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MARKEDNESS AND THE PERCEPTION OF SPANISH OBSTRUENTS

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ABSTRACT

MARKEDNESS AND THE PERCEPTION OF SPANISH OBSTRUENTS

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This study attempts to explain processing errors that occur in a second language learning context on the basis of markedness theory and equivalence classification (Flege 1987). Specifically, the context is where native Spanish speakers (NSS) misperceive the speech of native English speakers (NES) producing Spanish words.

A theory of markedness is developed which combines universal and language particular markedness notions. Equivalence classification (EC) deals with the production and perception of 'new', 'similar' and 'identical' sounds in a second language learning context and is used to explain errors by NSS.

It was predicted on the basis of markedness and EC that if English speakers pronounced todo 'all' as [toDo] then the NSS would perceive this as toro 'bull' rather than todo because English [D] and Spanish [r] are similar sounds on the basis of shared distinctive features and that Spanish [d] is marked intervocalically.

The results of the test showed that there were misperceptions by NSS. For example, they heard sera [sera] 'will be' for seda [seδa] 'silk' and toro [toro] 'bull' for todo [toδo] 'all'.

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Chapter 1

INTRODUCTION

During the 1950s and 1960s, languages were compared to each other using a technique called Contrastive Analysis (CA). The ease or difficulty in acquiring another language was thought to be directly related to how similar the two languages were to each other. The goal of CA was to predict what difficulties the learner would face with a new language. An example of a CA analysis of English and Spanish is in Stockwell and Bowen (1965).

This study will look at the production and perception of Spanish obstruents [b, d, g] in a second language learning context. Specifically the context is where native Spanish speakers misperceive the speech of native English speakers producing Spanish words. Previous studies concerning processing errors of Spanish voiced obstruents were done under CA methods. Generalizations about Spanish-English production errors were given in Stockwell and Bowen (1965), Politzer and Staubach (1965), and Cardenas (1961). In these studies, errors were given but it was not explained why they occur.

The goal of this paper is to show that there may be difficulties in perception by native Spanish speakers concerning the feature [continuant] in voiced obstruents when non-native speakers of Spanish use the marked value. It will be shown that [+continuant] can

be the unmarked value in voiced obstruents in the environment following a [+vocoid] segment.

The perceptions of native Spanish speakers (NSS) were analyzed in this study. The NSS heard productions of Spanish words by native English speakers (NES). These Spanish words were minimal pairs such as todo 'all' and toro 'bull'. Minimal pairs with a [ð] ~ [r] alternation were chosen in order to test the perception of a NSS.

In Spanish, [ð] is pronounced intervocalically while [d] is used utterance initially and following a nasal consonant. In English, [d] can be pronounced intervocalically. A flapping rule applies in English in the following environment: /d/ → [D] / $\acute{V}$__ V (Kenstowicz 1994: 68). For example, /lædər/ → [læDər] 'ladder' and /raydər/ → [rayDər] 'rider'. If an English speaker pronounces todo 'all' as [toDo], then a NSS may misperceive the word as toro 'bull'. The results of the test showed that there were misperceptions by NSS. For example, they heard sera 'will be' for seda 'silk' and toro 'bull' for todo 'all'.

The phonological background will be Autosegmental and Lexical Phonology. These are grounded in the Generative Phonology framework in which phonological structure are analyzed as segments and distinctive features. A key element that will be developed from this background is Underspecification Theory. This is the idea that a phone may not be lexically fully specified for all its features, which are filled in by rules.

The view of Radical Underspecification is that only marked features may be specified in the lexicon. This study will appeal to markedness and will develop a theory of markedness.

Second language acquisition (SLA) theory as it relates to second language processing will also be developed in this study. The production of a second language sound system and the perception by native speakers of non-native speaker productions are the main focus of this study. Studies by Flege (1987, 1991) deal with the production and perception of what he classifies as 'new', 'similar' and 'identical' sounds. This classification of second language sound production along with markedness theory will be used to explain the perception difficulties of Spanish speakers in this study.

Chapter 2

THEORETICAL BACKGROUND

2.1 Markedness Theory

2.1.1 Historical Perspective

The study of markedness has taken two distinct directions. One focuses on markedness universally across all languages, and the other direction focuses on markedness within a particular language. At times these studies have been viewed as in opposition to one another.

The theory of markedness itself was founded on work by Roman Jakobson and Nikolai Trubetzkoy. Jakobson looked at markedness in a general manner and attempted to deal with markedness as a universal aspect of language (Andrews 1990:13). Trubetzkoy limited his focus to phonology. He first used the terms 'marked' and 'unmarked' in his article "Die phonologishen Systeme" (1931). The major ideas of the theory of markedness have never been agreed upon. Trubetzkoy and Jakobson both developed markedness around the same time but they defined key elements such as 'marked', 'unmarked' and 'opposition' differently (Andrews 1990:13).

Trubetzkoy focused on markedness in application to phonology. He did not favor the binary system of opposition that Jakobson favored. Trubetzkoy proposed three types of contrasts of phonemes: (i) privative: two phonemes are identical except that one

contains a "mark" the other one lacks (eg. voicing in /b/ vs. /p/); (ii) gradual: phonemes have different degrees of a gradient property (eg. height in /i/ ~ /e/ ~ /æ/); (iii) equipollent: each member has a mark that the other lacks (eg. place of articulation in /p/ ~ /t/ ~ /k/) (Sampson 1980:108; Andrews 1990:14).

Jakobson extended markedness oppositions from phonology to morphology and semantics. In phonology, the term 'distinctive feature' was used to mean a binary markedness opposition that Jakobson proposed (Andrews 1990:13). A segment could have one of only two feature values which were indicated by a + or -.

The distinction between a 'universalist' and a 'particularist' markedness view began in the 1960s and still continues today. Joseph Greenberg has been a leading proponent of universal markedness relations in phonology as well as syntax and semantics. Postal (1968) and Chomsky and Halle (1968) also developed theories of markedness which appealed to universal ideas.

The language-particular camp was really started by Jakobson. Early in his studies on markedness he looked at markedness universally but later he focused on markedness in particular languages. Battistella (1990) describes the differences between looking at markedness universally and in a particular language. These differences will be explained in more detail below.

2.1.2 Markedness Value Determination

2.1.2.1 Universal Markedness Criteria

The criteria for determining markedness values differs when analyzing markedness from a universal or particular language point of view. Universal markedness studies such as Greenberg (1966) places emphasis on the high frequency of the unmarked sounds and the relative complexity of the marked sounds in phonology. Postal (1968) and Chomsky and Halle (1968) also make decisions based on data from dialect variation and sound change and physiological / perceptual findings.

First of all, relative frequency plays an important role in determining the markedness of a feature. Cross-linguistic frequency is given high priority when determining universal markedness. The unmarked case will have more frequency across the world's languages than the marked value which may only occur in a few languages. An example is the value [+spread glottis] which determines the aspirated forms of consonants. In a cross-linguistic inventory of voiceless stops in Maddieson (1984:27), 291 languages have plain voiceless stops (91.8%) as compared with 91 languages which have aspirated voiceless stops (28.7%). The unmarked value [-spread glottis] is more frequent than the marked value by far.

Greenberg (1966:17) states that the unmarked values have a higher frequency than marked values. He gives as an example the feature [nasal]. In Bengali and French, nonnasalized vowels outnumbered nasalized vowels. In Bengali, the ratio was 50:1 and in French the percentage was 82.5% to 17.5% in favor of oral vowels. He concludes that due to relative frequency, [-nasal] is the unmarked feature.

A point of clarification needs to be stated relating to frequency and markedness. A feature value is not unmarked because it is frequent, it is frequent *because* the feature is unmarked. Guitart (1979:54) explains: "Unmarked does not mean 'more frequent', or 'expected in positions of neutralization', or 'acquired first', etc. Unmarked means 'less complex' and Marked, 'more complex', and the complexity is either of a physiological or a perceptual nature."

The second criterion used to determine markedness is the relative complexity of the feature value. This is also related to the idea that the unmarked value is more 'natural' than the marked value. The notion of 'complexity' or 'simplicity' was described by Trubetzkoy as being a markedness distinction: "'a natural absence of marking' is attributed to that opposition member whose production requires the least deviation from normal breathing" (Trubetzkoy 1969:146). Articulatory and perceptual complexity can both be taken into account for markedness determination. Battistella (1990:49) states:

> the relevant notion of simplicity in phonology will be one that takes articulator and acoustic naturalness into account where articulatorily simple features will be those whose articulation requires the minimal deformation of the vocal tract from a neutral rest position and acoustically simple ones will be those that are most easily perceived.

For example, it was shown that the feature [+spread glottis] was the marked value as evidenced by frequency but aspiration is also presumably more 'complex' than plain articulation of stops. The feature [+constricted glottis] which is the feature that determines glotallalization is also more complex. How marked a feature is depends on how far the feature strays from the 'ideal' position (cf. Cairns 1969:878; Jakobson 1962:266).

2.1.2.2 Language Particular Markedness Criteria

The criteria for determining markedness within a particular language are different from those used for universal markedness considerations. Those who look at markedness from a language particular point of view will appeal to the distribution of sounds in a particular language. The frequency of the unmarked sound is given high priority in determining markedness values. 'Neutralization' describes the distribution patterns of the marked and unmarked in a language (Battistella 1990:51).

The frequency of a sound within a language is the focus of language-particular markedness. Frequency is looked at in different ways depending on a universal or particular language view. As an illustration of this difference the terms 'type' and 'token' can be used. Type frequency is used in a universal analysis. This refers to comparing many languages to see if a certain phone is a part of their phonetic inventories. The occurrence of a particular sound in a language inventory is counted. For a language particular analysis, the frequency of tokens is analyzed. The number of times a particular sound is used in a language is counted, usually as a percentage of usage compared to other phones in the language. The distribution of phones in a language is important in determining markedness values language specifically.

To illustrate the difference between type frequency and token frequency, the following are examples of how markedness is determined in both cases. An example of type frequency was given above with the feature [+ spread glottis] (Maddieson 1984:27).

Out of 317 languages surveyed, 291 had plain voiceless stops while 91 had aspirated voiceless stops. The unmarked value of [-spread glottis] is due to the greater frequency of the value across many languages.

An example of token frequency can be illustrated in English. The relative frequencies of the features [coronal] to [labial] and [velar] are analyzed. In a survey of 10,000 words of adult conversation, the following numbers and percentages of use were calculated (figure 2.1).

[+coronal]	/t/ 2248 4.615%	/d/ 1827 3.767%
[+velar]	/k/ 1414 2.903%	/g/ 598 1.228%
[+labial]	/p/ 694 1.425%	/b/ 877 1.800%

Figure 2.1: Frequency of English obstruents out of 10,000 spoken words. (Carterette and Jones 1974:445)

In Carterette and Jones (1974), the higher frequency of [+coronal] is shown by percentages of 4.615% and 3.767% for /t/ and /d/ respectively. The velar and labial obstruents have a lower percentage of occurrence in English. This is evidence that [+coronal] is the unmarked place of articulation in English.

The second criterion for particular language markedness is neutralization. When two sounds can contrast in a language but fail to do so in an environment, the unmarked value appears and there is a neutralization of the contrast between the marked and unmarked values. For example, in English the stop consonants /p, t, k/ have corresponding voiced stop consonants /b, d, g/. These are all phonemes in English and may occur in the same

position to make minimal pairs such as in initial position: pit, bit, tin, din, kin, etc. In the context following an /s/, the contrast is neutralized. There are spin, stop, and ski but there are no sbin, sdop, or sgi. The voiceless consonants remain after neutralization so [-voiced] would be the unmarked value in the environment # s__ (Battistella uses [tense] and [lax] in his example, so /p, t, k / (tense) are unmarked while /b, d, g/ (lax) are marked) (Battistella 1990:47).

2.1.2.3 The Relation Between Universal and Language Particular Markedness

This study will follow from the premise that universal markedness values reflect in general what features are marked or unmarked in languages. Universal markedness values are expressed in statements as to what is usually found across the world's languages. Universal markedness distinctions have been defined by the relative frequency and complexity of feature values across the world's languages. These are taken to be the regular tendencies of language or as general ways of categorizing language as a system.

In this study, universal markedness values will be appealed to and developed through the criteria of relative frequency and complexity. However, the definition of markedness of a feature value, for example, will then be applied to a particular language and to specific environments. The markedness value in these environments may not be the "common" or "general" markedness value.

Battistella (1990:54) addresses the concept of 'context-sensitive markedness':

> Two considerations are important with respect to phonological markedness relations: context sensitivity and universality. With respect to the first, it is important to recognize the markedness relations between phonological features are contextual in nature; the markedness values of phonological features are not immutable within a phonological system, but instead are determined according to the co-occurring features of a phoneme (its simultaneous context) and according to

the surrounding phonetic environment (its sequential or syllable-structure context).

An example of a markedness value that is changed due to its sequential context is shown when /t/ , which is relatively unmarked, would be marked when preceding a /d/ or an /l/. In those contexts, the features of /t/ that were unmarked when analyzed separately may be marked due to context (Battistella 1990:55).

2.2 Autosegmental and Lexical Phonology

Generative Phonology as set forth in Chomsky and Halle (1968) is the foundation for both Autosegmental Phonology and Lexical Phonology. The basis of a Generative Phonology (GP) framework is a lexical or underlying representation modified by rules. The basic units in GP are distinctive binary features which classify each phone in a language. Autosegmental Phonology (AP) and Lexical Phonology (LP) are both grounded in GP ideas but modify certain aspects for better explanation of the facts.

2.2.1 Autosegmental Phonology

Autosegmental Phonology differs from GP in that phonological representation does not consist of a single row of segments, but consists of different levels or tiers. AP was developed in Goldsmith (1976) as a means of explaining tonal languages. The argument put forth is that tones are on a separate tier and there is not a lexical one-to-one relationship between a tone and a segment.

AP has been used to analyze other features of phonology than tones. A characteristic of AP is a non-linear character of phonological representation. In a non-linear model, there is not a one-to-one relation between feature specifications and segments of the

string. One feature value [F] can be distributed over more than one position just as one tone can.

Another characteristic of AP that is important to this study is the notion of assimilation as a spreading process. Spreading in AP was at first studied in regard to tone. Later, however, it has been proposed that assimilation processes such as place of articulation assimilation or palatalization should be viewed as the spreading of a feature.

2.2.2 Lexical Phonology

Lexical Phonology is also a further development of GP and has both a phonological and morphological aspect. The work of Paul Kiparsky (1982) has guided much of the study of LP. Important aspects of LP include the Strict Cycle Condition, the Elsewhere Condition, Structure Preservation, and Underspecification Theory.

This study will appeal most directly to Underspecification Theory, which also developed from the interaction of AP with LP. Reference to the Elsewhere Condition will also be included in the study and will be extended to markedness theory.

A basic aspect of LP is the distinction of Lexical rules and Post-Lexical rules. Lexical rules: (i) have access to the internal structure of words, (ii) have exceptions, (iii) are cyclic, (iv) cannot apply to non-derived forms, (v) are subject to the SCC, and (vi) are structure preserving.

Post-Lexical rules: (i) have no access to the internal structure of words, (ii) have no exceptions, (iii) are non cyclic, (iv) apply across the board, (v) may apply to non-derived forms, (vi) are not subject to the SCC, and (vii) are not structure preserving.

Post-Lexical rules always apply and are like allophonic rules. Lexical rules are the default rules and will be explained more in the section relevant to Underspecification Theory.

The Elsewhere Condition (EC), explained in Kiparsky (1973), states that when two rules can apply with different results, the more particular rule overrules the more general rule. The EC has an important role in markedness theory in that a more particular language-specific markedness rule will overrule a more general universal rule if they are in the EC relationship.

In general, the idea that phonological features can be left unspecified in underlying representations is Underspecification Theory. There are differing viewpoints as to what exactly is specified in an underlying or lexical representation and what is not. There is a general agreement that non-contrastive features are not specified underlyingly and are specified by rule. The theories differ over the necessity of specifying all contrastive features. Redundant features are specified by feature filling rules. These redundancy rules are lexical rules (also called "lexical redundancy rules"). For example, in English the assignment of [+voice] to those phones specified as [+sonorant] is a lexical redundancy rule.

Post-Lexical rules: (i) operate crucially across morpheme boundaries or making critical use of phrasal or syntactic structure; and (ii) fill in, specify, or refer to non-contrastive features (Kenstowicz 1994:209). Spirantization in Spanish is a result of a post-lexical rule. An obstruent may spirantize word internally (i.e. <u>diga</u> [diɣa]) or across morpheme boundaries (cf. <u>la gata</u> [laɣata] and <u>un gato</u> [uŋgato]).

2.3 Underspecification Theory

In underspecification theory, there has been much debate as to what exactly is allowed to be specified underlyingly. Two main camps have emerged: Restricted and Radical Underspecification.

A restricted underspecification account (Steriade 1995) will specify underlyingly both the '+' and '-' values of a contrastive feature. The feature values that are not contrastive can be unspecified in the underlying representation.

Archangeli (1984, 1988) and Archangeli and Pulleyblank (1989) support a Radical Underspecification framework. In radical underspecification, generally only the marked value of a contrastive feature is specified underlyingly in all contexts. The unmarked or default value of a contrastive feature is unspecified (along with all noncontrastive features) and is filled in by a context-free default rule. As mentioned above, a default rule is a lexical rule. In this account, the unmarked value will be assigned.

Kiparsky (1982) supports a Radical Underspecification account. In Kiparsky (1993), he relies on radical underspecification but he also suggests the idea of context sensitivity in determining markedness and underspecification.

There have been some reviewers of Kiparsky (1993) that have gone as far as saying that radical underspecification according to Archangeli et al is "context-free" and Kiparsky (1993) is changing this to a "context-sensitive" account (cf. Iverson 1993, Dinnsen & Chin 1995, Dinnsen 1996).

Dinnsen (1996) illustrates the differences between Restricted Underspecification with Context-Free and Context-Sensitive Underspecification. In context-free radical

underspecification, the marked value of a contrastive feature is specified underlyingly in all contexts (1996:59). The unmarked value is unspecified and is filled in by a context-free rule (1996:59). In context-sensitive radical underspecification, context determines the underspecification of features. Dinnsen states, "This acknowledges that a given feature may be the default value in one context and that the opposite value may be the default in another context." (1996:59). He further states that, " [t]he consequence is that both values of a contrastive feature can be specified underlyingly, but not in the same contexts, preserving strict binarity" (1996:59).

		Context	
Framework	Sounds	X	Y
Restricted underspecification	A	[+F]	[+F]
	B	[-F]	[-F]
Context-free radical underspecification	A	[+F]	[+F]
	B	Ø	Ø
Context-sensitive radical underspecification	A	[+F]	Ø
	B	Ø	[-F]

Sounds A/B are contrastive and differ by [F] only.
'Ø' = underspecified

Figure 2.2: Three frameworks of underspecification (based on Dinnsen 1996:60)

Figure 2.2 illustrates the three frameworks of underspecification. The [-F] feature in the context-free radical underspecification account is the default value and is filled in by a context-free default rule. In the context-sensitive account, the [-F] in context X and the

[+F] in context Y are the default values and are filled in by a context-sensitive rule (Dinnsen 1996:60).

An example of context-sensitive underspecification has been illustrated in English quantity alternations in vowels (Kiparsky 1984, Iverson 1994:266). In English, vowel length may be long (*paint*) or short (*tent*) before consonant clusters in the same morpheme. A vowel is only short before Level 1 suffixes which create consonant clusters such as in the word *meant*. The vowel is predictably short before the irregular suffix *-t* but it is long before other suffixes (*meaning, means*, etc.) (Iverson 1994:266).
The feature [+long] would be given by default rule and vowels which do not fit in the environment of the precluster shortening rule are underspecified for length. The vowel in *pen* would be specified as [-long] underlyingly but the vowel in *mean* is unspecified for length. In the word *paint*, the vowel is specified as [+long] to avoid the vowel shortening rule application in precluster position since it is a nonderived context (Iverson 1994:266). In the word *tent*, a short vowel appears before a consonant cluster. The value for length may be unspecified and filled in by rule to give [-long]. The result is that some vowels are specified underlyingly and some are not. The value [+long] is specified in *paint*, [-long] in *pen*, and unspecified in words like *tent* and *mean*. Iverson (1994:266) states: "this mode of underspecification is still radical since the contexts where plus values occur (before clusters) never overlap with those where minus values occur (not before clusters); that is, only one feature value is specified in any given context found among underlying representations".

In this study we will refer to "Radical Underspecification" as it is defined by Archangeli while accepting the idea that underspecification (and markedness) is sensitive

to the phonological environment as Kiparsky (1993) suggests. I would suggest that Kiparsky is not overhauling the theory of radical underspecification but only clarifying it based on data which shows markedness is sensitive to context.

2.4 Methods of Analyzing Processing Errors in Second Language Acquisition

Communication in language results from a process of making sounds and listening to sounds in speech. For a speaker in a second language environment, communication is more complex due to difficulties in pronouncing sounds like a native speaker. Communication between a native speaker and a non-native speaker may be made difficult if both have problems understanding what sounds the other is intending to make. Non-native speakers may find it difficult to distinguish sounds which are allophones in their language but are phonemes in the second language. Native speakers may find it hard to understand a non-native speaker if that person substitutes sounds from their first language.

In this study, the term 'processing' refers to the process of producing sounds and perceiving sounds in speech. The terms 'production' and 'perception' refer to the acts of articulating speech and understanding speech respectively. Processing errors are those dealing with problems in articulating and understanding speech.

2.4.1 Production Errors in Second Language Acquisition

A foreign accent is inevitable to almost everyone who learns a second language as an adult. The studies on production errors in second language acquisition (SLA) have traditionally acknowledged that when second language learners speak a foreign language

they will identify phones from the second language (L2) in terms of their native language (L1) categories. Weinreich (1953) sought to describe what he called 'phonic transfer' within a theoretical framework. Weinreich originally attributed the problem of phonic interference to incorrectly identifying a new phone in terms of one's first language system (1953: 14). Weinreich (1957) revises his proposal concerning phonic transfer and the identification of an L2 sound. He redefined phonic transfer as "the manner in which a speaker perceives and reproduces the sounds of one language in terms of another" (1957:126). In Weinreich's analysis, distinctive features are the basis for identification instead of phonemes (1957:27).

Ritchie (1968) and Michaels (1974) focus on using distinctive features to explain identification problems for an L2 speaker of a language. Michaels (1974) is based on the markedness conventions from Chomsky and Halle (1968). He states that features in a second language which are marked in a speaker's L1 are sometimes replaced by the unmarked feature in the L1 when speaking the L2. James (1988:21) states that in this case, markedness of a particular feature is limited to a specific language and that an L1 system is imposed on the L2.

The Markedness Differential Hypothesis (MDH) was proposed in Eckman (1977) in order to appeal to markedness and phonic transfer between two languages. Eckman defines markedness as "a phenomenon A in some language is more marked than B if the presence of A in a language implies the presence of B; but the presence of B does *not* imply the presence of A" (1977:320). The definition of the MDH is:

> The areas of difficulty that a language learner will have can be predicted on the basis of a systematic comparison of the grammars of the native language, the target language and the markedness relations stated in universal grammar, such that,
> (a) Those areas of the target language which differ from the native language and are

more marked than the native language will be difficult,
(b) The relative degree of difficulty of the areas of the target language which are more marked than the native language will correspond to the relative degree of markedness,
(c) Those areas of the target language which are different from the native language, but are not more marked than the native language will not be difficult (1977:321).

The MDH relates to differences in the structure of L1 and L2 but is set forth within a universal rather than a language specific framework as in Michaels (1974).

Flege (1987, 1988, 1991) joins phonetic research to phonological theory in addressing the problem of phonic transfer. His studies refer to 'equivalence classification' in which L2 perception and production of 'identical', 'similar', and 'new' sounds are analyzed in a second language environment.

Flege (1987, 1988) makes a distinction between "new" phones in the L2, and "similar" sounds between the L1 and L2. He states that sounds that are similar in the two languages will be identified and produced in terms of a similar phone of the L1 even if these sounds are different. Sounds that are new in a second language would be easier to learn because of the lack of interference from the L1 categories. He states "new sounds may ultimately evade equivalence classification, thereby permitting the learner to avoid the limiting effect of previous phonetic experience" (1988:369).

Accurate perception and production of 'similar' and 'identical' phones in the L2 may be more difficult since they share acoustic similarity and phonologically may be interpreted as allophones of L1 phonemes (1988:368).

2.4.2 Perception Errors in Second Language Acquisition

The equivalence classification proposal can also be applied to perception errors in SLA. Bohn and Flege (1990) apply equivalence classification to the perception of L2 learners of the productions of L1 speakers. They propose that L2 learners will create new categories for sounds that are different from those in their L1 system (1990:303). Equivalence classification does not block the learning of a new sound category since it is a "new" rather than a "similar" sound. An L2 speaker will classify a sound in the L2 which is similar to a sound in their L1 as belonging to the same category.

Bohn and Flege (1990) use the notion of equivalence classification in the perceptions of the L2 learner of L1 productions. This study will apply this use of equivalence classification in another way -- to the perception of L1 speakers to the productions of L2 language learners. For example, the production of Spanish by native English speakers will be heard by native Spanish speakers. The perception errors of these native Spanish speakers will be studied and it will be proposed that they perceive English speakers' productions of Spanish within a Spanish phonemic matrix.

Chapter 3

SPANISH SPIRANTIZATION

3.1 Introduction to the Relevant Facts

This study will concentrate on the voiced obstruents [b, d, g] in Spanish. These obstruents alternate with the voiced fricatives [β, δ, γ] which differ with respect to the feature [+/- continuant]. The stops and fricatives are in complementary distribution and are allophones. The environments where the voiced stops [b, d, g] occur are (i) at the beginning of an utterance, (ii) following nasals, and (iii) following /l/ for [d] only (Harris 1969:38). The voiced fricatives [β, δ, γ] appear, (i) following a segment that is [+vocoid] (i.e. vowels and glides), and (ii) following a liquid (note exception for [d] above). The first context is usually realized intervocalically. The generalization of the environment in which the fricatives occur is following a segment specified as [+continuant].

In English, /b, d, g/ are phonemes and unlike Spanish they may occur intervocalically. English does not have corresponding voiced fricatives [β, δ, γ] as allophones of /b, d, g/. The phones [β] and [γ] do not appear in the phonetic inventory of English and /δ/ is a phoneme which contrasts with /d/.

3.2 Traditional Analyses

Traditional grammars of Spanish have posited a spirantization rule which changes the voiced stops to voiced fricatives [β, δ, γ] in a certain phonetic environment. In the traditional analysis, ordinarily the voiced stop obstruents are assumed to be underlying and are specified for the feature [-continuant], but undergo a change by way of a phonological rule. Harris (1969) represents spirantization with the following rule:

$$[\text{-son, +vcd}] \rightarrow [\text{+cont}] / \begin{Bmatrix} [\text{-son}] \\ [\text{+cont}] \\ \langle[\alpha\text{cor}]\rangle \end{Bmatrix} \begin{bmatrix} \_\_\_ \\ \langle[\text{-}\alpha\text{cor}]\rangle \end{bmatrix}$$

(Harris 1969:40)

This rule, however, includes [-sonorant] as an environment which promotes spirantization. This presumably is to account for a word such as [aδβerso] 'adverse' or [aβδomen] 'abdomen'. This part of the rule would not be needed since both obstruents are preceded by a [+continuant] segment. A more concise spirantization rule would be:

$$[\text{-son, +vcd}] \rightarrow [\text{+cont}] / \begin{Bmatrix} [\text{+cont}] \\ < [\text{-cont, -}\alpha\text{cor}] > \end{Bmatrix} \underline{\quad\quad} \langle[\alpha\text{cor}]\rangle$$

In this rule, spirantization occurs in voiced obstruents in either of two environments: when preceded by a [+continuant] segment or when preceded by a [-continuant] segment that does not share [coronal] place of articulation. An example of the first context is a preceding vowel or [r] as in [aδa] <u>hada</u> 'fairy' and [perδon] <u>perdon</u> 'pardon'. An example of the second context is a preceding [l] such as in [kalβo] <u>calbo</u> 'bald'. In the case of shared [coronal] place of articulation, spirantization would not occur as in [kaldo] <u>caldo</u>

'broth'. Harris makes an assumption that /l/ is [-continuant]. Harris (1969:39) states "...nasals and *l* comprise just the set of non continuant sonorants in the dialect of Spanish [Mexican] under study." For Harris, the features for /l/ are [+son, -cont, +cor].

	/digo/ 'I say'	/kalbo/ 'bald'	/kaldo/ 'broth'
Sp. rule:	γ	β	-----
	[diγo]	[kalβo]	[kaldo]

Figure 3.1: Spirantization rule application

An alternative analysis to having a spirantization rule is to posit a stop formation rule such as the one proposed in Goldsmith (1981). In this type of analysis, the voiced obstruents are specified as [+continuant] underlyingly and a rule changes stops to fricatives in a certain environment. A stop-formation or fortition rule is:

[-son,+vcd] → [-cont] / || ___; [-cont, αcor] ____
[αcor] (Goldsmith 1981:10)

The rule states that underlying fricatives become stops utterance initially and following a non-continuant which shares the feature [+/-coronal]. In this analysis also, /l/ in Spanish must be [-continuant] (Goldsmith 1981:11).

	/δiγo/ 'I say'	/kalβo/ 'bald'	/kalδo/ 'broth'
S-F rule:	d	----	d
	[diγo]	[kalβo]	[kaldo]

Figure 3.2: Stop-Formation rule application

Other stop-formation analyses (such as Nemer 1984:248) include homorganicity as part of the rule (represented as [αplace of articulation]). Goldsmith argues against the necessity of including homorganicity as a part of the rule since nasal assimilation will occur before spirantization. Goldsmith includes the [αcoronal] in order to account for [d] following [l].

3.3 Underspecification Analyses

In her 1979 dissertation, M.C. Lozano analyzes both spirantization and stop formation rules in Spanish. She supported a stop formation rule based on empirical factors but the important conclusion she found was that the Spanish obstruents [b, d, g] could be underspecified for the feature [continuant]. She proposed that segments such as [b, d, g] do not derive from underlying fricatives, rather that a stop formation rule, such as the one proposed by Goldsmith, applies to segments underlyingly unspecified for the feature [continuant].

Mascaro (1984) agrees with Lozano's proposal that the underlying obstruents [b, d, g] are not specified for [continuant]. He proposes, however, that the surface value for [continuant] is assimilated from the preceding segment. The feature value for [continuant] is specified by way of continuancy spreading. Following an Autosegmental Phonology

analysis, the assimilation of the feature [α continuant] to the following segment is a spreading process. This is a single feature assimilation as opposed to complete assimilation (Kenstowicz 1994:150). If the preceding segment is a vowel, glide or a liquid, the following segment is spirantized because the [+continuant] value is spread. If, however, the proceeding segment is a nasal consonant the [-continuant] value is spread.

Mascaro (1984:291) bases a continuancy spreading rule on a general spirantization rule. A continuancy spreading rule:

[-son, +vcd] → [αcont]/ [αcont] _____

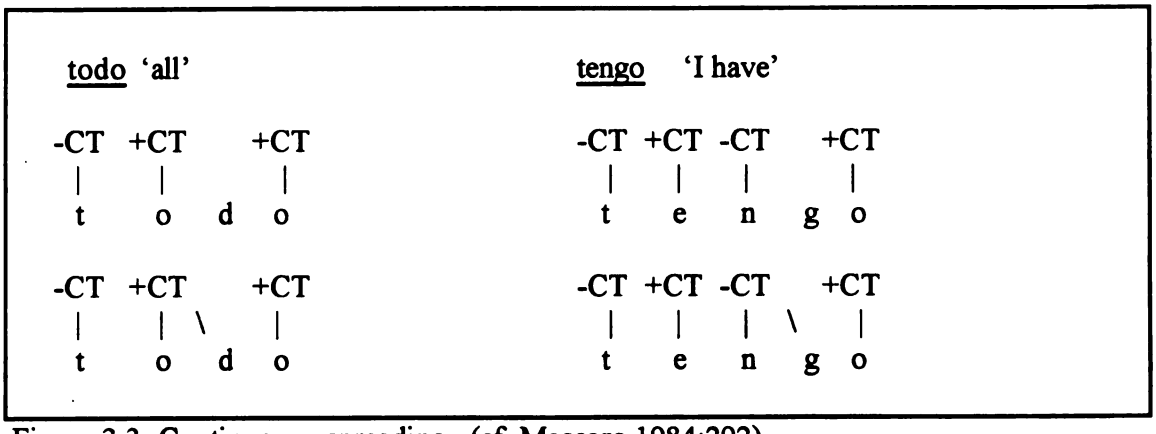

Figure 3.3: Continuancy spreading (cf. Mascaro 1984:292)

This continuancy spreading rule is a post-lexical rule which means that the rule can apply across word boundaries and fill in, specify, or refer to non-distinctive features (Kenstowicz 1994:209).

	/kalbo/ calbo 'bald'	/digo/ digo 'I say'	/tengo/ tengo 'I have'
(a)	β	d γ	g
	[kalβo]	[diγo]	[tengo]

(a) = application of continuancy spreading rule

Figure 3.4: Continuancy spreading rule application

Figure 3.4 illustrates the application of the continuancy spreading rule and the output of the rule in three words. For the word calbo, the rule applies to [b]. In a continuancy spreading analysis, /l/ is [+continuant] (see section 3.4.3.2). The [+continuant] value of /l/ spreads to [b]. For the word digo, the rule applies to both [d] and [g]. The [+continuant] value of the vowel [i] spreads to [g] which results in the output [γ]. For the word tengo, the rule applies to [g]. The [-continuant] value of /n/ spreads to [g].

The cases of [d] following an /l/ and in utterance initial position are not covered by the continuancy spreading rule. The first case would be handled by a properly including rule such as (a):

(a) [-son, +vcd, +cor] → [-cont] / [l] ____

The utterance initial case would receive [-continuant] by default since there is no preceding segment for spreading.

3.4 New Analysis for Spanish Spirantization

3.4.1 The Markedness Value for [continuant]

The phonological feature [+/- continuant] is the focus of this study. In section 2.1, criteria for determining markedness values were presented from both a universal and a language particular viewpoint. It was proposed that a general 'universal' markedness value could be reversed in a particular environment in a language. This proposal is supported by the so-called "markedness-reversal" examples given in the past (cf. Battistella 1990) and also by the Elsewhere Condition (Kiparsky 1973). The Elsewhere Condition states that the particular overrules the more general application of the rule. In this case the more specific environmental condition may overrule the more general 'universal' markedness value.

The frequency of the unmarked value is important in determining both a universal and a language particular markedness value. As mentioned in section 2.1.2.2, there are different kinds of frequency that are used. Type frequency counts the number of language inventories that a particular phone occurs. Token frequency calculates the percentage of usage of a particular phone in a language.

The value [-continuant] is the unmarked value in general. This value can be supported by the criteria of relative frequency (i.e. type frequency) and complexity. In Maddieson (1984:45, 206), the frequencies [b, d, g, β, δ, γ] are listed on the basis of surveying 317 languages. The stops [b, d, g] have a higher frequency of occurrence across the worlds languages than the corresponding fricatives.

[b]	198 / 317	62.4%	[β]	32 / 317	10.0%
[d]	195 / 317	61.5%	[δ]	21 / 317	6.6%
[g]	175 / 317	55.2%	[γ]	40 / 317	12.6%

Figure 3.5: Frequency of sounds in 317 languages (Maddieson 1984:45, 206)

On the basis of frequency data and the sense that [+continuant] is more complex since it 'adds' the mark of continuancy to the articulation, the value of [-continuant] is unmarked and [+continuant] is marked.

It was shown above that stops occurred in greater frequency than fricatives in a survey of 317 languages. However, the distribution of occurrence in a particular language such as Spanish gives a different result. In Spanish, the frequency of [b, d, g] and [β, δ, γ] were calculated by Navarro-Tomas (1946:15-30) for Castillian Spanish. His findings are listed in figure 3.6.

/b/	0.29%	[β]	2.25%
/d/	1.22%	[δ]	4.02 %
/g/	0.08%	[γ]	0.96%

Figure 3.6: Frequency calculations of certain Spanish phones out of 1,000 words (from Navarro-Tomas 1946)

The percentages in figure 7 represent token frequencies of Spanish phones out of a text of 1,000 words. In Spanish, the fricatives occur with higher frequency and

[+continuant] can be the unmarked value for Spanish voiced obstruents in the positions in which they occur.

In the comparison of the token frequencies of stops and fricatives in English, fricatives do not greatly outnumber stops. In most cases the frequency of stops is slightly higher or about the same as fricatives. English does not have [γ] or [β] and /δ/ is a phoneme, not an allophone of /d/.

/p/	694	1.425%	/t/	2248	4.615%	/k/	1414	2.903%
/f/	692	1.421%	/θ/	338	0.796%	/h/	793	1.628%
/b/	877	1.800%	/d/	1827	3.751%	/g/	598	1.228%
/v/	738	1.515%	/δ/	1354	2.780%			

Figure 3.7: English phoneme frequencies out of 10,000 words (Carterette and Jones 1974 : 445)

In general, stops outnumbered corresponding fricatives. The value [-continuant] is unmarked in English for obstruents which conforms to the universal markedness value for obstruents.

In Spanish also,then, [-continuant] is unmarked, but [+continuant] is unmarked in contexts where the voiced fricatives [β, δ, γ] occur (i.e. obstruents following segments specified as [+cont]). In a language such as English, there is no allophonic distinction between /d/ and /δ/, and [β, γ] do not exist in English. Therefore since a more particular markedness rule does not apply, the universal [-continuant] unmarked value applies to all English obstruents.

3.4.1.2 Classification of Feature [continuant] for Spanish Liquids

3.4.1.2.1 Classification of Spanish tap /r/

Spanish distinguishes between a voiced alveolar trill /rr/ and a voiced alveolar tap /r/. The tap and trill both occur intervocalically and therefore contrast in that position. An example of a minimal pair is [perro] perro 'dog' and [pero] pero 'but'. The tap and trill are both classified as [+continuant]. In Mascaro's continuancy spreading analysis, the tap [r] spreads a [+continuant] value (Mascaro 1984:290).

In this study, I make the assumption that the English flap [D] is not identical to the Spanish tap [r] in the way it is produced. Chomsky and Halle (1968) support the claim that the tap [r] and flap [D] may be produced in different ways. They write:

> It may be noted...that the tap [r] may be produced by a different mechanism than the so-called "tongue flap" [D] which greatly resembles the tap [r]. Whereas the latter is the result of [subglottal pressure], it is quite possible that the tongue flap [D] is produced by essentially the same muscular activity that is found in the dental stop articulation, except that in the case of the tongue flap the movement is executed with great rapidity and without tension. (1968:318)

Spanish tap [r] will then be assumed in this study to be [+continuant] and produced differently than the English flap [D]. Section 3.4.2.2 discusses these issues in more depth in relation to markedness and the misperception of native Spanish speakers to native English speaker productions.

3.4.1.2.2 The Classification of Spanish /l/

Harris (1969) and Goldsmith (1981) assume /l/ to be [-continuant]. It is preferable, however, to classify /l/ as [+continuant]. If /l/ is [+continuant], then [lβ] and [lγ] would be unmarked while leaving only [ld] to be explained as the marked sequence.

Padgett (1991) and Kenstowicz (1994:488) connect [continuant] with place of articulation in order to explain why only [d] follows [l] in Spanish. Kenstowicz (1994:488) proposes that homorganicity blocks the spread of continuancy due to an inalterability effect. Inalterability is from autosegmental phonology and states that when two segments are linked together by sharing features, that one part cannot be changed apart from the other.

Kenstowicz and Padgett assume /l/ to be [+continuant]. The analysis that they propose is that /l/ first delinks the feature [+continuant] and then assimilates the coronal features of the following [d]. Harris (1985) supports this assimilation by stating that /l/ is normally alveolar in Spanish but takes on the dental articulation of [d] in the word [kaldo] 'broth'.

In the cases involving [b] and [g], /l/ does not assimilate to either place of articulation so there is no inalterability involved. The [+continuant] of /l/ spreads to [b] yielding [kalβo]. Kenstowicz (1994:488) suggests that /l/ delinks [+continuant] and assimilates the [-continuant] of [d]. However, the dental assimilation of /l/ must precede the continuancy spreading rule because if spreading occurred first, the output would be *[kalδo]. Kenstowicz and Padgett posit an underlying [-continuant] for [d] which is spread to [l] when linked together. If [d] is underspecified for [continuant], then an ad hoc rule would have to apply in order for the marked for [kaldo] to be represented.

3.4.2 The Application of Markedness Rules

3.4.2.1 Spanish

Chomsky and Halle (1968) presented a list of markedness conventions that functioned like phonological rules to fill in markedness values (1968:403). Markedness rules in this study will be used to illustrate the differences in markedness values for different contexts in Spanish. Separate markedness rules will be given for each value of [+/- continuant]. In the following rules, '[u cont]' means "the unmarked value for [continuant]".

(a) [u cont] → [+cont] / [+cont] [-son, ___]

(b) [u cont] → [-cont] / [-son, ___]

In both cases, the target of the rule is an obstruent which is underspecified for the value [continuant] such as [b, d, g] in Spanish. For rule (a), [+ continuant] is the unmarked value if an obstruent underspecified for [continuant] is preceded by another segment with a [+continuant] value. Rule (b) functions as an 'elsewhere' rule in which [- continuant] is the unmarked value for those obstruents not following [+continuant], or in initial position. Markedness rule (b) is a universal rule and would apply in all languages.

Figure 3.8 illustrates markedness rule application. In the case of [kasa] 'house', the [s] is lexically specified as [-sonorant, +continuant]. Markedness rule (a) applies to the position following the vowel. The [s] in casa is unmarked for [continuant] since it follows a [+continuant] segment.

	/tengo/ tengo 'I have'	/ada/ hada 'fairy'	/kasa/ casa 'house'
	/n/ /g/ [-son] [-son] [-cont] [0cont]	/a/ /d/ [+son] [-son] [+cont][0cont]	/a/ /s/ [+son] [-son] [+cont][+cont]
	/...n__.../	/...a__.../	/...as.../
	apply rule (b)	apply rule (a)	apply rule (a)
	[-cont] is unmarked	[+cont] is unmarked	[+cont] is unmarked
output:	[tengo]	[aδa]	[kasa]

Figure 3.8: Markedness rule application

The next environments to analyze are those which have a liquid followed by an obstruent. If the /r/ preceding an obstruent is [+continuant], then markedness rule (a) will correctly predict the unmarked forms [β, δ, γ].

Environments which cause some difficulties in determining markedness are those involving /l/. In Spanish, [d] may follow /l/ but not [b] or [g]. Only the fricatives [β] and [γ] may follow /l/. Harris (1969:39) and Goldsmith (1981:11) assume that /l/ is [-continuant]. In this study, /l/ will be [+continuant] and the analysis was given in section 3.4.1.2.2 above.

Assuming that /l/ is [+continuant], the unmarked value for obstruents following /l/ would be [+continuant]. This would predict that [d] following /l/ would be marked.

This study focuses on Spanish /d/ and /r/ and misperceptions based on these sounds. Figure 3.9 compares the phonemic and phonetic feature representations for Spanish /d/ and /r/.

Spanish /d/	Spanish /d/	Spanish /r/
[-sonorant]	[-sonorant]	[+sonorant]
[+voiced]	[+voiced]	[+voiced]
[+coronal]	[+coronal]	[+coronal]
[0 continuant]	[0 continuant]	[0continuant]
Context: [+cont] __	Context: Elsewhere	
markedness rule (a)	markedness rule (b)	redundancy rule: [+son] → [+cont]
[δ]	[d]	[r]
[-sonorant]	[-sonorant]	[+sonorant]
[+voiced]	[+voiced]	[+voiced]
[+coronal]	[+coronal]	[+coronal]
[+continuant]	[-continuant]	[+continuant]

Figure 3.9: Spanish phonemic and phonetic representation comparisons

The Spanish /d/ is [-son, +vcd, +cor, 0cont]. The markedness rules

(a) [ucont]→ [+cont] / [+cont] [-son, ___]
(b) [ucont] → [-cont] / [-son, __]

fill in the values for continuancy. In the context [+cont] __ , the first rule would apply resulting in the voiced fricative [δ]. The features of [δ] are [-son, +vcd, +cor, +cont]. Elsewhere the second rule would apply resulting in a [d]. The features of the voiced stop [d] are [-son, +vcd, +cor, -cont]. These features are the same as English [d] except that English [d] is produced at the alveolar ridge while Spanish [d] is produced dentally.

The Spanish tap /r/ is [+son, +vcd, +cor, 0cont]. The redundancy rule [+son] → [+cont] also applies to the tap /r/. Phonetically, the features of [r] are [-son, +vcd, +cor, +cont].

3.4.2.2 English

When markedness rules are applied to English the results differ from Spanish. The following rules were shown to apply to Spanish obstruents in order to determine the markedness value for [continuant].

(a) [u cont] → [+cont] / [+cont] [-son, ___]

(b) [u cont] → [-cont] / [-son, ___].

English violates rule (a) because [-son, +cont] can be specified. English has words with post-vocalic stops (cf. [dogi] doggy and [kæbi] cabby) which violate rule (a). English does not violate rule (b). Rule (b) is the more general rule because it refers to a superset of the cases referred to by rule (a).

The English phones relevant to this study are /d/ and /ð/. Figure 3.10 compares the phonemic and phonetic representations for English /d/ and /ð/.

English /d/	English /d/	English /δ/
[-sonorant] [+voiced] [+coronal] [0 continuant]	[-sonorant] [+voiced] [+coronal] [0 continuant]	[-sonorant] [+voiced] [+coronal] [+continuant]
Context: V́__ V	Context: Elsewhere	
flapping rule	markedness rule (b)	
[D]	[d]	[δ]
[-sonorant] [+voiced] [+coronal] [+continuant]	[-sonorant] [+voiced] [+coronal] [-continuant]	[-sonorant] [+voiced] [+coronal] [+continuant]

Figure 3.10: English phonemic and phonetic representation comparisons

The English /d/ is [-son, +vcd, +cor]. Following radical underspecification, [continuant] is unspecified. For the phoneme /δ/ in English, the feature [+continuant] is specified underlyingly. In English a flapping rule /d/→ [D] / V́__V́ applies intervocalically. The phonetic form for [D] is [-son, +vcd, +cor, +cont].

3.5 The Equivalence of English [D] and Spanish [r]

The English flap [D] and Spanish tap [r] share the features [+vcd, +cor, +cont] but they differ with respect to the feature [sonorant]. English [D] is [-sonorant] while Spanish [r] is [+sonorant]. English [D] and Spanish [r] are also produced slightly

differently. According to Chomsky and Halle (1968), the Spanish tap [r] is produced by subglottal pressure, while the English flap is a rapid articulation of a stop.

Equivalence Classification (Flege 1987, 1988) classifies sounds between L1 and L2 as 'new', 'similar', and 'identical'. A sound in an L2 would be classified as 'similar' to an L1 sound due to the sharing of distinctive features. English [D] and Spanish [r] are similar on the basis of equivalence classification. The sounds share the features [+vcd, +cor, +cont]. English [D] and Spanish [d] are also similar sounds since they share the features [-son, +vcd, +cor]. English [D] and Spanish [r] differ with respect to the feature [+/-sonorant]. English [D] and Spanish [d] differ with respect to the feature [+/-continuant].

In section 2.1, a theory of markedness was shown to be context sensitive. The more general, universal marked value could be unmarked in a certain environment. In section 3.4, it was argued that in Spanish [+continuant] is the unmarked value in the context following a [+continuant] segment. Equivalence classification and markedness are separate notions. The similarity between two sounds is not affected by markedness per se. The preference for one of two possible similar sounds, however, can be affected by markedness. English [D] is similar to both Spanish [d] and [r]. English [D] differs by one feature with Spanish [d] ([+/-continuant]) and Spanish [r] ([+/-sonorant]). Native Spanish speakers (NSS) may prefer the perception of [r] over [d] when a native English speaker produces [D] because of markedness. The [D] and [r] share the [+continuant] feature value which is unmarked in Spanish following a [+continuant] segment. Spanish [d] is [-continuant] and does not appear in the context following a [+continuant] segment in Spanish. Therefore, NSS would prefer the unmarked

[+continuant] over the marked [-continuant] so [r] would be perceived over [d] due to markedness.

Chapter 4

TEST INVOLVING PROCESSING ERRORS IN SECOND LANGUAGE ACQUISITION

4.1 Preliminaries

The test was designed to collect data in order to duplicate the generalizations of processing errors as shown in Stockwell and Bowen (1965). It was proposed by Stockwell and Bowen (1965:44-47), Politzer & Staubach (1965:71), and Nunez-Cedeno (1987:363-364) that English L1 speakers may mispronounce Spanish [δ] as English [d]. They also proposed that a native Spanish speaker would hear this as Spanish tap [r] and misperceive a word if there was a minimal pair (Nunez-Cedeno 1987:364).

4.2 Testing Method

4.2.1 Subjects

The subjects of the test are 5 native English speakers who were learning Spanish at the college level, and there were 5 native Spanish speakers who acted as a control group for the study. There were also 3 native Spanish speaker judges who listened to recordings made by the 10 subjects. The eight native Spanish speakers in this test were either from Cuba or Mexico and now live in the United States (It was my intention to have all my subjects speak one dialect but I had to use subjects from two dialects. Though this was

not an ideal situation, I did not encounter any unusual problems with my results. There is no difference in spirantization between Cuban and Mexican dialects (cf. Harris 1969, Guitart 1976)). Of the control group, 3 spoke a Cuban dialect and 2 spoke a dialect of Mexico. Of the judges, 2 judges were from Cuba and one spoke a Mexican dialect. Of this group there were none who were fluent bilingual speakers of English. Each of the subjects and judges have Spanish as their first language and spoke a Cuban or a Mexican dialect.

The 5 native English speakers ranged in age from 19 to 32 years. All learned Spanish in the United States and had from 2 to 6 years of instruction.

Native English Speakers

	Age	Years of Spanish Study
(1)	32	6 years
(2)	19	4 years
(3)	21	3 years
(4)	25	4 years
(5)	28	2 years

Figure 4.1: Information on Native English Speakers involved in test

4.2.2 Testing procedure

The test in this study was designed to elicit processing errors by Spanish and English speakers. The 10 subjects heard a list of 10 Spanish words read by a native speaker of Spanish in a Cuban dialect (see figure 4.2). In the list, 5 of the 10 words included the voiced obstruent [δ] between vowels. (Originally the test included 5 additional words

with intervocalic [β]. The English speakers generally heard and pronounced the voiced bilabial fricative [β] as the English voiced labio-dental fricative [v]. This substitution labeled the speaker as 'non-Spanish' but there was no misperception by the NSS. This study will focus on data concerning Spanish /d/~[δ].)

After each word was read, the subjects wrote down the word they believed they heard. After they finished listening to the tape and wrote down the 10 words, they turned their sheet over and listened to the tape again. They were recorded producing each word after they listened to the word spoken on the tape. There were 5 words included as distracters. The recordings were later played for the 3 native Spanish speaker judges. The native speaker judges listened to all of the recorded words and wrote down the word they believed they had heard. The list included words which are members of /d/ ~ /r/ minimal pairs (see figure 4.3). For example, it was expected that the native English speakers may incorrectly pronounce Spanish words with /δ/ with an English /d/ and the Spanish judges would hear those words as having a Spanish /r/. For example, cada would be pronounced with English /d/ =[D], and this would be heard as cara.

1. mudo	6. hada
2. mujer	7. bueno
3. seda	8. todo
4. gato	9. banco
5. cada	10. perro

Figure 4.2 Word list used in study (in random order)

δ~r minimal pairs					
(1a)	cada	[kaδa]	'each'	(1b) cara [kara]	'face'
(2a)	hada	[aδa]	'fairy'	(2b) hara [ara]	'will do'
(3a)	mudo	[muδo]	'mute'	(3b) muro [muro]	'wall'
(4a)	seda	[seδa]	'silk'	(4b) sera [sera]	'will be'
(5a)	todo	[toδo]	'all'	(5b) toro [toro]	'bull'

Figure 4.3 [δ~r] minimal pairs in Spanish

Chapter 5

RESULTS AND ANALYSIS OF TEST

5.1 Predictions on the Basis of Equivalence Classification and Markedness

The background for analyzing processing errors in SLA is 'equivalence classification' (EC) which was introduced in section 2.4. Flege (1988) and (1991) uses EC in analyzing the production errors and the perception errors of the second language learner. This study applies EC to the perception of the native speaker to a second language learner's production of the second language.

James (1986) analyzes processing errors that occur between native and non-native speakers and he states that phonological context can contribute to phonic transfer (1986:140). James (1988:24) gives an example of how phonological context relates to phonic transfer. When a native Dutch speaker speaks English as an L2, the pronunciation of English /δ/ may be affected by context. The specific context involved is the 'suprasegmental context' which is the location of the phoneme such as syllable initial or syllable final within a word. Dutch speakers tend to produce English /δ/ as a stop [d] or tap [D] word-initially and as a fricative [z] or [s] in other positions (James 1988:24).

This study proposes that when a native speaker perceives the production of a non-native speaker, the native speaker will identify the sound in terms of an L1 category.

Misunderstanding will result if non-native speakers produce a sound in terms of their L1 and this is perceived as a similar sound of the L2.

It is predicted by EC that a phone identical in the L1 and L2 will be perceived and produced the same in the L1 and L2 by non-native speakers. A new sound of the L2 will be given a new category by non-native speakers and will be processed as such. A sound in the L2 which is similar to one of the L1 will be classified as that of the L1 by non-native speakers. (cf. Flege 1988:367-369).

In the case involving English /d/ and Spanish /r/, the following is predicted by equivalence classification. First, English [D] and Spanish [r] are similar sounds based on the sharing of the features [+vcd, +cor, +cont]. In an intervocalic environment, English [D] has a high similarity to Spanish [r] based on the actual equivalence of distinctive features. As discussed in section 3.5, Spanish [r] is preferred by NSS over Spanish [d] due to [r] being unmarked following a [+continuant] segment and [d] being marked in that position.

Second, because of this high degree of similarity between [D] and [r], a new category will not be created by a NSS. The similarities between English [D] and Spanish [r] do not result in the creation or recognition of a new category by a NSS, but rather a presumed equivalence based on the actual equivalence of distinctive features.

In section 3.4.1 it was proposed that [+continuant] is unmarked in the contexts following a segment specified as [+continuant] in Spanish. A stop obstruent such as [b] or [d] would be marked in an intervocalic position in Spanish.

Therefore due to EC and Markedness Theory, this study hypothesizes the following results:

(1) if an NES produces the Spanish word seda he will replace Spanish /d/ with English /d/. This will undergo the English flapping rule so an NES will produce [seDa].

(2) if an NES produces seda as [seDa] then a NSS will hear [sera] due to (a) the perceived equivalence of [D] to [r] and (b) that Spanish [d] is marked in an intervocalic position. The feature [+continuant] is unmarked in Spanish intervocalically so the result is the perception of [r] (which is unmarked due to being [+cont]) rather than [d] (which is marked due to being [-cont]).

For example, todo, seda, and mudo would be perceived as toro, sera, and muro respectively by a NSS.

5.2 Test Results

5.2.1 Results of Native Spanish Speakers

The test included five Native Spanish Speakers (NSS) as a control group. Their results are listed in Table 5.1. In each table there are 15 cases of each word that were heard by the NSS judges. This is because each word was spoken by 5 NES's and each word was heard by the 3 judges (5 x 3=15). Overall, the judges heard each word 30 times because there were 15 productions from NES and 15 from the NSS control group.

Spanish word spoken by L1 Spanish speaker	Word written by native Spanish speaker Judge				
(1) mudo	mudo	15/15	100%	muro	0/15 0%
(2) seda	seda	12/15	80%	cera	3/15 20%
(3) todo	todo	14/15 1 unsure	93.3%	toro	0/15 0%
(4) cada	cada	15/15	100%	cara	0/15 0%
(5) hada	hada ada	15/15	100%	hara	0/15 0%

Table 5.1: Results from Native Spanish Speakers

When judges listened to the native Spanish speaker control group, in all cases but one, there were no instances of mishearing [ð] as [r]. In the case of seda, all three judges heard the same subject produce this word as cera instead of seda. This uniformity of responses would lead us to believe that the subject did in fact pronounce the word with an [r]-like quality.

5.2.2 Results of Native English Speakers

The five native English speakers (NES) were tested for their production of Spanish [ð]. Table 5.2 gives the results for the five words with a possible misperception of /d/ and /r/ for native English speakers.

Spanish word spoken by L1 English speaker	Word written by native Spanish speaker judge					
(1) mudo	mudo	14/15	93.3%	muro	1/15	6.7%
(2) seda	seda	6/15	40%	sera cera	9/15	60%
(3) todo	todo	12/15	80%	toro	3/15	20%
(4) cada	cada	13/15	86.7%	cara	1/15 1 unsure	6.7%
(5) hada	hada ada	13/15	86.7%	hara	0/15 2 unsure	0%

Table 5.2: Results from Native English Speakers

The results of Table 5.2 show that misperception does not occur in every case but did in some. Even when the correct word with [ð],such as cada was chosen by the judge, there was a difficulty in choosing cada or cara. In two cases, judges refused to write an answer when they were unsure which one was produced (these are indicated with 'unsure' in the table above).

5.3 Analysis

5.3.1 Native Spanish Speakers (NSS)

As noted in table 5.1, there was no pattern of misperception between native Spanish speakers in this study. Figure 5.1, below, illustrates the derivations of the Spanish words donde, seda, and toro.

	Spanish 'donde'	Spanish 'seda'	Spanish 'toro'
	/donde/	/seda/	/toro/
markedness rule (a)	-------	δ	-----
markedness rule (b)	d d	-----	-----
	[donde]	[seδa]	[toro]

Figure 5.1 Derivations of Spanish words

In the word donde, markedness rule (b) applies to both instances of /d/ to give the phonetic representation [donde]. Markedness rule (a) applies to seda to give [seδa]. Neither markedness rule applies in the case of toro because [r] is a sonorant. These derivations illustrate the phonology of NSS. No misperceptions resulted from the NSS because the markedness rules were applied with the NSS control groups productions. The only case of hearing [r] by the NSS judges was when all three judges wrote that one subject said sera instead of seda.

5.3.2 Native English Speakers (NES)

The test showed that NSS did misperceive some NES productions as [r] instead of [δ], however, the results do not conform to the expected results hypothesized in section 5.1. According to the hypothesis, all cases should be misperceived. Table 5.2 showed that [r] was misheard for [δ] for muro, cera, toro, and cara. However, only cera was misheard a majority of instances (for 9 of 15 words).

There are a few reasons why the results were not as hypthosized. First, the data was of subjects listening to a native speaker of Spanish and then reciting a word list and not of conversational speech. Second, the subjects wrote down what word they heard so

orthography could have had an effect on their speech. Results would likely be different if conversational speech was analyzed.

The results did not follow exactly as predicted but that does not mean that nothing was found. The comparison of results from native Spanish speakers (NSS) and native English speakers (NES) reveals that markedness may be involved in the production and perception of Spanish obstruents, which supports the premise behind this study. The results of NSS perception were different between NSS and NES subjects.

While there were instances of misperception involving a NSS subject, there were also a few misperceptions involving NES subjects as mentioned above. This suggests that the L1 of the NES subjects and their phonological systems (comprised of underlying systems and rules) affect their speaking of an L2 (in this case Spanish).

Figure 5.2 illustrates the rules that occur in English and gives derivations for rider, leather, and candy.

	English 'rider'	English 'leather'	English 'candy'
	/rayder/	/lɛδɛr/	/kændi/
flapping rule	D	-----	-------
markedness rule (b)	-------	------	d
	[rayDer]	[lɛδɛr]	[kændi]

Figure 5.2 Derivations of English words

In these words, the flapping rule /d/ → [D] / V́__ V only applies in rider.

Markedness rule (b) applies to the /d/ in candy as the universal default rule but does not apply in rider since the flapping rule precedes and bleeds the markedness rule. In radical

underspecification, /δ/ in English [+continuant] would be specified underlyingly since it is marked in English while [-continuant] is assigned to /d/ in candy by markedness rule (b).

In this study, NES produced Spanish words and those words were heard by NSS judges. In the cases involving misperception it is proposed that NES applied English phonological rules when producing Spanish and these were misperceived by NSS due to markedness and equivalence classification. Figure 5.3 illustrates NSS misperception of a NES production.

Spanish todo 'all'

	/todo/	
(a)	D	English flapping rule /d/ →[D]/ V́__V applied by NES
(b)	[toDo]	this production with [D] heard by NSS as [+son, +cont, +cor, +vcd]
(c)	[toro]	markedness theory blocks intervocalic [d] in Spanish, and [r] is perceived by NSS on the basis of equivalence classification

Figure 5.3: Misperception of NES production by NSS

5.4 Conclusion

This study has focused on the misperceptions of native Spanish speakers (NSS). It has been previously documented that misproductions and misperceptions occur between English and Spanish speakers concerning [δ] and [r] (Stockwell and Bowen (1965:44-47), Politzer and Staubach (1965:71), Nunez-Cedeno (1987:363-364), Zampini 1994: 471)). These processing errors have been explained in this study by appealing to markedness theory and to equivalence classification.

This study has only scratched the surface in applying markedness theory to L1-L2 processing situations. The application of markedness theory and equivalence classification to L1 perception of L2 productions is an issue for future research.

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