Variability in Pretonic Vowel Reduction by Fluent Brazilian Speakers of English

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1. Introduction

This paper describes an analysis of vowel duration in pretonic syllables produced by advanced Brazilian speakers of English. Brazilians have a tendency to use full vowels in unstressed word-initial syllables where native speakers would have a short central vowel. This is readily explainable in terms of L1 influence, as pretonic syllables are more prominent in BP than English. They always permit (in principle) five vowel contrasts, /i e a o u/ (Major, 1985; Wetzels, 1992), whereas only two distinct vowels occur in unstressed English pretonics, /ə/ and /ɪ/, and these extremely rarely if ever contrast with one another (Giegerich, 1992). Such pairs as *illusion~allusion* and *accept~except* can be distinguished, if necessary, but apart from such cases there is no vowel contrast in unstressed English pretonics.

The difference between Brazilian Portuguese (BP) and English pretonics is clear in pairs of cognates with the same stress pattern:

isento /i/	*exame* /e/	*ataque* /a/	*opor* /o/	*supor* /u/
exempt /ɪ/	*exam* /ɪ/	*attack* /ə/	*oppose* /ə/	*suppose* /ə/

Some normally reduced word-initial syllables tolerate a full vowel, for example *morality*, *botanical*, *abdominal*, *september* (Marusso, 2003). The reasons for this are not obvious, since most words <u>must</u> have a reduced vowel - a full vowel in the first syllables of *paralysis*, *potato* or *suggest*, for instance, would be totally non-nativelike. But the fact that such unpredictable variation is a part of the language may trap the unwary learner into assuming that extreme reduction is always optional.

In fact, extreme reduction in word-initial syllables in English needs explaining. Flemming (under submission) points out that many languages, such as Estonian and Turkish, have their largest set of vowels in word-initial syllables, possibly to facilitate lexical access by providing maximum information early in the word. The fact that English neutralizes vowel contrasts where they might be thought important for word recognition (e.g., *observe~absurd*, *modernity~maternity*) indicates that even greater importance is attached to the information provided by stress, perception of which is enhanced by maximizing length differences and reducing unstressed vowels. According to Cutler (1992), reducing a full vowel or giving full value to a reduced vowel results in an inaccurate segmental representation and hence in poorer recognition performance.

In Optimality Theoretic terms, Input-Output faithfulness is ranked higher in Brazilian Portuguese than the constraint requiring a maximization of durational differences between stressed and unstressed syllables, which is the highest ranked constraint in English. The reduced duration entails another high-ranking constraint in English, that banning full vowels in perceptually weak syllables. In Burzio (2007) the relevant constraints are presented as follows:

ΔE: Maximize energy differences between stressed and unstressed vowels;

*WEAK-Q: Non-minimal articulatory activity resulting in perceptually weak vowel quality cues is banned;

IDENT-Q: The vowel quality specified in the input must be present in the output.

The BP ranking appears to be IDENT-Q >> ΔE >> *WEAK-Q, while faithfulness is ranked comparatively lower in English: ΔE >> *WEAK-Q >> IDENT-Q

As pretonic syllables are not always reduced by Brazilian speakers of English where native speakers would reduce them, this research aimed to identify factors in the phonological environment systematically affecting degree of reduction. The specific factors investigated were suggested by the results of an earlier study (Watkins, 2006), which investigated variability in the use of weak forms of three prepositions, *to*, *of* and *for*, by advanced Brazilian speakers, and found syllable weight, the stress level of the preceding syllable, and the type of following segment to be the most influential variables.

A better operational definition of "degree of reduction" was required than the rather subjective auditory judgment in Watkins (2006), which left room for inter-rater (and quite possibly even intra-rater) disagreement. Flege and Bohn (1989) found durational reduction occurring in Spanish-accented English without there always being a corresponding reduction of quality to schwa. Therefore the theoretical assumption that shortening drives loss of contrast (e.g., Flemming, under submission; Van Bergem, 1994, 1995) does not necessarily follow in L2 English. However, Fear, Cutler and Butterfield (1995) showed the importance of quality in native speakers' perception: unreduced but unstressed vowels, as in the first syllable of *automata*, were "heard" as being strong syllables, while weak syllables implied centralization. It thus appeared that both duration and quality needed to be measured, independently. In the part of the experiment described in this paper, three hypotheses were tested regarding duration:

> H1: There is a systematic relationship between orthographic letter and degree of durational reduction.
> H2: There is a systematic relationship between preceding stress level and degree of durational reduction.
> H3: There is a systematic relationship between presence or absence of a coda and degree of durational reduction.

The results for the corresponding hypotheses for vowel quality, and the overall conclusions drawn from a comparison of degree of durational and spectral reduction, will be published in a separate paper.

2. Method

The subjects were 30 fluent Brazilian speakers of English with BP as their L1, otherwise no other requirements, although all were in fact teachers of EFL. 20 were from the south of Brazil, and 10 from the NE, 24 women and six men. None knew the specific purpose of the research. Advanced subjects were chosen as a way of finding out which are the most resistant environments. A control group of five native speakers (four male, one female) - all EFL teachers, living in Brazil - also participated: one Australian, one American, one South African, one Welsh and one English.

All read a randomized list of 24 sentences, twice each in succession (plus 6 distractor sentences). Each letter 'a', 'o', and 'u' occurred in a token word in six sentences, twice in unstressed open syllables, twice in unstressed closed syllables, and twice in stressed syllables (one open, one closed) for comparison. Segmental and metrical environments were controlled, half of the tokens being preceded by a stressed syllable, half by a weak one. The sentences were:

1. The boss **approves** of our suggestion
2. The workers **approve** of the decision
3. The boys **accepted** the invitation
4. The owners **accepted** our offer
5. Her parents **act** in films
6. He likes **apple** pie with cream
7. The guards **oppose** the new schedule
8. Most teachers **oppose** the change
9. The boys **obtained** visas
10. The members **obtained** admission
11. There are some apartments **opposite** the college
12. Jack's **obviously** unhappy in his job
13. The guards **suppose** we are members
14. Most people **suppose** he's rich
15. Bill **succeeded** in getting promoted
16. The doctors **succeeded** in curing her
17. Fred was a real **sucker** to believe that
18. My mother is coming to **supper** tonight

3. Results

The mean percentage duration for unstressed versus stressed vowels was as follows (stressed =1.00):

	BP	NS
Overall	.45	.40
'a'	.42	.42
'o'	.46	.39
'u'	.46	.38
W_	.46	.38
S_	.43	.42
No coda	.46	.40
Coda	.43	.41

For the last two lines (plus or minus coda, i.e. H3, which tested the influence of syllable weight), the 'u' tokens could not be included, as all the syllables containing this letter were coda-less (according to the usual definition), due to an oversight.

The degree of reduction is quite close to that found by Lee, Guion and Harada (2006):.45 for NSs (although this was not just for just pretonics). They found a similar figure for the Japanese participants, while Koreans showed less reduction (as predicted, since their language does not have a phonemic length distinction, as do Japanese and English).

An important detail when considering the findings for durational reduction is the fact that the BP participants' stressed vowels were on average 14.9% longer than the stressed vowels produced by the native speaker control group, which is perhaps why the overall difference

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BP:NS is not very great. The BPs were making the duration distinction, but more by lengthening stressed vowels than by producing very short unstressed vowels (as the NSs did).

While the figures presented above show a tendency, this did not reach statistical significance:

H1 Letter: (Friedman) p = .267
H2 Preceding stress level: (Wilcoxon, 2-tailed) p = .166
H3 Plus or minus coda: (Wilcoxon, 2-tailed) p = .399

The three hypotheses were therefore not supported by the results of this study.

4. Conclusions

While the results for the three hypotheses tested for duration show no statistically significant effect of orthographic letter, preceding stress level, or presence vs absence of coda, what can nevertheless be seen is a tendency – a small but consistent overall difference between the means for the five NSs and the 30 Brazilians for all the token types, the NSs reducing rather more than the Brazilians. It might have been expected that NS reduction would be relatively greater, but the fact that Brazilians produced stressed vowels that were almost 15% longer than the NSs must be taken into account. Length is not phonemic in BP, as it is (indirectly)in English in such pairs as *beat - bead*, where vowel length is usually the most reliable cue for the voicing distinction in word-final obstruents.

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