

# THEORETICAL LINGUISTICS

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## The Psychological Relevance of Phonological Generalizations in Spanish: An Experiment

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**Abstract:** A psycholinguistic experiment aids in determining if the phonological generalizations which appear in the literature on Spanish phonology are psychologically significant for Spanish speakers. The experiment focuses on whether common phonological alternations play a role in native speakers' perceptions of whether two words share a morpheme. The results indicate that they are a significant factor in speakers' perceptions of morphemic relatedness. Therefore, these findings provide some evidence that these phonological generalizations are psychologically valid, and not merely descriptive in nature.

**Key Words:** psychological reality, experimental approach, psycholinguistics, phonology, Spanish language, allomorphy

### 1. Introduction

Much contemporary phonological research has as its goal to discover and formalize salient phonological and phonetic patterns. Furthermore, the claim is often made that these patterns do not merely exist in a corpus of language data, but that they are relevant to speakers' cognitive capacities. Of course, not all patterns are considered significant. Certain alternations are considered significant because of their frequency in the language, or because they are easily incorporated into a formal representation of the phonological system of the language. Uncommon alternations, or alternations which are difficult to formalize are relegated to the domain of suppletion.

It is the hypothetical dichotomy between common and suppletive alternations which lends itself to experimentation. If language speakers are found to treat alternations which are considered significant by linguists, differently than they do suppletive alternations, that would constitute evidence that the patterns which linguists account for are psychologically significant.

Contemporary phonological analyses have had success in discovering structures, patterns, and generalizations which are to be found in language data. Because these

data have been produced by language speakers, they are available to the speakers to be potentially known, internalized, or captured. However, their mere existence is not proof that speakers have knowledge of them, or utilize them in language production, storage or comprehension. It only demonstrates that those structures and patterns are available to be potentially known or used. In order to determine what is actually known or utilized by the speakers, the focus of the research must turn away from the raw data and back towards the speakers themselves.

Central to this goal of speaker-oriented research, is an experiment designed to determine whether linguistically naive Spanish speakers treat the alternations which have received attention in the literature, differently than they do suppletive alternations. It is carried out in the spirit of Wheeler's vision of psychological phonology. According to Wheeler (1980, 71),

The goal of psychological phonology is to discover what generalizations speakers make from phonological data, not what generalities linguists can discover by analyzing such data in accordance with the principle of maximal generalization.

The experiment is an extension of an experiment by Ohala and Ohala (1987).

ity using *tan* + adj/adv + *como* based on one or more pictures in the collection, (3) to make two comparisons of inequality using *más ... que* or *menos ... que*, (4) to use two of the following words to make a comparison: *mejor*, *peor*, *menor* or *mayor*, and (6) to make a statement about an outfit using the superlative with *el/la más ... de*. Instructors may wish to include bonus items such as: use the expression *más de* in a sentence, use the absolute superlative (*-ísimo*) in a sentence or use *tanto como* in a sentence. Students take turns creating responses. Each student may record his/her sentences on the response sheet or a designated group leader may record the group's responses. As a follow-up activity, classroom teachers can make transparencies of newspaper advertisements featuring clothing. These transparencies serve as vehicles for involving the whole class in critiquing new fashions. In this manner, students practice the different grammatical structures used to make comparisons collaboratively in a non-threatening manner. The instructor is free to work with individuals or small groups that need extra help and to challenge students that have mastered the structures.

"Te cambio" is an example of a kit designed to review the use of direct and indirect object pronouns and vocabulary from past chapters. To create "Te cambio" the teacher needs a large manila envelope, smaller letter sized envelopes, magazine or newspaper pictures, and index cards. After assembling the students in groups of four or five, the teacher provides each group with a letter-size envelope containing a set of pictures and an index card with a list of four categories. The object of this collaborative small group task is to be the first group to obtain one picture of each of the four categories on the index card. Four sample categories might include: *objetos para la clase*, *objetos de valor*, *cosas para los viajes*, and *pasatiempos y diversiones*. The following is an example of the types of classroom exchanges generated between groups with this task:

- ¿Tienen ustedes un objeto de valor?  
—Sí, tenemos un reloj.

- Si nos lo dan, les damos una película.  
—Sí, se lo cambiamos.

Instructors can construct "¿Dónde está?" a similar kit, using pictures with hidden objects such as those found in *Highlights for Children*, an educational children's magazine available at most public libraries, or in *Where's Waldo?* Students work in small groups to find the hidden objects. When students find an object, they must state what object they have found and tell where it is located. A sample exchange among group members follows:

- Veo un gato.  
—¿Dónde lo ves?  
—Lo veo al pie de la página.  
—¿Dónde?  
—A la izquierda. En la hierba. ¿Lo ves?  
—Sí, ahora lo veo.

Tasks that are games create interest and motivate students to interact cooperatively as a team. Classroom exchanges become conversational in nature.

Structuring classroom activities so that students work in small groups on collaborative tasks represents one way to put conversation back into classroom practice. These types of tasks simulate the circumstances found in most language learning outside of the classroom. In natural language learning scenarios, the topics deal with objects and actions that are being observed at the time the exchange occurs. Learner initiations predominate. Learners focus on presenting meanings that can be linked to express ideas. The native speaker provides a guide to syntactic constructions, and the discourse centers on interactions that facilitate communication and social bonding. In this way, communicative interactions facilitate the development of proficiency in the elementary Spanish class.

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## 2. Ohala and Ohala's Experiment

Ohala and Ohala's (1987) experiment involved measuring the degree to which the test subjects perceived pairs of words to have a morpheme in common, or in other words, the degree to which the words are perceived as derivationally related. The use of derivational relatedness in experiments on phonological generalizations is not unmotivated. The rules which underlie phonological alternations are designed to account for the different allomorphs of a single morpheme. Therefore, a logical way of testing their significance, is to determine their role in what words speakers perceive as having a morpheme in common.

A common assumption is that in order for two words to contain the same morpheme, they must be perceived as being both semantically and phonetically similar. The question Ohala and Ohala ask is whether there is a third factor which plays a part in determining morphemic relatedness—the frequency of a phonological alternation in the language. That is, are words which have frequently occurring, well-attested, phonological alternations perceived as being related more often than words which have infrequent alternations?

The word-pair *extreme/extremity*, for example, contains one of the frequent alternations of the English vowel shift ([ij]~[ɛ]). Because of its frequency, this alternation is considered significant. The alternation which holds between *pope/papal* ([ow]~[ej]), on the other hand, is not well-attested in English. Therefore, it is suppletive. If the frequency of an alternation is a factor which speakers use to determine derivational relatedness, then a case can be made that the generalizations which underlie these alternations have psychological significance for those speakers as well.

Ohala and Ohala tested this hypothesis by means of a questionnaire. It consisted of pairs of words. About half of the word-pairs contained frequently occurring phonological alternations such as the one in *extreme/extremity*. Alternations of this type will be called regular alternations. The other half

contained uncommon alternations that must be considered suppletive (*pope/papal*). These alternations will be referred to as isolate alternations. The purpose was to determine if word-pairs with regular phonological alternations would be perceived to have a morpheme in common more often than word-pairs with isolate alternations. The subjects judged each word-pair on a five point scale. They first judged each word-pair for derivational relatedness. Later each pair was judged for semantic similarity.

Ohala and Ohala found that the frequency factor (regular versus isolate alternations) did not affect the subjects' judgments of whether the words in the pair shared a morpheme. In other words, a word-pair containing a regular alternation was not judged to share a morpheme to a greater extent than a pair with an isolate alternation. Of course, the subjects ratings of semantic similarity allowed the different pairs to be judged at the same level of semantic similarity. Ohala and Ohala conclude that,

Whether the word-pair exhibits a phonologically well-attested pattern or not plays no role in subjects' judgments that the word might be derivationally related. . . . It would appear that native speakers, unlike linguists, cannot recognize a linguistically significant generalization when they see one. (1987, 232)

The importance of Ohala and Ohala's study is that in it, they develop a methodological tool which can be utilized to determine the psychological status of phonological generalizations. However, their results are somewhat suspect because the statistical assumptions which they used to arrive at their conclusions are unclear.

Ohala and Ohala calculated three different correlations and compared them. They calculated the correlation between the semantic and derivational relatedness scores of the isolate word-pairs, of the regular word-pairs, and then of the combination of isolate and regular word-pairs together. They found that the amount of variance accounted for by the regular pairs, as well as by the isolate pairs, does not differ substantially from the amount of variance ac-

counted for by the combination of all the word-pairs taken together. The do not specify exactly what analysis they used to determine that there was no substantial difference between the amounts of variance accounted for.

The question which the experiment attempts to determine is whether the isolate and regular groups of word-pairs are significantly different from each other. That is, whether one group rated significantly higher on the scale of derivational relatedness than the other. However, instead of comparing the two groups to each other, Ohala and Ohala compared the two groups to a third group. The third group was comprised of all the word-pairs, both regular and isolate. The real question is whether the means of the isolate and regular groups differ significantly from each other, not whether they differ from the mean which results when the two groups are combined.

It is also unclear why Ohala and Ohala chose to carry out a correlational analysis instead of an analysis of variance (ANOVA). Correlational analyses determine the extent to which two factors are related. In this case, a correlational analysis can determine whether there is a relationship between the subjects' derivational relatedness scores and their semantic relatedness scores. However, the objective of the experiment is to discover whether word-pairs with regular alternations are rated higher on the scale of derivational relatedness than word-pairs with isolate alternations. The objective is not to calculate if there is a higher correlation between derivational and semantic relatedness for one group than there is for the other.

Unlike a correlational analysis, an analysis of variance (ANOVA) allows one to decide if the means of two or more groups are different enough that they can be considered separate groups. It can also determine if the means of the groups are merely different samplings of the same population, and are therefore, not significantly different. The experiment described below utilizes Ohala and Ohala's methodology, but the interpretation of the results is calculated by

means of an ANOVA.

### 3.0. The Word-pair Experiment

The purpose of the experiment is to determine if naive Spanish speakers have any knowledge of the phonological generalizations in their language. Phonologists have used the frequency of phonological patterns in order to determine what patterns are significant. However, this does not mean that these patterns are significant for linguistically naive speakers. For example, Skousen (1973, 172-73) speculates that,

Speakers may, in fact, miss the so-called obvious generalizations and instead set up what may seem to be unnatural and complex morphophonemic rules. We cannot assume what speakers will do with the data they are confronted with in learning a language.

In order to discover what role generalizations play for linguistically naive speakers of Spanish, I carried out the following experiment.

#### 3.1. Subjects

The 25 subjects were all natives of Spain, most of them (16) from Navarre. Seventeen women and eight men took the questionnaire. Twenty of them were between 18 and 20 years old, and the remaining five were between 32 and 49 years old. The average level of education was high; 15 of the subjects had studied until the ages 19 to 22, two had studied until or beyond 26 years of age, and the remaining eight concluded their formal studies between the ages of 14 and 18. Three subjects acknowledged having studied linguistics or philology, which in Spain usually means having studied prescriptive grammar and literature.

#### 3.2. Stimulus Materials

The purpose of this questionnaire was to compare word-pairs which demonstrate well-attested, regular alternations, with word-pairs that contain uncommon, isolate alternations that cannot be derived from general rules. In order to do so, I devised

the list in Table 1. It contains 36 isolate word-pairs and 36 regular word-pairs.

Table 1  
Regular and Isolate Word-pairs

**Isolate Pairs**

cueva/cavidad	'cave, cavity'
salud/sanatorio	'health, hospice'
selva/salvaje	'jungle, savage'
dos/ambos	'two, both'
ojo/óptico	'eye, optical'
vida/vivir	'life, to live'
mundo/vagabundo	'world, vagabond'
rana/renacuajo	'frog, pollywog'
herejía/herético	'heresy, heretic'
sangre/sanguíneo	'blood, blood, adj.'
campeón/competencia	'champion, competition'
Teruel/turolense	'Teruel, native of Teruel'
inglés/anglicano	'English, Anglican'
cazar/captar	'to hunt, to capture'
brazo/braquial	'arm, arm, adj.'
costilla/cosquillas	'rib, tickles'
barra/parrilla	'bar (of iron), grill'
rito/rutinario	'ritual, routine'
pulso/empujar	'pulse, to push'
mano/mendigo	'hand, beggar'
aguja/aguda	'needle, sharp'
hembra/hermosura	'female, beauty'
cómplice/complacer	'accomplice, to please'
llorar/llanto	'to cry, cry'
oro/dorado	'gold, golden'
baño/balneario	'bath, health spa'
correr/carrera	'to run, race'
nasal/nariz	'nasal, nose'
gordo/grueso	'fat, thick'
hielo/congelar	'ice, to freeze'
resucitar/resurrección	'to resurrect, resurrection'
amigo/amistad	'friend, friendship'
diez/décimo	'ten, tenth'
revés/reversa	'backwards, reverse'
heredar/herencia	'to inherit, inheritance'
boca/bozal	'mouth, muzzle'

**Regular pairs**

saludar/salutación	'to greet, greeting'
vértigo/vertical	'vertigo, vertical'
dividir/divisor	'to divide, divisor'
presumido/presunción	'conceited, conceit'
vil/villano	'vile, rustic'

lado/lateral	'side, lateral'
huésped/hospital	'guest, hospital'
margen/marginado	'margin, alienated'
despecho/despectivo	'spite, spiteful'
igual/equidad	'equal, equity'
eje/axial	'axle, axle, adj.'
yegua/equitación	'mare, horsemanship'
crisis/crítica	'crisis, critical'
génesis/genético	'genesis, genetic'
divertir/diversidad	'to amuse, diversity'
bien/beneficio	'well, benefit'
suelto/soltero	'unattached, bachelor'
huelga/holgazán	'strike, lazy person'
comité/cometer	'committee, to commit'
natal/nación	'natal, nation'
ademán/mañoso	'gesture, skillful'
conejo/conexión	'rabbit, connection'
miel/melón	'honey, melon'
insecto/sección	'insect, section'
ducha/conducto	'shower, conduit'
inversa/invertir	'reverse, to invest'
monje/Mongolia	'monk, Mongolia'
reflejo/reflexivo	'reflection, reflexive'
redimir/redentor	'to redeem, redeemer'
que/cual	'that, which'
relato/relación	'story, relationship'
fondo/fundamental	'bottom, fundamental'
desdén/desdeñoso	'scorn, scornful'
lumen/luminoso	'lumen, bright'
colmo/culminación	'limit, culmination'
dicho/dictadura	'said, dictatorship'

I designed the list with several criteria in mind. As in previous experiments (Ohala and Ohala 1987; Derwing and Baker 1977), I chose words which demonstrate a wide range of possible semantic similarity. In this way, subjects were exposed to a true continuum of word-pairs that could be judged to be very similar, or not similar at all. Since the questionnaire was designed to determine what morphemic and semantic associations naive native speakers may make synchronically, whether a word-pair has a diachronic relationship or not is irrelevant.

It is highly possible that in some cases naive speakers relate diachronically unrelated words while failing to relate diachronically associated ones. This, in fact, was found to be the case in several instances; the subjects ratings of derivational related-

ness were higher for the historically unrelated pairs *carrera/correr*, *llanto/llorar*, and *resucitar/resurrección*, than they were for the diachronically related pairs *pulso/empujar*, *divertir/diversidad*, *huésped/hospital*, and *yegua/equitación*. At any rate, it is unrealistic to assume that naive speakers have the same knowledge of historical relationships that linguists have.

Because the questionnaire consisted of visually presented stimuli, word-pairs were chosen in which there was at least one spelling change in what could be interpreted as the root morpheme (e.g. *inver/t/+ir* vs. *inver/s/+a*). This requirement eliminated some alternations which are not represented graphemically, such as the alternation between [k] and [θ] in *apical* and *ápice* 'apical, apex.'

An attempt was made to roughly equalize the number of changes that occur in the root morpheme of each pair of words, so that approximately the same number of word-pairs in the isolate and regular lists would have the same number of changes. This was done by considering the alternation between a single vowel or consonant, and a vowel or consonant cluster as one change (e.g. *h/wé/sp+ed* vs. *h/o/sp+ital*; *o/x/+o* vs. *ó/pt/+ico*). Metathesis, as well as the addition of a letter (*revés* vs. *reve/r/s+a*), were also counted as one change, therefore there are two changes between *he/mbr/+a*

and *he/rm/+osura*. Of the isolate word-pairs, 29 have only one change, five have two, and two pairs have three changes. Thirty one of the regular word-pairs have one change, and five pairs show two changes.

The regular word-pairs were taken from examples found in the literature on Spanish phonology, or are words that could in principle be derived from the same root by the application of the rules set forth in the literature. Fifteen rule based alternations are represented in the regular word-pair list (Table 2).

Table 2  
Alternations in Stimulus Words

- I. The pairs *saludar/salutación*, *vértigo/vertical*, and *lado/lateral* are examples of lenition (Harris 1969, 43; Cressey 1978, 91).
- II. The alternation between /δ/ and /s/ in *divertir/diversidad*, *invertir/inversa*, and *dividir/divisor* may be ascribed to a rule which converts the stem final /δ/ or stem final /t/ of a second or third conjugation verb into /s/ in certain contexts (Harris 1969, 143/54; Pilleux 1979, 64-65).
- III. Harris considers the pairs *yegua/equitación*, *igual/equidad*, and *que/cual* to 'share a formative' and sets up a rule which relates /k/ and /gw/ or /kw/ in each pair (1969, 153-57), while Hooper accounts for them with disjunctive listings (1976, 63).
- IV. The questionnaire pairs *despecho/despectivo*, *ducha/conducto*, and *dicho/dictadura* reflect a rule or disjunctive listing which relates /kt/ and /č/ (Harris 1969, 168-72; Hooper 1976, 8-20).
- V. The alternation between /ks/ and /x/ has similarly been described as rule governed (Harris 1969, 168-72; Cressey 1978, 90); *eje/axial*, *reflejo/reflexivo*, and *conejo/conexión* contain this alternation.
- VI. The pairs *presumido/presunción*, and *redimir/redentor* are examples of nasal assimilation (Harris 1984).
- VII. Because velar softening is not represented graphemically, it was difficult to find word-pairs with the alternations /ɣ/~ /x/ and /k/~ /θ/; *monje/Mongolia* is the sole questionnaire item demonstrating velar softening.
- VIII. Diphthongization has received a great deal of attention in the literature (e.g. Harris 1985; Hooper 1976, 45-49; García-Bellido 1986). This alternation is reflected in *huésped/hospital*, *suelto/soltero*, *yegua/equitación*, *miel/melón*, *huelga/holgazán*, and *bien/beneficio*.
- IX. In *crisis/crítica*, and *génesis/genético* nouns ending in /-sis/ correspond to adjectives with /-tik-/ as described by Pilleux (1979, 61-62).
- X. Similarly, nouns ending in /-Cen/ correspond to non-nouns with /-Cin-/ as in *margen/marginado*, and *lumen/luminoso* (Pilleux 1979, 56).
- XI. The word-pair *cometer/comité* demonstrates the constraint which prohibits /i/ in the root of second conjugation verbs (Harris 1977).
- XII. The fact that /e/ is not found in the root of third conjugation verbs is represented in the pair *redimir/redentor* (Harris 1977).
- XIII. Pilleux considers the alternation between /o/ and /u/ in pairs such as *fondo/fundamental*, and *colmo/culminación* to be a morphologically conditioned alternation (1979,

58).

XIV. The alternation in *natal/nación*, and *insecto/sección* reflect a rule that transforms /t/ into /s/ (or into  $\theta$  in the dialect area these data come from) before a front vowel followed by another vowel (Harris 1969, 142-43).

The alternation between palatal and nonpalatal consonants of the type seen in *vil/villano*, *ademán/mañoso*, *desdén/desdeñoso* has been discussed in terms of rules by Harris (1982), Contreras (1977) and Wong-opasi (1987).

As with the regular word-pairs, isolate word-pairs were selected which demonstrate a range of possible semantic similarity. In order for an alternation to be considered isolate it could not have been described in the literature on Spanish phonology. For example, the alternation between / $\theta$ / and /pt/ (*cazar*, *captar*) is not considered significant. The /a~/e/ alternation of *rana*, *renacuajo* is considered an isolate one even though such an alternation has been described in the literature (e.g. *leche*, *láctico* 'milk, lactic'). This is because it occurs in a context unrelated to the alternation described in the literature. The /e/ < /a/ does not appear before /č/ in *renacuajo*, while it is the existence of /č/, (or at least some precursor of /č/ in a derivation) which triggers the raising of /a/ to /e/ in *leche* and other words which the rule is designed to account for.

It is for this same reason that three different isolate pairs with the alternation /a~/e/ are still considered isolates; *selva/salvaje*, *mano/mendigo*, and *rana/renacuajo* all contain an /a/ that alternates with an /e/. However, there is no phonological or morphological context that these three pairs have in common which would allow them to be considered instances of the same general rule, and hence underlie a generalization.<sup>1</sup>

The reason for classifying an alternation as an isolate one is more often than not, a matter of what intuitively looks isolate. The alternation between / $\delta$ / and / $\beta$ / in *vida/vivir* appears to be limited to that one pair of words, but it is entirely possible that some speaker may strongly relate another pair of words with that same alternation, and in that same context. Nevertheless, if an alternation seemed to apply exclusively to only one pair of words, in a unique con-

text, it was considered isolate.

It is worth noting that three isolate word-pairs contain alternations which are counterexamples to the general rules. Velar softening creates pairs in which a /k/ appears before a back vowel, and which alternates with a / $\theta$ / before a front vowel. In *brazo/braquial* the opposite is true, and in *boca/bozal* a / $\theta$ / appears before a back vowel. Stressless mid-vowels usually alternate with stressed diphthongs, yet there is no diphthong in *décimo* (compare to *diez* 'ten').

### 3.3. Design

The regular and isolate word-pairs were randomized in regards to the question number they were assigned in the questionnaire, as well as in regards to which member of the pair preceded the other in any given question. Eight filler items, which were not relevant to the study, were also included. The resulting order of 80 test questions appeared in the first part of the questionnaire. The word-pairs were again randomized as above and the resulting order appeared in the second part of questionnaire. As a result, each subject responded to a total of 160 items.

Studies by Ohala and Ohala (1987), and Derwing and Baker (1977) had three parts. The subjects ranked word-pairs according to semantic, derivational, and phonetic similarity. However, since phonetic similarity was roughly equalized across the regular and isolate word lists, the subjects only rated the words for semantic and derivational similarity.

The independent variable in this experiment is the category the word-pair belongs to (regular or isolate alternation). The subjects' rating of semantic relatedness is a covariate, and the subjects' rating of deriva-



tional relatedness is the dependent variable.

### 3.4. Procedure

The first part of the questionnaire determines to what extent the subjects judged each word-pair to be semantically similar. The subjects were given both written and oral instructions. They were asked to judge how similar in meaning they felt that each word-pair was. The subjects rated each word-pair on a Lickert-type scale of one to five. Two examples were included following the written instructions in order to give the subjects a more clear idea of what was being asked of them. The pair *pan/pantalón* 'bread, pants' was given as an example of an item which was not semantically similar, and therefore, ranked as a '1' on the scale. On the other hand, the item *latir/latido* 'to beat, heartbeat' would be given a '5' because of the close semantic similarity of the words. The subjects were allowed to take as much time to complete the task as they needed, and the experimenter was present at all times.

The second part of the questionnaire determines the extent to which the subjects felt each word-pair shared a morpheme, that is the word-pairs' derivational relatedness. After completing the first part of the questionnaire, the subjects were given oral and written instructions for the second part. They were told that two words may look similar out of mere coincidence, or because they share the same root. To illustrate this point, the words *pie* and *piedad* 'foot, piety' were given as an example of two words which are similar out of coincidence, and should be given a '1' on the five point scale. The words *Madrid* and *madrileño* 'Madrid, native of Madrid', on the other hand, share

the same root, which accounts for their similarity. This pair should be assigned a '5' on the scale. In the instructions, emphasis was put on the fact that the subjects were no longer to judge the word-pairs as to how related they were in meaning. Although they would see the same words, the next task was independent from the first.

### 3.5. Results

The mean derivational relatedness rating for the word-pairs, at each of the five levels of semantic relatedness, is illustrated in Table 3.

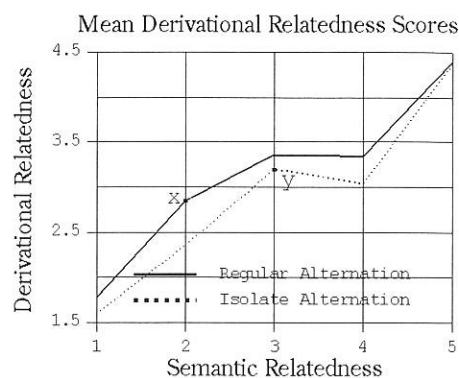


Table 3

As can be seen, word-pairs with regular alternations received higher derivational relatedness scores than word-pairs with isolate alternations, at all five levels of semantic similarity. A two-way ANOVA was performed to determine what factors influenced the subjects' judgements of derivational relatedness. The two factors are the nature of the alternation found in the word-pair (regular or isolate), and semantic relatedness. The results appear in Table 4.

No significant interaction was found be-

Table 4  
Results of the ANOVA

Source of Variation	DF	Sum of Squares	F	p ≤
Semantic Relatedness	4	2009.786	325.601	.001
Regular or Isolate Alternation	1	11.289	7.316	.007
2-way Interactions	4	8.905	1.443	.217

tween the derivational relatedness ratings and the type of alternation in the word-pairs ( $p \leq .217$ ). The subjects' ratings of a word-pair's semantic relatedness were extremely significant ( $p \leq .001$  level). This is to be expected since there is a strong correlation between peoples' judgements about whether two words have a similar meaning, and whether they contain the same root.

More important, however, is whether word-pairs with regular alternations would be judged to be derivationally related to a greater degree than word-pairs containing isolate alternations. The graph in Table 3 shows this difference. The lines represent the subjects' mean derivational relatedness rating for the word-pairs, at each of the five levels of semantic relatedness. For example, point 'x' represents the mean derivational rating given to those word-pairs with regular alternations, which were given a rating of '2' on the scale of semantic relatedness. Point 'y' represents the mean derivational relatedness rating of word-pairs with isolate alternations, which were given a semantic relatedness rating of '3.'

The results of the ANOVA indicate that the distance between the two lines is very significant ( $p \leq .007$ ). That is, the line representing word-pairs with regular alternations is significantly separated from the line representing word-pairs with isolate alternations. It is interesting to note that the point of greatest divergence occurs in the middle of the semantic relatedness scale. This suggests that the subjects were more likely to perceive word-pairs with regular alternations as derivationally related when they were most unsure of the word-pair's semantic relatedness.

### 3.6. Discussion

The results of this study indicate that the type of alternation exhibited by the word-pairs (regular or isolate) influenced the subjects' derivational relatedness ratings. More specifically, word-pairs with regular alternations were judged to share a morpheme to a greater extent than word-pairs with isolate alternations. This suggests that the subjects

have knowledge about what patterns are common and uncommon in the morphophonology of Spanish. Furthermore, they put this knowledge to use in determining whether two words have a common root or not.

The results of this experiment provide some evidence for the psychological significance of phonological generalizations. The regular alternations in the experiment correspond to phonological alternations which are considered significant, while the isolate alternations do not. In the experiment, the type of alternation found in a word-pair was a significant factor in determining the degree of derivational relatedness. Therefore, it appears that phonological generalizations are psychologically real in that they play a role in the subjects' perception of whether the word-pairs are derivationally related or not.

It is important not to draw any unwarranted conclusions from these results. The subjects in this study were asked to make a very careful, conscious, and deliberate analysis. It would be unjustified to construe these results as evidence that such generalizations play any part in actual perception or production strategies, or in on-line derivation of related words from single underlying morphemes.

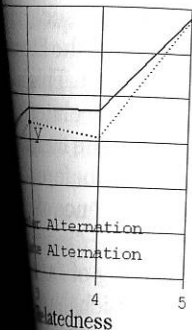
### 4. Conclusions

The search for generalizations represents an attempt to codify phonological systems, which exist in the minds of language speakers, and are somehow manipulated by them. Therefore, it is highly possible that there is some correlation between the generalizations which are found in a language and the actual knowledge that speakers have about the phonological system of their language. The major premise of the experiment is that if phonological generalizations are psychologically significant, Spanish speakers should treat the phonological alternations they underlie differently than alternations which are suppletive.

Common (regular) phonological alternations, which exemplify linguistic generali-

ational relatedness rating  
at each of the five levels  
ness, is illustrated in

Mean Derivational Relatedness Scores



with regular al-  
derivational re-  
word-pairs with iso-  
levels of seman-  
ANOVA was per-  
factors influ-  
ments of deriva-  
factors are the  
in the word-  
semantic relat-  
Table 4.  
as found be-

zations, were contrasted with uncommon (isolate) alternations. The experiment involved measuring the degree to which the test subjects perceived pairs of words to have a morpheme in common—their derivational relatedness.

The outcome argues in favor of a psychological interpretation of phonological generalizations. The subjects perceived word-pairs with regular alternations to share a morpheme to a greater extent than word-pairs with isolate alternations. In other words, the factor regular versus isolate alternation was a significant factor in the subjects' perceptions of derivational relatedness. This suggests that the subjects have made generalizations about what alternations are common and uncommon and put that knowledge to use in determining derivational relatedness.

These results are by no means definitive. The list of regular and isolate word-pairs is central to the experiment. One thing which will strengthen the validity of the results of the word-pair experiment will be to replicate it with a different set of test words. If similar outcomes are achieved, then the results are less likely to be due to the test material, and more likely to be dependent on the type of alternation exhibited by each pair of words.

In any event, it is my hope that this experiment will stimulate others to probe the minds of language speakers in order to discover what kinds of knowledge speakers have about their language. As far as phonological generalizations are concerned, once a large body of evidence has been amassed on them, their role in language processing will become more apparent and more definite conclusions may be reached.<sup>2</sup>

#### ■ NOTES

<sup>1</sup>The pairs *inglés/anglicano* and *cómplice/complacer* also share the alternation /a/~i/, but without having a phonological or morphological context in common.

<sup>2</sup>I wish to thank Orlando Kelm for his input and critique of the experiment.

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