Spanish

language increases, the percent occurrence of that same phoneme on the assessment increases as well. This means that phonemes that occur more often in Spanish also occurred more often on the assessment, while phonemes of fewer occurrences appeared less often on the test.

Discussion

While the Pearson correlation between the criterion and predictor variables was not a perfect 100%, a near 80% correlation between them shows that the percent occurrence of consonant phonemes on the test effectively mirrors the frequency of occurrence of consonant phonemes in the Spanish language, demonstrating good criterion validity of the assessment. Because the phonemes from the list of words to be analyzed generated a positive significant correlation, the list proved that it was suitable to be included in a phonological assessment of the Mexican Spanish dialect. The words provide at least two opportunities for each phoneme to be produced in word initial, medial, and final positions, and take into account the unique phonological features of Mexican Spanish. Table 5 demonstrates the final word list to be used on the phonological assessment, excluding the separate list of words beginning with clusters. Table 6 shows the separate word list containing words with the most common Spanish consonant clusters in the word-initial position.

As it has been previously stated, there is an ever-growing Latino population living in the United States that vary greatly in terms of their dialects' phonologies. Because there exist few phonological assessments for Spanish-speaking children of any dialect, there is a gross overrepresentation of their population receiving speech and language services. This occurs because speech-language pathologists (SLPs) lack the knowledge and tools necessary to distinguish the characteristics of the speech of typically-developing Spanish-speaking children from the speech of children with actual speech sound disorders. In order to educate SLPs on

specific dialect phonological features and to provide them with a tool to diagnose impaired speech in Spanish-speaking children, it is necessary to develop a phonological assessment for each different dialect of Spanish. This study sought to develop a word list for a phonological assessment that would account for the unique dialect features of Mexican Spanish. With the use of this assessment, SLPs will be able to use the assessment to understand Mexican Spanish's unique phonological features and to accurately distinguish between typically-developing Mexican Spanish speaking children and those with speech sound disorders. Through this assessment, the Mexican Spanish-speaking population should experience a more accurate representation in the population of children receiving therapy for speech sound disorders.

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TABLE 1. Phonemic Inventories of Spanish and English

Sound Class	Spanish	English
Stops	p, b, t, d, k, g	p, b, t, d, k, g
Nasals	m, n, ɲ	m, n, ŋ
Fricatives	f, s, x	f, v, s, z, θ, ð, ʃ, ʒ
Glides	w, j	w, j
Affricate	tʃ	tʃ, dʒ
Liquid	l	l, ɹ
Flap	r	
Trill	r	
Vowels	i, e, u, o, a	i, e, u, o, ɑ, ɔ, ɔɪ, ɪ, ɛ, æ, ʊ, ɔ, ə, ʌ, ɚ, ɝ

Taken from Goldstein, B. A. (2001). Transcription of Spanish and Spanish-influenced English. *Communication Disorders Quarterly*, 23(1), 54-60.

TABLE 2. Major Dialectal Features of Mexican, Cuban, and Puerto Rican Spanish

Phoneme	Allophone			Example
	Mexican	Cuban	Puerto Rican	
/b/	[v]	—	—	/boka/ mouth → [voka]
/d/	—	∅	∅	/dedo/ finger → [deo]
/k, g/	∅	—	∅	/aktual/ actual → [atual]
/f/	—	—	[ϕ]	/emfermo/ sick → [emϕfermo]
/s/	∅	∅	∅	/dos/ two → [do]
	aspirated	aspirated	aspirated	/dos/ two → [do ^h]
/x/	[h]	[h]	[h]	/xamon/ ham → [hamon]
/tʃ/	—	[ʃ]	[ʃ]	/mutʃo/ a lot → /muʃo/
/ɲ/	—	[ɲ]	[ɲ]	/xamon/ ham → [hamoɲ]
/ɾ/	—	[l]	[l]	/martijo/ hammer → [maltijo]
/r/	[r] (rare)	—	[r], [x]	/pero/ dog → [pero]/[pexo]
/l/	—	—	[ɾ]	/azúl/ blue → [azúr]

Note: “—” = not typically exhibited in that dialect; “∅” = deleted.

Taken from Goldstein, B. A. (2001). Transcription of Spanish and Spanish-influenced English. *Communication Disorders Quarterly*, 23(1), 54-60.

TABLE 3. Summary of Consonant Phonemes on the Assessment and Their Frequencies of Occurrence

Phoneme	Total number of occurrences on test	Percent occurrence on test	Frequency of occurrence in language
m	5	3.13	5.28
n	18	11.25	13.00
ɲ	2	1.25	0.70
p	12	7.50	3.85
b	5	1.84	1.84
f	4	2.50	0.80
t	10	6.25	9.43
d	6	3.75	4.27
k	7	4.38	6.93
g	4	2.50	1.00
l	15	9.38	9.25
r	2	1.25	1.66
ɾ	18	11.25	8.98
s	16	10.00	16.69
j	12	7.50	1.60
h	7	4.38	2.36
tʃ	5	3.13	0.52
β	4	2.50	2.84
ð	5	3.13	5.85
ʎ	2	1.14	0.06
TOTAL	159		

TABLE 4. Pearson Correlation Results

		Frequency of occurrence in language	Percent occurrence on test
Frequency in Language	Pearson Correlation	1	.793**
	Sig. (2-tailed)		.000
	N	20	20
Percent on test	Pearson Correlation	.793**	1
	Sig. (2-tailed)	.000	
	N	20	20

** Correlation is significant at the 0.01 level (2-tailed).

TABLE 5. Final Word List (excluding cluster words)

Spanish Word	Transcription	English Translation
anillo	/anijo/	ring
árbol	/arβol/	tree
aspiradora	/aspiraðora/	vacuum cleaner
avión	/aβjon/	airplane
baño	/baño/	bathroom
beso	/beso/	kiss
carro	/karo/	car
casa	/kasa/	house
cepillo	/sepijo/	brush
chango	/tʃango/	monkey
chicle	/tʃikle/	gum
ciudad	/siuðað/	city
conejo	/koneho/	rabbit
cuchara	/kutʃara/	spoon
cuchillo	/kutʃijo/	knife
dedo	/deðo/	finger
difícil	/difisil/	difficult
ducha	/dutʃa/	shower
estrellas	/estrejas/	stars
falda	/falda/	skirt
fiesta	/fjesta/	party
gato	/gato/	cat
gol	/gol/	goal
jamón	/hamon/	ham
jugo	/huyo/	juice
lago	/layo/	lake
lámpara	/lampara/	lamp
lápiz	/lapis/	pencil
lentes	/lentes/	glasses
llave	/jaβe/	key
llorando	/jorando/	crying
madre	/madre/	mother
mujer	/muher/	woman
naranja	/naranja/	orange
niña	/nipa/	girl
nopal	/nopal/	nopal
pala	/pala/	shovel
pato	/pato/	duck
payaso	/pajaso/	clown
pelota	/pelota/	ball
perro	/pero/	dog
pingüino	/pinguino/	penguin
rana	/rana/	frog

Spanish Word	Transcription	English Translation
reloj	/reloh/	clock
resbaladero	/resβalaðero/	slide
silla	/sija/	chair
tambor	/tambor/	drum
teléfono	/telefono/	telephone
tijeras	/tiheras/	scissors
vaca	/baka/	cow
ventana	/ventana/	window
zanahoria	/sanaorja/	carrot
zipper	/siper/	zipper

Total number of words: **53**

TABLE 6. List of Words Beginning with Common Consonant Clusters

Spanish Word	Transcription	English Translation	Frequency of Occurrence of the Cluster in the Language
grande	/grande/	big	19.72
granero	/granero/	farm	
pregunta	/preyunta/	question	16.30
princesa	/prinsesa/	princess	
frijol	/frihol/	bean	14.28
fruta	/fruta/	fruit	
cueva	/kweβa/	cave	5.10
tren	/tren/	train	4.40
fuelle	/fwente/	fountain	3.57
bruja	/bruha/	witch	3.45
bloque	/bloke/	block	2.59
puerta	/pwerta/	door	2.17
crayola	/krajola/	crayón	1.62
plátano	/platano/	banana	1.08
dragón	/drayon/	dragon	0.80

Total number of words: **15**