How do the non-target pronunciations of the consonants /θ/ and /ð/ by Brazilian learners of English affect comprehensibility?

Thaís Suzana Schadech
Rosane Silveira

HOW DO THE NON-TARGET PRONUNCIATIONS OF THE CONSONANTS /θ/ AND /ð/ BY BRAZILIAN LEARNERS OF ENGLISH AFFECT COMPREHENSIBILITY?

Thaís Suzana Schadech[1]

Rosane Silveira[2]

ABSTRACT: *When learning English, Brazilian learners tend to replace the consonant sound /θ/ with [s], [t], or [f], and replace /ð/ with [z], [d], or [v] (REIS, 2006). The objective of this study is to analyze if the non-target pronunciations of these consonant sounds by Brazilians hinder comprehensibility, as judged by English native speakers. Ten speech samples containing the pronunciation of the sounds /θ/ and /ð/ by Brazilians were collected and presented to a group of eleven native English speakers. The listeners were asked how difficult it was for them to understand the words that contained these consonant sounds. The results indicate that non-standard pronunciations of the interdental fricative sounds by Brazilians affect comprehensibility.*

KEYWORDS: *comprehensibility; English interdental fricatives; Brazilian learners.*

1. INTRODUCTION

When learning a second language (L2), most students aim to produce the standard pronunciation of that language. However, languages do not always share the same sounds, which can make the process of learning an L2 more difficult, leading learners to produce non-target pronunciations (commonly called *mispronunciations)* of unfamiliar sounds. Usually, these non-target pronunciations are recognized as a foreign accent. According to Munro, Derwing and Morton (2006) speech marked by a foreign accent may be difficult for native speakers to understand.

For Brazilians, one of the most common problems faced and caused by the difference between the Brazilian Portuguese (BP) and the American English sound systems concerns the pronunciation of the interdental fricative sounds /θ/ and /ð/, as in the first consonant sounds of the words 'things' and 'this', respectively (REIS, 2006). These sounds are part of the phonetic and phonological system of English but do not belong to BP. This difference is usually a source of perception and pronunciation difficulty for Brazilian learners of English, which frequently leads them to replace these two consonant sounds with similar sounds present in BP (REIS, 2006). According to Reis (2006) Brazilian learners of English tend to replace the consonant sound /θ/ with the sounds [s], [t] or [f], and replace /ð/ with the sound [d], and also (but rarely) with [v] or [z]. These results were also confirmed by Leitão (2007) and Trevisol (2010).

1 Trabalha no Programa de Fonética e Fonologia Aplicadas à Língua Estrangeira da UFSC. E-mail: thaissuzana@gmail.com

2 Doutora em Inglês pela Universidade Federal de Santa Catarina (UFSC). Trabalha no Programa de Pós-Graduação do Departamento de Línguas Estrangeiras e Literatura da UFSC. E-mail: rosanesilveira@hotmail.com

Non-native utterances can be evaluated in several dimensions and their classifications, as well as their definitions, can vary according to different researchers. However, the most common dimensions found in the literature are intelligibility and comprehensibility, for which different authors prescribe different definitions, some of them adopting a particular term embracing both these and other dimensions. The definition for the term comprehensibility that seems to be most appropriate for this study is the one given by Derwing, Munro and Thomson (2007), in which comprehensibility is defined as "the ease or difficulty with which a listener understands L2 accented speech" (p. 360). This definition was chosen because it is very specific and relates to the speaking/listening process. In addition to the dimension of comprehensibility, Munro and Derwing (1995) also present two others: intelligibility and accentedness. In their view, intelligibility "refers to the extent to which an utterance is actually understood", while accentedness refers to "non-pathological speech that differs in some noticeable respects from native speaker pronunciation norms" (p. 289).

It is important to highlight that, although these three concepts are highly intertwined, they can also be evaluated independently – which is the objective of this study, since it focuses on comprehensibility. For example, as cited by Munro and Derwing (1995), even though a speech sample might be heavily accented, it can be perfectly comprehensible and intelligible. In addition, comparing accentedness and comprehensibility, the latter is more important in terms of communication (DERWING; MUNRO, 2009, p. 184).

As previously stated, the differences between two sound systems may be a barrier for learners of a second language, which may lead them to produce non-target pronunciations of some sounds. Likewise, Flege (1999) states that non-target pronunciations also happen because of an inaccurate perception on the part of L2 learners in relation to L2 sounds that do not match their mother tongue system. As a consequence, learners tend to replace the uncommon sounds with ones that are more similar to them and that belong to their mother tongue sound system. This is the case with Brazilians' difficulty in pronouncing the interdental fricative sounds /θ/ (as in the words 'think', 'things' and 'birth') and /ð/ (as in the words 'the', 'these' and 'brother').

The production of the interdental fricatives occurs "by placing the tip or blade of the tongue between the upper and lower front teeth" (YAVAS, 2011, p. 7). English has a voiced (/ð/) and a voiceless (/θ/) interdental fricative. The two sounds share place and manner of articulation, and the only difference between them is whether there is vibration of the vocal cords (voiced or voiceless). The consonants /θ/ and /ð/ are such difficult sounds that they are the last ones to be acquired by English native children (VIHMAN, 1996). Furthermore, according to Eckman's Markedness Differential Hypothesis (1977), both sounds are difficult for many learners of English as a second language (ESL) because they are *marked phonemes*, meaning that they are not very frequent sounds in the world's languages. Still according to Eckman's Hypothesis, the /ð/ sound is more difficult for ESL learners to acquire than the /θ/ sound, since voiced phonemes are more marked and therefore expected to be more difficult to learn than voiceless ones.

As stated by Munro, Derwing and Morton (2006), "the impact of an accent on communication is complex" (p. 112), as a speech marked by an accent may be difficult for listeners to understand on some occasions, while it can be perfectly understood on others. Sometimes, producing non-native patterns of a language may lead to sentences being misunderstood and, "even though the speaker's message may ultimately be understood, the listener may have to work especially hard to decode it, perhaps even by 'replaying' it from the short term memory" (MUNRO; DERWING, 1995, p. 290). Moreover, listeners may have a negative reaction to an accent when they are not used to it, becoming impatient or presenting bias against foreign accented speech (MUNRO; DERWING; MORTON, 2006).

On the other hand, other studies show that a foreign accent may not be such a negative issue. An example is the study carried out by Munro and Derwing (1995), in which

English listeners evaluated two groups of speakers (a group of native speakers of English and another group of native speakers of Mandarin) reading in English, concluding that, in general, "an accent – even a strong one – is by no means an inevitable barrier to communication" (p. 302). Moreover, familiarity with an accent can also be an important variable when rating comprehensibility, as will be discussed in the following paragraphs.

Comprehensibility is usually evaluated by listeners, some of whom report "how difficult an utterance is to understand and how strongly accented it is" (MUNRO; DERWING; MORTON, 2006, p. 112). According to these authors, having listeners rate comprehensibility is a reliable procedure, as verified in studies carried out by many authors in the area (e.g., BRENNAN; BRENNAN, 1981; BURDA; SCHERZ; HAGEMAN; EDWARDS, 2003; DERWING; MUNRO, 1997; THOMPSON, 1991, as cited in MUNRO; DERWING; MORTON, 2006).

However, in order to obtain reliable results, Munro, Derwing and Morton (2006) remind us that it is necessary to pay attention to the variables involved in the process of rating comprehension (e.g., familiarity with the speakers' L1, listeners' L1 background, listeners and speakers' proficiency level). Due to time constraints and informants availability, this study will focus on listeners who share the same L1 (English) and are familiar with the speakers' L1 (BP). The fact that familiarity with an accent may positively affect comprehensibility is also reinforced by Cruz and Pereira (2006), who recommend selecting different groups of listeners when conducting research on intelligibility of pronunciation (which can also be applied to comprehensibility), so that more reliable results can be obtained. This procedure had already been followed by Thompson (1991), with listeners (both with and without experience with the Russian accent) rating Russian speakers of English, and by Cruz (2004), with British listeners unused to the way Brazilians speak English examining the intelligibility of these speakers' pronunciation. Due to the difficulty of finding participants with no familiarity with BP and who were willing to answer the questionnaire, the familiarity variable was not analyzed.

Another variable that may affect the results of comprehensibility tests is language proficiency, which can apply to the speaker but also to the listener, when the latter is a non-native speaker of the language that s/he is rating for comprehensibility. In the case of the present study, the speakers' proficiency level may affect the listeners' performance. This relationship between the speaker's proficiency level and comprehensibility has not yet been broadly investigated. Derwing and Munro (1997) investigated the intelligibility of 48 ESL speakers when listened to by 12 native speakers of English (NSE) and found that "speaker proficiency level did not appear to affect the quasi-independent relationships among intelligibility, perceived comprehensibility, and accentedness" (p. 1), meaning that the speakers' level of proficiency did not affect comprehensibility. Considering the previously stated features of BP speakers' pronunciation and the possible relationship between foreign accent and degree of comprehensibility, the general objective of this study is to analyze whether the non-target pronunciations of the consonant sounds /θ/ and /ð/ by Brazilians affect comprehensibility, as judged by NSE listeners. For this purpose, comprehensibility will be measured by a comprehension rating scale. In order to achieve this objective, the following research questions guided the study:

RQ1) How do non-target pronunciations of /θ/ and /ð/ by Brazilian speakers of Portuguese hinder comprehensibility, as judged by English native speakers?

RQ2) How do speakers' proficiency levels and frequency of non-target productions of interdental fricatives relate to the comprehensibility rates assigned by listeners?

After this brief introduction, which reviewed the relevant literature in the area and introduced the research topic and questions, we present the method, in which the participants'

profile, as well as the research instruments, procedures and data analysis are described. The next section presents and discusses the results in light of the literature, and we conclude the paper with a discussion of the main points of the research, along with the limitations of the study and suggestions for further research.

2. METHODS

In this study, two groups of participants were involved, the speakers and the listeners. Therefore, information on both groups will be presented in this section, along with the description of the instruments and procedures implemented for data collection and analysis.

2.1 Speakers' profiles and data collection instruments and procedures

The speakers' recordings were taken from the site http://accent.gmu.edu/index.php (WEINBERG, 2011), which provides recordings of native and non-native speakers of English reading the same English paragraph, accompanied by the respective phonetic transcription. The main purpose of this online archive is to "uniformly exhibit a large set of speech accents from a variety of language backgrounds" (WEINBERG, 2011), so that linguists and other people can use them for comparing foreign accents or just for listening. In addition to speaking samples and transcriptions, the website contains some background information about the informants, such as age, native language, gender, place of birth, knowledge of other languages, age of L2 learning onset, time spent abroad and L2 learning experience (academic and/or naturalistic context). All this information is requested when the informant signs in, before recording the paragraph.

In this study, excerpts recorded by ten native BP speakers were taken from The Speech Accent Archive website. All speakers were born in Brazil, but come from different states: one from Bahia, one from Espírito Santo, one from Ceará, two from Rio Grande do Sul, four from São Paulo, and one from Minas Gerais. Their ages ranged from eighteen to fifty-four (mean=23.5), two females and eight males. Eight participants stated that they had learned English academically, while only two stated that they had learned it naturalistically. Five of them have lived in the USA for a period of time that ranged from 1 month to 3 years; one lived in Scotland for 2.5 years; another one lived in the UK for 8.5 years, and the other three had never lived in an English-speaking country.

The paragraph read by all informants was the following:

> Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station. (Target words underlined by the researchers)

The paragraph contained 11 words with the interdental fricatives. For the sound /ð/, the words were: 'these' (repeated twice), 'with', 'brother', 'the' (repeated three times). For the /θ/ sound, the words were: 'thick', 'three', 'things' (repeated twice). The number of non-target pronunciations of the interdental fricatives /θ/ and /ð/ found in the recordings of these participants ranged from two to eleven, out of eleven potential words containing the target sounds. Note that, as explained by Kunath and Weinberger (2009, p. 9), all phonetic transcriptions in the Speech Accent Archive are performed by relaying on auditory analysis

and "are constructed by 3 to 4 trained linguists, and disagreements are settled by consensus". For this study, non-target pronunciations of the sounds /θ/ and /ð/ are exemplified in Table 1.

Table 1 - Examples of non-target pronunciations of /θ/ and /ð/.

Phonemes and key words	Non-target pronunciations		
/θ/	[t]	[s]	[f]
'thing' /θɪŋ/	[tɪŋ]	[sɪŋ]	[fɪŋ]
/ð/	[d]	[z]	[v]
'this /ðɪs/	[dɪs]	[zɪs]	[vɪs]

2.2 Listeners' profiles and data collection instruments and procedures

The group of listeners was formed by eleven English native speakers born in the United States. These Americans had come to different neighborhoods in Florianópolis and São José to work as missionaries for two years. In addition, they were all teaching free English classes to beginners once or twice a week or conducting conversation classes for advanced students who aimed to develop their fluency and learn more about the language. For this reason, the listeners were very willing to answer the research questionnaires and contribute to the advance of knowledge on second language learning. Before presenting further information about the listeners, it is important to describe the two questionnaires used to collect data from them.

The instruments used to verify whether non-target pronunciations of the consonant sounds /θ/ and /ð/ by Brazilians hinder comprehensibility were two questionnaires, one to collect listeners' biographic data and the other to check the comprehensibility rates these listeners assigned to English words spoken by Brazilian speakers.

The first questionnaire (see Appendix A) contained 15 questions, divided into three categories: personal data, education, and familiarity with Brazilians and Brazilian accents in English. In the category *Personal Data*, the listeners had to write their names, birth date and place of birth (city, state, and country). In the second category, *Education*, the participants had to state their highest level of education. Further questions inquired about their knowledge of foreign languages, mainly to find out whether the listeners really spoke Portuguese, without directly inducing the answer. Subsequently, there was a question about the length of time the listeners had been speaking Portuguese.

The third category, *Familiarity with Brazilians and Brazilians accents in English,* included the 8 remaining questions. Whenever there was a reference to Portuguese, it would be very clear that the researchers meant Brazilian Portuguese, so that the listeners would not think of other varieties of Portuguese (e.g., European or African Portuguese). Most questions in this category aimed to check how familiar the listeners were with Brazilians and their accent in English, and if the listeners were aware of features of the Brazilian accent in English.

Question 14 was important for verifying whether or not the listeners noticed Brazilians' non-target pronunciation of /θ/ and /ð/ without inducing this answer. Moreover, by not exclusively focusing on this issue, it was possible to identify what other pronunciation problems caught the attention of NSE the most. These could inform suggestions for further studies. Finally, question 15 aimed to elicit the listeners' personal opinion on whether the Brazilian accent hinders comprehension, with the answers complementing the results found in the second questionnaire.

The main purpose of Questionnaire II (see Appendix B), in common with Questionnaire I, was to answer the study research questions through an actual data collection of listeners' difficulty/ease in understanding the speakers' recordings. A *Listeners' Guidelines*

section was developed, and the listeners were asked to read these guidelines before practicing the procedures with a speech sample and starting to answer the questionnaire itself. The sample used to exemplify and practice the procedures for data collection was a recording of the *Please call Stella* paragraph by a Japanese woman. This sample was chosen because of the difference between the Japanese and the BP accents; consequently, this practice session would have no interference on the results.

Questionnaire II was divided in two parts: proficiency level and comprehensibility. In the *Proficiency level*, the listeners listened to each speaker's reading of the whole paragraph and then were asked to evaluate what the speaker's proficiency level in English was by circling a number from 1 to 10, according to the following classification: Beginner (1 to 3), Pre-intermediate (4 to 5), Intermediate (6 to 7), Pre-advanced (8), and advanced (9 to 10). This procedure was repeated for each speaker. The purpose of this classification was to get an insight into how the listeners themselves, based on their experience, would evaluate the speakers' performance, since it was not possible for the researcher to administer a placement test to the Brazilian informants (speakers). The classification of the speakers' proficiency level was necessary in order to investigate the relation between the comprehension rates assigned by the listeners and the speakers' proficiency levels (RQ2).

After assigning a proficiency level to a speaker, the listeners listened to separate parts of the same speaker's recording again, and were asked to pay attention to specific words in each part. They then reported how difficult it was for them to understand the selected words by circling a number from 1 to 10, according to the following classification: Very difficult (1 to 2), Difficult (3 to 4), Not very easy (5 to 6), Easy (7 to 8), Very easy (9 to 10). The words they had to pay attention to were presented in the *Please call Stella* paragraph. The listeners would then repeat this procedure for each of the ten speakers' samples.

The data collection was conducted individually or in pairs, except for one group of four volunteers that agreed to meet to answer the questionnaires in a group session. Before the listeners answered the questionnaire, the researcher in charge of collecting data briefly talked about the research without giving details that could interfere with the results. The listeners received the printed material for data collection (in booklet format) and were asked to read the consent form and sign it. The next step was to ask them to answer Questionnaire I. After doing this, they read the *Listeners' Guidelines* for Questionnaire II, and then modeled the procedure with the speech sample produced by a Japanese speaker, in order to ensure they had no doubts about how to proceed. Finally, the listeners completed Questionnaire II, and then most of them informally commented on the research and asked questions about it. The whole procedure took no longer than 40 minutes. The recordings were all played using a notebook, whose sound quality was very good. There was no difficulty in understanding the audio files.

The listeners were all from the United States of America, but from different states. Participants A, E, G, I, J and K were from Utah, Participant B was from New Mexico, Participants C and F were from Arizona, and Participants D and H were from Indiana. They were all male and their ages ranged from 20 to 23, and 70% of them had already had some college education (Participants B, C, F, G, H, I and K), the other 30% having graduated from High School (Participants A, D, E and J). Only Participant G stated he could speak other languages besides English and Portuguese - he is also fluent in Mandarin and Spanish.

Regarding the time the listeners had spent in Brazil, it varied from 14 to 24 months (mean = 22.27 months), the same amount of time that most of them had been speaking Portuguese with Brazilians (range = 14 to 24 months, mean = 22.27 months). The listeners reported they had been talking to Brazilians in English from 3 to 40 months (mean = 23.18 months). One of them had started interacting with Brazilians in English before arriving in Brazil (Listener H). The listeners stated that they heard Brazilians talking in English from *once in a while* to *everyday*. It is therefore possible to infer that the listeners were used to the Brazilian accent and that they actually noticed differences in the way Brazilians pronounce

words in English. This is confirmed by their own answers to the questions addressing their awareness about features of the Brazilian accent and familiarity with this accent, as 100% of the participants answered affirmatively to both questions.

2.3 Data analysis

The data collected in this research were analyzed as follows. First, the phonetic transcription of the words containing /θ/ and /ð/ were taken from the Speech Archive website and double-checked by the researchers by conducting auditory analysis, and the researchers agreed with all transcriptions. These phonetic transcriptions served as a basis to calculate the percentages of non-target productions. The second step was to analyze the questionnaire completed by the listeners, especially the open questions about the types of pronunciation problems they noticed when listening to BP speakers using English. This step provided qualitative data that helped us identify whether NSE identified the interdental fricatives as sounds that caused difficulty to BP speakers of English, and whether they thought that the BP accent hindered communication. The third step consisted of calculating the average of the numbers circled by the listeners in the evaluation of each word, along with the answers to question 15 of Questionnaire I (*Do you think that the Brazilian accent hinders English native speakers' comprehension?*) This average provided the answer for the main research question: Does the non-target pronunciation of /θ/ and /ð/ by Brazilian speakers of Portuguese hinder English native speakers' comprehension? In order to further explore this question, we correlated the percentages of non-target pronunciation for /θ/ and /ð/ with their respective comprehension rates (assigned by the listeners).

The dataset spreadsheets were transferred to the SPSS program (version 16.0) and underwent statistical analysis, generating frequency tables for the comprehensibility rates and for the rates of non-target pronunciations of /θ/ and /ð/. The initial procedure was to obtain descriptive statistics for the dataset (e.g., means, standard deviations, percentages) and to check if the dataset presented normal distribution. Due to the nature of the dataset and the limited number of participants, most of the analysis relies on the interpretation of descriptive statistics. Nevertheless, correlational analysis was performed to correlate the percentages of non-target pronunciations of the interdental fricatives with their comprehension rates (RQ1). As the dataset was small and the frequency of non-target pronunciations was expressed in percentages, we ran non-parametric correlations (LARSON-HALL, 2010), called Spearman correlations. A similar procedure was used to answer RQ2, in which we used Spearman to correlate three variables: proficiency level, non-target pronunciations of /θ/ and /ð/, and comprehensibility rates.

Having presented the research informants (speakers and listeners), the research instruments and procedures, as well as the steps for data analysis, we turn now to the results obtained in the present study.

3. RESULTS AND DISCUSSION

In this section, the main results gathered from data collection are presented and discussed in light of the literature in the area of comprehensibility. The results are organized in three sections. In the first section, information concerning the speakers' percentages of non-target pronunciations of the interdental fricative sounds is presented, together with a qualitative analysis of the listeners' answers to the first questionnaire. The second section discusses the data provided by the listeners regarding the comprehensibility of the /θ/ and /ð/ phonemes for each speaker in order to answer RQ1. In the third section, we discuss the results concerning

RQ2, which inquired about the relationship between the listeners' comprehensibility rates, the speakers' proficiency levels and the frequency of non-target productions.

3.1 Speakers' frequency of non-target pronunciations and pronunciation problems noticed by listeners

Having already presented the speakers' general profiles (see Method section), a more thorough analysis is necessary concerning the number of non-target pronunciations. The results displayed in Table 2 show that the amount of non-target productions of /θ/ and /ð/ varied among speakers. Generally, they had difficulty pronouncing at least one of the sounds.

Table 2 - Percentage of non-target productions for /θ/ and /ð/

Speakers	Non-target /θ/	Non-target /ð/	Total non-target
G	100%	100%	100%
E	40%	83.3%	63.6%
F	20%	83.3%	54.5%
A	40%	33.3%	36.4%
C	20%	50%	36.3%
D	80%	0%	36.3%
J	0%	66.6%	36.3%
B	20%	16.6%	18.1%
H	20%	16.6%	18.1%
I	20%	16.6%	18.1%

It is possible to infer that the recordings containing more non-target pronunciations of the sounds /θ/ and /ð/ are more likely to be perceived by the NSE as marked by a foreign accent. As previously defined, a foreign accent is "non-pathological speech that differs in some noticeable respects from native speaker pronunciation norms" (MUNRO; DERWING, 1995, p. 289). Munro, Derwing and Morton (2006) state that accented speech may hinder comprehensibility in some cases, while in others it seems to have no influence on communication. This topic will be further explored when we discuss the comprehensibility rates assigned by the listeners who participated in this study.

When asked about the main problems Brazilians face in relation to the pronunciation of English, eight of the listeners (72.72%) reported the non-target pronunciation of the sounds /θ/ and /ð/. Listener A mentioned that the "th" sound is a problem in general for Brazilians, and then gave the example of the word "think". Listener B also gave some examples of this pronunciation difficulty and related it to the nonexistence of these sounds in Portuguese: "The combination "th" in words like 'the', 'that', 'these', etc., are usually wrong, probably because similar sounds in Portuguese don't exist". Listeners D, E, F and J, on the other hand, just mentioned the "th" sounds as being a problem for Brazilians. Listener G used the words 'three' and 'thirty' to exemplify the non-target pronunciation of the sounds, as well as Listener K, who listed the words 'the', 'three', 'there' and 'although'.

The listeners' comments on the difficulty Brazilians have in pronouncing the interdental fricative sounds confirms the results found in Reis (2006), who concluded that Brazilians tend to replace the interdental fricative sounds with others that are more similar to

their mother tongue. As a consequence of this and other kinds of phonetic substitutions, communication may sometimes be affected, as stated by Munro, Derwing and Morton (2006).

It is interesting to point out that, when mentioning the non-target pronunciation of the "th" sound as a problem faced by Brazilians, the listeners did not make any reference to the existence of two different interdental fricative sounds (/θ/ being the voiceless one, as in words like 'think', and /ð/ being the voiced one, as in words like 'that'), which leads us to believe that they, as native speakers of English, may not be aware of this difference.

Finally, when they were asked if the Brazilian accent hinders their comprehension of English utterances, 6 listeners out of 11 said it did. As explained in the Method section, the notion of comprehension that the listeners were dealing with here refers to their self-reported view of how difficult it was for them to understand the selected words. Therefore, it could be said that more than half of them agreed that the Brazilian accent hinders their comprehension whilst the remainder do not see it as an obstacle for comprehension.

3.2 The non-target pronunciation of /θ/ and /ð/ by Brazilians and English native speakers' comprehensibility rates

In order to answer the first research question *Do the non-target pronunciations of /θ/ and /ð/ by Brazilian speakers of Portuguese hinder comprehensibility, as judged by English native speakers?*, listeners evaluated 110 words containing the interdental fricative sounds produced by ten different Brazilian speakers. The hypothesis formulated for this question was that NSE would have difficulty in comprehending the speech samples that contained non-target pronunciations of the interdental fricative sounds. This was expected to happen because of assimilation to L1 sounds and consequent non-target pronunciations, which are believed to hinder communication (MUNRO; DERWING; MORTON, 2006).

In order to illustrate the results gathered from the listeners' evaluations of speakers' samples, the scores given to each speaker are presented in Table 3. The first column in the table presents the proficiency level assigned by each listener to each speaker, which varies from *Beginner* (rates 1-4), *Pre-intermediate* (4.1-6), *Intermediate* (6.1-8), *Pre-advanced* (8.1-9) and *Advanced* (9.1-10). The average comprehensibility rates given to each sound is shown, followed by the respective classification of comprehensibility, which varies between *Very difficult, Difficult, Not Very Easy, Easy and Very Easy*.

Regarding the speakers' proficiency, the scores ranged from 4.51 to 8.55 (mean=7.41), with one speaker being classified as beginner (speaker E), two as pre-intermediate (speakers C, G), five as intermediate (speakers A, D, I, F, J), and two as pre-advanced (speakers B, H).

Table 3 – Speakers' final comprehensibility rate average

Speakers	Compreh. rate for /θ/	Compreh. Classification	Compreh. rate for /ð/	Compreh. Classification
A	5.36	Not Very Easy	5.63	Not Very Easy
B	7.78	Easy	7.5	Easy
C	4.79	Difficult	7.09	Easy
D	5.73	Not Very Easy	7.77	Easy
E	3.39	Difficult	4.77	Difficult
F	7.18	Easy	7.55	Easy
G	4.91	Difficult	6.59	Not Very Easy
H	8.55	Easy	8.82	Easy

I	7.00	Easy	7.82	Easy
J	8.09	Easy	8	Easy
Average	**6.28**	**Not Very Easy**	**7.15**	**Easy**

The comprehensibility rates for /θ/ ranged from 3.39 to 8.55 (mean = 6,28), and for /ð/ they ranged from 4,77 to 8,82 (mean = 7,15). These results indicate that, on average, /θ/ was classified as not very easy to understand, while /ð/ was considered easy to understand. Spearman correlations (rho) were run to examine the relationship between non-target pronunciation percentages and comprehension rates. The results show that the two variables are moderately correlated for /θ/ (rho = -.636, p = .04) and /ð/ (rho = -.492, p = .06). Note that both correlations are negative, but only the correlation for /θ/ reached statistical significance, while /ð/ approached significance. In other words, a significant, negative correlation was found for /θ/, but not for /ð/, thus indicating that the higher the percentages of non-target pronunciations of the interdental fricatives, the lower the comprehensibility rates assigned by the listeners. These results support the hypothesis that non-target pronunciations of interdental fricatives hinder the comprehensibility of words produced by BP speakers.

Table 4 attempts to show whether or not low scores would only be assigned by the listeners to the words that contained non-target pronunciations of the sounds in question. In the same way, it was intended to check if high scores would even be given to the words that contained non-target pronunciations. Table 4 lists the words that contained non-target pronunciations of the sounds /θ/ and /ð/, followed by their scores and respective comprehensibility classification. The last column shows whether or not the scores given by the listeners matched the expected comprehensibility classifications for the words with non-target pronunciations. The results show that for the 19 words that were produced with non-target pronunciations, there was 68.42% agreement between the fact that the word was mispronounced and the listeners' assigned scores, these being classified as *not very easy*, *difficult* and *very difficult*. The remaining 31.57% of the words were classified as *easy* to understand. The word 'three' was mispronounced by 60% of the speakers, 'the' by 50%, 'with' and 'thick' by 30%, and 'brother' by 20%.

Table 4 - Speakers' non-target pronunciations of the words and listeners' comprehensibility rates

Speakers	Words with non-target productions	Score average assigned by Listeners	Classification
A	three	5.45	Not very easy
B	the	7.73	Not very easy
C	three	5.09	Not very easy
	with	6.55	Easy
	thick	6.45	Easy
D	three	4.18	Difficult
E	thick	3.27	Difficult
	brother	5.09	Not very easy
	three	2.91	Very difficult
F	the	6.36	Not very easy
	three	5.45	Not very easy

	with	4.73	Difficult
	thick	5.36	Not very easy
G	brother	7.00	Easy
	the	6.18	Not very easy
	three	4.64	Difficult
I	with	7.00	Easy
	the	7.36	Easy
J	the	7.27	Easy

Total matches: 34 out of 50 words = 68%

Thus, from a total of 50 words that were evaluated for comprehensibility, 34 (68%) received the expected rate and classification, meaning that: *a)* the words containing non-target pronunciations of the sounds /θ/ and /ð/ received lower rates, or *b)* the words that contained target pronunciation of these sounds received higher rates. Therefore, these results provide support to the hypothesis that Brazilians' non-target pronunciations of the interdental fricative sounds in English hinder comprehensibility, as assessed by NSE listeners.

3.3 Correlating listeners' comprehensibility rates, speakers' proficiency levels and non-target productions

Table 5 shows the proficiency level of each speaker, according to the scores assigned by the NSE listeners, the total percentages of non-target productions, as well as the total comprehensibility rates (combining results for /θ/ and /ð/). Based on the listeners' classification of speakers' proficiency levels, it was possible to answer RQ2: How are the speakers' proficiency levels and the frequency of non-target productions of interdental fricatives related to the comprehensibility rates assigned by the listeners? As explained in the Methods section, the proficiency scores provided by the listeners allowed the speakers to be classified in four proficiency levels: beginner (1 speaker), pre-intermediate (2 speakers), intermediate (5 speakers) and pre-advanced (2 speakers).

Table 5 – Speakers' proficiency scores, total percentages of non-target productions and comprehensibility rates

Speakers	Total non-target productions	Total comprehensibility scores	Proficiency
G	100%	5.75	4.91
E	61.65%	4.08	4.0
F	51.65%	7.36	7.36
A	36.65%	5.50	6.45
C	35%	5.94	5.45
D	40%	6.75	7.36
J	33%	8.04	7.91
B	18.3%	7.64	8.18
H	18.3%	8.68	8.55
I	18.3%	7.41	7.64

In order to check the relationship between the speakers' proficiency levels, the frequency of non-target productions and the comprehensibility rates assigned by the listeners, Spearman correlations were run. The results displayed in Table 6 show the higher the speakers' proficiency level, the higher the comprehensibility rates assigned by the listeners (rho = .948, p = .001). The relationship between speakers' proficiency and listeners' comprehensibility rates is quite strong and statistically significant, which means that an increase in proficiency, accompanied by an increase in pronunciation accuracy, leads to higher levels of comprehensibility. Turning to the correlation between frequency of non-target productions and comprehensibility rates, a strong, negative correlation was obtained (rho = -.767, p = .01), which indicates that the larger the percentage of non-target productions, the lower the comprehensibility rate assigned by the listeners. This correlation also reached statistical significance, thus corroborating the hypothesis that the non-target productions of the interdental fricatives lead to comprehension problems.

Table 6 - Spearman correlation results for comprehension rates, non-target productions and proficiency

		Comprehension	Proficiency
Non-Target Productions	Correlation Coefficient	-,767	
	p value		,010
Comprehensibility	Correlation Coefficient		,948
	p value		

N = 10

Overall, the results indicate that the pronunciation of the interdental fricatives poses difficulties to Brazilian learners of English, as demonstrated by the percentages of non-target productions of /θ/ and /ð/ in a paragraph-reading task. The non-target productions found in the dataset seem to have hindered the comprehensibility of words spoken by BP learners of English, as assessed by NSE listeners. Correlational analysis confirmed the impression that the higher the percentage of non-target productions, the lower the comprehensibility rates assigned by the listeners. A similar result was obtained when examining the correlation between comprehensibility rates and the speakers' proficiency levels.

4. CONCLUSION

Having concluded that non-target pronunciations of the sounds /θ/ and /ð/ by Brazilians hinder comprehension, teachers should be aware that the teaching and practicing of these sounds is essential for English learners to be understood. It is also important that teachers explain to their students that, even though it is difficult for late learners not to speak with a foreign accent (and this should not be the goal of pronunciation teaching), it is necessary to practice specific phonemes so that communication with both native and non-native speakers can occur without problems.

Even though the results show that the voiceless interdental fricative sound was more difficult for NSE to understand than its voiced counterpart, the review of the literature has shown that more experienced researchers in the area state the opposite (ECKMAN, 1977; REIS, 2006; TREVISOL, 2010). Therefore, since this study was conducted with a small sample, it may be better for teachers to focus on both the voiced and voiceless phonemes

when teaching the interdental fricative sounds, for both seem to be difficult regarding Brazilians' perception and production, and non-target productions can be hard to understand.

As stated during the discussion of the results, one of the limitations of this study is the small number of listeners, which prevented the study from yielding more reliable results. There was also the limitation of having only one group of native listeners, who were all familiar with the BP accent. Therefore, in order to yield more detailed results, further studies should collect data from different groups of listeners, with varied degrees of familiarity with spoken BP (CRUZ; PEREIRA, 2006; CRUZ, 2004). The groups can be formed not only by NSE, but by speakers of other languages (BENT; BRADLOW, 2003; IKENO; HANSEN, 2007), and even Portuguese speakers with different proficiency levels in English (SCHADECH, in progress).

Finally, the present study analyzed data from a paragraph-reading task. It is important to conduct further studies that collect data from spontaneous speech, so that we can gain new insight into how non-target productions of the interdental fricatives may hinder comprehension and communication.

REFERENCES

BENT, T.; BRADLOW, A. R. The interlanguage speech intelligibility benefit. *The Journal of the Acoustical Society of America*, v. 114, n. 3, p. 1600-1610, 2003.

CRUZ, N. C. *Pronunciation intelligibility in spontaneous speech of Brazilian learners of English*. Doctoral Dissertation. Universidade Federal de Santa Catarina, 2004.

CRUZ, N. C.; PEREIRA. Pronúncia de aprendizes brasileiros de inglês e inteligibilidade: um estudo com dois grupos de ouvintes. *Revista Virtual de Estudos da Linguagem – ReVEL*, v. 4, n. 7, p. 1-26, 2006.

DERWING, T. M.; MUNRO, M. J. Accent, Intelligibility, and Comprehensibility - Evidence from four L1s. *Studies in Second Language Acquisition*, v. 20, p. 1-16, 1997.

_____. Comprehensibility as a Factor in Listener Interaction Preferences: Implications for the Workplace. *Canadian Modern Language Review/ La Revue canadienne des langues vivantes*, v. 66, n. 2, p. 181-202, 1 dez. 2009.

DERWING, T. M.; MUNRO, M. J.; THOMSON, R. I. A Longitudinal Study of ESL Learners' Fluency and Comprehensibility Development. *Applied Linguistics*, v. 29, n. 3, p. 359-380, 1 jul. 2007.

ECKMAN, F. R. Markedness and the contrastive analysis hypothesis. *Language Learning*, v. 27, p. 315-330, 1977.

FLEGE, J. E. Age of Learning and Second-Language Speech. In: BIRDSONG, D. (Ed.). *Second Language Acquisition and the Critical Period Hypothesis*. NJ: Lawrence Erlbaum, p. 101-132, 1999.

IKENO, A.; HANSEN, J. H. L. The Effect of Listener Accent Background on Accent Perception and Comprehension. *EURASIP Journal on Audio, Speech, and Music Processing*, v. 2007, p. 1-8, 2007.

KUNATH, S. A.; WEINBERGER, S. H. STAT: Speech Transcription Analysis Tool. *Proceedings of NAACL HLT 2009:* Demonstrations. Boulder, Colorado, p. 9–12, 2009.

LARSON-HALL, J. *A Guide to Doing Statistics in Second Language Research Using SPSS*. New York and London: Routledge, 2010.

LEITÃO, E. L. C. *Aquisição das fricativas interdentais do inglês*: uma abordagem via restrições. Master Thesis - Universidade Federal de Santa Maria, 2007.

MUNRO, M. J.; DERWING, T. M. Foreign accent, comprehensibility, and intelligibility in the speech of second language learners. *Language Learning*, v. 49, n. Sup. 1, p. 285-309, 1995.

MUNRO, M. J.; DERWING, T. M.; MORTON, S. L. The Mutual Intelligibility of L2 Speech. *Studies in Second Language Acquisition*, v. 28, n. 01, p. 111-131, 10 fev. 2006.

REIS, M. S. *The Perception and Production of English Interdental Fricatives by Brazilian EFL Learners*. Doctoral Dissertation. Universidade Federal de Santa Catarina, 2006.

SCHADECH, T. S. *The production of word-initial /r/ by Brazilian learners of English and the issues of comprehensibility and intelligibility*. Master Thesis - Universidade Federal de Santa Catarina, 2013.

THOMPSON, I. Foreign accent revisited: The English pronunciation of Russian immigrants. *Language Learning*, v. 41, p. 177–204, 1991.

TREVISOL, J. *The production of the English interdental fricatives by Brazilian former and future EFL teachers*. Master Thesis -Universidade Federal de Santa Catarina, 2010.

VIHMAN, M. *Phonological Development:* The Origins of Language in the Child. Boston: Wiley-Blackwell, 1996.

WEINBERGER, S. *The Speech Accent Archive*. Retrieved from: http://accent.gmu.edu/. Accessed on: 8 jul. 2011.

YAVAS, M. *Applied English Phonology*. Oxford: Wiley-Blackwell, 2011.

DE QUE MANEIRA AS PRONÚNCIAS NÃO-PADRÃO DAS CONSOANTES /θ/ E /ð/ POR BRASILEIROS APRENDENDO INGLÊS AFETAM A COMPREENSIBILIDADE?

RESUMO: *Uma das principais dificuldades enfrentadas pelos brasileiros ao aprender inglês é a pronúncia das fricativas interdentais /θ/ e /ð/, sendo comum a substituição do fonema /θ/ por [s], [t] ou [f], bem como a substituição do /ð/ por [z],[d] ou [v] (REIS, 2006). O objetivo deste estudo é verificar se as pronúncias não padrão desses fonemas dificultam a compreensibilidade dos falantes nativos de inglês. Dez gravações (feitas por brasileiros) em inglês contendo pronúncias não padrão das fricativas interdentais foram coletadas e apresentadas a onze falantes nativos do inglês para que avaliassem o grau de dificuldade para entender as palavras que continham tais pronúncias. Os resultados indicam que as pronúncias não padrão das consoantes /θ/ e /ð/ por brasileiros afetam a compreensibilidade.*

PALAVRAS-CHAVE: *compreensibilidade; fricativas interdentais do inglês; aprendizes brasileiros.*

Questionnaire for Listeners

PART I: QUESTIONNAIRE

❖ **Personal Data:**

1. Name:_____

2. Birth Date: ___/___/_____

3. Place of Birth (city, state, and country): _____

❖ **Education:**

4. Highest Level of Education completed:

( ) Less than High School

( ) High School Grad

( ) Tech School Grad

( ) Incomplete College

( ) Other: _____

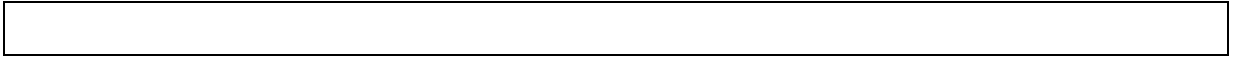**5. Do you speak other languages besides English?**

( ) Yes   ( ) No

6. If your answer is *yes*, please list them below in the order you have learned them:

1. _____   3. _____   5. _____

2. _____   4. _____   6. _____

7. If one of the answers for the previous question was *Portuguese*, for how long have you been speaking this language?

_____

❖ **Familiarity with Brazilians and Brazilians' accent in English:**

8. How long have you been living in Brazil?

_____

9. Have you ever heard a Brazilian Portuguese native speaker talking in English?

    ( ) Yes   ( ) No

If your answer is Yes, please continue to answer the rest of the questionnaire.

10. For how long have you been talking to Brazilian Portuguese native speakers in English?

_____

11. How many times have you heard or what is the frequency that you hear Brazilian Portuguese native speakers talking in English?

_____

12. Do you notice a difference in the way that Brazilian Portuguese speakers pronounce words in English and the way native English speakers do?

    ( ) Yes   ( ) No

13. Do you consider yourself familiar with the Brazilian accent in English?

    ( ) Yes   ( ) No

14. In your opinion, what are the main pronunciation problems that Brazilians have when speaking English? Can you give examples?

_____
_____
_____
_____
_____
_____

15. Do you think that the Brazilian accent hinders English native speakers' comprehension?

    ( ) Yes   ( ) No

Comprehensibility Assessment Test

LISTENERS' GUIDELINES

You are going to listen to 10 Brazilian native speakers of Portuguese reading the following paragraph:

Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station.

After listening to each participant's reading, you will be asked to do the following procedures:

1. In your opinion, indicate what the participant's proficiency level in English is by circling a number from 1 to 10, as in the example below:

PARTICIPANT X:

Beginner			Pre-intermediate		Intermediate		Pre-advanced		Advanced	
1	2	3	4	5	(6)	7	8		9	10

2. Then you will listen to the participant's recording again and will be asked to indicate how difficult it was for you to understand the given words by circling a number from 1 (very difficult to understand) to 10 (very easy to understand). See the example below:

PARTICIPANT X:

▶ **WITH:**

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	(6)	7	8	9	10

▶ **THICK:**

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	(6)	7	8	9	10

EXAMPLE

1. **Proficiency level**

   After you listen to the participant's reading, indicate what the participant's proficiency level in English is by circling a number from 1 to 10:

Beginner			Pre-intermediate	Intermediate		Pre-advanced	Advanced	
1	2	3	4	5	6	7	8	9	10

2. **Comprehensibility:**

   Now you are going to listen to separated parts of the participant's recording again. You will be asked to indicate how difficult it was for you to understand the given words in capital letters by circling a number from 1 (very difficult to understand) to 10 (very easy to understand).

WITH:

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	6	7	8	9	10

THICK:

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	6	7	8	9	10

BROTHER:

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	6	7	8	9	10

THE:

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	6	7	8	9	10

THREE:

Very difficult		Difficult		Not very easy		Easy		Very Easy	
1	2	3	4	5	6	7	8	9	10