Is the Pronunciation of the <s> Between Vowel Letters Really Unpredictable in English?

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1. Introduction

The purpose of this paper is threefold: to demonstrate that there is a spelling-to-sound pattern in English involving the grapheme <s> when it occurs between two vowel letters in morpheme boundary contexts; to relate this claim to a general framework about English orthography that takes into account morphemic features; and to point out its relevance as a pedagogical strategy to EFL learners, especially to those who speak Portuguese as their first language. In order to do so, first we will briefly overview major studies of English spelling concerning the grapheme <s> between vowel letters and describe the Portuguese spelling-to-sound convention regarding this grapheme in the same context. Then, we will summarize our claims as to the predictability of the pronunciation of the intervocalic <s> grapheme based on a corpus collected from major English dictionaries, according to specific methodological procedures and criteria. Next, we will offer the results of our analysis of this corpus as evidence to support our claim. Finally, we will discuss our proposal within a pedagogical perspective, drawing primarily from usage-based phonological models such as the one suggested by Bybee (2001, 2002).

2. Previous studies on the pronunciation of the <s> between vowel letters in English

Most major studies on English spelling-to-sound conventions agree that EFL learners very often can resort to morpheme boundaries to successfully predict the pronunciation of orthographic sequences that form lexical items to which they come into contact mostly through reading alone, that is, via visual channel. Classical cases presented in the literature are sequences such as <dd> <gm>, <gn>, <ll><mb> <ng> (Venezky, 1970:41-2; Wijk, 1966:92-6; Wells, 1990:468-9). Those which do not mention morpheme boundaries per se point out the importance of morphological factors (Celce-Murcia, Brinton & Goodwin 1996:269-88).

As far as the grapheme <s> is concerned, however, a peculiar situation is presented. On the whole, its pronunciation is considered a source of difficulty to most EFL learners, no matter the context, as argued by Wijk (1966:10), each difficulty due to a specific reason. Though general patterns can be used to teach its pronunciation in some contexts (*e.g.,* in word-initial consonant clusters), morphemic factors are relevant only when the <s> itself stands for a morpheme (Venezky, 1970:92-100). However, not a single author who has focused on the issue considers that a general and useful rule applies to the <s> between vowel letters in medial position within polymorphemic words. In other words, thus far, to the best of our knowledge, morphemic boundaries have not been taken into consideration in research on spelling-to-sound correspondence of the <s> between vowel graphemes. Two typical conclusions about the <s> in this context can be seen below:

The voiceless pronunciation appears to be more common than the voiced, but no useful general rule concerning the distribution of the two sounds can be given, except that [z] predominates when the stress falls on the immediately following syllable (Wijk, 1966:102).

In the middle of a word, we must take account of the letters on either side of the **s**. (...)
(ii) Where **s** is between two vowel letters, the pronunciation may be either

s, as in **basin** [ˈbeɪsən], **crisis** [ˈkraɪsɪs] , or

z, as in **poison** [ˈpɔɪzən], **easy** [ˈiːzi]

There is no rule: each word must be considered separately (Wells, 1990:613).

3. The Portuguese spelling-to-sound convention

While no rule has been detected for the pronunciation of the English intervocalic <s>, in Portuguese this grapheme follows a regular pattern in the same context: invariably it is pronounced as [z], a voiced alveolar fricative. Compare the examples below that highlight similarities and differences in pronunciation of the medial <s> between vowels in Portuguese and English cognate words:

Portuguese		English	
vi**s**ita	[vi**z**itɐ]	vi**s**it	[ˈvɪ**z**ɪt]
cri**s**e	[ˈkɾi**z**ɪ]	cri**s**is	[ˈkraɪ**s**ɪs]
de**s**obedecer	[dʒi**z**obedeˈseh]	di**s**obey	[ˌdi**s**oʊˈbeɪ]
bá**s**ico	[ˈba**z**ikʊ]	ba**s**ic	[ˈbeɪ**s**ɪk]

In order to preserve this spelling-to-sound convention, the letter <s> must be represented as <ss> in Portuguese so that its voiceless pronunciation is maintained. In morphologically related forms, this rule applies to words containing a base form beginning with an <s> to which a prefix ending in a vowel is attached (Scliar-Cabral, 2003:42-9):

Portuguese		English	
a**ss**exual	[a**s**ekɪsuˈaw]	a**s**exual	[ˌeɪˈ**s**ɛkʃuəl]

The only exception to the use of double <s> is found in hyphenated words:

Portuguese		English	
pré-**s**elecionar	[ˌprɛ**s**elesioˈnah]	pre**s**elect	[ˌpriː **s**ɪˈlɛkt]

4. Predicting the pronunciation of the intervocalic <s> in English: A new proposal

There is no doubt that all previous studies that emphasize the unpredictability of the pronunciation of the <s> in the context at hand are correct as far as English monomorphemic words are concerned. In this case, EFL students must learn each item individually as claimed by Wells (1990). However, this does not mean that no general rule can be posited in relation

to polymorphemic words, which can be used as teaching strategy. [1] Thus, we claim that the pronunciation of the <s> between vowel letters is predictable at undisputed morpheme boundaries since it follows either one of two patterns: **Pattern A** or **Pattern B**.

However, before each pattern is presented, a set of criteria must be clearly defined to characterize undisputed morpheme boundaries, since it is a well-known fact that deciding where a morpheme boundary is located within a complex word is not always a straightforward task and, depending on the lexical item, the identification of its formatives may not be consensual even among native speakers (Plag, 2003:20-30).

Our proposal only accounts for cases in which boundaries can be easily determined and, hence, used as a pedagogical tool in the EFL classroom. Three criteria should be applied for this purpose:

1. the word must contain a semantically and / or grammatically transparent affix;
2. once the affix is isolated, the remaining form must sound as an independent word even when its spelling requires a final silent <e>;
3. an affix is considered a prefix if it withstands a test to corroborate its status: secondary stress assignment (Plag, 2003:197-8).

If all three conditions are met, and word segmentation is clearly established, the pronunciation of the <s> at morpheme boundaries can be determined by means of the patterns mentioned previously: **A**, the more general one, or **B**, a secondary pattern involving three special suffixes.

Pattern A can be summarized as follows:

- The sonority specification of the segment that corresponds to the grapheme <s> at left or right margins of independent base forms tends to be maintained in both inflected and derived items. The letter <s> is considered to be at the right margin even when it is followed by a silent <e>.
- The original voicing feature of affixes that contain an <s> at a morpheme boundary also tends to be preserved in derived forms.

Note that both prefixes {dis-} and {mis-} can always be pronounced with a voiceless fricative. Only {dis-} admits variation: when a stressed vowel immediately follows it, both voiced and voiceless forms are allowed. Therefore, the voiceless feature can be considered as default and taught to EFL students as their first choice, especially in early stages of language development. The examples below illustrate this pattern:

PREFIX	BASE FORM	SUFFIX	DERIVED/INFLECTED FORM
re+	[s]ell		re[s]ell
	ga[s]	+ify	ga[s]ify
	cha[s]e	+ing	cha[s]ing
	two	+[s]ome	two[s]ome
di[s]+	appear		di[s]app**ea**r
di[s]~di[z]+	arm		di[s]**a**rm~ di[z]**a**rm
mi[s]+	apply		mi[s]appl**y**

[1] Even in Cristófaro-Silva's (2005:26-33) detailed comparison between English and Brazilian Portuguese sound systems there is no reference to morphemic boundary as an important element to predict the pronunciation of the <s> between vowel letters.

Pattern B, on the other hand, should be resorted to when a few special and productive derivational suffixes are identified: {-ive}, {-ion} and {-(i)an}[2]. No matter the voicing feature of the grapheme <s> at the end of the base form, these suffixes determine specific spelling-to-sound correspondences for the preceding <s> and must be learned independently. In other words, **pattern B** comprises pattern subtypes.

The suffix {-ive} preferably selects the voiceless fricative as default both when the base form ends in <se> or in <d(e)>. In the last case, there is spirantization ([d] → [s]). Some varieties of English allow an alternate voiced alveolar fricative, but this pronunciation is never presented as the sole option. Here are some examples:

abu[z]e + ive	→	abu[s]ive ~ abu[z]ive	(abusive)
intru[d]e + ive	→	intru[s]ive	(intrusive)
ero[d]e+ ive	→	ero[s]ive ~ ero[z]ive	(erosive)

The suffix {-ion} always triggers a voiced palatal fricative as default both when the base form ends in <s> or in <d>. In the last case, there is spirantization, the same process that occurs with {-ive} but with a different output, since the segment produced must be [ʒ], as shown below:

preci[s]e+ion	→	preci[ʒ]ion	(precision)
revi[z]e+ion	→	revi[ʒ]ion	(revision)
conclu[d]e+ion	→	conclu[ʒ]ion	(conclusion)

The last suffix, {-(i)an}, follows the most complex pattern. When a polymorphemic word is spelled with a final sequence <...Vsian> or <...Vsan> and there is a clear morpheme boundary after the <s>, the default pronunciation of this grapheme is a voiced fricative. Variant forms are, however, allowed: <s> may even correspond to no sound at all. Notice that the examples provided below all correspond to adjectives that share the fact that they are derived from names of persons or places:

Pari[s]+ian	→	Pari[z ~ ʒ]ian	(Parisian)
Jame[z]+ian	→	Jam(e)[z]ian	(Jamesian)
Venu[s]+ian	→	Venu[z ~ ʒ ~ s ~ ʃ]ian	(Venusian)
Rabelai∅+ian	→	Rabelai[z]ian	(Rabelaisian)
Illinoi∅ ~ Illinoi[z]+an	→	Illinoi∅an ~ Illinoi[z]an	(Illinoisan)

5. Methodological procedures and the corpus

The data was collected from the website onelook.com, linked to rhymezone.com. This site provides a tool that searches 54 online dictionaries for words in reverse letter ordering. Once we obtained the complete list of words and expressions with a specific ending or beginning, another system tool allowed us to select just those among them deemed as common words due to their occurrence rate on the web.

[2] Due to their peculiar morphophonological behavior in English and consequent challenging theoretical implications, these suffixes have been the subject of close scrutiny by major studies, such as Chomsky & Halle (1968), Rubach (1984), Halle & Mohanan (1985), and Myers (1999), to name a few. Our proposal simply reflects this fact.

The next step was to establish our own criteria to limit the corpus to the issue at hand. We only considered words that complied with the following:

- they were found in at least two general reliable dictionaries (such as *Webster's Encyclopedic Unabridged Dictionary of the English Language* or *The American Heritage*);
- their base forms and affixes were transparent as far as content was concerned;
- their pronunciations were found in at least two reliable pronunciation dictionaries: Kenyon & Knott (1953) , Jones (1997, 2003), Wells (1990), Dictionary.com;[3]
- they showed an unquestionable origin, clearly reflected in their independent base forms from which the targeted affix could be removed.[4]

In order to form the corpus used in this research, additional procedures where undertaken. We did not consider compound words containing formatives such as{bio-} {deca-}, {electro-}, {-archy}, {-side}, {-sized}, though we expect to arrive at results that are similar to the ones concerning the derivational and inflected forms reported in this paper. We also computed forms spelled with <s> when the base form or the affix could have an alternate <z> spelling. Finally, although we did not include base forms that did not result in an independent word once the affix was removed (e.g., *analgesic* > *analgesia, fantasist* > *fantasy*), we consider them important for a future study, since many of them have cognates in Portuguese, especially those from Latin / Greek origin. Cognates like these may contribute to Brazilian EFL students' foreign accent.

These methodological procedures resulted in a corpus comprised of 1403 lexical items distributed as follows:

Items in the Corpus	
Prefixes ending in a vowel letter + base form starting with < s + vowel>	165
Prefixes ending in <vowel +s> + base form starting with a vowel letter	277
Subtotal 1	**442**
Base forms ending with a vowel letter + <s (e)> + a suffix beginning with a vowel letter	941
Base forms ending with a vowel letter + a suffix beginning with <s> + a vowel letter	25
Subtotal 2	**966**
TOTAL	**1403**

6. Analysis of the corpus: Results

Figure 1 accounts for what happens in two types of morphemic boundaries, both of which involving prefixes where the <s> is either at the beginning of the base form or at the end of the prefix. As shown in its horizontal axis, the relevance of the morpheme boundary for the

[3] This is also a search site that offers as its main source *Dictionary.com Unabridged (v 1.1)*, which is based on the *Random House Unabridged Dictionary*, 2006. It also refers the user to other reliable sources.

[4] For example, according to our criteria, the morpheme boundary is transparent or undisputed in the word "re-sign" ("to sign anew") as it is in "re-sort" ("to sort again"), but not in "resign" ("to give up, to quit") or "resort" ("to have recourse").

pronunciation of the intervocalic <s> was tested with 19 different prefixes, some more productive than others**.** The blue bars represent the number of items in the corpus; the red ones, the number of items that follow **Pattern A**; and the green ones, cases where there is variation, that is, both voiced and voiceless forms are found.

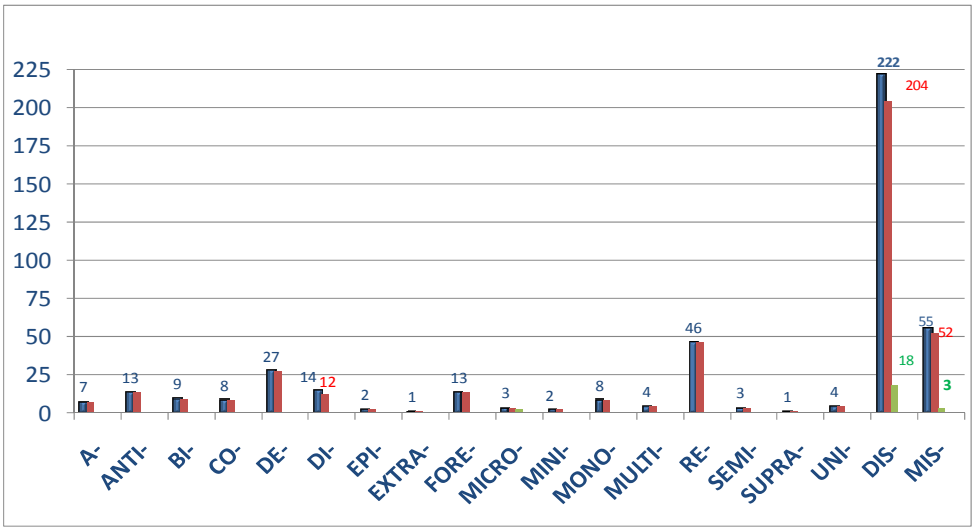

Figure 1

Notice that, no matter the prefix, the application of PATTERN A to the <s> is highly productive at this morpheme boundary, boardering on 100%. We conclude that this boundary has a rate of voicing feature retention of the alveolar fricative similar to that of the <s> in word initial position. In other words, the prefix tends not to alter the pronunciation of the <s> in the base form at this morpheme boundary. We found very few instances of variation: only one with {micro-} and a few with {dis-} (18 out of 222). Involving the prefix {mis-}, we computed three cases of variation.

Similarly, Figure 2 accounts for two types of morphemic boundary: one in which the <s> is at the end of the base form, and the other in which the <s> starts the suffix. Note that the latter includes only one suffix: {–some}. The first context far outnumbers the second: it comprises 23 suffixes. Again, the blue bars refer to the number of lexical items containing each type of suffix in the corpus; the red bars represent those that follow **Pattern A**, the green ones register variation; and the purple ones indicate the cases that fall under **Pattern B**.

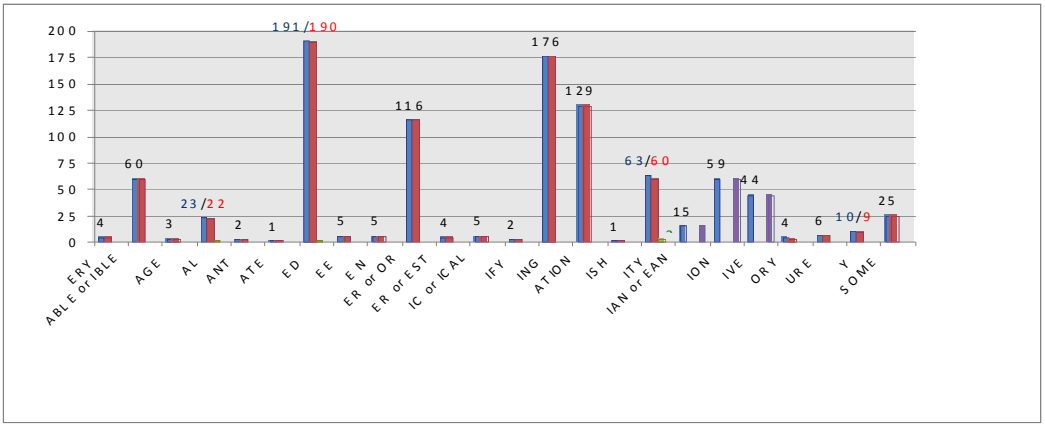

Figure 2

As demonstrated above, **Pattern A** applies to 20 out of 23 suffixes attached to base forms ending in <s>. Among the items that contain these 20 suffixes, **Pattern A** applies to nearly 100% of the data. Variation is found only in relation to the suffix {–ity} (3 out of 60 cases) and in one item containing the suffix {–ed}, that is, in the form "erased". **Pattern B** occurs exclusively with the three prefixes we have already mentioned: {-ive}, {-ion}, and {ian / an}. Finally we must point out that there is only one case that can be considered an exception to our proposal since it does not follow either pattern nor does it admit variation: it is the word "lousy", the only one out of 10 words whose base form ends in <s> and is followed by the suffix {–y}. In this case the sonority specification of the base must be altered in the derived form.[5]

On comparing the three possibilities concerning spelling-to-sound patterns for the grapheme <s> in intervocalic position at morpheme boundary in our corpus, we arrive at the following results, represented in Figure 3.

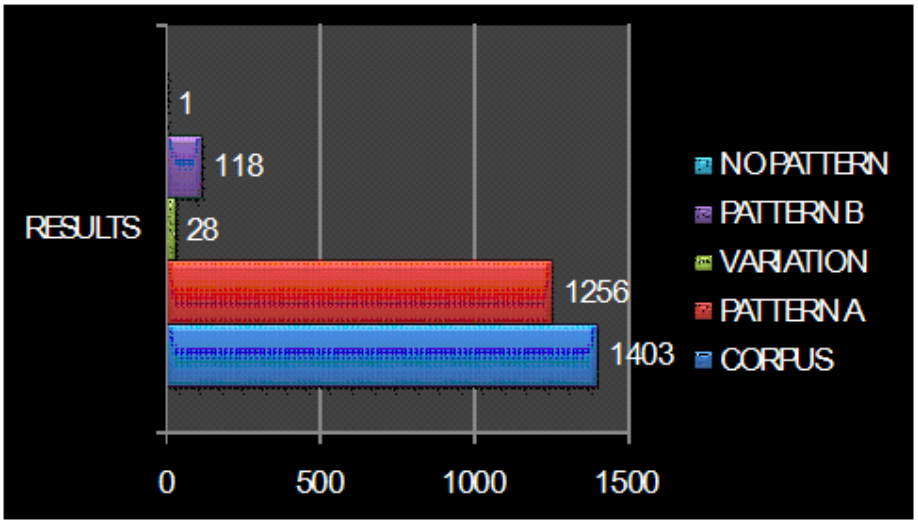

Figure 3

In order to estimate the relevance of undisputed morpheme boundaries to predict the pronunciation of the <s> between vowel letters in polymorphemic words in English and, therefore, test the validity of our claim, we computed together all the cases that follow either **Pattern A** or **B** and compared this result with those that present **variation** or **no pattern** at all. In other words, we asked the following question, whose answer can be visually represented in Figure 4: "Is morpheme boundary relevant to predict the pronunciation of the <s> between vowel letters in polymorphemic words in English?"

[5] In his study about fricative alternations and their orthographic representations, Venezky (1970:100) identifies the "noun-adjective" pair "louse: lousy" as "petrified" forms in the language.

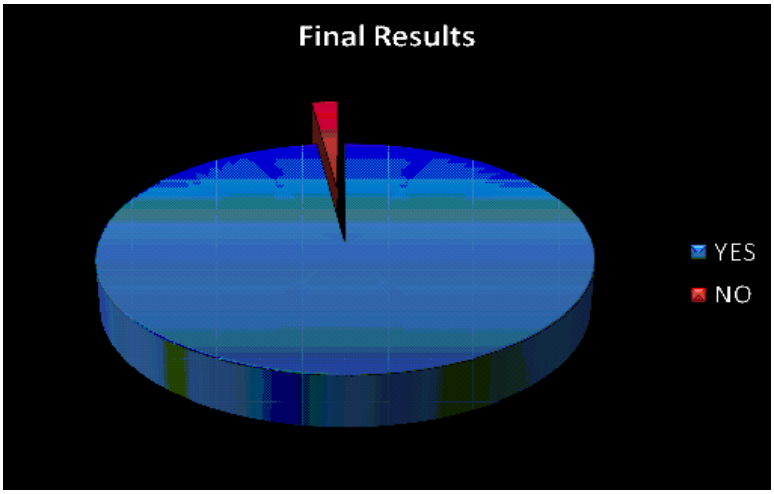

Figure 4. Yes = 97.93%

The affirmative answers to our question amount to 97.93%, a strong enough indication that the patterns proposed in this paper provide a new way of looking at the issue concerning the pronunciation of the intervocalic <s>, thus allowing us to envision pedagogical strategies that can help EFL learners predict its pronunciation within a larger framework that treats morphology as an important asset.

7. Pedagogical implications

Our argument is that the patterns presented in this paper can be taught to EFL students, especially to those whose L1 is Portuguese, through several different activities, some of which not necessarily devoted exclusively to pronunciation practice as, for instance, while teaching vocabulary. Whatever classroom tasks we can think of, in order to predict the pronunciation of the grapheme <s> at morpheme boundaries of polymorphemic words the student should be able to do the following:

1. To recognize orthographic sequences that correlate with recurrent streams of sounds that go along with the same grammatical and / or semantic meaning. This can be achieved by providing the student with a large number of exemplars that show the same pattern. The more frequent the pattern, the easier it is for the student to perform the task of identifying a grammatical category and the sound sequence that corresponds to it.
2. To identify the token that does not fit the pattern, that is, to realize that phonetic similarity and / or spelling coincidence are important cues, although they do not necessarily imply morphemic identify: "the morphological structure of words is not a given, but rather is derived from relations of similarity", as Bybee (2000:25). suggests.
3. To establish a new category for the English language based on a large number of tokens with the same morpheme type in the target context, especially when there is a cognate in their L1 with a different pronunciation.

In order to achieve these goals, language teachers should try to teach pronunciation by relating phonetic forms with spelling conventions, grammatical, semantic and all other kinds of linguistic information. This will help the student realize that a word is an item in the lexicon of a language. And the lexicon is a complex network structure (Bybee, 2000:29) where the parts of a word overlap with all existing items in it.

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