

# On the (Un)Markedness of Spirantization: Evidence from First Language Acquisition

Martin Rakow<sup>†</sup> and Conxita Lleó<sup>‡</sup>

<sup>†</sup> Research Center on Multilingualism, University of Hamburg, Germany

<sup>‡</sup> Department of Romance Languages, University of Hamburg, Germany

E-mail: martin.rakow@web.de, lleo@uni-hamburg.de

## ABSTRACT

This study examines the production of voiced stops and their spirant counterparts by three monolingual Spanish, three monolingual German and three German-Spanish bilingual children (aged 1;3 to 3;0). The data on Spanish reveal high percentages of targetlike spirants from the earliest word productions. The early presence of spirants clearly reflects the process of spirantization in target Spanish, according to which underlying voiced stops are produced as spirants (or continuants) in certain contexts. However, it poses the question of markedness: It is widely believed that continuants are more marked than stops and should thus be acquired later. German children produce a negligible number of spirants. In the case of the Spanish of bilinguals, they begin with a degree of spirantization slightly lower than that of monolinguals, which is later further reduced. The theoretical implications of these findings both for first language acquisition and for bilingualism are discussed.

## 1. INTRODUCTION

It is widely believed that continuants are more marked than stops, and that this is clearly reflected in first language acquisition [1]. Thus young children begin producing stops earlier than fricatives; a well-known process of stopping, by which stops are substituted for fricatives has been often documented in early first language acquisition (see e.g. [2]). In Optimality Theoretic terms, markedness constraints outrank faithfulness constraints, and it is thus to be expected that if a language contains fricatives or spirants in its inventory, children acquiring that language will go through a phase of stopping. This is precisely the case of Spanish, which has an obligatory allophonic rule of voiced stop spirantization in certain contexts, especially in postvocalic position and after certain sonorants. The question thus arises whether Spanish children begin by producing stops instead of spirants. Theories of markedness have also pointed out that there is a tendency to assimilation between features of neighboring segments. For instance, Stampe [3] argues that although voiceless obstruents are less marked or more natural than voiced obstruents, this is only true from a paradigmatic perspective. Syntagmatically, a voiced obstruent between vowels

may be less marked than a voiceless one, because it shares the feature [voiced] from the vocalic context. Children may be thus confronted with these two tendencies, the voicelessness and voicing of the obstruent, and favor one or the other. In the case of Spanish spirants we are confronted with this type of situation: stop obstruents are less marked in isolation, but in certain contexts, as e.g. after a vowel, continuants might be preferred.

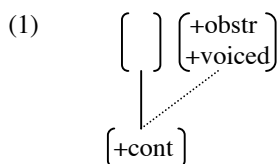
The purpose of this paper is to test such predictions with evidence on the acquisition of Spanish. Do Spanish children substitute spirants with stops? Or do they produce spirants in a targetlike manner? With these questions in mind we examine the acquisition of spirants and plosives by three Spanish children. In order to gain a larger perspective, we compare acquisition of voiced stops in a language without spirantization, in this case German. We will see that Spanish children produce spirants from the start and that German children only produce stops; spirants are present, but in negligible numbers. The comparison of these findings with stop-spirant production by German-Spanish bilinguals can shed light on theoretical issues of both acquisition in general and bilingualism in particular. Do the languages of the bilingual develop independently or do they interact? In what sense is markedness an influential factor in bilingual development? On the basis of the data of three Spanish monolingual, three German monolingual and three German-Spanish bilingual children (aged 1;3 to 3;0) this study focuses on the question of markedness both in monolingual and bilingual acquisition.

### 1.1 SPANISH SPIRANTIZATION

Both German and Spanish have the voiced stop consonants /b d g/, but in Spanish there exists an obligatory allophonic rule of voiced stop spirantization, the analysis of which will constitute the bulk of the paper. Spanish /b d g/ appear phonetically as stops in certain contexts and as spirants (or continuants) [β ð ɣ] in other contexts. Descriptions of the distribution of the stop versus spirant allophones suggest that stops occur after a pause or nasal segment, and in the case of /d/ only, after /l/; spirants occur elsewhere, although there exists a great deal of dialectal variation (see [4], [5], [6]). Hence, the present study

concentrates on the sole obligatory context in which spirantization occurs in all dialects - postvocalic position.

Several analyses have been provided for spirantization in Spanish. Within Generative Phonology there has been a certain debate about whether the underlying segment should be [-cont] or [+cont]. Whereas most phonologists prefer the [-cont] obstruent and adhere thus to a process of spirantization, Hammond (1976) proposes the spirant in the underlying representation, bound to a process of fortition. With the advent of Non-linear Phonology and the theory of Underspecification, a process of spirantization based on spreading of the feature [+cont] to the right has been formulated by Harris (1984) (see (1)). The target segment is characterized as neither [+cont] nor [-cont], that is, the target segment undergoing spirantization is underspecified in the underlying representation. Universal Principles of Underspecification will attribute the specification [-cont] to the segments that do not satisfy the structural description of the spirantization rule, e.g. those segments that, because of being in absolute initial position or after a nasal, are not submitted to the rule.



Notice that (1) only requires that the target segment be specified for the features [+obstr, +voiced], because the sole voiced obstruents in Spanish are the stop-spirant pairs; at the same time (1) cannot specify less than that, because only the voiced stops are submitted to the process, whereas the voiceless stops /p t k/ are not. A point to notice is also the fact that (1) presupposes a theory of Radical Underspecification, which postulates voiceless obstruents as universally unmarked.

## 1.2 MARKEDNESS, OPTIMALITY THEORY AND ACQUISITION

Since Jakobson [1] formulated his laws of solidarity, it is generally accepted that stops are less marked than fricatives (and spirants) and that children in their early productions replace fricatives by stops [2]. This well-established finding makes us wonder how very young Spanish-speaking children will pronounce the pairs of sounds constituted by a stop and a spirant. Since spirants are more marked than stops, we would predict that in the earliest stages of acquisition, Spanish-speaking children substitute stops for the spirants.

There is another proposal in relation to markedness, though. Stampe [3] criticised Jakobson's concept of markedness for being exclusively paradigmatic and proposed the notion of naturalness, based on syntagmatic relations. Adapting Stampe's proposal it can be said that markedness or naturalness relations are also defined by neighboring relationships. Accordingly, a [-cont] sound may be defined as unmarked in general, but a [+cont] sound may tend to assimilate to a [+cont] neighboring sound and thus

[+cont] may be more natural intervocalically. This is obviously the situation we have in the case of Spanish spirantization. An output [+cont] obstruent that results through the application of the spreading rule (1) is more natural than a [-cont] sound in the same context. By this notion of naturalness we would predict that Spanish children produce spirants targetlike.

Optimality Theory (OT) is specially well-suited to express such contradictory facts, and we will briefly refer to this model in relation to a theory of acquisition. In OT, both notions, Jakobsonian markedness and Stampe's naturalness have a direct interpretation as markedness constraints, one referring to inventory markedness (preference for noncontinuants) and the other one to contextual markedness (preference for identity of features in a given context). This proposal can be formalized in terms of the following two constraints:

- (2) \*[cont] » \*[stop]
- (3) AGREE<sub>[cont]</sub>

Constraint (2) [7] accounts for the preference, i.e. unmarkedness of stops over continuants, and constraint (3) [8] gives preference to assimilation or linking of the feature [cont] between vowel and consonant. These two constraints account for the preference of either stops or continuants depending on the context. It should be noticed that (3) constitutes a subset of (2), since (3) is not applicable in absolute initial position, whereas (2) is applicable in all contexts. Accordingly, where (3) is not relevant, plosives make their appearance, whereas in contexts in which spirantization is applicable, (2) and (3) are in contradiction. In such contexts, whether plosives or spirants are produced will depend on how powerful the evidence for spirantization is, and thus on how dominant the contextual constraint in the corresponding grammar is. The OT account is utterly simplified given place restrictions and restricted to the implications for a theory of acquisition couched in OT terms.

## 2. THE STUDY

With the aim at finding out how children acquiring a language with spirantization produce the alternation of stops and spirants at the earliest stages, three monolingual Spanish children (aged 1;3 to 3;0) growing up in Spain were observed and their productions analyzed. In order to compare the results with children acquiring a language with voiced stops but without spirantization, three monolingual German children of the same age growing up in Germany were also studied (the control group). Because with such small numbers of children in each language it is not clear whether individual factors play a role, three German-Spanish bilingual children of the same age growing up in Germany, were also incorporated into the study. The bilingual child serves as his own control and thus circumvents the problem of individual variation bound to monolinguals [9].

## 2.1. DATA AND METHODOLOGY OF ANALYSIS

All children were audio- and video-recorded fortnightly in their homes from the beginning of word production, in unstructured play situations, while interacting with an investigator and one of the parents. Following testing, all sessions were glossed and phonetically transcribed by two transcribers (one native speaker of German and the other one native speaker of Spanish) and all productions were entered into a database. Reliability tests for transcriptions resulted in very high percentages of agreement. Intra-transcriber reliability as regards plosives and spirants amounted to 100% in both languages. Inter-transcriber reliability reached 100% for German and 88.1% for Spanish. Target words containing plosives or their corresponding spirants were selected from the data sessions. Only sessions containing a minimum of 10 such target words were considered. For the evaluation of plosives only absolute initial contexts were taken into account, and for the evaluation of spirants only the context between vowels was considered, both within words and across word boundaries.

The bilingual children were visited by two separate teams, a German- and a Spanish-speaking team, and the two languages were recorded separately. Only Spanish words spoken in Spanish sessions and German words spoken in German sessions were included in the study.

## 2.2 RESULTS AND DISCUSSION

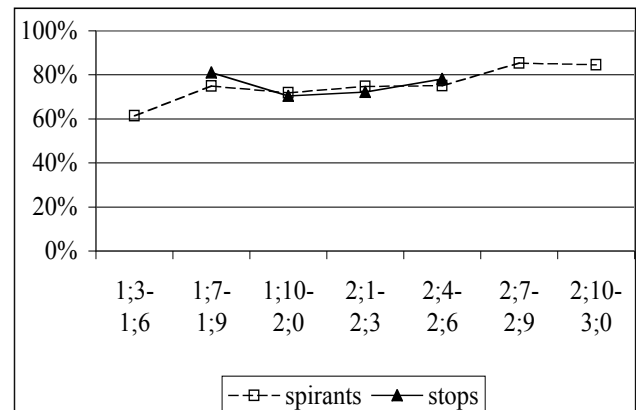
Figure 1 shows the percentages of target spirants and target plosives produced correctly –according to whether the target features [cont] and [Place] were faithfully produced– by the group of Spanish children, in three-monthly periods. Missing points for stops in Figure 1 are due to very low numbers of target segments in the relevant context. Some examples of spirantization by Spanish children are shown in (4):

- (4) cabeza /ka'beθa/ [ga'βesv] 'head' Miguel 2;3  
 nada /'nada/ ['naða:] 'nothing' José 1;10  
 tortuga /tor'tuɣa/ [do'tuɣa] 'a turtle' Miguel 2;6  
 otro gato/'otro'gato/ [hɔtɔ'yakɔ] 'another cat' José 2;3

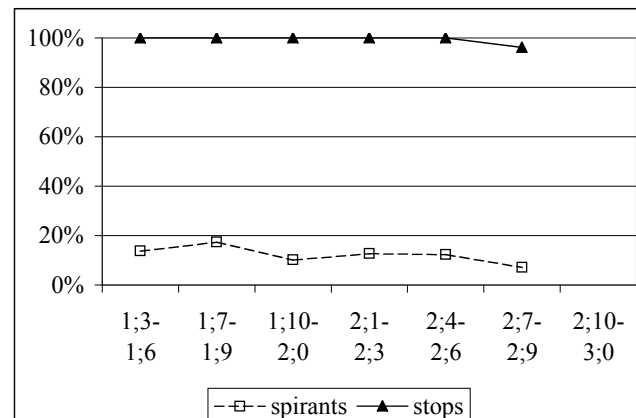
Figure 2 shows the percentages of initial plosives produced correctly as plosives and the percentages of intervocalic plosives produced as spirants by German children. Both figures show very high values of correct production of target plosives, especially in German, where they reach 100%. In Spanish plosives reach about 80%. The presence of spirantization is low in German, as it was predicted from markedness considerations. However, Figure 1 shows that the percentages of targetlike spirantization is very high in Spanish, beginning at the initial time points: it never appears below 60% and it soon reaches almost 80% (see also [10]). It can be claimed that spirantization in Spanish hardly undergoes development, reaching very high values from the beginning, and displaying a slight increase at 2;7-2;9. A comparison of spirant production in the Spanish and German group by means of U-tests

showed statistically significant values at points 1;10-2;0 and 2;1-2;3:  $p=0,05$ .

The early production of spirants by the Spanish children poses the question of markedness that we have discussed above. Spanish children's early productions are faithful to their target language as far as the feature [cont] is concerned. In spite of [+cont] being marked, they produce spirants as such. This implies that constraint (3) dominates constraint (2) in Spanish children's grammars.



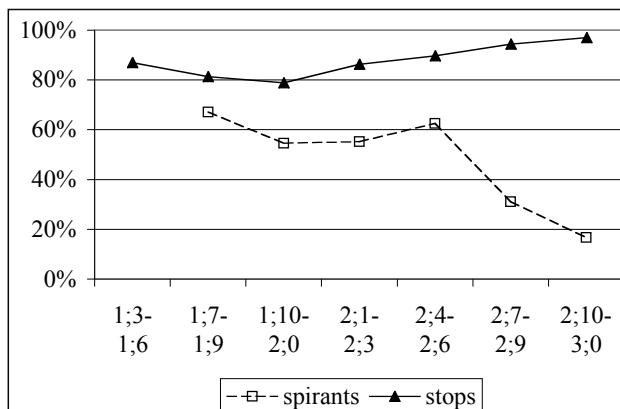
**Figure 1:** Percent of Voiced Stop and Spirant Production by the Spanish Group across 3-Monthly Periods.



**Figure 2:** Percent of Voiced Stop and Spirant Production by the German Group across 3-Monthly Periods.

Spanish children's grammars must contain constraint (2) banning continuants, since it is a universal markedness constraint that must be present in all grammars. Moreover, being a markedness constraint, it should have an outranking position at the initial state. Constraint (3) requiring identity of features between vowels and consonants, as in the case of [+cont] must also be in all grammars; other constraints requiring identity of features involve [voice], [nasal], etc. These constraints are universal, too, but their position in the grammar is given by the outputs of the target language. Spanish is a language with high degrees of assimilation [11] which means that the child is sensitized to assimilation, as in the present case of [+cont]. What we are proposing is that not only the direct presence of spirants leads to spirant production, i.e., it is not only a question of being faithful to spirants, rather, it is the far-reaching processes of spreading that provide evidence to

the child that sharing features is outranking. Thus in the Spanish children's grammars sharing features outranks the ban against spirants, that is, (3) outranks (2). In the case of bilinguals, only Spanish results are shown in Figure 3, because German monolinguals exhibited almost 100% of correct voiced stop production and negligible percentages of spirants. Figure 3 shows that voiced stops in the Spanish of the bilinguals reach the same high percentages, in fact even higher, than those of the Spanish monolinguals. Interestingly, though, percentages of spirantization are lower than those of the monolinguals. From 1;7 to 2;6 they are high (always above 50%), although slightly lower than those of the monolinguals. In the following time points (from 2;7 to 3;0), the values substantially decrease, reaching less than 20% at the last point.



**Figure 3:** Percent of Voiced Stop and Spirant Production in Spanish by the Bilingual Group across Same Periods.

From the data in Figure 3 it is obvious that the bilinguals in Spanish begin with a grammar that is very similar to the grammar of the monolinguals, with constraint (3) in a dominant position, since spirants are correctly produced most of the time. These results show a growing influence from the German of the bilinguals onto their Spanish. This strong influence is surprising, in view of the fact that in other realms of phonological acquisition, influence is rather weak. For instance, bilinguals produce Spanish vowels in a way that is indistinguishable from Spanish monolinguals [12]. Clearly, the determining factor for this strong influence is markedness: the constraint banning spirants, (2), universally dominates the one sharing features, (3).

### 3. CONCLUSIONS

This study examined the production of voiced stops and spirants by a group of Spanish monolingual children. In spite of the alleged markedness of spirants, they are produced targetlike from the very beginning. German-Spanish bilinguals show less spirants in their productions and what is more important, percentages of spirants are drastically reduced from 2;7 on. These findings shed light on the interaction between different markedness constraints and at the same time exemplify the interaction between the two languages of the bilingual child on the basis of markedness.

### ACKNOWLEDGMENTS

This study was carried out in the Research Center on Multilingualism, supported by the Deutsche Forschungsgemeinschaft and the University of Hamburg. We would like to express our gratitude to these institutions. We also want to thank Imme Kuchenbrandt and Dr. Margaret Kehoe for their assistance in the preparation of the study and the manuscript, as well as Inmaculada Cerezo for her help with phonetic transcription.

### REFERENCES

- [1] R. Jakobson, *Kindersprache, Aphasie und allgemeine Lautgesetze*. Cambridge MA: Hiltop University Press, 1941.
- [2] N.V. Smith, *The Acquisition of Phonology*. Cambridge: Cambridge University Press, 1973.
- [3] D.L. Stampe, The acquisition of phonetic representation. In *Papers from the Fifth Regional Meeting*. Chicago Linguistic Society, 443-454, 1969.
- [4] R.M. Hammond, Phonemic restructuring of voiced obstruents in Miami-Cuban Spanish. In F.M. Aid, M.C. Resnick & B. Saciuk (eds.), *1975 Colloquium on Hispanic Linguistics*, 42-51. Washington D.C.: Georgetown University Press, 1976.
- [5] J.W. Harris, La espirantiación en castellano y la representación fonológica autosegmental. *Estudios gramaticales 1*, 149-167. Barcelona: UAB, 1984.
- [6] M. Macken and D. Barton, The acquisition of the voicing contrast in Spanish: a phonological study of word-initial stop consonants. *Journal of Child Language 7*, 433-458, 1980.
- [7] L. Lombardi, Second language data and constraints on manner explaining substitutions for the English interdental. *ROA-418-0900*, 2000.
- [8] L. Lombardi, Positional Faithfulness and Voicing Assimilation in Optimality Theory. *NLLT 17*, 267-302, 1999.
- [9] A. de Houwer, *The Acquisition of two languages from birth: A case study*. Cambridge, UK: Cambridge University Press, 2000.
- [10] A. Soltau, *Der phonologische Erstspracherwerb im Spanischen und Deutschen am Beispiel der stimmhaften Plosive und Spiranten*. University of Hamburg: M.A. Thesis, 2002.
- [11] C. Lleó and I. Vogel, Limiting the scope of phonological processes along the prosodic tree in L2, *International Journal of Bilingualism*, forthcoming.
- [12] M. Kehoe, Developing vowel systems as a window to bilingual phonology. *International Journal of Bilingualism 6*, 315-334, 2002.