



Concordia Working Papers  
in Applied Linguistics

*Proceedings of the International Symposium on the Acquisition of Second Language Speech*  
*Concordia Working Papers in Applied Linguistics, 5, 2014 © 2014 COPAL*

# Singing in a Foreign Language: Can the Fat Lady Pronounce her Phonemes?

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## Abstract

This study investigates the intelligibility of foreign singers when they sing in Brazilian Portuguese. It addresses the following questions: How intelligible is the pronunciation of foreign singers when they sing in BP? What are the main pronunciation problems that affect intelligibility in their singing? What are the implications and applications of the findings for diction training? 17 Brazilian raters assessed the intelligibility of recordings of an excerpt of Villa-Lobos' *Bachianas Brasileiras No. 5* sung by six renowned opera singers and a Brazilian singer, used as a model. They were asked to identify their pronunciation problems and how they affected their understanding of what was being sung. The results indicate that non-native singers are considerably less intelligible than the native Brazilian singer. The results also indicate that the pronunciation problems observed were mostly of a segmental nature, involving consonants, vowels and related phonetic phenomena. Similar results found in an independent analysis of the non-native recordings confirm the reliability of the raters' assessment of the pronunciation problems that affect their understanding of singing in a foreign language.

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Singing in an unknown foreign language (L2) is a complex process for singers: They must convey the intended meanings and emotions of the

composer, be understood by speakers of that language (Ophaug, 2010), and at the same time fulfill certain diction requirements that favour *singability* over faithfulness to the target language (Zedda, 1997). One of the factors which contributes to the achievement of these goals is intelligibility in the L2, defined as the listener's ability to understand what is being sung.

Understanding the sung text is often challenging because singing modifies the phonetic and prosodic properties of speech (Jesse & Massaro, 2010). Existing research suggests several factors affecting the intelligibility of song lyrics. For example, much has been written on frequency problems for the intelligibility of vowels, demonstrating that sung vowels become increasingly less intelligible as the fundamental frequency is increased (Smith & Scott, 1980; Benolken & Swanson, 1990; Hollien, Mendes-Schwartz & Nielsen, 2000; Scotto Di Carlo, 2007). Some researchers have also considered prosodic aspects as factors of intelligibility loss. McCrea and Morris (2005), Scotto Di Carlo (2007), and Sunderberg (1982) have found that vowel lengthening, which often occurs in singing, hinders the recognition of vocal forms at syllabic and word levels, and thereby perturbs intelligibility. Scotto Di Carlo (2007) and Sundberg (1982) have also studied the extra linguistic factors that lessen intelligibility, such as the orchestral accompaniment masking the semantic forms of the lyrics.

Apart from the above-cited difficulties involved in comprehending the lyrics of a song, other factors also contribute to problems of intelligibility; for example, a singer's poor diction due to not fully understanding a non-native language's phonemic inventory. Literature involving the pronunciation of languages in singing is still scarce and has primarily focused on languages considered standard in this domain, such as Italian, French, German, and English (Adams, 1999; Adler, 1974; Colorni, 1996; Farish, 1994; Forward & Howard, 2001; Grubb, 1979; La Bouff, 2008; Marshall, 1975; Moriarty, 1975; Odom, 1997; Sheil, 1975; Wall, 2009), and though a few studies (Castel, 1994; Cheek, 2001; De'Ath, 2010; Herr, Kayama, & Mattos, 2008; Hersey, 2012; Piatak, 1991) have covered languages other than those mentioned above, most of them were written in English and addressed to North American singers. The lack of resources which enable us to acquire an understanding of the pronunciation of a language remains one of the major obstacles for an intelligible interpretation of sung text. Indeed, the uncertainty or misunderstanding of a non-native language's pronunciation not only affects the singers' intelligibility, but also hinders the execution of the songs as intended by the composer.

Although we have described a wide range of possible factors underlying intelligibility, this paper focuses on factors related to the pronunciation problems which affect intelligibility in singing. In the present study, we examine the intelligibility of non-Brazilian singers singing in Brazilian Portuguese (BP) and investigate the major causes of unintelligibility. More specifically, the study aims to answer the following general questions: (Q1) How intelligible is the pronunciation of (a set of renowned) foreign singers when they sing in BP? (Q2) What are the main pronunciation problems that affect intelligibility in their singing? (Q3) What are the implications and applications of the findings for diction training?

To answer these questions, the study was conducted in two phases. In the first phase of this study, participants, using an online questionnaire, were asked to: (1) assess the intelligibility of seven excerpt recordings of the *Bachianas Brasileiras No. 5* by one native and six non-native opera singers; and (2) identify the pronunciation problems that hindered their understanding. In the second phase, the researchers analyzed the selected excerpt for specific pronunciation problems via an errors analysis, in which segmental and suprasegmental errors were identified and analyzed according to the recommendations of the *Brazilian Portuguese Norms for Lyric Diction* (Herr, Kayama, & Mattos, 2008).

The paper proceeds as follows: In the following section, we describe the methodology employed in the experiment. This is followed by the presentation of the results and a discussion of the general trends observed.

## METHOD

### Participants

We recruited 17 native speakers of BP, 77% male and 23% female, with age ranges varying from 21 to 41 years (average age: 31.9). None were regular *lieder* listeners or had any specific learning experience in lyrical singing. All subjects were university students or professionals with a university education. They also indicated having normal hearing.

### Materials

The data analyzed was comprised of seven recordings of an excerpt of Villa-Lobos' *Bachianas Brasileiras No. 5* sung by 7 renowned opera singers. Six of these singers were non-Brazilian with different rates of

accentedness, and one native Brazilian singer, who served as a control. Among the non-Brazilians, there was one Algerian, one Latvian, one New Zealander, two Canadians, and one French singer. All recordings were normalized and saved as mp3 files for use in this study. The excerpt is comprised of 33 words organized in 5 lines (translation: The moon gently rises into infinity / Adorning the evening, like a sweet maiden / Dreamily getting ready, making herself beautiful / Desiring her soul to be beautiful / She calls to the heavens, the earth, to all of Nature!):

*Surge no infinito a lua docemente,  
Enfeitando a tarde, qual meiga donzela  
Que se apresta e alinda sonhadoramente,  
Em anseios d'alma para ficar bela  
Grita ao céu e à terra toda a Natureza!*

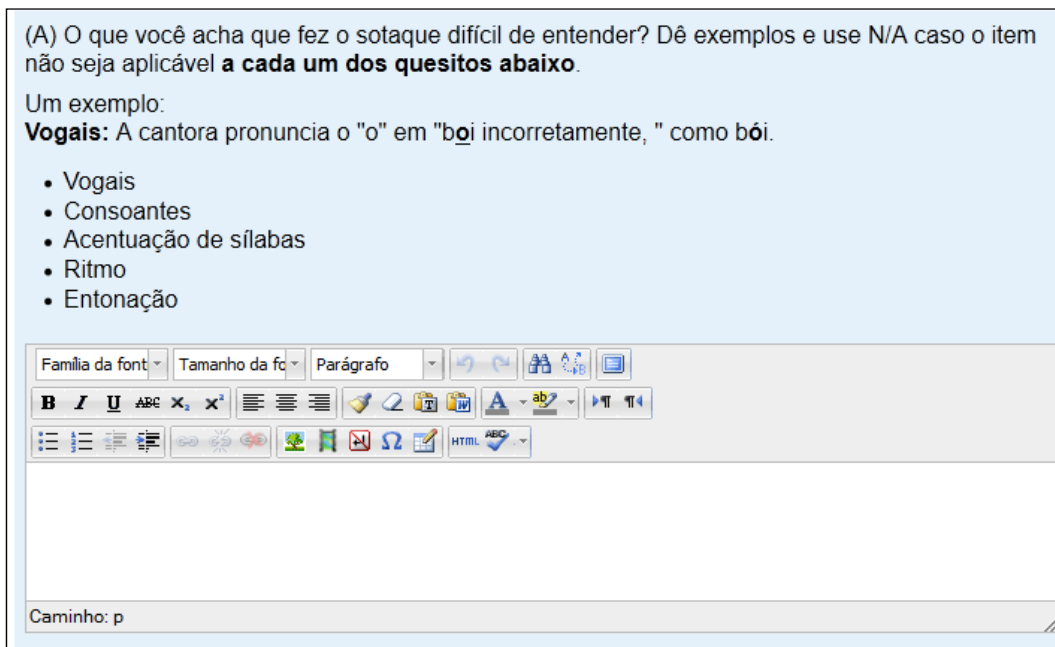
There were two main reasons for the selection of this excerpt. First was the large number of recordings of this *lied* by non-Brazilian singers. Considering that Brazilian *lieder* still remains mainly unknown on the international scene, it was necessary to choose a Brazilian song which, according to Brandão (1999), is performed most often in concert halls outside of Brazil, and which is also the most recorded by singers of the international scene. The second reason lies in the conditions of intelligibility in the actual singing of the lyrics. The chosen excerpt is written in a zone of height considered intelligible because, as alluded to earlier, phonemes in lyric singing undergo important distortions due to the frequency at which they are produced (Smith & Scott, 1980; Benolken & Swanson, 1990; Hollien, Mendes-Schwartz & Nielsen, 2000; Scotto Di Carlo, 2007).

## Procedure

The data collection procedure occurred in two stages. In the first stage, participants completed two tasks: First, using an online questionnaire, designed and implemented using the content management system Moodle, participants (also referred to as “raters”) evaluated the intelligibility of the excerpt sung by each singer. Participants listened to each recording as many times as they wished without seeing a transcription of the sung text. They then proceeded to give each an intelligibility rating on a six-point Likert scale from 1 to 6. A score of 1

indicated that the sung text was not understood, while 6 meant that the text was fully understood.

In the second part of the online questionnaire, the participants were provided with the orthographic transcription of the excerpt. They were asked to hear the recordings one more time. This time, however, the participants answered a set of open-ended questions about the pronunciation problems that hindered their understanding of the sung text. There were five main headings: vowels, consonants, word stress (stress), sentence rhythm (rhythm), and sentence-level intonation (intonation). One example for each of the first five headings was given. An illustration of the interface of this part of the experiment is given below (translation: *What do you think made the accent difficult to understand? Give examples and use N/A if the item is not applicable to each of the headings below. An example: Vowels: The singer pronounces the "o" in "boi" incorrectly, as "bói". - Vowels; - Consonants; - Stress; - Rhythm; - Intonation*). For tasks 1 and 2, participants were allowed to listen to the recordings as many times as they wished and to take as much time as they needed.



(A) O que você acha que fez o sotaque difícil de entender? Dê exemplos e use N/A caso o item não seja aplicável **a cada um dos quesitos abaixo**.

Um exemplo:  
**Vogais:** A cantora pronuncia o "o" em "boi" incorretamente, " como bói.

- Vogais
- Consoantes
- Acentuação de sílabas
- Ritmo
- Entonação

Família da fonte Tamanho da fonte Parágrafo

**B** *I* U ABC x<sub>1</sub> x<sub>2</sub> [List of icons for text alignment, bulleted and numbered lists, indentation, link, unlink, insert table, insert image, insert video, insert audio, insert code, insert HTML, and undo/redo]

Caminho: p

**Figure 1.** A sample pronunciation question – questionnaire on Moodle.

The second part of this study consisted of an error analysis, conducted by the researchers, where we analyzed each singer's performance of the selected excerpt in order to identify pronunciation problems. For the sake of comparison, we included the same headings and questions used in the raters' questionnaires, described above: Vowels, Consonants, Stress,

Rhythm and Intonation. As mentioned earlier, the analysis also obeyed the norms of lyric diction for Brazilian Portuguese proposed by Herr, Kayama, and Mattos (2008). With regard to software, we used Audacity, which allowed us to change the recording speed for more detailed listening.

All recordings were phonetically transcribed. For each singer, a list of errors was established following the criteria described above.

## RESULTS

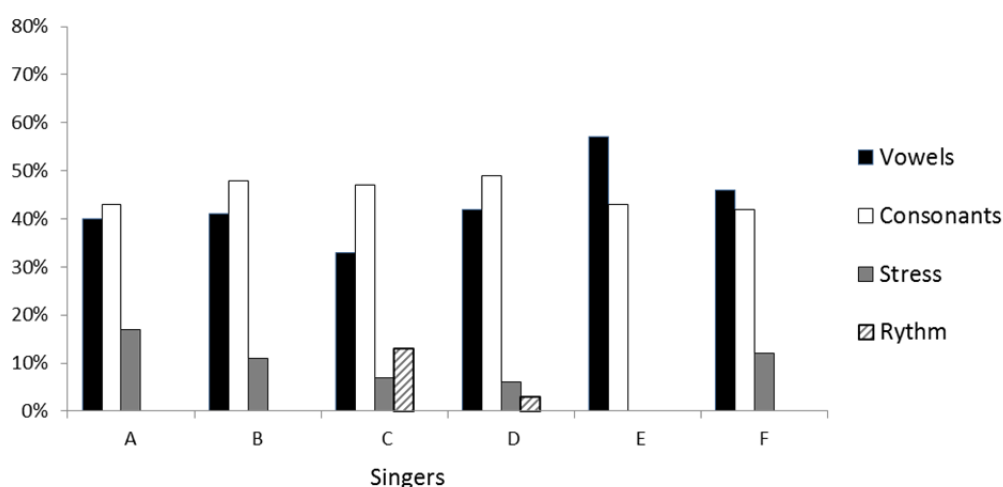
The results of the survey were analyzed using descriptive statistics, which calculated the mean score and standard deviation for each singer. The mean scores by singer are reported in Table 1. The perception test scores show the Brazilian listeners (raters) magnitude of difficulty in understanding what the non-Brazilians (A to F) sang. The non-Brazilian singers' mean ratings of 2.41, 2.53, 1.65, 3.65, 3.59 and 2.88 respectively are lower than that of the Brazilian singer (G) with a mean of 4.65. Having lower intelligibility scores suggests that one of the major sources of unintelligibility from non-Brazilian singers turns out to be poor pronunciation, not the influence of vocal technique; as indicated earlier, all singers are internationally renowned for the quality of their singing. The scores also show that the set of recordings of non-Brazilian singers has a proportion of 35% less intelligibility than the Brazilian singer's recording.

**Table 1.** Means and Standard Deviations of Intelligibility Scores

Singers	<i>M</i>	<i>SD</i>
A	2.41	1.06
B	2.53	1.07
C	1.65	0.61
D	3.65	1.32
E	3.59	1.54
F	2.88	1.58
G	4.65	1.58

The findings of the second task—the identification of the pronunciation problems that hindered the sung text's intelligibility—were used to answer Q2 (note that the “intonation” factor was removed from the chart because it was never indicated as problematic by the raters). Figure 2 shows that segmental features played a more important role in the

intelligibility of the sung text; it was mainly vowels (43.1%) and consonants (45.3%) that caused major problems with understanding. As can be seen from the results, word stress (8.8%) also had a significant influence on intelligibility. The non-native singers had numerous difficulties controlling BP word stress, singing some unstressed syllables too strongly even if the composer aligned downbeats and accents with stressed syllables. We also found that rhythm and intonation were not perceived as important factors in the intelligibility of a singer's singing. The rhythm problem found in the performances of two singers (C and D in Figure 1) can be attributed to musical errors, since the *musical* rhythm has already been written by the composer and, thus, cannot be changed.

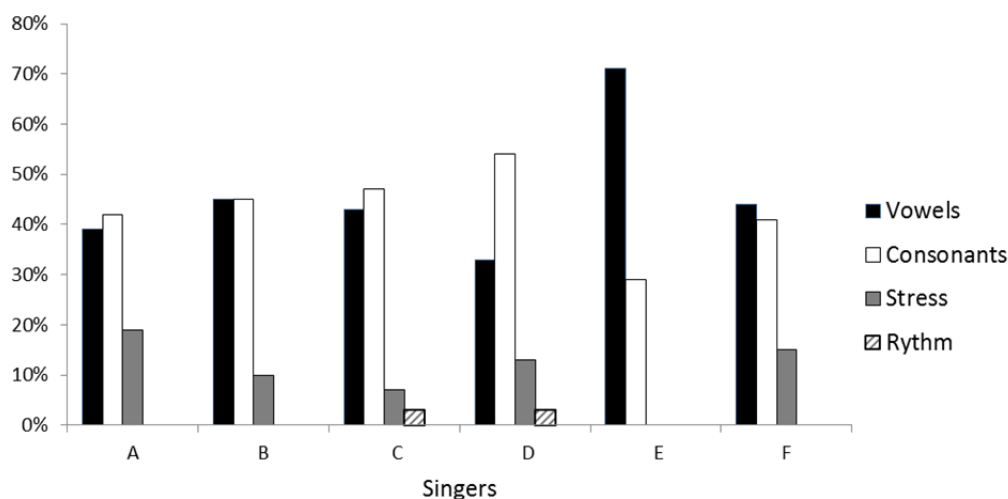


**Figure 2.** Main pronunciation problems according to raters' perception.

Examining the results, we discovered that the main vowel problem which caused intelligibility failure, as perceived by the raters, was the substitution of [e] for [ɛ], and vice-versa (e.g., pronouncing "terra" 'earth' as [te.xa] instead of [tɛ.xa]). This is due to the fact that the distribution of closed versus open vowels is not fully predictable in Portuguese. Raters recognized this problem frequently. Another problem pointed out was the monophthongization of the diphthong [ej] to [i], such as in the words, *enfeitando* and *anseios*. Among consonants, a frequent pronunciation problem affecting sung text intelligibility noted by raters was the "Italianized" pronunciation of the majority of the [r], [ɾ], and [x] sounds, which were often pronounced as Italian-sounding [r]. The non-vocalization of /l/ in syllable-final position also led to intelligibility difficulties for the raters, as in *alma* and *qual*, which are pronounced [aw.ma] and [qɰaw] respectively in this variety of Portuguese. Difficulty

in understanding the consonant [z] was noticed in words such as *natureza* and *donzela*, where [z] was mispronounced as [ts] (another instance of an “Italianized” grapheme-to-phoneme association). The raters also pointed out as problematic the following: the replacement of [ʒ] with [dʒ] in the word *surge*, the non-nasalization of /m/ in a word's final position such as in the word *em* (incorrectly produced as [em] and not [ẽj]), and the incorrect substitutions of [s] for [ʃ] or [tʃ] in the word *docemente*, for example.

In the second part of the study, the researchers analyzed the performances of the selected excerpt to identify pronunciation problems via an error analysis of segmental and suprasegmental errors. For the analysis, we based our criteria on the norms for lyric diction for Brazilian Portuguese (Herr, Kayama, & Mattos, 2008). The results are illustrated in Figure 3 (note that the “intonation” factor was removed because there were no intonation problems in the data observed). As illustrated, our findings were similar to those encountered by the raters; however, we detected two pronunciation problems that the raters did not identify in their answers to the questionnaire. The first problem relates to the non-neutralization of the final unstressed mid-vowels /e/ and /o/ to [ɪ] and [ʊ] respectively, which was found to occur many times in the singing by the six non-Brazilian singers. The second problem involves the non-palatalization of /t/ and /d/ before the unstressed word-final letter *e*, as in *docemente*, *sonhadoramente*, and *tarde*.



**Figure 3.** Main pronunciation problems, based on error analysis.



## DISCUSSION AND CONCLUSIONS

In this study, we set out to investigate the intelligibility of non-Brazilian singers' performances in Brazilian Portuguese, and to analyze the major sources of intelligibility failure. The focus was on both segmental (vowel and consonants) and suprasegmental features (stress, rhythm, and intonation). Our results revealed that, from the perspective of comparing native and non-native singers, the speech of non-native singers (i.e., singing *Bachianas Brasileiras No. 5*) is not uniform, and the participants rated them as less intelligible as the Brazilian model. This pattern is in agreement with Brandão (2002), for whom "[i]t is impossible to find two recordings of the *Bachianas* by [foreigners] with a uniform pronunciation", and contrary to what is usually observed for languages such as English, French, German, and Italian. The study also shows that, in the two analyses (raters' perception and researchers' analysis), pronunciation errors involving vowels and consonants were the most important factors that can potentially hinder the intelligibility of a singer's performance. With regards to the suprasegmental features, the results suggested that word stress can also lead to lack of intelligibility, while problems in rhythm and intonation do not seem to play a role in BP native speakers' perception of L2 intelligibility.

Our findings have some implications for the teaching of BP diction. First, the study reported that non-Brazilian singers have many pronunciation problems that hindered native speakers' comprehension ability. It is thus important to develop diction training materials that tackle these particular pronunciation problems (e.g., vocalization of syllable-final /l/, vowel reduction in word-final position, palatalization of /t/ and /d/ in unstressed positions, stress placement). Second, these findings demonstrate that segmental features are important factors in determining a singer's intelligibility. This suggests that, in the development of diction materials, it is important to focus on segmental features, including phonetic details such as t/d palatalization, l-vocalization, vowel reduction in word-final position, etc. Although this suggestion goes against current proposals for pronunciation teaching (e.g., Derwing & Munro, 2005 and many other L2 pronunciation scholars), who recommend a focus on suprasegmentals or both segmental and suprasegmental features, it is important to note the fundamental difference of singing. In singing, stress, intonation, and rhythm are often determined by the composer (Moriarty, 1975), leaving singers with very little room for deviation from the author's original intension. In the case of

word stress assignment, for example, sometimes the composer gives a longer note value or higher note to an unstressed syllable rather than a stressed syllable, or even makes prosodic errors. In this case, the singer needs to have some knowledge of stress “to make the verbal and expressive shortcomings appear natural, intentional” (Bernac, 1978). Interestingly, the study revealed that one suprasegmental feature, the assignment of word stress, also seemed to cause pronunciation problems and thus affected intelligibility in singing. In summary, the results obtained in this study allow us to identify the problems that foreign singers have when they attempt to sing in Brazilian Portuguese, and to determine their needs, constraints, and priorities in order to improve their singing pronunciation in the target language.

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