

Perception of Spanish /l/ - /r/ distinction by native Japanese

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In previous works we have reported phonetic similarities between Japanese and Spanish vowels and syllabic sounds. (1) (2) (3) (4).

In the present communication we explore the relative importance of duration of the consonantal segment to elicit Spanish /l/ - /r/ distinction by native Japanese talkers.

Three Argentine and three trained native Japanese talkers recorded /l-r/ combined with /a/ in VCV sequences.

Modifications of consonant duration and vowel context with transitions were made by editing natural /ala/ sounds.

Mixed VCV were produced by combining sounds of both languages.

Perceptual tests were performed presenting the speech material, to native trained and non trained Japanese listeners. In a first session a discrimination procedure was applied. The items were arranged in pairs and listeners were told to indicate the pair that sounded different. In the following session they were asked to identify and type the letter corresponding to each one of the items.

Responses are examined in terms of critical duration of the interval between vowels.

Preliminary results indicate that the duration of intervocalic intervals was a relevant cue for the identification of /l/ and /r/. It seems that to differentiate the two sounds, Japanese listeners required relatively longer interval steps than the Argentine subjects. There was a tendency to confuse more frequently /l/ for /r/ than viceversa.

Introduction

This communication is part of a more extensive study in which we are analyzing the acoustical components that elicit a perceptual distinction between /l/ and /r/. Working with Spanish /l/ and /r/ in VCV context we have observed that the duration of the intervocalic segment was a relevant cue to differentiate the two sounds. (3, 5, 6, 7)

Since we have previously reported phonetic similarities between Japanese and Spanish vowels and syllabic sounds (1, 2, 4) the present experiments represent an attempt to verify whether the duration of the central consonantal component could also serve as a cue to elicit Japanese /*l*/ /*r*/ distinction.

Speech material

Three Argentine talkers (two males and a female) and three native Japanese (two female and one male) recorded the sequences /*ala*/ /*ara*/ and /*aba*/ /*ada*/ /*aga*/. The last three items served as control stimuli. Other six stimuli that resulted of a computer modified version of natural utterances of /*ala*/ were added. Tempo of /*l*/ was varied by splicing the intervocalic segment while keeping unmodified the vowel transition frequency. Depending on the duration of adjacent vowels segments were reduced from 120 and 80 ms to 15 and 12 ms. Figure 1 shows the waveforms of Spanish /*ala*/ /*ara*/ and spliced /*ala*/ in that order.

Figure 1

Perceptual tests

All stimuli were pooled, and presented binaurally through headphones in a sound proof room. Informants were six native Japanese, two of them were trained.

The experiments consisted of identification and discrimination tests.

In the first test the items were arranged in pairs and listeners were told to indicate the one that sounded different by typing in a terminal the letter "d".

In the second, they were asked to identify the central component of the VCV stimuli by typing the corresponding letter.

Results and Discussion

Preliminary results indicate that the duration of intervocalic intervals is a relevant cue for the identification of /*l*/ and /*r*/.

Results for the discrimination experiment are shown in Table 1. It is of interest to note that the correct responses scored higher, 83.3%, for the Spanish than for the Japanese, 61.1% utterances.

Table 1

As it is shown in Table 2 this was also the case for the identification of /l/. When pronounced by the Argentine talkers reached 72.2%, and dropped close to chance, 56.6 % for the Japanese talkers.

Table 2

The fact that the identification performance was better for Spanish /l/ seems to indicate that in order to perceive the contrast Japanese listeners require relatively longer intervocalic interval than the ones they produce in their own language. In effect, the central component of /ala/ is as much a three times shorter in the Japanese than in the Spanish utterances.

The responses were reversed for /r/, where subjects gave 83.3%, for sequences presented by Japanese talkers and 72.2% for the Spanish utterances. As it expected a relatively shorter consonantal interval will facilitate the identification of /r/.

In general, there was a tendency to confuse more frequently /l/ for /r/ than viceversa.

Table 3 shows the data obtained for the test with spliced /ala/.

Table 3

As it was the case for Spanish subjects, when the duration of the intervocalic segment is reduced, Japanese listeners shift from /l/ to /r/. Their responses for /ara/ scored 66.7 % and for /ala/ only 16.7%. The Spanish sequences were less significant. The "shifting" effect was more clear in Spanish and could also be observed in other phonetic contexts as CV, VC and CUV. (5, 6, 7).

In the light of these findings we are currently searching for critical durations of the consonantal interval that could enhance the perceptual contrast between /l/ and /r/. In the same experiments we are also inquiring whether the relative amplitude of the vowel could emerge as a cue when the duration of intervocalic steps is ambiguous.

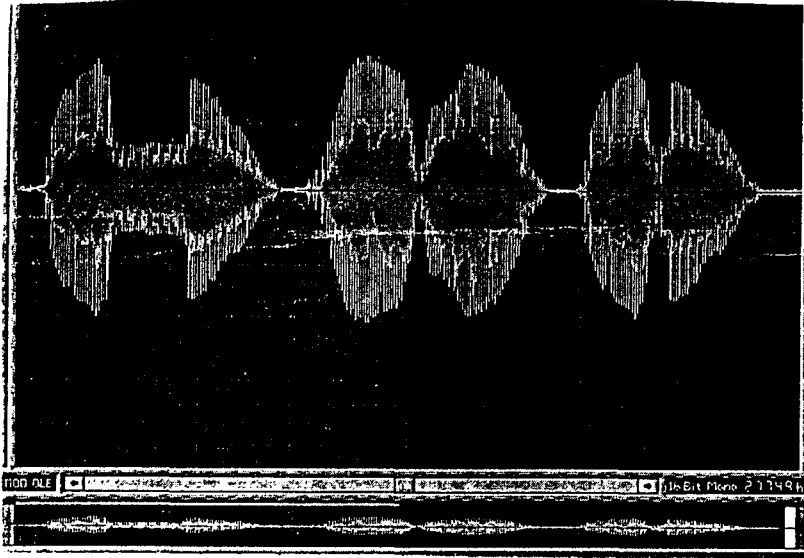


Figure 1. Waveforms of Spanish /ala/ /ara/ and spliced /ala/ in that order.

TABLE 1: Discrimination of /ala/ /ara/ by Japanese listeners

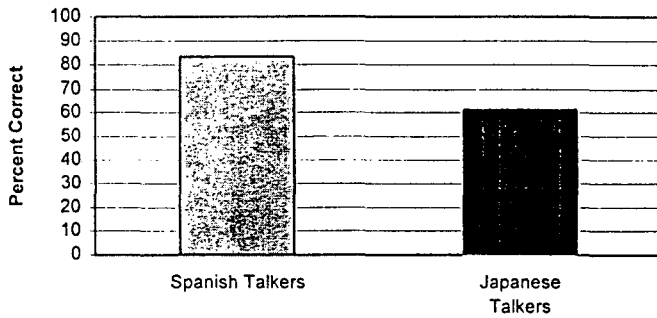


TABLE 2 : Identification of /ara/ /ala/ by Japanese listeners

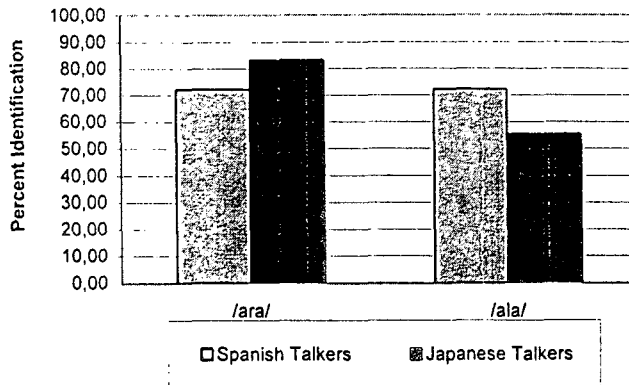
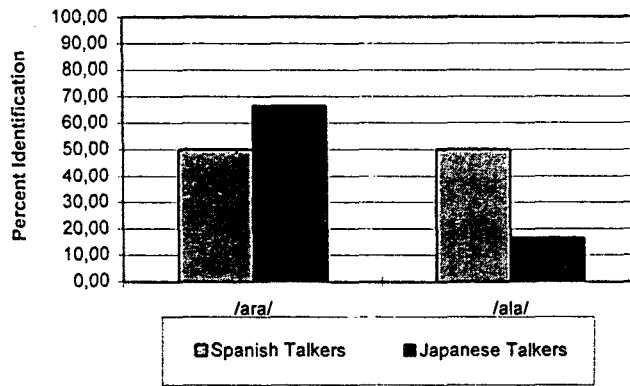


TABLE 3 : Identification of a spliced /ala/ by Japanese listeners



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