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## RELATIVE INFLUENCE OF SPANISH- AND ENGLISH-LANGUAGE DOMINANCE AMONG BILINGUAL LEARNERS IN THE ACQUISITION OF PORTUGUESE SYLLABLE TIMING

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### Introduction

The population university students of Portuguese in the United States consists overwhelmingly of speakers of Spanish at some level. Moreover, these Spanish speakers also know English. Thus, Portuguese is a third language for most students, an L3, and their interlanguage while learning may show influence from their two prior languages.

The considerable body of literature dealing with second-language acquisition generally assumes a single prior language and has as one of its frequent goals that of determining possible influences from that prior language, or L1. "Interference" errors are said to be attributable to elements of L1 that are carried over to L2 and presumably differ according to the specific L1 involved, while "developmental" errors seem to be due to inherent difficulties in the acquisition of the specific L2, and may not vary much in accordance to the particular L1 involved. The debate over the role of L1 in acquiring L2, interference vs. development, is a long and heated one, and will not be dealt with here. The reader is referred to the following works, a mere tip of the iceberg, for more on that debate: Gass & Selinker, 1994; James, 1998; Odlin, 1989; Ringbom, 1987.

The L3 situation presents some difficulties under the normal L1/L2 model. In recent years, however, growing research has evolved that looks at the situation of students who come to a new language already

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in possession of two (or more) prior languages. Interesting questions arise as to which of the two is more influential in acquisition of L3? (The more similar, the less similar, the more dominant, the earlier learned, etc.). Or what is the interplay between L1 and L2? Also, with the Spanish/Portuguese combination, there are issues of the proximity of the TL and one of the prior languages, a situation which also exists in other sets of closely related languages. See the excellent collection of papers edited by Cenoz, Hufeisen, Jessner, 2001; also several of the papers in the volume edited by Simões, Carvalho, Wiedemann, 2004, specifically those authored by Jensen, Koike and Flanzer, Santos and Silva, and Almeida Filho.

Of special interest in the case of English/Spanish to Portuguese in North America is the type of learner we have in terms of the relationship that exists between E and S, with the three populations of students that we normally see: native English speakers who have learned Spanish as a second language; native Spanish-speaking immigrants or international students who have learned English as a Second Language; and heritage Spanish speakers, who either were born in this country to a Spanish-speaking family, or arrived as immigrants as small children, and are apparently English-dominant but with often advanced levels of ability in Spanish.

This last group is the most varied and difficult to classify. At its fringes, it overlaps the other two groups: heritage speakers born to Spanish-speaking parents but who rejected speaking the family language early in favor of English may differ little from Americans who have acquired Spanish as a second language, while those born and reared in a Spanish-speaking home, perhaps surrounded by a nurturing Spanish-speaking community, including some of their formal schooling, may differ little from adult immigrants. Nonetheless, it has been found useful in many studies to attempt to draw these lines in studying the effects of Spanish on the acquisition of Portuguese as L3.

A number of different attempts have been made to gauge the relative influence of two prior languages on the acquisition of Portuguese, such as Jensen, which looked at student compositions, and the Koike and Flanzer paper that worked with pragmatics. The current study uses pronunciation as a measure, which, in general, has probably been the most used metric of "interference" in any language acquisition study. However, instead of the more usual examination of distortions to the phonemic-phonetic structure, this study focuses on one aspect of prosodics: syllable timing, in an attempt to determine to what degree timing patterns are carried over from Spanish and/or English into Portuguese, as perhaps symptomatic of wider issues in phonology.

## 1. Why Timing?

Syllable timing, as an element of prosodics, has been a frequently studied but somewhat specialized branch of phonetics; however, it has rarely come to the attention of students of language acquisition. Yet it offers some special advantages for use as a measure of influence from a prior language in acquisition on a new one, specifically the following:

- 1) It is highly measurable, and, therefore, objective. Given the proper tools, measurement is simple and reliable, and today those tools are widely available and inexpensive;
- 2) Typical syllable timing patterns, as described in monolingual or bilingual studies, are different for Spanish, English, and Portuguese, therefore, making detection of variances from normal, and the direction or nature of those variances, something that should be relatively simple;
- 3) Timing is not one of those teaching problems that receives much explicit attention in the Portuguese-language classroom. Therefore, acquisition of native-like timing patterns is usually a matter of student listening and non-cognitive repetition, so that learner success or failure is probably not a reflection of specific teaching effort, but rather, of a more natural process of acquisition. Results, therefore, more likely reflect the nature of the language contact situation without much skewing from specific teacher input.

## 2. Timing and Stress

What is syllable timing? At its most basic level, syllable timing is simply the duration of a syllable, usually measured in milliseconds, from initiation of its first segment or *onset*, to termination of its last or *coda*; however, what is of greater interest is not the absolute value of duration, but rather the relative duration among the syllables of a breath group or word. That duration, and the rhythm patterns that it produces, are functions of various factors, particularly the rapidity with which the speaker is speaking and other matters of paralinguage or expression. Nonetheless, it has long been observed that certain rhythmic patterns are most typical of specific languages or language groups, no matter what expressive elements a speaker may apply. (See, for example Puppel, 1986; Hoequist, 1983; Clegg & Fails, 1987; Bertinetto & Fowler, 1989; Oller, 1979.)

Syllable timing, of course, is part of the larger picture of syllable stress. Phonetically, stress consists of a combination, in various degrees, of the three principle prosodic variables: duration, loudness, and pitch. And phonologically, stress actually plays different roles in different languages: in Portuguese, Spanish, and English, it is differential, or "phonemic": a shift of stress alters the lexical meaning of the word: *sábia, sabia, sabiá; llego, llegó; récord, recórd*; etc. However, in French, for example, stress placement does not have a differential effect. In language contact situations in which the L1 is phonologically stressless, one would expect to find specific learning problems in regard to stress, an effect that is certainly recognizable in a typical French accent in English, in which stress placement may appear haphazard. For this study, however, since our three languages all give phonological recognition to the role of word stress, we can concentrate on the specific aspects of timing, rather than placement of stress itself.

### 3. "Stress-timed" vs. "Syllable-timed"

Kenneth Pike (1945, 35) defined two typical timing or rhythm patterns that he called "stress-timed" and "syllable-timed." This concept has influenced virtually all studies of syllable timing since. The idea was that in a syllable-timed language (Spanish being a typical example), all syllables have relative equal duration, so that the overall duration of an utterance is primarily a function of the number of syllables contained in it. On the other hand, in a stress-timed language (such as English), the duration of an utterance will depend primarily on the number of stressed syllables it contains. The utterance is marked by "feet," as in metrics, each consisting of a single stressed syllable and a number (typically from zero to four) of surrounding unstressed syllables. In the ideal example, the stressed and unstressed syllables of a given foot "share" the same canonical time frame, such that they adjust their lengths within the foot to preserve that foot length. Thus, a stressed syllable appearing alone in a foot will typically last longer than one that shares its foot with one or two other unstressed syllables. Likewise, a foot with three or four unstressed syllables will give each less time than one with a single unstressed syllable.

Such a notion of stressed-time and syllable-timed, of course, is not unrelated to the traditional metrical patterns in a language. In Spanish and other Romance languages, for example, poetic metrics consists, primarily, of a particular count of syllables in a line, seven and eleven being common values, for example. On the other hand, in a stress-timed

language like English, metrics deals with feet, each containing a single stressed syllable and a particular number and placement of unstressed syllables (bearing Greek names), such as *iamb*s, producing, for example, *iambic pentameter*--five *iamb*s to a line. For readers interested in the relationship between stress, accent, and metrics, the following works are suggested for consultation: Hayes, 1995; Beckman, 1986; Kavitskaya, 2002.

But in spite of the traditional evidence of poetic metrics, is such a dichotomy as stressed-timed and syllable-timed an accurate classification of languages? Is it possible to categorize all languages into one of these two categories, or is there a third or fourth category? (Hoequist, 1983, for example, proposes a third category, *mora-timed*, for such languages as Japanese.) Or do these types consist of extreme points of a continuum along which all languages may be classed according to the degree to which they are "iso-syllabic" or "iso-accentual" (these terms are applied less categorically and less impressionistically than the "stress-timed" and "syllable-timed" labels). This is the position taken by Bertinetto (1989) and others who have worked with a wide variety of languages.

Researchers, using instrumental measurement of syllable timing rather than impressionistic measures, have generally not been able to verify the categorical "stress-timed" versus "syllable-timed" attributions. Rather, they have confirmed that there are a number of factors that contribute to the relatively iso-accentual or iso-syllabic nature of a language. Bertinetto (1989, 124) lists six factors that seem to characterize languages that tend toward the iso-accentual end of the continuum:

- i -- more intrasyllabic compensation;
- ii -- more CS [compensatory shortening of stressed syllables] at the foot (and word) level;
- iii -- more vowel reduction in unstressed syllables;
- iv -- more tolerance for extreme shortening of unstressed syllables
- v -- sharp contrast in the exploitation of prosodic features in stressed vs. unstressed syllables;
- vi -- in general, less sensitivity to all linguistic and non-linguistic events localized on unstressed syllables.

English bears all six of these factors; Spanish shows none, so that by these measures, English is iso-accentual and Spanish is iso-syllabic. Nonetheless, the idea that all syllables in a Spanish utterance are of the same length, the basis of "syllable-timing," is erroneous. Extended length still constitutes one of the prosodic elements that mark stressed syllables. We shall see below that the ratio of stressed: unstressed syllables reflects the relative iso-syllabic nature of Spanish.

#### 4. Brazilian Portuguese

And Portuguese? Is it iso-accentual or iso-syllabic? Portuguese would seem to satisfy all or most of Bertinetto's criteria listed above. Although he did not address that question directly, Roy C. Major (1984) presented a study of Portuguese timing in three-syllable oxytones. He used the frame *Repita a palavra batata de novo*, 'Repeat the word potato again' and following Liberman and Streeter (1978), he then replaced *batata* 'potato' with the nonsense sequence *lalala* to minimize effects of different consonants on measurement of syllable length. (This use of nonsense speech has come to be known as 'iterant' speech and is a controversial, if common, technique in prosodic studies.) Major showed that BP (Brazilian Portuguese) has three degrees of word stress, correlated with syllable length. Primary stress falls on the traditional tonic syllable. The final syllable is unstressed, that is, is of relatively short duration. The initial syllable shows intermediate stress. He proposed that there is an ordering to syllable reduction, post-tonic syllables being most subject to shortening, followed by pre-tonic syllables. Major gives impressive evidence for this position from a study of various related phenomena in Portuguese phonology. Brakel (1985) compared French, English, Spanish, and Portuguese on the stressed-/syllable-timed scale. He found that Portuguese occupies an intermediate position, and that on the morphophonological level it is very close to Spanish, but in production, it is much more subject to vowel shortening and laxing, and therefore comes to share many characteristics of a stress-timed language.

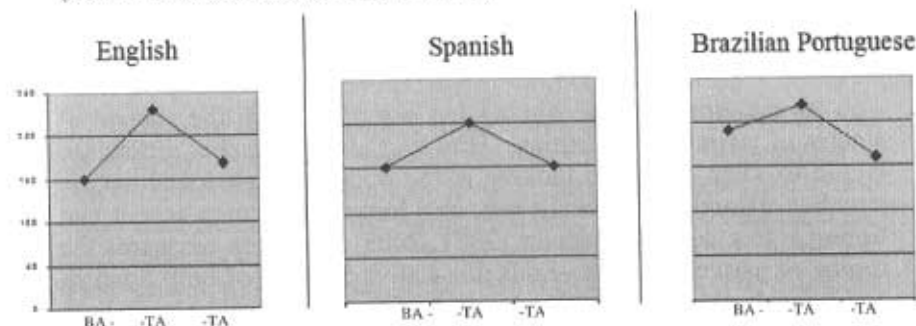
More recently, Cagliari and Massini-Cagliari (1998) used actual speech samples from the *Gramática do Português Falado* project (see Ilari, 1993 for other works based on that project). In spite of apparently not having the benefit of instrumental analysis, those authors made a number of interesting determinations about syllable timing in BP, such as the fact that in fast speech the timing relationship among syllables does not change from that expected in speech at a normal speed (p. 56); such an altered relationship, with reduction of unstressed syllables, is an

expected effect in stress-timed languages. They also found independence between syllable *timing* in production and syllable *quantity* (as per Hayes, 1995) at the phonological level.

#### 5. Expected Native Timing Patterns

On the basis of the general beliefs about iso-accentual and iso-syllabic languages, and the findings of Majors and others for Portuguese, we can hypothesize the following expected timing sequences in a three-syllable word (such as *batata* 'potato') pronounced by native speakers of English, Spanish, and Portuguese using their native timing patterns. Approximate syllable timing in milliseconds is represented on the vertical axis in the following charts:

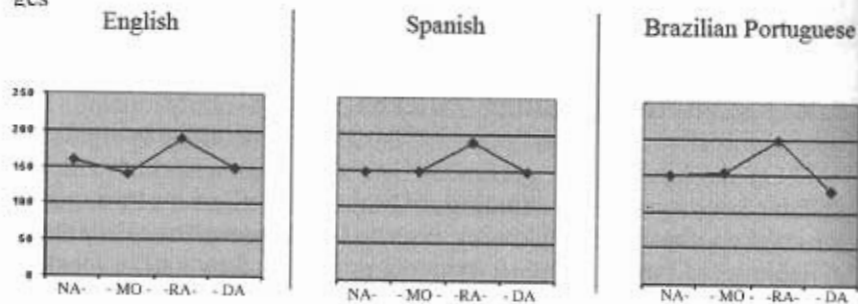
Figure 1. Theoretical timing of 'batata' following norms of three languages (scale is in milliseconds, 50 per gridline)



We see that we might expect English to give relatively longer time to the mid, stressed syllable, and of the unstressed syllables, the pre-tonic would be shorter than the final. In Spanish we would see relatively less lengthening of the stressed syllable and even timing of the unstressed. In Portuguese we would expect somewhat longer duration of the initial unstressed syllable and less on the final syllable.

A four-syllable word such as *namorada* might have the following profiles:

Figure 2. Theoretical timing of *namorada* following norms of three languages



Here we have shown the propensity of English to alternate longer and shorter syllables, with a shortened second syllable in relation to the first. Spanish, again, is shown to have unstressed syllables of equal length, and Portuguese to shorten final syllables more than pre-tonic.

## 6. Timing in Language Acquisition

As mentioned above, timing has not often been the subject of studies of language acquisition. However, one researcher, Francisco Gutiérrez-Diez, has been looking at the Spanish/English acquisition situation. (Bond and Fokes, 1985, also looked at foreign accent and timing.) In a series of articles (2001, 2005) Gutiérrez compares the timing of native speakers versus non-native learners of both Spanish and English. He finds that the duration of unstressed syllables in both languages is relatively similar, contradicting the usual understanding that English greatly reduces its unstressed syllables, while Spanish maintains them. On the other hand, he finds that the ratio between the average stressed syllable and unstressed syllable in the two languages is notably different, with greater lengthening of stressed syllables in English. He uses that ratio unstressed:stressed to express the performance of natives in each language, as well as non-native learners, finding, not surprisingly, that learners lie between the measures of natives of each language. We shall use his notion of that ratio in our own analysis.

## 7. Hypotheses and Research Questions

It was hypothesized that English native speakers learning Portuguese will reproduce patterns of English timing in Portuguese, such that their Portuguese timing resembles English; we likewise hypothesize that native Spanish speaking students of Portuguese will reproduce patterns of Spanish timing in Portuguese, such that their Portuguese timing resembles Spanish. We further hypothesize that because both native English- and Spanish-speakers in the study are bilinguals, we may see “interference” from the other language in among them, and that heritage speakers of Spanish may reflect either Spanish or English patterns.

The primary research questions used were: a) In bilingual speakers, which is the primary source of “interference” in timing: English or Spanish? And b) are there differences among our three defined populations of language learners?

## 8. Method

Data were derived from a set of new recordings, as well as two sets of legacy recordings. The new recordings consist of 48 samples of speech recorded by intermediate-level Portuguese students and a few non-student Brazilians in the spring of 2006. Two of the students were native speakers of Haitian Creole and were eliminated from the tallies; of the remaining 46 samples, there were 6 Brazilians, 6 native English speakers, 16 heritage speakers of Spanish, and 18 native speakers of Spanish.

Determination of group membership was made by means of a questionnaire completed by each participant which asked, in addition to age, sex, and marital status:

*What language do you consider to be your first/native language?; Country of birth; Age arrived in the U.S. if foreign born; Did you continue to use your first language at home?; What language do you speak at home now?; Primary language of education (at five levels from elementary to graduate school); and a rating of speaking ability in English, Spanish, and Portuguese on a scale from 1 (poor) to 5 (native).*

The primary factors considered in assigning group membership were country of birth and age of arrival in the U.S. Other factors were looked at in cases of doubt.

The recordings were made in a quiet classroom, using a Sony professional cassette recorder with Dolby C noise reduction and a double-headed condenser microphone. Following oral identification by subject number, each participant was asked to read the following sentences:

*Esto ya es todo.* (Spanish) 'This is everything already.'

*My friend's name is Tony* (English)

*Repita a palavra batata de novo* (Portuguese) 'Repeat the word potato again.'

*Repita a palavra lalala de novo* (Portuguese) 'Repeat the word lalala again.'

*Você tem namorada?* (Portuguese) 'Do you have a girl/boy friend?'

*E namorada, você tem?* (Portuguese) 'And a girl/boy friend, do you have one?'

Prior to making the recordings, the sentences were read to the students and they were instructed to use a normal speaking pace. They were also told how to pronounce the non-sense word *lalala*, with stress on the middle or penultimate syllable. They were allowed to practice, but were not corrected in any way. However, they were not told what the object of the study was. A post-session to satisfy their curiosity explained that we were looking for rhythm effects that might vary according to their linguistic backgrounds.

### 8.1 Rationale for Items in the Recordings

The Spanish and English sentences were designed to elicit the initial /t/ in similar environments in order to get a measure of each informant's Voice Onset Time (VOT) in the two languages. It has been determined that there is a correlation between this easily measurable variable and "overall degree of native-like speech or global foreign accent" (Yavas, 1996, 131) so that it was thought that these measures would help determine the phonetically dominant language of those Spanish-speakers who were not obviously classifiable as heritage or native. (See Boucher, 2002 for a study relating VOT to length of the following syllable.)

The sentence frame *Repita a palavra batata de novo* emulates Major's work (1987), with a three-syllable test word, *batata*. Similarly, *Repita a palavra lalala de novo* uses the non-sense word to replace the real word *batata* 'potato,' for reasons mentioned above. However, few of the informants were able to pronounce *lalala* with anything like normal stress

patterns, in spite of prior instruction on how the word was to be pronounced. Most said lá-lá-lá, stressing each syllable as if a sequence of three words, a sort of singing practice, so no data was extracted from that sample.

The two sentences with *namorada* were designed to test timing in a four-syllable word with typical penultimate stress in a common, simple open-syllable. That particular frame, in two variants, was selected because of the good natural language data available for comparison (see below). The variants provided two separate samples in different sentence positions, final and non-final.

### 8.2 "Legacy" Data

In addition to the new data, some old or "legacy" data were available and were used. On a previous occasion I had done a preliminary study of this same issue (Jensen, 1987), using student recordings similar to those made this time, but without collecting or recording full information on the heritage/native status of the "Spanish" speakers. Informants were divided between English and Spanish groups only, with 6 English and 14 Spanish. For the current study, when the heritage/native difference was taken into consideration, the 1987 "Spanish" data was not tallied, leaving the six English informants. Data is available for the *batata* frame and for each of the *namorada* sentences.

A third source of data comes from field research consisting of several hours of recordings that I made in 1974 and 1975 in locations around Brazil, in the process of gathering sociolinguistics data for another study. Pairs of young people were recorded together, interviewing each other. It was found that a frequent question was *Você tem namorada/o?* or the variant *E namorada/o, você tem?* (glossed above). A total of 16 occurrences were found for the first variant and two for the second. The recordings are of good quality, made on a Superscope dual-track cassette recorder with close microphoning of each speaker (each recorded on a separate track) such that it was possible to produce clear spectrograms and measure syllable length. These measurements entered the data base as 'Brazilian,' representing most of the responses in that category. For the *batata* item there is no data available from this spontaneous source, as none of the informants happened to mention potatoes.

### 8.3 Analysis

All recordings were digitized using Speech Analyzer 2.6 (from Digital Resources—Sumer Institute in Linguistics) running on a Sony Vaio desktop

computer. From these files, complete spectrograms were produced for each case/item studied and measurements were taken of the VOTs of the initial plosive of the words *Tony* and *todo* and then all syllables in the three words *batata*, *namorada* (1) and *namorada* (2) were measured for duration by placing vertical cursors around the syllables and recording the time data in an Excel data base. For each syllable measured, the entire articulation of the (initial/onset) consonant was counted with its following vowel, since all syllables are of CV structure. The data base also included information on case number, a three-way grouping (English, Spanish, Brazilian) and a four-way grouping (English, Spanish Heritage, Spanish Native, Brazilian). Other classifications were also made, such as an audible judgment of degree of “Spanish” or “English” accent, and an overall VOT score combining both responses.

The data were then processed through SPSS 14.0 on a Dell laptop computer and by using SAS working on a Dell desktop unit.<sup>1</sup>

## 9. Results

### 9.1 VOT data

It was found that on the VOT data in *Tony* and *todo* almost all subjects successfully produced differentiated VOTs for Spanish and English in accordance with expected criteria (that is, <30 ms. for Spanish or “unaspirated” and >30 ms. for English or “aspirated”; Yavas, 132). Results for *todo* are very close among groups and are fully as would be expected for native-like articulation of the initial [t]. The differences among the groups for *Tony* are interesting, and show a statistically significant relationship, with shorter VOTs for native speakers, intermediate values for heritage speakers, and the highest values for English. (Why the Brazilian figures are lower than the Spanish is unknown at this time; the Brazilian informants on these items were as bilingual as the Spanish speakers.) Below are the group averages on both words with values in milliseconds:

Figure 3. VOT data by groups (correlation of .439, significant at the <.01 level on a two-tailed Pearson)

Group	VOT in TONY	VOT in TODO
English	67	22
Heritage	59	19
Spanish	49	20
Brazilian	35	14

Although attempts to utilize the VOT data to correlate with syllable durations were not successful in showing significant relationships, the VOT responses, with their significant correlations to group membership, support the validity of the somewhat subjective assignments made to groups. The VOT has been shown to be an accurate measure of “accent” in the Spanish/English pairing, as pointed out above.

### 9.2 Timing Data

Timing data were looked at in two different ways: The first approach was to use a multivariate analysis of variance (MANOVA) statistical test for parallelism of the curves that result from plotting the mean syllable lengths for each group. This test did not average the unstressed syllables, thus preserving the relative lengths of the unstressed syllables, so was sensitive to differences among the three unstressed syllables in *namorada* and the two unstressed in *batata*.

For the second analysis, following Gutiérrez (2001), unstressed syllables in each token were averaged to determine a value representing unstressed syllables, with a number for each informant. That value was then compared to the stressed syllable in the same token as a ratio, the resulting number over 1.00 being the length of the stressed syllable in relation to the mean unstressed in the word. Tests for between-subject effects were applied, as well as Tukey’s post hoc HSD test.

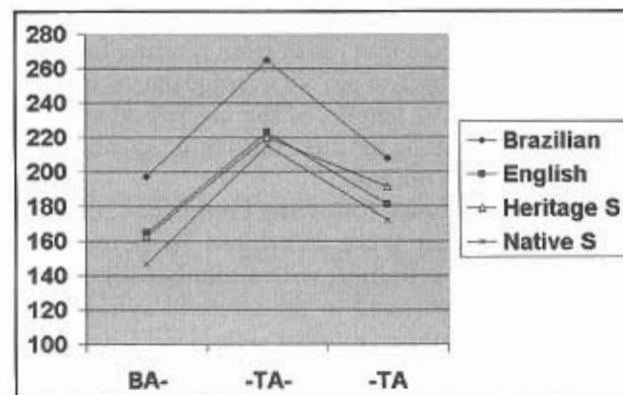
#### 9.2.1 Batata

Below are mean syllable lengths for each group (in milliseconds, “ms.,” and standard deviation, “sd”). The test for parallelism failed to show a statistical difference (that is, non-parallelism) among the curves, which were therefore found to be parallel, without significant effects from group membership. However, they were not congruent because the Brazilian numbers, in absolute terms, were higher than all three learner groups, which were, among themselves, parallel and congruent.

Figure 4. Syllable lengths in *batata*, by groups, with Standard Deviations

Group (N)	ba-		-ta-		-ta	
	ms.	sd	ms.	sd	ms.	sd
English (14)	165	30.97	223	30.02	181	38.24
Heritage S (16)	163	33.01	220	32.24	192	48.16
Native S (18)	147	14.14	215	29.90	172	46.33
Brazilian (5)	197	43.14	265	49.22	208	64.77

Figure 5. Mean syllable length for *batata*, in milliseconds, plotted by group.



The second procedure, using the length of the stressed syllable over the mean unstressed syllable, shows for all groups a stressed syllable approximately one-third (27% - 36%) longer than the average unstressed. Results of tests for effects of group membership for *batata* failed to show significant between-subject effects and Tukey's post hoc HSD statistical tests, figures for all four groups closely approximating each other.

Figure 6. Ratio of stressed:unstressed syllables, *batata*, by group, with Standard Deviations. No significant difference demonstrated.

Group (N)	Mean ratio of stressed/ unstressed	s.d.
English (14)	1.31	.222
Heritage S (16)	1.27	.250
Native S (18)	1.36	.179
Brazilian (5)	1.33	.124

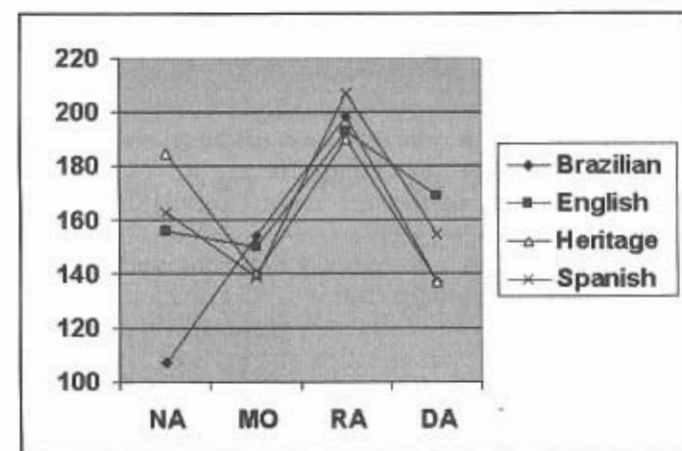
## 9.2.2 Namorada (1)

Following are the mean syllable lengths for each group for the *namorada* (1) item in the frame *Você tem namorada?*

Figure 7. Syllable lengths in *namorada* (1), by groups, with Standard Deviations

Group (N)	na-		-mo-		-ra-		-da	
	ms.	sd	ms.	sd	ms.	sd	ms.	sd
English (14)	156	34.52	150	17.75	192	29.27	169	28.41
Heritage S (16)	185	38.61	140	18.69	190	34.82	137	23.98
Native S (18)	163	37.00	139	24.19	207	16.88	155	46.56
Brazilian (17)	107	28.96	154	25.21	198	47.25	137	49.66

Figure 8. Mean syllable length for *namorada* (1), in milliseconds, plotted by group.



The test for parallelism shows that the curves are *not parallel* over all: For the four groups Wilks' Lambda = 0.40, with  $p < .0001$ , that is, the differences among them are significant, and that group membership has an effect on syllable length. In separating the Brazilian plot from the others and testing the student groups versus the Brazilian model,  $W = 0.52$ , also at  $p < .0001$ . However, among the three student groups, no significant differences were demonstrated and the curves are parallel ( $W = 0.74$ ,  $p = .006$ ).

The data using the ratio between mean unstressed syllable and the stressed syllable for *namorada* (1) give the following measurements:

Figure 9. Ratio of stressed:unstressed syllables, *namorada* (1), by group with Standard Deviations

Group (N)	ratio 1:stressed -RA-	s.d.
English (14)	1.23	.19363
Heritage (16)	1.24	.22703
Spanish (18)	1.39	.24457
Brazilian (17)	1.49	.20682

Here figures are progressively greater going down the table from English to Brazilian. The numbers show an overall significant difference  $F(3,61) = 5.32, p = .003$ .

Performing the Tukey HSD post hoc test comparing each group with each other we find that the difference between the Brazilian group and both English and Heritage groups is significant, but not that between the Brazilian group and the Spanish Natives, nor between any of the student groups: In other words, only the Spanish Native group produced timing that was statistically equivalent to the target Brazilian group. Both the English and Heritage Spanish groups produced divergent timing in the first iteration of *namorada*: their numbers were too low and produced too short a stressed syllable. See Figure 10.

Dependent Variable: *namorada1\_ratio*: Tukey HSD

Figure 10. Ratio statistics on *namorada* (1) comparing student groups with Brazilians, including all relevant figures.

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Brazilian	English	.2632(*)	.07953	.008	.0531	.4732
	Heritage Spanish	.2515(*)	.07675	.009	.0488	.4542
	Native Spanish	.0974	.07452	.562	-.0994	.2942

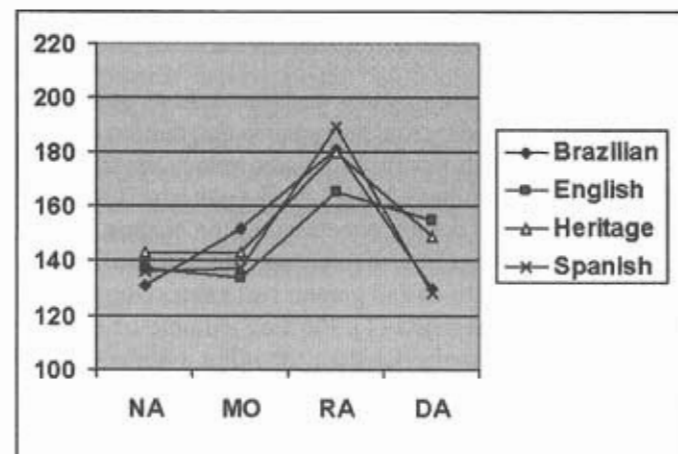
### 9.2.3 Namorada (2)

For the second iteration of *namorada* (*E namorada, você tem?*) the timing figures and plots are the following:

Figure 11. Syllable lengths in *namorada* (2), by groups, with Standard Deviations

Group (N)	na-		-mo-		-ra-		-da	
	ms.	sd	ms.	sd	ms.	sd	ms.	sd
English (14)	137	21.99	134	27.42	165	38.37	155	41.93
Heritage S (16)	143	28.36	143	25.54	180	32.74	149	33.67
Native S (18)	136	20.33	137	17.17	188	43.43	129	35.87
Brazilian (17)	131	25.10	152	13.57	182	40.63	130	43.89

Figure 12. Mean syllable length for *namorada* (2), in milliseconds, plotted by group.



Tests of Parallelism fail to show a significant difference among these curves, the four groups being parallel ( $W=0.74, p = .1048$ ).

On the ratio test, only the difference between the English group at 1.17 and the Native Spanish group at 1.41 approached significance:  $F(3.51) = 2.54, p = .067$ .

Figure 13. Ratio of stressed:unstressed syllables, *namorada* (2), by group with Standard Deviations

Group (N)	ratio 1:stressed RA	s.d.
English (14)	1.17	.20444
Heritage (16)	1.25	.23197
Spanish (18)	1.41	.31916
Brazilian (7)	1.32	.26667

Otherwise the intergroup numbers are not significant. However, one may observe that except for the Brazilians, the relationship among the three student groups is very similar to the *namorada* (1) results; the Heritage and Spanish numbers are virtually the same (1.24 ~ 1.25; 1.39 ~ 1.41) and the English numbers are somewhat lower, further distancing the English from all other groups. One may suppose that the low number of valid cases for the Brazilian group (7 versus 17 for *namorada* (1)) was responsible for the different and non-significant results. Therefore, we will discount the *namorada* (2) numbers for further comment. We recall that the difference in cases was due to the much lower occurrence of the *namorada* (2) in the field data.

## 10. Conclusions

The research appears not to show that the students' performance in Portuguese timing is affected by first language in that there were almost no statistically significant effects that differentiated among the three groups of students; they consistently showed English-like patterns. On both *batata* and *namorada* (1) we saw coincidence among the student groups with differentiation from the target Brazilian group. On *batata* all curves were parallel but the Brazilian natives had greater real values (longer syllables) than the students. On *namorada* (1), the first syllable of the Brazilian informants was consistently shorter than the other syllables, while the student groups all lengthened the first syllable in relation to the second, the expected tendency in English. On the *namorada* (1) ratio test, results were actually counter-intuitive in that the significant differences were seen only for the Heritage Spanish and American English groups, and that the Spanish Natives (who should have been those most likely to use an iso-accentual model) actually come closest to the Brazilian target.

There are three possible conclusions from these findings:

- 1) The iso-accentual model assumed for Spanish is incorrect, such that it does not make an appearance in the Portuguese of Spanish-speaking learners;
- 2) That "interference" effects in timing are virtually non-existent, the slight differences demonstrated between Brazilians and all learners probably being due to developmental error;
- 3) That for English-Spanish bilingual learners of Portuguese in the United States, the "preferred" source of interference is English rather than Spanish.

The first possibility can safely be discarded from the impressive body of literature that confirms an iso-accentual (if not a full "syllable-timed") pattern for Spanish. The second conclusion can also be ruled out, perhaps somewhat less assuredly, from the studies of Gutierrez which confirm the interference effects in the Spanish-English (2001) and English-Spanish (2005) learning models. That leaves us with the third possibility: that in the situation of our students, English is the model upon which learners base their incipient Portuguese timing.

## 10.1 Hypotheses and Research Questions

Therefore, the first hypothesis, that English patterning in Portuguese occurs for English native-speaker students, appears confirmed. The second hypothesis, that Spanish patterning will occur in Portuguese for Spanish-speaking learners, has not been confirmed. The third hypothesis, that Heritage speakers may reflect either English or Spanish patterns is confirmed, but in the direction of English. On the research questions, what is the primary source of "interference" for bilingual students, and are there differences among the groups, the answers appear clear: English and no.

## 10.2 A Final Check on Non-bilingual Subjects

Curious about the apparent effects of the bilingualism of most subjects, I looked at VOT and *namorada* (1) figures from the two informants who were among the "least bilingual" of the subjects: Case no. 13 is an American who learned Portuguese while living in Brazil and has never studied Spanish; case no. 43 is an international student from Argentina whose English appears to be very basic. No statistical tests were performed because these are isolated cases.

Figure 14: Numbers for "least bilingual" subjects: VOTs, *namorada* (1) duration and ratios.

Case no.	VOT Tony	VOT todo	na-	-mo-	-ra-	-da-	ratio -ra-
13	54	29	119	143	155	131	1.18
43	21	19	235	180	193	171	0.99

These data show that the American, perhaps through his intimate contact with Portuguese in Brazil, has actually achieved the target timing curve demonstrated by the Brazilian informants, while the Argentine, besides showing fully "Spanish" VOTs in both English and Spanish, is among those with the lowest ratio number, and, in fact, with rather even timing – except for a lengthened first syllable; all others, including stressed *-ra-* are very close, a typical iso-syllabic pattern. These numbers for our extreme cases seem to tell us that the measurement system is working and that the hypotheses are probably valid for monolingual learners or in isolated cases.

Future work should set out to verify the dominance of English patterning in bilinguals' Portuguese acquisition, both replicating timing data and extending the research into other aspects of prosodics or segmental phonology. We may find that a Spanish background is less of a hindrance for attaining native-like Portuguese pronunciation than is often thought.

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