

DURATIONAL PROPERTIES OF STRESSED SYLLABLES AS A CUE FOR ENGLISH-ACCENTED FRENCH?

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1. INTRODUCTION

This paper reports on some preliminary findings of a corpus of recorded speech by Anglophones learners of French as a second language (FL2 hereafter). Excerpts from this corpus were examined in an effort to find the cause of greater temporal syllabic variability, which is associated to the perception of a greater prosodic foreign accent. In order to do so, proper production of stressed syllables is essential. This proves to be a challenge for learners, as past studies [5, 2] have shown notable differences in the temporal rhythmic patterns of learners and those of native speakers. The data presented in [5], which are specific to Anglophones learners of French, did not however isolate the most important factors responsible for these temporal differences.

English rhythm is the result of a succession of accented (longer) and unaccented (shorter) syllables. French rhythm is characterized as having syllables of relatively equal duration, except for the final rhythmic-group syllables which is stressed and noticeably longer. This distinction between the two languages means that Anglophones learning FL2 transfer phonological properties from English and display greater syllabic variability. The analysis presented here examines the duration of accented words in an effort to narrow down the greater temporal variations displayed by Anglophones learners.

2. METHOD

2.1 Participants

A total of nine speakers were used for this first analysis divided into three groups: 3 intermediate English learners of French (EL1), 3 advanced English learners of French (EL2), and 3 native speakers (NS). The assessment of Anglophone learners' proficiency in French was done through a language-background questionnaire that evaluated their level of formal instruction and their overall experience in French. All learners reported having English as their first language. Low proficient learners were enrolled in 200-level language classes at university while advanced learners were enrolled in advanced literature and linguistics courses required for a major in French. Native speakers of French Learners were university professors at Simon Fraser University who had immigrated to an English-speaking environment less than 3 years ago. They speak without excessive traces of regional accent. All subjects were paid a small honorarium upon completion of the experiment.

2.2 Stimuli

The speech samples analyzed for this study are recalled single-sentence utterances which consisted in carrier sentences with a target word embedded word (underlined in (1)) in final rhythmic-group position:

(1) "Le mot pas est très joli."

In order to examine if the presence of the English stress pattern is transferred on polysyllabic words, 8 monosyllabic and 8 trisyllabic words were embedded in the carrier sentences. In total, 16 sentences were analyzed for each of the 9 speakers. The stimuli used for this part of the experiment are: *pas, pou, bas, bout, fa, fou, va, vous, décampa, déroba, habita, balada, étouffa, échafaud, cérébraux, vertébraux.*

2.3 Experiment procedure

Participants were required to say out loud the carrier sentences displayed on computer monitor, wait two seconds, and to repeat it once it had disappeared from the screen. This procedure provides more natural speech than a reading task while the speech material remains identical across subjects.

2.4 Acoustical analysis procedure

Recordings were digitized and analyzed with Computer Speech Lab version 4300. Syllabification of French utterances was done according to the rules generally accepted [3] and verified experimentally [1].

Variability Index: a variability index [3, 5, 6] was used to compare the temporal properties of the entire utterances. The formula to obtain the index, shown below, assesses the average variation of syllable duration for a given sentence, based on a normalized duration to account for variations in tempo.

$$VarIndex = \left(\sum_{k=1}^{n-2} |d_{k+1} - d_k| \right) / (n-1)$$

d_k = normalized duration (duration of a syllable divided by average duration of all syllables of a phrase/sentence) of the k^{th} syllable, and

n = number of syllables

Perfect syllable isochrony would allow for no durational variability, hence leading to an index of 0 while greater variability in syllable duration would lead to a greater index.

Group-final lengthening: durational variations of stressed syllables were computed by dividing the duration of the stressed syllable by the average duration of all syllables within that sentence, exclusive of the final sentence.

3. RESULTS

3.1 Variability Index

The average indexes presented in Table 1 show a slight tendency for EL1 and EL2 to produce greater variability than NS, which was expected. The figure also shows a greater tendency for EL1 to produce more variability in carrier sentences with monosyllables than EL2 and EL2 greater than NS. On carrier sentences with trisyllables, EL2

displays slightly greater variability than EL1, while both EL1 and EL2 display greater variability than NS. The small sample used for this analysis did not however prove significant when an ANOVA was computed.

Table 1: Variability index

	Monosyllables	Trisyllables	Average
EL1	0.756	0.652	0.704
EL2	0.732	0.707	0.720
NS	0.71	0.612	0.661

3.2 Group-Final Lengthening

Contrary to what was expected, EL2 displayed the greatest average increase in duration, followed by NS and EL1. As can be seen in Table 2 and Figure 1, EL2 speakers produced increases in monosyllabic words of 164.3% compared to 159.3% and 159.8% for EL1 and NS speakers respectively. On trisyllable words, however, EL2 speakers increased the stressed syllable in an almost identical ratio as the NS with values of 161.1% and 161.4% respectively, where EL1 speakers increased their duration by only 154.3%. Again, the small sample did not allow for statistical validation at this point.

Table 2: Group-Final Lengthening

	Monosyllables	Trisyllables	Average
EL1	159.3	154.3	156.8
EL2	164.3	161.1	162.7
NS	159.8	161.4	160.6

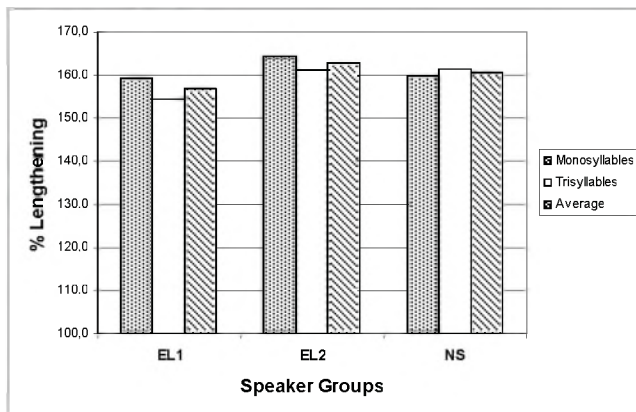


Figure 1: Group-Final Lengthening

3.3 Monosyllabic Words Lengthening

In an effort to determine if the transfer of the aspirated voiceless stops from English to French could account for longer syllables, the data for monosyllabic words containing *pas, pou, bas, bout* were examined. The results, presented in Table 3 and Figure 2, show that EL1 produced longer syllables with a voiced stop was in onset position, with an increase of 170.3% compared to 157.5% for syllables with a voiceless stop in onset. The transfer of aspiration may have had an effect for more advanced speakers who produced increases of 167.5% for stressed syllables with a voiceless stop in initial position and increases of 149.0% for syllables with a voiced stop.

Table 3: Lengthening for Voiceless and Voiced Stops in Monosyllabic Words

	Voiceless	Voiced
EL1	157.5	170.3
EL2	167.5	149.0
NS	163.5	154.3

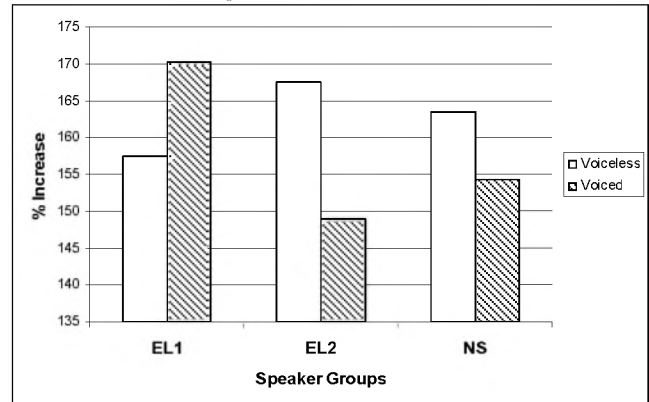


Figure 2: Lengthening for Voiceless and Voiced Stops in Monosyllabic Words

4. DISCUSSION

These preliminary results show that Anglophones do display greater temporal variability than NS. EL1 speakers increase monosyllables more than the last syllables of trisyllabic words. Segmental properties may also have caused increases in syllabic duration, as voiced stops seem to be associated with longer monosyllables produced by EL1.

It is not clear at this point if the main cause for temporal syllabic variability related to the rhythmic properties of a language is related to the way learners produce stressed syllables. Although the results do exhibit tendencies, greater corpora are required to further explore this hypothesis.

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