# ACQUISITION OF ENGLISH STRESS SHIFT BY SPEAKERS OF BRAZILIAN PORTUGUESE[1]

Carina FRAGOZO[*]
Raquel Santana SANTOS[**]

▪ ABSTRACT: By addressing the acquisition of the English stress-shift rule by speakers of Brazilian Portuguese, this article sheds more light on the debate about the influence of first language and formal instruction on the acquisition of a second language. We carried out an experiment in which 37 native and non-native English speakers were asked to pronounce the same words as single words, in stress clash and non-stress clash contexts in order to observe the productivity of this phenomenon. The results show that stress shift occurs in similar proportions in contexts with and without stress clash and that productivity of the phenomenon among the advanced-level learners was very similar to that of the native speakers. We also found that words ending in an obstruent do not favor the application of the rule, whereas words ending in long vowels or nasals do. These findings show that syllable structure and the segmental inventory of the first language affect the results in the target language.

▪ KEYWORDS: Second language acquisition. Stress shift. English. Brazilian Portuguese. Phonological acquisition

## Introduction

From the outset, research in Second Language Acquisition (L2) has sought to describe possible similarities and differences between the representations of native language grammar (L1) and non-native grammar. On the one hand, there are not many differences in the target to be achieved through the acquisition process: in both cases (L1 and L2), learners aim to acquire a linguistic system that corresponds to the input they have received so that they can speak and understand the target language. On the other hand, L2 learners usually need some kind of previous instruction and take much

[*] Universidade de São Paulo (USP). School of Philosophy, Languages and Literature, and Human Sciences - São Paulo – SP, Brazil. cfragozo@gmail.com. ORCID: 0000-0002-8582-8469.

[**] Universidade de São Paulo (USP). School of Philosophy, Languages and Literature, and Human Sciences - São Paulo – SP, Brazil. raquelss@usp.br. ORCID: 0000-0002-0277-7994.

[1] An earlier version of this research was presented in Fragozo (2017). We would like to thank the members of the examining committee for their comments and discussion of the manuscript. They bear no responsibility for any remaining problems.

longer to achieve a basic level of proficiency in the target language. Moreover, although the target to be reached is the same, the final stage of L2 acquisition is, in most cases, very different from that of L1.

The transfer of grammatical properties of the mother tongue to the target language is considered to be an important influence during the acquisition process of a foreign language. The concept of transfer stems from behaviorist research, which advocates that the knowledge of a given task "A" would affect how a given task "B" is learned, in a "cumulative learning" relationship. The transfer may be positive (also known as facilitation), if it results in the correct output, or negative (also known as interference), if the output is different from that of native speakers (GASS; SELINKER, 2008). As pointed out by Major (2001), the role of transfer in L2 acquisition had already been mentioned in Trubetskoy (1939); however, the development of the Contrastive Analysis Hypothesis actually began with the studies of Fries (1945), Weinreich (1953) and Lado (1957). This hypothesis predicts that features of L2 that are similar in L1 would be acquired more easily than the ones that are different. The above-mentioned studies attempted to predict and explain pronunciation errors made by L2 learners. However, the findings reported by Selinker (1972) showed that not all errors made by L2 learners were caused by transfer from L1 to the target language, because the transfer was only one of the factors affecting learner output.

According to Broselow and Kang (2013), there are two problems with stating that L2 learners' errors are caused exclusively by transfer. The first problem is that, in many cases, certain structures that do not exist in L1 are more easily acquired than others that are also non-existent in L1, regardless of the characteristics of either L1 or L2. The second problem is that while L2 learners' speech has coherent and systematic patterns, such patterns are often different from those in L1 or L2. The authors argue that such cases are influenced by universal factors such as markedness, and in the world's languages, marked phenomena are more complex and unusual than unmarked ones. Markedness, a theoretical construct introduced by Trubetzkoy (1939), influenced most studies on the phonological acquisition of L1, but it was first addressed in L2 acquisition research by Eckman (1977), who proposed the Markedness Differential Hypothesis (MDH). The purpose of the MDH was to identify the degree of difficulty in acquiring a particular property of L2 in comparison to L1. This hypothesis states that the areas of L2 that differ from those of L1 and are more marked than in the mother tongue will be harder to acquire; the relative degree of difficulty of the areas of L2 that are more marked than in L1 will correspond to the relative degree of markedness; the areas of L2 that are different from those in the mother tongue, but are not more marked than those in the latter, will not be difficult (ECKMAN, 1977). In short, unmarked phenomena are acquired more easily than marked phenomena, even if neither of them occurs in L1, which can be understood as the result of a universal preference for less marked structures.

In addition to markedness, degrees of similarity/dissimilarity are relevant aspects for transfer from L1 to L2. Unlike the predictions of the Contrastive Analysis Hypothesis,

Major (2001) proposed that sounds that are similar in L1 and L2 are more difficult to acquire than those that are dissimilar, because similarity would make it difficult for learners to develop new phonological categories for sounds which are so similar in both languages. In such cases, learners are likely to apply the L1 pattern rather than develop the corresponding L2 category.

The issue of similarity in the perception of non-native sounds was also pointed out in the research of Flege (1995). Through his *Speech Learning Model*, he argues that the difficulty in acquiring non-native sounds can be predicted according to the degree of similarity between the sounds of L1 and L2. The model predicts that L2 sounds that are identical to those of L1 will be easily acquired, L2 sounds that are very different from the ones in L1 will be acquired a little less easily, and L2 sounds that are similar but not identical to those of L1, will be the hardest to acquire. In other words, a certain degree of dissimilarity is required between L1 and target language sounds for learners to be able to perceive a contrast, because when the sounds are similar but not identical, learners tend to process an L2 sound into a perceptual category of L1.

Therefore, the mother tongue plays a crucial role in second language acquisition, especially when considering acquisition by adult speakers. Contrary to the predictions of the behaviorist view, however, the L1 transfer does not occur automatically and mechanically; rather, it depends on several linguistic and non-linguistic factors[2] that determine how or when this transfer tends to occur. Therefore, the aim of this research paper is to contribute to the debate on language transfer by looking into the acquisition of a very similar process in both English and Brazilian Portuguese (hereinafter BP), namely, stress shift.

To this end, this paper is organized as follows: first, we describe the stress shift rule; then, we explain how this rule occurs in English and BP, and also review the studies previously conducted on the acquisition of English stress shift by speakers of BP. Next, we present the methodology used in this study, and then the results. Finally, we present the discussion and the final remarks.

## The stress shift rule

A discussion of stress shift has to be preceded by a characterization of lexical stress, since shift occurs in both languages when there is a clash between primary stresses. As far as articulation is concerned, more muscle energy and more respiratory activity are needed to produce a stressed syllable than an unstressed one. In terms of perception, stressed syllables are recognized as such because they are more prominent

[2] Several studies have also addressed non-linguistic factors, e.g., aptitude (GASS; SELINKER, 2008; CARROLL, 1989, among others); amount of input (CORDER, 1967), quality of input (FERGUSON, 1971; KRASHEN, 1981; MATTOS, 2000; GASS; SELINKER, 2008 among others) and emotional factors such as motivation, little self-confidence and anxiety (KRASHEN, 1981). However, these factors are still a subject of debate, because demonstrating their relationship with L2 acquisition is not a simple task.

than unstressed syllables. Therefore, stress is seen as a relational property, because one syllable can only be considered as stressed when compared to other unstressed syllables.

Acoustically, the four main correlates of stress are fundamental frequency (F0 or pitch), duration, intensity and, less commonly, formants, and languages may behave differently with respect to these correlates (REETZ; JONGMAN, 2009). In BP, although Mattoso Câmara Jr. (1972) pointed F0 as the main acoustic correlate of stress, recent studies have reported duration as the most important acoustic parameter for the definition of lexical stress (MAJOR, 1992; MASSINI, 1992; BARBOSA, 2000; FERREIRA, 2008). In the case of English, a stressed syllable typically has a higher fundamental frequency, longer duration and higher intensity in comparison to unstressed syllables, with pitch as the most important correlate (FRY, 1958; BOLINGER, 1986).

In addition to the acoustic parameters of stress, languages also differ with respect to the rhythm. Some languages are stress-timed, with regular stress intervals regardless of the number of syllables between them (e.g., English, Russian, and Arabic) while others are syllable-timed, that is, stress intervals increase according to the number of syllables between them (e.g., Spanish, French and Italian) (MASSINI, 1992).

Unlike English, whose rhythm is usually characterized as stress-timed, there is no consensus among researchers regarding the rhythm of BP. According to Abaurre-Gnerre (1981), the rhythm of BP cannot be considered as totally syllable-timed or stress-timed because there is dialectal variation. For example, the variants of Bahia and Rio Grande do Sul are more syllable-timed while the variants of Rio de Janeiro and Espírito Santo are more stress-timed. The same author claims that, even within the same region, a language may have different stress patterns, depending on speech style: while formal and slow speech has a more syllable-timed rhythm, the rhythm of informal and fast speech is more stress-timed. Massini (1992) also points out that BP has characteristics of both stress-timed and syllable-timed rhythms. She argues that while people's speech is more syllable-timed in Rio Grande do Sul, it is more stress-timed in São Paulo, as syllables in these variants have very different durations. Barbosa (2000) advocates that the dichotomy between syllable-timed and stress-timed rhythms should only be seen as labels indicative of trends in the study languages.

However, a rhythmic phenomenon common to all languages is the preference for an alternation between strong (stressed) syllables and weak syllables (with weaker stress or no stress), known as the Principle of Rhythmic Alternation (SELKIRK, 1984) or Eurythmy (NESPOR; VOGEL, 1986). Because of this tendency, a sequence of two stressed syllables is avoided, which otherwise causes a *stress clash*. According to Liberman and Prince (1977), stress clash is not characterized by any given phonetic sequence of strong stresses, because only adjacent stresses in the same line of the metrical grid are considered as clashing stresses subject to rhythmic readjustment phenomena.

The studies on stress by Selkirk (1984) in English and Abousalh (1997), among others, in BP, show that the speakers of these languages use stress shift as a strategy for stress clash resolution. Stress shift, which occurs within the domain of the phonological

phrase in these languages, causes the stress of the first word that forms the clash to be shifted to the left, so as to favor alternation between strong and weak syllables.

## The stress shift rule in English

English stress can occur within a four-syllable window (e.g., *kangaROO, TOMAto, ARticle* and *CAtegory*). According to Selkirk (1984), an alternation between weak and strong syllables defines an ideal rhythmic organization for English, and stress shift is recognized as a resource to avoid stress clash - see (1) (examples from HAYES, 1984, p. 33):[3,4]

(1) a. fourTEEN → FOURteen WOmen
b. MissiSSIppi → MIssissippi LEgislature

Hayes (1984) argues that stress clashes are gradually reorganized. Adjacent stresses are strictly avoided while in the case of close but nonadjacent stresses, avoidance is less strict, as they follow a strong-weak stress sequence.

There are cases, however, in which stress clashes are maintained in English. Stress shift does not occur, for example, when two words are separated by the boundary between two phonological phrases, (HAYES, 1989), that is, stress shift occurs only within the same phonological phrase (e.g.: ([I]ϕ [saw]ϕ [THIRteen MEN]ϕ [in the park]ϕ).[5] Stress clash is also maintained when the vowel of the syllable to be stressed in case of shift is a *schwa*, as in the sequence *maroon coat* (/məRU:N KOʊT /); stress on the syllable *-coon* cannot be placed on *ra-* because the reduced vowel cannot receive stress (LEVEY, 1999).

However, Cooper and Eady (1986) measured syllable duration and pitch in stress clash contexts in English, but they did not find any evidence of change of these correlates in this context. According to the authors, the acoustic correlates that influence the occurrence of stress clash are difficult to identify because the absolute values of a single syllable may not always indicate any tendency towards a change in the rhythm of the sentence as a whole. Through perceptual and acoustic analysis, Levey (1999) also sought to investigate the phonetic characteristics of stress clash as produced by native English speakers. Her perceptual analysis showed that stress clash was resolved in 27% of cases, including sequences with no clash. Her acoustic analysis, in turn, pointed out that fundamental frequency was the only clue that could influence the perception of stress shift, but there was not enough evidence to claim that F0 is, in fact, the acoustic correlate responsible for the shift itself.

---

[3] Capital letters indicate syllables bearing word stress.

[4] See also Levey and Lawrence (2002) for different strategies of clash resolution.

[5] For the rules to create phonological phrases, see Nespor and Vogel (1986).

Authors such as Grabe and Warren (1995) and Kimball and Cole (2014) suggest that stress shift is, in fact, a perceptual rather than an acoustic phenomenon. Grabe and Warren (1995) developed a perception experiment in which participants should point out the stressed syllable in a series of words. When asked to identify the stressed syllables in stress clash sequences such as *thirTEEN MEN,* the participants noticed a stress shift, i.e., *THIRteen MEN*. When the same word *THIRteen* was presented alone, however, the participants identified the stressed syllable as *thirTEEN*.

## Stress Shift in Brazilian Portuguese

In Brazilian Portuguese, primary stress may be assigned to either one of the last three syllables. According to Abousalh (1997) and Gayer and Collischonn (2007), there are several strategies to resolve stress clash in BP: movement of one of the stresses, reduction of one of the prominences, insertion of a pause, and stress shift.

Gayer and Collischonn (2007) analyzed the strategies used by speakers from Porto Alegre and São Borja (RS) in situations of stress clash and found the following distribution of strategies: 7% shift; 20% pause insertion; 61% reduction of one of the prominences; 4% movement of the second stress to the right and 8% permanence of stress clash. Although stress shift did not occur very often, their study confirmed that this strategy was used in the above-mentioned variants of BP.

According to Abousalh (1997), if rhythm were the only condition for stress shift, stress clashes would be expected to be always undone, since this is a violation of the Principle of Rhythmic Alternation. However, her study showed that for a stress clash to be undone, it must be within the same phonological phrase (SELKIRK, 1984; NESPOR; VOGEL, 1986), and stress clashes in phonological phrase boundaries are not undone. Example (2) (example from Tenani (2017, p.117) illustrates this point. In (2a), *Jornal Hoje* is the name of a Brazilian newscast, while in (2b), *hoje* ("*today"*) refers to the day a particular newscast was watched. According to prosodic mapping rules, *Jornal Hoje* (2a) forms a single phonological phrase, whereas *jornal hoje* (2b) is mapped as two different phonological phrases. Different prosodic mapping in the phonological domains explains why stress shift is accepted only in (2a), since the two words that form the clash are in the same phonological phrase. In (2b), the rule is blocked because each word belongs to a different phonological phrase, which does not allow stress movement.

(2) a. [Você]ϕ [viu]ϕ [o *Jornal Hoje*?]ϕ
You watched Jornal Hoje
'Have you watched Jornal Hoje?'

b. [Você]ϕ [viu]ϕ [o *jornal*]ϕ [*hoje*?]ϕ
You saw the newspaper today
'Have you seen the newspaper today?'

In turn, Sândalo and Truckenbrodt (2002) argue that the occurrence of stress clash within the same phonological phrase is not enough to justify stress readjustment. According to the authors, a shift occurs when phonological phrases have the same prosodic length, that is, when they have the same number of phonological words. Thus, a shift is allowed in (3a) but not in (3b) (authors' examples):

(3) a. [caFÉ QUENte]ϕ [queima a boca]ϕ → [CAfé QUENte] ϕ [queima a boca]ϕ
coffee hot burns the mouth
'Hot coffee burns one's mouth'
b. [caFÉ QUENte]ϕ [queima]ϕ → # [CAfé QUENte] ϕ [queima]ϕ
coffee hot burns
'Hot coffee burns'

Santos (2003) shows that syntactic information is also relevant for application or blocking of stress shift, because empty syntactic categories (such as *pro*) prevent shift if they occur between the two stressed syllables.

To check the phonetic character of stress shift in BP, Barbosa (2002) and Madureira (2002) investigated whether phonological strategies for stress clash resolution also occurred from a phonetic-acoustic perspective. Barbosa's (2002) analysis of stress focused on duration and he found that, instead of stress shift, there was an increase in the duration of the oxytone syllable in the first word of the clash, that is, the occurrence of stress clash was favored. In addition to duration, Madureira (2002) analyzed fundamental frequency (F0), and he also concluded that stress shift was not the strategy chosen by his informants.

All previous studies had analyzed contexts of adjacent primary stresses. Note that while the shift is possible in (4a) because there is a clash between two primary stresses, it would sound unnatural in sequences such as (4b), with stress clash between primary stress and secondary stress.

(4) a. caFÉ QUENte → CAfé QUENte
coffee hot
'hot coffee'
b. caFÉ *re*quenTAdo → ? CAfé *re*quenTAdo
coffee rewarmed
'rewarmed coffee'

**English stress shift by Brazilian speakers**

The study of Silva Jr. (2013), to the best of our knowledge, is the only one that compared the production of stress clash sequences in English and BP. The author investigated whether the rhythm of BP influences the production of English as L2 by

native speakers of BP. To this end, he analyzed stress clash sequences inserted into the phonological phrase domain of English and BP. His purpose was to check whether Brazilian informants would prefer beat movement or silent beat addition to resolve stress clashes.

Thus, he analyzed the outputs of three Brazilian speakers of English as L2 and two American speakers of Portuguese as L2. The group of Brazilian informants was divided into three levels of proficiency: *C1* (*advanced*)*, B2* (*high intermediate*) and *B1* (*low intermediate*)*.* The *corpus* was composed of 20 sentences: nine affirmative and one interrogative in English and eight affirmative and two exclamatory in Portuguese; all of them contained some sequence of words with stress clash in English (e.g., *thirTEEN BALLS*) or in Portuguese (e.g., *muLHER Ótima '*great woman'). The analysis of the study acoustic correlates showed that, instead of stress shift, the strategy most often used by the Brazilian speakers to resolve stress clash in both languages was an insertion of a short silent rhythmic pulse - or, according to Selkirk (1984), a "silent beat" -. The American speakers, in comparison, preferred the beat movement strategy, that is, stress shift.

Next, an American speaker of BP as L2 and a Brazilian speaker of English as L2, both non-informants of the study, listened to each of the sequences produced by the first informants and marked the stressed syllable in the sequences. Although the author did not present a statistical comparison between the results of the perception of the two listeners and the results provided by acoustic analysis, he concluded that there are definitely differences between perceived stress shift and stress shift detected in the acoustic signal. In other words, listeners tended to perceive stress intervals as more regular than they really were, as shown by the acoustic analysis.

## Method[6]

This research included 30 Brazilian L2 English learners and seven native English speakers. These Brazilians had not lived in an English-speaking country for more than a month, had monolingual Brazilian parents, and spoke no foreign language other than English. The native English speakers had been living most of their lives in their home countries. Stratified random sampling was used (LEVIN; FOX, 2004); learners were selected according to their L2 proficiency level. Proficiency was set at 3 levels (basic, intermediate and advanced), based on the *Common European Framework of Reference for Languages* (COUNCIL OF EUROPE*,* 2001). The informants' level of proficiency was determined in two steps: an online multiple-choice test and an oral proficiency test (both of which are available on the website of the University of Cambridge). The online test served as the basis for the level of the oral test to be applied. Therefore,

[6] This research was approved by the Ethics Committee of the Institute of Psychology, University of São Paulo - CAAE 46139815.1.0000.5561.

the informants' level of proficiency was ultimately determined according to their performance in the oral test.

A production experiment was developed with 21 oxytone words in three contexts: single word (e.g., *thirTEEN*), word inserted into sentences with a stress clash sequence (e.g., *thirTEEN MEN*) and word inserted into sentences with no stress clash sequence (e.g., *thirTEEN poTAtoes*) - see Table 1 - to observe how native and non-native speakers assign stress to the same words in each of these contexts.[7]

**Table 1** – Words and word sequences of the Experiment

| Single word | Sequences with stress clash | Sequences without stress clash |
|---|---|---|
| 1. thirTEEN | 1. thirTEEN PENcils | 1. thirTEEN poTAtoes |
| 2. fourTEEN | 2. fourTEEN WOmen | 2. fourTEEN baNAnas |
| 3. fifTEEN | 3. fifTEEN GIRLS | 3. fifTEEN toMAtoes |
| 4. sixTEEN | 4. sixTEEN CHAIRS | 4. sixTEEN imiTAtions |
| 5. sevenTEEN | 5. sevenTEEN YEARS | 5. sevenTEEN paPAYas |
| 6. eighTEEN | 6. eighTEEN CHILdren | 6. eighTEEN adVENtures |
| 7. nineTEEN | 7. nineTEEN BOYS | 7. nineTEEN eXAMples |
| 8. unKIND | 8. unKIND COmment | 8. unKIND reVENge |
| 9. kangaROO | 9. kangaROO KIM | 9. kangaROO MeLIssa |
| 10. TenneSSEE | 10. TenneSSEE PEOPLE | 10. TenneSSEE volCAno |
| 11. groTESQUE | 11. groTESQUE PICtures | 11. groTESQUE deCEPtion |
| 12. roBUST | 12. roBUST BAbies | 12. roBUST umBRElla |
| 13. bamBOO | 13. bamBOO BRAcelets | 13. bamBOO maTErials |
| 14. poLICE | 14. poLICE OFFICER | 14. poLICE conVENtion |
| 15. disCRETE | 15. disCRETE AREAS | 15. disCREET beGInning |
| 16. comPLETE | 16. comPLETE PAper | 16. comPLETE comPUters |
| 17. Bel-AIR | 17. Bel-AIR BOY | 17. Bel-AIR ceLEbrity |
| 18. U2 | 18. U2 SONG | 18. U2 celeBRAtion |
| 19. reTAKE (v.) | 19. reTAKE COURSE | 19. reTAKE examiNATION |
| 20. exPRESS | 20. exPRESS TRAIN | 20. exPRESS transforMAtions |
| 21. disLIKE | 21. disLIKE CHOcolate | 21. disLIKE perFECtionism |
| | 22. disLIKE POWer | 22. disLIKE conFUsion |
| | 23. disLIKE PROblems | 23. disLIKE poliTIcians |

**Source:** Authors' elaboration.

To avoid any influence of the syntactic or prosodic context on stress shift, all word sequences were inserted into phonological phrases of the same length and in the same type of carrier phrase, as shown in (5):

(5) a) [I saw] [grotESQUE PICtures] [in the park].
b) [I have] [thirTEEN poTAtoes] [at home].

[7] The sentences and words were presented in random order, mixed with 152 distractor phrases and sentences.

Perceptual analysis of stress position followed the procedures adopted by Levey (1999) and Stander (2007): the position of stress in each word of the corpus was marked by two experts in phonetics and phonology of English. The experts discussed the cases of disagreement to reach a consensus on stress assignment to the syllables.

For this research, the dependent variable is the occurrence of stress shift and the factors are: *shift occurred* (e.g., *THIRteen MEN*) and *shift did not occur* (e.g., *thirTEEN MEN*). Table 2 shows the factors of the controlled variables.

**Table 2** – Controlled Variables - Stress Shift

| | | |
|---|---|---|
| **DEPENDENT VARIABLE** | *Occurrence of Stress Shift* | Shift occurred.<br>Shift did not occur. |
| **INDEPENDENT VARIABLES** | *Context* | Single word<br>Sentence With Clash<br>Sentence Without Clash |
| | *Target Word* | Each of the 21 words analyzed |
| | *Stress Pattern in Use* | Oxytone<br>Paroxytone<br>Proparoxytone |
| | *Segment in the Final Syllable* | Long vowel<br>Long vowel + nasal<br>Long vowel + obstruent |
| | *Pause* | Pause<br>No Pause |
| | *Level of proficiency* | Basic<br>Intermediate<br>Advanced<br>Native Speaker |
| | *Informant* | 1, 2... 37 |

**Source**: Authors' elaboration.

To account for the occurrence of stress shift, the dependent variable was related to the variable *context*, which indicates whether the word was produced in a sentence with stress clash, in a sentence without stress clash or produced as a single word. A word such as *fifTEEN*, for example, could be produced as *FIFteen* when spoken as a single word, because of the influence of the stress rule of BP, which favors the production of paroxytones (CINTRA, 1997). In this case, stress assignment to the syllable *fif-* in a sequence such as *FIFteen MEN* by the same informant would not indicate an occurrence of stress shift, since there was no change in the stress pattern used in the context of the

single word and in the case of stress clash. Thus, a shift was only considered to occur when the speaker produced the oxytone pattern in the single word (e.g., *fifTEEN*) and the paroxytone or proparoxytone pattern in phrases with clash (e.g., *FIFteen MEN*) or without clash (e.g., *FIFteen poTAtoes*). The variable *Target Word* was included to check the stress pattern used by the informants in each of the 21 analyzed words. It should be noted that shift is not possible in words such as *police* and *complete* in the speech of native English speakers because these words contain the reduced vowel *schwa* [ə] in the syllable that would receive the stress in case of shift ([kəmˈpliːt], [pəˈliː s]). However, these data showed that learners, especially at the basic level of proficiency, tend to produce full vowels in these contexts; therefore, a shift can be analyzed in these cases.

The stress pattern actually produced by the speakers was checked with the variable *Stress Pattern in Use*. The factors of this variable are *Oxytone, Paroxytone*, and *Proparoxyton*e, which are the most common stress patterns in BP and English.

The variable *Pause* was included to control cases in which an informant paused between the two words in the clash and non-clash sequences - even though they had been instructed to read the sentences without interruption and as naturally as possible. However, there were cases in which the informants were unable to read the sentences without pausing, even when they were asked to read them again without interruption, especially the basic learners of English. Therefore, we controlled these occurrences of pause through this variable, whose factors are *Pause* and *No Pause.*

The variable *Segment in the Final Syllable* was included to check the influence of the syllable pattern of the last syllable of the first word of the clash on the application of the rule. The following factors were analyzed: long vowel (e.g., *bamBOO*), nasal consonant (e.g., *thirTEEN*) and obstruent consonant (e.g., *japaNESE*)[8]. In addition to these linguistic variables, social variables *Level of proficiency (*basic, intermediate and advanced) and *Informant* were also controlled in the analysis.

The data classified through perceptual judgment were analyzed statistically using the software GoldVarb-X. Application of the stress shift rule has a binary character (applied/did not apply stress shift); therefore, it is consistent with the type of statistical test offered by the software.

## Results

A total of 2,645 data were collected and stress shift occurrences were only considered as such when the informant produced the oxytone pattern in a single word (e.g., *fifTEEN, sevenTEEN*) and the paroxytone pattern (e.g., *FIFteen MEN*) or the proparoxytone pattern (e.g., *SEventeen MEN*) in the same word in sentences with or without a stress clash sequence. Importantly, the results for native and non-native

[8] In these words, an epenthetic vowel may be inserted into the final syllable, especially by basic learners of English, and this could block the occurrence of stress clash (e.g., *com.PLE.te PApers*).

speakers include only occurrences of words inserted into sentences (with and without clash), since the production of single words was used only as a parameter to control cases in which shift occurred.

## Native Speakers

Three of the 21 oxytone words of the experiment were classified as paroxytones when read separately in the speech of the native speakers: *discreet*, *nineteen* and *thirteen*. In these cases, although these words were also produced as paroxytones in clash and non-clash sentences, the occurrence of stress shift was not accounted for as there was no change in the position of stress in the different contexts being analyzed.

The rate of stress shift application by the seven native English speakers was 50.6% (163/322), both in sentences with and without stress clash sequences. In the first statistical round, the variables *Word* and *Stress Pattern in Use* were knockouts. Therefore, a new round was performed, excluding these two variables from the multidimensional analysis. Among the remaining variables, only *Final Segment* was found to be statistically significant.

The variable *Context* was not statistically significant for stress shift application by the native English speakers, but we reported the descriptive results to check what actually occurs. As shown in Table 3, 49.7% of the cases of stress shift occurred in sentences with a stress clash sequence and 51.6% in sentences without stress clash. The rate of application of the rule was very similar in both groups.

**Table 3** – Stress Shift per Context - Native Speakers

| Context | Shift | | No shift | |
|---|---|---|---|---|
| | N | % | N | % |
| *Sentence With Clash* | 80 | 49.7% | 81 | 50.3% |
| *Sentence Without Clash* | 83 | 51.6% | 78 | 48.4% |

**Source**: Authors' elaboration.

Table 4 shows the results for the variable *Final Segment,* the only one that proved to be statistically relevant for the application of stress shift by the native speakers. Words ending in a *nasal* consonant and in a *long vowel* favored the application of the rule, whereas words ending in an obstruent consonant disadvantaged the application of the rule.

**Table 4** – Stress Shift and Final Segment - Native Speakers

| Final Segment | Shift | | No shift | | RELATIVE WEIGHT |
|---|---|---|---|---|---|
| | N | % | N | % | |
| *Nasal* | 78 | 79.6% | 20 | 20.4% | 0.80 |
| *Long vowel* | 42 | 75% | 14 | 25% | 0.75 |
| *Obstruent* | 43 | 25.6% | 125 | 74.4% | 0.23 |

**Source**: Authors' elaboration.

Table 5 shows the rate of rule application per *Target Word*, a variable that could not be included in the multidimensional analysis because of the occurrence of knockouts.

**Table 5** – Stress Shift per Target Word - Native Speakers

| Target word | Shift | | No shift | | Target word | Shift | | No shift | |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | | N | % | N | % |
| *Eighteen* | 14 | 100% | 0 | 0 | *Fifteen* | 7 | 50% | 7 | 50% |
| *Seventeen* | 14 | 100% | 0 | 0 | *U2* | 6 | 42.9% | 8 | 57.1% |
| *Sixteen* | 12 | 85.7% | 2 | 14.3% | *dislike* | 16 | 41% | 23 | 59% |
| *Tennessee* | 12 | 85.7% | 2 | 14.3% | *Bel-Air* | 5 | 35.7% | 9 | 64.3% |
| *bamboo* | 12 | 85.7% | 2 | 14.3% | *robust* | 2 | 14.3% | 12 | 85.7% |
| *kangaroo* | 12 | 85.7% | 2 | 14.3% | *grotesque* | 0 | 0 | 14 | 100% |
| *fourteen* | 11 | 78.6% | 3 | 21.4% | *complete* | 0 | 0 | 14 | 100% |
| *retake* | 11 | 78.6% | 3 | 21.4% | *discrete* | 0 | 0 | 14 | 100% |
| *thirteen* | 11 | 78.6% | 3 | 21.4% | *police* | 0 | 0 | 14 | 100% |
| *nineteen* | 9 | 64.3% | 5 | 35.7% | *express* | 0 | 0 | 14 | 100% |
| *unkind* | 9 | 64.3% | 5 | 35.7% | | | | | |

**Source**: Authors' elaboration.

The words *eighteen* and *seventeen* were the only ones with 100% application of the rule. This means that all native speakers applied the oxytone pattern when producing them as single words, but the paroxytone pattern when producing them in sentences (with and without clash). On the other hand, the words *grotesque*, *complete*, *discrete*, *express* and *police* did not present any case of shift.

The finding that words ending in nasal consonants favored shift (see Table 4) is due to the fact that the words *eighteen, seventeen* and *sixteen*, all ending in a nasal consonant, have the highest rates of application of the rule (see Table 5). In comparison, the fact that words ending in a long vowel also favored the application of the rule can be explained by the fact that the words *Tennessee, bamboo,* and *kangaroo*, which end

in a long vowel, had high rates of stress shift application. Words ending in an obstruent ultimately inhibited the application of the rule because this is the syllabic pattern found in the words *grotesque, complete, discrete, police* and *express,* which did not present any occurrence of stress shift.

Table 6 shows the results for the variable *Stress Pattern in Use,* which also had to be excluded in the statistical rounds, but it shows the stress pattern applied by native speakers both when the shift occurred and when it did not occur. In 95.4% of the cases, the shift occurred in oxytone words that became *paroxytones* when inserted into the sentences (e.g., *fifTEEN → FIFteen*). In 95% of cases, the shift occurred in oxytone words that became *proparoxytones* in the context of clash (e.g., *kangaROO → KANgaroo*). There were 6 cases in which the informants applied the paroxytone pattern and 2 cases in which they used the proparoxytone pattern in sentences in which shift was not accounted for. This occurred because the speakers used the same stress pattern in single words, which does not characterize the application of the rule. Finally, the words in which the informants applied the *oxytone* pattern had 0% application of the rule because it means that the word was oxytone and continued as an oxytone in the context of sentences with stress clash, which does not characterize shift.

**Table 6** – Stress Shift and Stress Pattern in Use - Native Speakers

| Stress Pattern in Use | Shift | | No shift | |
|---|---|---|---|---|
| | N | % | N | % |
| *Paroxytone* | 125 | 95.4% | 6 | 4.6% |
| *Proparoxytone* | 38 | 95% | 2 | 5% |
| *Oxytone* | 0 | 0 | 151 | 100% |

**Source**: Authors' elaboration.

## Speakers of English as L2

Table 7 shows the stress pattern in each single word produced by the BP speakers. In 11 words, the percentage of application of the oxytone pattern (the expected pattern in this context) was much higher than that of the other two patterns. In the other 10 words, however, the application of the paroxytone or proparoxytone pattern was almost as frequent as that of the oxytone pattern. In these cases, the occurrence of the paroxytone or the proparoxytone pattern in words inserted into the sentences with or without clash was not classified as stress shift, since there was no change in the stress pattern used in the different contexts.

**Table 7** – Stress Pattern Applied to Single Word- English as L2

| Target Word | STRESS APPLIED TO SINGLE WORD | | | | | |
|---|---|---|---|---|---|---|
| | Oxytone | | Paroxytone | | Proparoxytone | |
| | N/Total | % | N/Total | % | N/Total | % |
| *Bamboo* | 24/30 | 80 | 6/30 | 20 | | |
| *Bel-Air* | 26/30 | 86.6 | 4/30 | 13.4 | | |
| *Complete* | 25/30 | 83.3 | 5/30 | 16.7 | | |
| *Discrete* | 23/30 | 76.6 | 7/30 | 23.4 | | |
| *Dislike* | 26/30 | 86.6 | 4/30 | 13.4 | | |
| *Eighteen* | 16/30 | 53.3 | 14/30 | 46.6 | | |
| *Express* | 28/30 | 93.3 | 2/30 | 7.7 | | |
| *Fifteen* | 13/30 | 43.3 | 17/30 | 56.5 | | |
| *Fourteen* | 18/30 | 60 | 12/30 | 40 | | |
| *Grotesque* | 23/30 | 76.6 | 7/30 | 23.4 | | |
| *Kangaroo* | 15/30 | 50 | 1/30 | 3.3 | 14/30 | 46.6 |
| *Nineteen* | 16/30 | 53.3 | 14/30 | 46.7 | | |
| *Police* | 15/30 | 50 | 15/30 | 50 | | |
| *Retake* | 29/30 | 96.7 | 1/30 | 3.3 | | |
| *robust* | 18/30 | 60 | 12/30 | 40 | | |
| *seventeen* | 17/30 | 56.6 | 0/30 | 0 | 13/30 | 43.4 |
| *sixteen* | 18/30 | 60 | 12/30 | 40 | | |
| *Tennessee* | 17/30 | 56.6 | 3/30 | 10 | 10/30 | 33.4 |
| *thirteen* | 14/30 | 46.6 | 16/30 | 53.3 | | |
| *U2* | 26/30 | 86.6 | 4/30 | 13.4 | | |
| *Unkind* | 23/30 | 76.6 | 7/30 | 23.4 | | |

**Source**: Authors' elaboration.

Stress shift occurred in 28.7% of cases (396/1378) and was not applied in 71.3% of the data (982/1378). In the statistical analysis, the variables *Level of Proficiency* and *Target Word*, in this order, were selected as statistically relevant. The variables *Final Segment, Context,* and *Pause* were not considered to be statistically significant.

Table 8 shows the results for the variable *Context*, which, as in the native speaker data, was not statistically significant for the application of stress shift. There were more cases of stress shift in sentences with a stress clash, but the difference between these two types of sentences was not statistically significant.

**Table 8** – Stress Shift per Context - English as L2

| Context | Shift | | No shift | |
|---|---|---|---|---|
| | N | % | N | % |
| *Phrases with Clash* | 206 | 29.9% | 483 | 70.1% |
| *Phrases without Clash* | 190 | 27.6% | 499 | 72.4% |

**Source**: Authors' elaboration.

Among the linguistic variables tested, only *Target Word* proved to be statistically relevant in the production of L2 English speakers. The results for this variable are shown in Table 9 below, which includes both clash and non-clash contexts.

**Table 9** – Stress Shift per Target Word - English as L2

| Target Word | Shift | | No shift | | Relative weight |
|---|---|---|---|---|---|
| | N | % | N | % | |
| *U2* | 31 | 51.7% | 29 | 48.3% | 0.75 |
| *Seventeen* | 30 | 50% | 30 | 50% | 0.74 |
| *Sixteen* | 29 | 48.3% | 31 | 51.7% | 0.72 |
| *Nineteen* | 26 | 43.3% | 34 | 56.7% | 0.68 |
| *Fourteen* | 24 | 40% | 36 | 60% | 0.64 |
| *Unkind* | 21 | 35% | 39 | 65% | 0.64 |
| *Tennessee* | 23 | 38.3% | 37 | 61.7% | 0.63 |
| *thirteen* | 23 | 38.3% | 37 | 61.7% | 0.63 |
| *fifteen* | 23 | 38.3% | 37 | 61.7% | 0.63 |
| *kangaroo* | 22 | 36.7% | 38 | 63.3% | 0.61 |
| *eighteen* | 22 | 36.7% | 38 | 63.3% | 0.61 |
| *robust* | 18 | 30% | 42 | 70% | 0.58 |
| *bamboo* | 20 | 33.3% | 40 | 66.7% | 0.57 |
| *grotesque* | 15 | 25.9% | 43 | 74.1% | 0.52 |
| *express* | 12 | 20% | 48 | 80% | 0.43 |
| *police* | 12 | 20% | 48 | 80% | 0.43 |
| *Bel-Air* | 11 | 18.3% | 40 | 81.7% | 0.41 |
| *discrete* | 9 | 15% | 51 | 85% | 0.35 |
| *retake* | 8 | 13.3% | 52 | 86.7% | 0.31 |
| *complete* | 7 | 11.7% | 53 | 88.3% | 0.28 |
| *dislike* | 10 | 5.6% | 170 | 94.4% | 0.14 |

**Source**: Authors' elaboration.

Among all the words tested, the compound word *U2* had the highest rate of stress shift application by the non-native speakers: 51.7%. This means that the Brazilian speakers applied the oxytone pattern to U2 when it was produced as a single word in 51.7% of the cases, and they applied the paroxytone pattern in the clash and non-clash phrases.

Table 10 shows the results for the variable *Final Segment,* which was not statistically significant for the application of stress shift by the learners.

**Table 10** – Stress Shift and Final Segment - English as L2

| Final Segment | Shift | | No shift | |
|---|---|---|---|---|
| | N | % | N | % |
| *Nasal* | 177 | 42.1% | 243 | 57.9% |
| *Long vowel* | 96 | 40% | 144 | 60% |
| *Obstruent* | 123 | 17.1% | 595 | 82.9% |

**Source**: Authors' elaboration.

Long vowels followed by a nasal consonant had the highest rate of stress shift because of the words *seventeen, sixteen, nineteen* and *fourteen*, which presented very high shift rates (between 40% and 50%). Words ending in a long vowel also had a high application rate because the word with most cases of shift was *U2,* whose final syllable has a long vowel. Finally, the words ending in an obstruent had the lowest rates of application of the rule because of *discrete, retake, complete* and *dislike*.

Table 11 shows the stress pattern used by Brazilian speakers in cases of stress shift. Importantly, this variable has a descriptive character, i.e., it was not included in the multidimensional analysis because of the occurrence of knockout.

**Table 11** – Stress Shift and Stress Pattern in Use - English as L2

| Stress Pattern in Use | Shift | | No shift | |
|---|---|---|---|---|
| | N | % | N | % |
| *Paroxytone* | 320 | 54.4% | 268 | 45.5% |
| *Proparoxytone* | 76 | 54% | 65 | 46% |
| *Oxytone* | 0 | 0 | 649 | 100% |

**Source**: Authors' elaboration.

It was found that 54.4% of the cases in which the informants applied the paroxytone pattern were occurrences of stress shift and that, in 45.5% of the cases, the informants applied the paroxytone pattern to words produced both individually and in sentences, which does not characterize shift. Similar results were found when the proparoxytone

pattern was used. Applications of the oxytone pattern indicate the cases in which shift was not applied.

Table 12 shows the intersection between the variables *Stress Pattern in Use* and *Target Word* and should read as follows: the word *dislike*, for example, was produced as an oxytone 171 times in the sentences with clash and without clash, which means that stress shift did not occur in any of these cases. This same word was produced with the paroxytone pattern in 9 cases, 8 of which were occurrences of stress shift and 1 was not (because the paroxytone pattern was also applied to the single word). The word *U2*, in turn, was produced as an oxytone in the clash sentence and non-clash phrases in 26 cases and as a paroxytone in 36 cases, 29 of which were occurrences of stress shift, and so on.

**Table 12** – Stress Pattern in Use per Target Word - English as L2

| Target Word | STRESS PATTERN APPLIED IN CASES OF SHIFT | | | | | |
|---|---|---|---|---|---|---|
| | Oxytone | | Paroxytone | | Proparoxytone | |
| | Cases/Total | % | Cases/Total | % | Cases/Total | % |
| *Dislike* | 0/171 | 0 | 8/9 | 89% | 0 | 0 |
| *U2* | 0/26 | 0 | 29/36 | 81% | 0 | 0 |
| *Bamboo* | 0/35 | 0 | 20/25 | 80% | 0 | 0 |
| *Retake* | 0/50 | 0 | 8/10 | 80% | 0 | 0 |
| *express* | 0/45 | 0 | 12/15 | 80% | 0 | 0 |
| *unkind* | 0/32 | 0 | 21/28 | 75% | 0 | 0 |
| *Bel-Air* | 0/45 | 0 | 11/15 | 73% | 0 | 0 |
| *discrete* | 0/46 | 0 | 9/14 | 64% | 0 | 0 |
| *sixteen* | 0/8 | 0 | 29/52 | 56% | 0 | 0 |
| *grotesque* | 0/30 | 0 | 15/28 | 54% | 0 | 0 |
| *complete* | 0/47 | 0 | 7/13 | 54% | 0 | 0 |
| *fourteen* | 0/14 | 0 | 24/46 | 52% | 0 | 0 |
| *nineteen* | 0/6 | 0 | 26/54 | 48% | 0 | 0 |
| *eighteen* | 0/12 | 0 | 22/48 | 46% | 0 | 0 |
| *robust* | 0/19 | 0 | 18/41 | 44% | 0 | 0 |
| *thirteen* | 0/7 | 0 | 23/53 | 43% | 0 | 0 |
| *fifteen* | 0/4 | 0 | 23/56 | 41% | 0 | 0 |
| *police* | 0/25 | 0 | 12/35 | 34% | 0 | 0 |
| *Tennessee* | 0/13 | 0 | 1/6 | 17% | 22/41 | 54% |
| *seventeen* | 0/4 | 0 | 0/2 | 0 | 30/54 | 56% |
| *kangaroo* | 0/12 | 0 | 0/2 | 0 | 22/46 | 48% |
| **TOTAL** | **0/651** | **0** | **318/588** | **54%** | **74/141** | **52%** |

**Source**: Authors' elaboration.

Table 12 shows that the occurrence of the oxytone pattern in the words *sixteen, nineteen, thirteen* and *fifteen* was quite low while the application of the paroxytone pattern was high in all these words. Most of the cases in which the paroxytone pattern was applied to these words were not cases of shift, which reveals a tendency for Brazilian speakers to apply the paroxytone pattern to these words when they are produced both as single words and inserted into sentences. The same result was found in the word *seventeen*, which was produced as an oxytone in only 4 cases but as a proparoxytone in 54 cases, of which only 30 were cases of shift.

The last linguistic variable considered in the analysis of the stress shift rule was *Pause* - see Table 13. If we compare the application of shift in cases with pause and without pause, the difference is not very significant. However, if we observe the application of shift in cases of pause compared to cases in which there was no shift, this difference is quite significant.

**Table 13** – Stress Shift in Cases of Pause - English as L2

| **Pause** | **Shift** | | **No shift** | |
|---|---|---|---|---|
| | **N** | **%** | **N** | **%** |
| *Pause* | 5 | 11.1% | 40 | 88.9% |
| *No Pause* | 391 | 29.3% | 942 | 70.7% |

**Source**: Authors' elaboration.

There were few occurrences of pause, considering the total data collected in this study (45/1378). This is because, as mentioned above, we asked informants to read sentences naturally and without interruption to avoid the influence of pauses on stress clash sequences. However, especially at the basic level, some informants were unable to read sentences without interruption. This is evident in the results shown in Table 14, with occurrences of pause and shift by the level of proficiency. Of the 45 pauses, 39 occurred at the basic level, but the shift occurred in only 4 of these cases. The number of pauses was significantly smaller at the intermediate and advanced levels.

**Table 14** – Intersection between shift, pause, and level of proficiency - English as L2

| **Level of proficiency** | **Pause** | | | |
|---|---|---|---|---|
| | Pause | | No Pause | |
| | N/Total | % | N/Total | % |
| Basic | 4/39 | 10% | 76/419 | 18% |
| Intermediate | 0/5 | 0 | 114/455 | 25% |
| Advanced | 1/1 | 100% | 201/459 | 44% |
| **TOTAL** | **5/45** | **11%** | **391/1333** | **29%** |

**Source**: Authors' elaboration.

*Level of Proficiency,* as mentioned above, was the first variable selected as statistically relevant. The results in Table 15 show that the application of the rule was favored by the speakers with an advanced level of proficiency, while the relative weight presented by the intermediate-level speakers was similar to the neutral point; finally, the basic-level informants applied the rule less often.

**Table 15** – Stress Shift per Level of Proficiency - English as L2

| Level of Proficiency | Shift | | No shift | | RELATIVE WEIGHT |
|---|---|---|---|---|---|
| | N | % | N | % | |
| *Basic* | 80 | 17.5% | 378 | 82.5% | 0.34 |
| *Intermediate* | 114 | 24.8% | 346 | 75.2% | 0.45 |
| *Advanced* | 202 | 43.9% | 258 | 56.1% | 0.69 |

**Source**: Authors' elaboration.

In order to check if the application of shift in the contexts without stress clash becomes more frequent during the learning process, we intersected the variables *Level of Proficiency* and *Context*. Table 16 shows that the application of shift was very similar in both contexts.

**Table 16** – Stress Shift per Context and Level of Proficiency

| Level of proficiency | Context per Level of Proficiency | | | |
|---|---|---|---|---|
| | With clash | | Without clash | |
| | N | % | N | % |
| *Basic* | 42 | 20.4% | 38 | 20% |
| *Intermediate* | 57 | 27.7% | 57 | 30% |
| *Advanced* | 107 | 51.9% | 95 | 50% |

**Source**: Authors' elaboration.

## Discussion and final remarks

First, we will address the findings for the native speakers. Our results showed that stress shift occurred in 50.6% of cases, even in sequences in which there was no clash between two adjacent primary stresses. This rate of application of the rule is not a surprising result as it is a *variable* strategy for stress clash resolution. According to Hayes (1989), adjacent accents are strictly avoided in English, and close but nonadjacent stresses tend to occur less rigorously. Thus, stress shift was expected to be more frequent in sentences with a stress clash sequence, that is, with two adjacent primary stresses, than in sentences without a stress clash, in which there was no clash between two

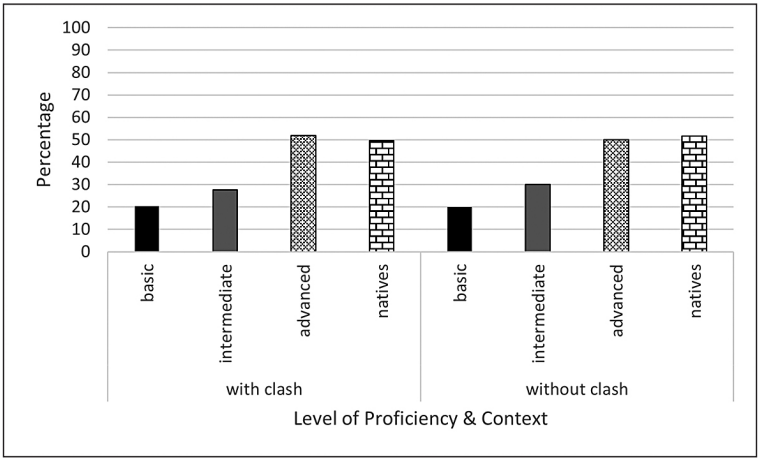
primary stresses. The results indicated that the variable *Context* was not statistically significant for the application of the rule by the native speakers. Importantly, there was a difference in the rate of rule application found by Levey (1999) and the rate in this research. In stress clash contexts, Levey found 27% application, while the rate was 49% in this study. In non-clash contexts, Levey found an application rate of 12% compared to 51% in this research. According to the author, the effect of pitch accent, which was controlled in her study by inserting sequences with stress clash both at the beginning and at the end of the sentence, may have influenced the perceptual judgment in these two contexts. In the present research, all sequences (with and without stress clash) were inserted into the same prosodic and syntactic position in the sentences. Thus, we believe that pitch accent has not influenced our results.

As mentioned above, it was predicted that stress shift would not occur in words such as *complete* [kəmˈpliːt] because the first syllable of the word contains the reduced vowel *schwa* [ə], which could not be stressed. And that is what actually happened.

The results also showed that *Final Segment* was the only statistically significant variable for application of the stress shift rule by the native English speakers. Words ending in a long vowel (e.g., *bamboo*) and a nasal consonant (e.g., *thirteen*) favored the application of the rule, while those ending in an obstruent (e.g., *retake*) did not. The results for the application of shift per word showed that words ending in an obstruent did not favor the application of the rule, as the words *grotesque, complete, discrete, police* and *express* did not show any occurrence of shift. In addition to final syllable structure, it is clear that these words have something in common: the penultimate syllable contains a *schwa* (in the case of *p[ə]lice* and *c[ə]mplete*), a diphthong with *schwa* (*gr[əʊ]tesque*) or the short, lax vowel [ɪ] (*d [ɪ] screte, [ɪ] xpress*). Although we did not statistically control the type of vowel in the syllable to be stressed in case of shift, we believe that this aspect may also have influenced the results of this research. The reason is that similar results were reported by Levey (1999), who did not find any case of a shift in words containing a diphthong [əʊ] in the syllable that would receive stress (e.g., *obese*).

The aim of this research was to observe the acquisition of a rule in English that is very similar in BP (except for the distance between stress clashes), in order to analyze a potentially positive L1 transfer in L2 acquisition. In the case of the stress shift rule, the transfer of the L1 rule would have a facilitating role in the acquisition of L2, since the rule occurs very similarly in Portuguese and English. The results for the 30 L2 English speakers indicated that shift was applied in 21.7% of cases. The results also showed that shift becomes more frequent in higher levels of proficiency, that is, the advanced-level speakers applied stress shift more often than the basic- and intermediate-level speakers. Gayer and Collischonn (2007) found stress shift in only 7% of stress clash contexts in BP, which indicates that the application rate of stress shift is higher in English than that in the native language, even by learners with a basic level of proficiency. At the advanced level, the rate of application of stress shift by the Brazilian speakers was very similar to that of the native English speakers, as shown in Figure 1.

**Figure 1** – Stress shift per level of proficiency and context - native speakers and L2 speakers




**Source**: Authors' elaboration.

As shown above, the application of the stress shift rule had quite similar results in BP and in English. In fact, there is a narrower context in BP: it only occurs with adjacent primary stresses. Thus, non-native speakers would have to learn how to apply the rule in this context, which it does not occur in BP. In this case, application rates should be higher than those found in this research: similar rates in stress clash contexts and a gradual increase in application rates in non-clash contexts, depending on learners' level of proficiency. This gradual increase in non-clash contexts is exactly what we have found. However, the rates are very similar to those of clash contexts - but higher rates had been expected, as the context of the rule was the same in both languages. Our interpretation is that the rule has been poorly applied at the basic level because these informants are not always able to read sentences naturally and without pauses, which ultimately blocks the application of the rule. In other words, as basic-level informants are not yet able to read sentences fluently, they naturally tend to have lower stress shift rates than intermediate- and advanced-level informants, as that the rule was blocked by reading more carefully and with more pauses, which is typical of this level of proficiency. Therefore, the fact that the basic-level speakers have a relatively low stress shift rate cannot be used as justification for stating that L1 was not operating at the beginning of L2 acquisition. On the other hand, application in non-clash contexts by advanced-level informants points to the acquisition of the English rule, which is the same as that of BP except for the distance between stresses.

The results for the speakers of English as L2 also showed that the only statistically relevant linguistic variable for applying the rule was *Target word.* As with native speaker data, the words containing a *schwa* (*p[ə]lice*), a diphthong with a *schwa* (*gr[əʊ]tesque*)

or a vowel [ɪ] (*d[ɪ]screte, [ɪ]xpress*) did not favor stress shift. As expected, cases of a shift in words such as *police* (20%) and *complete* (7%) indicate that Brazilians may have produced full vowels in the syllables *po-* and com-, which enabled the application of paroxytone stress. Through the intersection between *Target Word* and *Final Segment*, we realized that there is a tendency for words ending in a long vowel or a nasal consonant to be more favorable to shift than those ending in an obstruent.

In short, there are many similarities between the results of native speakers and non-native speakers: 1) From a perceptual perspective, shift occurs both in clash or non-clash contexts in very similar proportions; 2) The rate of shift application by advanced-level speakers was very similar to the rate of application by native speakers; 3) Words ending in an obstruent do not favor the application of the rule, while words ending in a long vowel or a nasal consonant do.

The results for the stress shift rule, therefore, indicated several similarities between the results of the native speakers and those of the non-native speakers. Thus, we consider that, especially at the advanced level, the English stress shift rule and all its particular aspects have been transferred from BP to English.

FRAGOZO, C; SANTOS, R. Aquisição da retração acentual do inglês por falantes de português brasileiro. **Alfa**, São Paulo, v.65, 2021.

- *RESUMO: Este artigo discute a aquisição da regra de retração do acento do inglês por falantes do português brasileiro, lançando luzes sobre a influência da L1 e do ensino na aquisição de uma L2. Foi aplicado um experimento no qual 37 falantes nativos e não-nativos de inglês produziram as mesmas palavras isoladamente, em contexto de choque acentual e em contexto sem choque acentual, de modo que se pudesse observar a produtividade desse fenômeno. Os resultados encontrados mostram que a retração ocorreu em proporções semelhantes em contextos com e sem choque acentual e que os aprendizes de nível avançado se aproximaram bastante da taxa de aplicação dos nativos. Também se observou que palavras terminadas em obstruinte não favoreceram a aplicação da regra enquanto palavras terminadas em vogal longa ou nasal favoreceram, o que evidencia que a estrutura silábica e o inventário segmental da L1 afetam os resultados da L2.*

- *PALAVRAS-CHAVE: Aquisição de segunda língua. Retração acentual. Inglês. Português brasileiro. Aquisição fonológica.*

## REFERENCES

ABAURRE-GNERRE, M. B. Processos fonológicos segmentais como índices de padrões Prosódicos diversos nos estilos formal e casual do português do Brasil. **Caderno de Estudos Lingüísticos***,* Campinas, n. 2, p. 23-34, 1981.

ABOUSALH, E. **Resolução de choques de acento no português brasileiro**: elementos para uma reflexão sobre a interface sintaxe/fonologia. 1997. 157f. Dissertação (Mestrado em Linguística) - Instituto de Estudos da Linguagem, Universidade Estadual de Campinas, Campinas, 1997.

BARBOSA, P. Explaining Brazilian Portuguese resistance to stress shift with a coupled-oscillator model of speech rhythm production. **Cadernos de Estudos Lingüísticos**, Campinas, n. 43, p. 71-92, 2002.

BARBOSA, P. Syllable-timing in Brazilian Portuguese: uma crítica a Roy Major. **D.E.L.T.A.**, São Paulo, v.16, n. 2, p. 369-402, 2000.

BOLINGER, D. **Two kinds of vowels, two kinds of rhythm**. Bloomington, IN: Indiana University Linguistics Club, 1986.

BROSELOW, E.; KANG, Y. Second language phonology and speech. *In*: HERSCHENSOHN, J.; YOUNG-SCHOLTEN, M. (ed.). **The Cambridge Handbook of Second Language Acquisition**. Cambridge, MA: Cambridge University Press, 2013. p.529-554.

CARROLL, J. B. The Carroll Model: A 25-Year Retrospective and Prospective View, **Educational Researcher**, Washington, v.18, n.1, p.26-31, 1989.

COOPER, W. E.; EADY, S. J. Metrical phonology in speech production. **Journal of Memory and Language**, New York, n.25, p.369-384, 1986.

CINTRA, G. Distribuição de padrões acentuais no vocábulo em português. **Confluência,** Assis, v. 5. n. 3, p. 83-92, 1997.

CORDER, S.P. The significance of learners' errors. **International Review of Applied Linguistics in Language Teaching***,* Heidelberg, v.5, n.1/4, p.161-170, 1967.

COUNCIL OF EUROPE. **Common European Framework of Reference for Languages**: learning, teaching, assessment. Cambridge: Cambridge University Press, 2001.

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

FERGUSON, C. Absence of copula and the notion of simplicity: A study of normal speech, baby talk, foreigner talk and pidgins. *In*: HYMES, D. (ed.). **Pidgination and Creolization of Languages**. Cambridge: Cambridge University Press, 1971. p. 141–150.

FERREIRA, L. **High initial tones and plateaux in Spanish and Brazilian Portuguese neutral declaratives**: Consequences to the relevance of F0, duration and vowel quality as stress correlates. 2008. 187p. Thesis (Doctorate in Linguistics) – University of Illinois, Urbana-Champaign, 2008.

FLEGE, J. E. Second Language Speech Learning: Theory, findings, and problems. *In*: STRANGE, W. (ed.). **Speech perception and linguistic experience**: Issues in cross-language research. Timonium, MD: York Press, 1995. p. 233-277.

FRAGOZO, C. **Aquisição de regras fonológicas do inglês por falantes de português brasileiro.** 2017. 246f. Tese (Doutorado em Linguística) - Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo, 2017.

FRIES, C. C. **Teaching and learning English as a foreign language**. Ann Arbor: University of Michigan Press, 1945.

FRY, D.B. Experiments in the perception of stress. **Language and Speech**, Middlesex, n.1, p.126-152, 1958.

GASS, S. M.; SELINKER, L. **Second Language Acquisition:** An Introductory Course. 3.ed. Hillsdale, NJ: Lawrence Erlbaum Associates, 2008.

GAYER, J. E. L.; COLLISCHONN, G. Análise variacionista da resolução de choque de acento. **Revista Virtual de Estudos da Linguagem – ReVEL**, v.5, n. 9, ago. 2007.

GRABE, E.; WARREN, P. Stress Shift: Do Speakers Do It or Do Listeners Hear It? *In*: CONNELL, B.; ARVANITI, A. (ed.). **Phonology and Phonetic Evidence**. 1995. **(**Papers in Laboratory Phonology, IV). p.95-110.

HAYES, B. The prosodic hierarchy in meter. *In*: KIPARSKY, P.; YOUMANS, G. (ed.). **Rhythm and Meter**. Orlando: Academic Press, 1989. p.201-260.

HAYES, B. The Phonology of Rhythm in English. **Linguistic Inquiry**, Cambridge, v.15, n.1, p. 33-54, 1984.

KIMBALL, A.; COLE, J. Avoidance of Stress Clash in Perception of American English. *In:* SPEECH PROSODY, 7., 2014, Dublin. **Proceedings** [...], Dublin, Ireland, 2014. p. 497-501.

KRASHEN, S. D. **Second Language Acquisition and Second Language Learning**. Oxford: Pergamon Press, 1981.

LADO, R. **Linguistics across cultures**. Ann Arbor: University of Michigan Press, 1957.

LEVEY, S. **The role of vowel quality in stress clash**. 1999. 148f. Thesis (Doctorate in Linguistics) - University of New York, New York, 1999.

LEVEY, S.; LAWRENCE, R. Stress clash: Frequency and strategies of resolution. **Acoustical Society of America Journal**, Melville, v.111, n.5, p. 2476-2476, 2002.

LEVIN, J.; FOX, J. A. **Estatística para ciências humanas**. 9. ed. São Paulo: Pearson; Prentice Hall, 2004.

LIBERMAN, M.; PRINCE, A. On stress and linguistic rhythm**. Linguistic Inquiry**, Cambridge, v. 8, n. 2, p. 249-336, 1977.

MADUREIRA, S. An acoustic study of sequences of words with adjacent primary-stressed syllables: does stress shift occur in Brazilian Portuguese?. **Cadernos de Estudos Lingüísticos**, Campinas, v. 43, p. 109-126, 2002.

MAJOR, R. **Foreign accent:** The ontogeny and phylogeny of second language phonology. Mahwah, NJ: Lawrence Erlbaum Associates, 2001.

MAJOR, R. Stress and rhythm in Brazilian Portuguese. *In*: KOIKE, D. A.; MACEDO, D. P. (org.). **Romance Linguistics**: The Portuguese Context. Westport: London: Bergin Garvey, 1992. p. 3-30.

MASSINI, G. **Acento e ritmo**. São Paulo: Contexto, 1992.

MATTOS, A.M.A. A hipótese da gramática universal e a aquisição de segunda língua. **Revista Estudos da Linguagem**, Belo Horizonte, v.9, n.2, p.51-71, jul./dez. 2000.

MATTOSO CÂMARA Jr., J. **Estrutura da Língua Portuguesa**. Petrópolis: Vozes, 1972.

NESPOR, M.; VOGEL, I. **Prosodic Phonology**. Dordrecht: Foris Publications, 1986.

REETZ, H.; JONGMAN, A. **Phonetics:** transcription, production, acoustics and perception. Oxford: Wiley-Blackwell, 2009.

SÂNDALO, F.; TRUCKENBRODT, H. Some Notes on Phonological Phrasing in Brazilian Portuguese. *In:* CSIRMAZ, Z. *et al.* **Phonological Answers (and their corresponding questions).** 2002. (MIT Working Papers in Linguistics 42.). p.285-310.

SANTOS, R. Traces, pro and stress shift in Brazilian Portuguese. **Journal of Portuguese Linguistics**, Lisboa, v. 2, n. 2, p. 101-113, 2003.

SELINKER, L. Interlanguage. **International Review of Applied Linguistics**, Heidelberg, p.209-230, 1972.

SELKIRK, E. **Phonology and Syntax:** The Relation between Sound and Structure. Massachussetts: The MIT Press, 1984.

SILVA Jr, L. J. **Interferências rítmicas do português no inglês como L2**: o choque acentual. 2013. 223f. Tese (Doutorado em Linguística) - Universidade Federal da Paraíba, João Pessoa, 2013.

STANDER, L. **A aquisição do acento primário em inglês como LE**: o caso das palavras sufixadas à luz da Teoria da Otimidade. 2007. 162f. Dissertação (Mestrado em Letras) - Universidade Católica de Pelotas, Pelotas, 2007.

TENANI, L. Fonologia prosódica. *In*: DA HORA, D.; MATZENAUER, C. (org.). **Fonologia, fonologias**: uma introdução. São Paulo: Contexto, 2017. p.109-123.

TRUBETZKOY, N. Princípios de Fonologia. **Prague Linguistic Circle Papers,** Praga, v.7, 1939.

WEINREICH, U. **Languages in contact**. New York: Linguistic Circle of New York, 1953.

Received on October 1, 2018

Approved on August 2, 2019