THE PERCEPTION OF THE SINGLE-GEMINATE CONSONANT CONTRAST BY NATIVE SPEAKERS OF ITALIAN AND ANGLOPHONES

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ABSTRACT

The results of a psychoacoustic experiment suggest that native speakers of Italian distinguish between intervocalic single and geminate consonants (as in fato and fatto) on the basis of the duration of these consonants, and not in terms of the duration of the preceding vowels, while anglophones perceive the same contrast not in terms of the duration of these consonants but in terms of the duration of the preceding vowels.

INTRODUCTION

The difference between Italian words like fato ('fate') and fatto ('fact') is generally stated in terms of the opposition between a single consonant (in fato) and a double consonant (in fatto), or between a short and a long consonant.

It is well known, however, that this consonantal length difference is accompanied by a vowel length difference: Italian geminates are preceded by short vowels, while their single intervocalic counterparts are preceded by long vowels [1, 2, 3, 4].

As in all cases where two phonetic characteristics covary, the question arises as to whether one of those two characteristics is perceptually more salient than the other.

Although it is generally assumed that native speakers of Italian are sensitive to the difference in consonantal length, it has been suggested that the primary perceptual cue in distinguishing between words like fato and fatto is the difference in vowel duration that characterizes such words [4]. Neither claim has been tested experimentally.

Contrary to Italian, English does not make use of an opposition between single and double consonants, and it is reasonable to assume that English speakers learning Italian do not perceive the difference between words like fato and fatto in terms of the duration difference between [t] and [tt].

The purpose of this study was to establish

1. whether the difference between words like fato and fatto is perceived by native speakers of Italian as residing in the consonant or the vowel; and

2. whether this difference is perceived in the same way by anglophones learning Italian.

PROCEDURE

Stimuli

The stimuli were prepared in the following way. A token of fato recorded by a native speaker of northern Italian on a good quality cassette recorder was low-pass filtered at 8.8 kHz to preclude aliasing, and digitized at 22 kHz. The digitized signal was then modified by means of a waveform editor (SoundEdit) to produce 7 stimuli by decreasing the length of the vowel from 215 to 92 ms in steps corresponding to two pitch periods (17-18 ms); each pair of pitch periods was removed from the middle portion of the vowel to leave the CV and VC transitions intact.

For each stimulus thus obtained, 5 new stimuli were produced by increasing the length of the silent portion of the intervocalic consonant ([t]) in 30 ms steps from 100 ms to 220 ms. This yielded a total of 35 stimuli (7 vowel durations x 5 consonantal durations).

Subjects

Subjects were twelve native speakers of northern Italian enrolled at the University of Bologna, and twelve native speakers of Canadian English attending the University of Alberta. Their ages ranged from 21 to 24 years.

Experimental Task

Subjects were asked to identify as fato or fatto the stimuli described above, in which the durations of the intervocalic consonant ([t]/[tt]) and the vowel preceding it ([a]) were varied systematically. They listened to 10 repetitions of each stimulus played in random order via a computer program and delivered through good quality headphones. The subjects' task was to identify each token as either fato or fatto by clicking in the appropriate box on a computer screen using a mouse-driven cursor.

RESULTS

The results for the Italian and English listeners are presented below by means of identification functions, with consonant duration varying in some, and vowel duration in the others.

Italian Listeners

The identification functions in Figures 1 and 2 are representative of those obtained from all the Italian listeners, with minor variations.

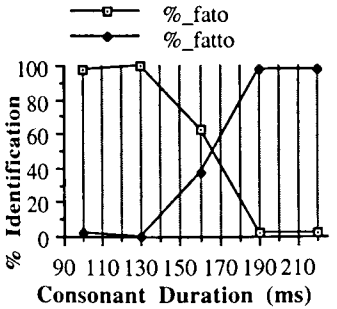

Figure 1.

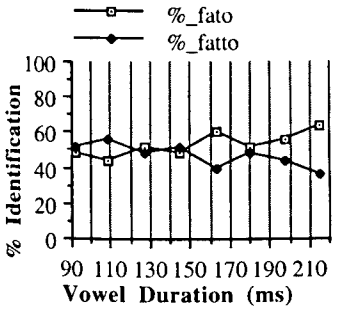

Figure 2.
The well-defined identification functions in Figure 1 (where the variable is consonant duration) and the undifferentiated identification functions in Figure 2 (for vowel duration) suggest that the Italian listeners distinguished between fato and fatto on the basis of consonant duration but not on the basis of vowel duration.

English Listeners

The identification functions in Figure 3 are representative of those obtained from all the anglophones, with minor variations. These undifferentiated identification functions suggest that when the varying dimension was consonant duration, the anglophones were unable to distinguish fato from fatto.

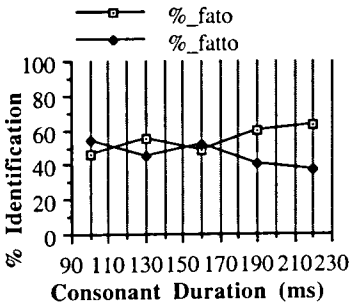

Figure 3.
When the varying dimension was vowel duration, two patterns of identification emerged for the anglophones, as illustrated in Figures 4 and 5.

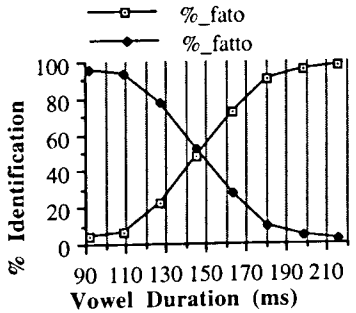

Figure 4.
Figure 4 suggests that some anglophones (n=8) used vowel duration as a perceptual cue to distinguish between fato and fatto. Because they associated fato with a perceived long vowel and fatto with a perceived short vowel, it can be said that those listeners' identification of fato and fatto was

essentially correct, in spite of the fact that they used vowel duration instead of consonant duration as a perceptual cue. For those listeners, a long vowel signaled a following short (or single) consonant, and a short vowel signaled a long (or geminate) consonant, in keeping with the duration characteristics of Italian.

On the other hand, Figure 5 suggests that some anglophones (n=4) equated vowel duration and consonant duration in a direct way. They identified as fato tokens with a short vowel and as fatto tokens with a long vowel. This is contrary to the facts observed about Italian quantity, and results in misidentification of fato and fatto.

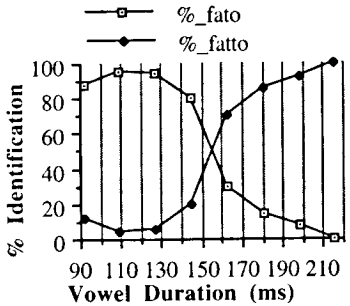

Figure 5.

DISCUSSION

These results suggest that Italian listeners may be sensitive to differences in consonant duration and not to co-occurring differences in vowel duration in the process of distinguishing between words like fato and fatto. This finding lends support to phonological analyses that describe the opposition between words like fato and fatto in terms of differences in consonant duration, and view the associated vowel duration differences as allophonic variation.

On the other hand, it appears that anglophones may not be sensitive to differences in consonant duration and that they may rely instead on differences in vowel duration when they are asked to make the fato-fatto distinction. This is not surprising in view of the fact that English speakers do not distinguish between long and short consonants, but distinguish vowels that may be differentiated in terms of their durations (e.g., /i/ vs /I/, /u/ vs. /U/), and rely on preconsonantal vowel duration differences in perceiving voiced-voiceless consonant contrasts [5, 6, 7].

Although the difference between the two subgroups of anglophones who used vowel duration in different ways to identify fato and fatto may reflect different levels of linguistic aptitude, it remains a superficial difference and does not affect this study's basic findings. Neither subgroup used consonant duration as a perceptual cue to distinguish between fato and fatto; both used vowel duration. The subjects who equated vowel and consonant duration appear to be sensitive to quantity differences only as they pertain to vowels, as suggested by the fact that they attributed to consonants the duration differences they perceived among the vowels. The subjects who were able to detect that vowel and consonant duration were negatively correlated appear to have shown some sensitivity to consonant duration, but they used vowel duration differences as the primary perceptual cue.

Although English learners appear to be capable of distinguishing between Italian single and geminate consonants on the basis of concommitant vowel duration differences, their continued reliance on the latter in production is likely to prevent them from being understood, or perceived as native or near-native by Italian listeners, because the latter appear not to be sensitive to vowel duration differences but only to consonant duration differences.

CONCLUSIONS

The results of this experiment suggest that listeners from different language backgrounds may perceive the same phonetic input in different ways, i.e., by using different characteristics of the acoustic signal as perceptual cues. One implication of these results is that foreign language pronunciation training should consider the linguistic background of the learners, both to understand their pronunciation mistakes, and to devise instructional tools that focus on the language-specific phonetic features that need attention.

In addition, it appears that although foreign language learners' inaccurate pronunciations may reflect faulty articulation, it is also possible that such mispronunciations are the consequence of a faulty perception of the target sounds, i.e., a perception of those sounds in terms of the learners' native language categories [8]. Consequently, it appears that auditory training must play an important part in foreign language pronunciation instruction.

The results of this study also suggest that pronunciation training should take into account not only the perceptual biases of the learners (to adopt the appropriate instructional procedures that make it possible to modify those biases), but also the perceptual expectations of the native speakers of the target language, to make sure that learners produce the appropriate phonetic cues, i.e., those that are recognizable by the target language speakers. This in turn provides support for a type of contrastive phonetics that derives its explanatory power from a thorough examination of foreign language learners' perceptual and articulatory behaviours, and the perceptual consequences of those behaviours on target language listeners [9].

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