THE EFFECT OF CONSONANTAL ENVIRONMENT ON FRENCH LISTENERS' PERCEPTION OF ENGLISH [u]

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1. INTRODUCTION

This paper challenges the traditional view of the French high rounded vowels, according to which French [y] is a difficult sound for English-speaking learners because their L1 inventory has no equivalent, and French [u] is less difficult because English does have an [u]. Current theory claims that L2 sounds are perceived by learners as members of L1 categories and that foreign accent is the result of their producing those L2 sounds according to L1 phonetic realization rules [1]; and English listeners have been found to categorize both French [y] and [u] as exemplars of English [u] [2]. It is known that English [u] has much higher F2 values in alveolar than in labial context [3], and that English listeners compensate for this in categorizing vowels [4]. One may expect, then, that English-speaking learners will produce both [y] and [u] with higher F2 values in alveolar than in labial environment. The *density hypothesis* [5] predicts that the 3 French high vowels, [i,y,u], will vary less as a function of context than the 2 English vowels, [i,u]. It was hypothesized, then, that the contextually-induced F2 shift of English [u] in production would be greater than the perceptual shift in French listeners and that, consequently, the latter would hear more English [u]s as French [y] in alveolar than in labial environment.

2. METHOD

2.1 Production of English [i,u]

Speakers of Canadian English recorded tokens of [bib], [did], [bub], [dud]. An F2 value was taken from each item.

2.2 French Listeners' Perception of English [i,u]

The above samples were played to European French listeners, who identified the vowel of each as [i], [y], or [u].

2.3 French Perception of Synthetic Vowels

The 20 members of a high-vowel continuum varying in F2 were attached to transitions appropriate for initial [b] and [d]. The [bV] and [dV] syllables were played 10 times in random order to French listeners for vowel identification.

3. RESULTS [6]

3.1 Production of English [i,u]

Analysis of speaker means for each vowel in each context revealed significant differences between [bib] and [did] ($p=.001$) and between [bub] and [dud] ($p<.0001$). In line with previous findings [3], F2 was higher in alveolar than in labial context for both vowels but the difference was much smaller for [i] (60 Hz) than for [u] (379 Hz).

3.2 French Listeners' Perception of English [i,u]

English [i] was heard as [i] in both contexts by French listeners. Analysis of [y] identifications given to English [u] showed the mean proportion for [bVb] environment (0.19) to differ significantly ($p<.0001$) from that for [dVd] (0.61). These findings support the hypothesis that French listeners would hear more English [u]s as [y] in alveolar context.

3.3 French Perception of Synthetic Vowels

For each listener F2-crossover values were computed for the [u-y] and [y-i] boundaries in each environment. Analysis revealed significant difference between the [bV] and [dV] contexts for [i-y] ($p=.001$; Mean=85 Hz), but not for [y-u] ($p=.5167$; Mean=14 Hz). While the former contrast was significant, this boundary shift was quite small in comparison to the production shift found for English [u].

4. DISCUSSION AND CONCLUSION

The perceptual results from synthetic vowels, along with the analysis of English production, explain the perception of English vowels by French listeners. In both contexts English [i] lies well within the French [i] category. By contrast, as is illustrated in Figure 1, English [u] production shows a very large contextually-induced shift where French perception shows none. These two functions place English [u] close to the boundary, and within the French [u] category when it is in labial environment, but within the [y] category when in postdental environment.

An assessment of the relative difficulty of French [y] and [u] for English-speaking learners must be context-sensitive if it is to be accurate. French [u] is not a less difficult sound than [y]. Rather, [y] is particularly difficult in labial context, while [u] presents its greatest challenges in postdental context.

5. REFERENCES

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6. FIGURE 1: English F2 production means for [u] (male speakers) and the mean French [y-u] perceptual boundary.