

The identification of /l/ in Spanish and French

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This presentation explores on the perceptual characteristics of the lateral sound /l/ in CV syllables. At initial position we found that /l/ has well marked formant transitions. Then several questions arise: 1) are these formant structures dependent on the following vowel?. 2) Are the formant transitions giving an additional cue for the identification?. Considering that the French vocalic system presents a greater variety of vowels than Spanish, several experiments were designed to verify to what extent a more extensive range of vocalic timbres contribute to the perception of /l/. Natural emissions of /l/ produced in Argentine Spanish and Canadian French CV syllables were recorded, where V was successively /i, e, a, o, u/ for Spanish and /i, e, ε, a, α, o, u, y, ø/ for French. For each item, the segment C was maintained and V was replaced by cutting & splicing by each of the remaining vowels without transitions. Results of the identification tests for Spanish show that natural /l/ segments with low F1 and high formants F3, F4 can be clearly identified in the /i, e, u/ vowel contexts without transitions. For French subjects the combination of /l/ with a vowel without transitions reflected correct identifications for its own original vowel context in /e, ε, y, ø/. For both languages, in all these combinations, F1 values remained rather steady along the syllable. In the case of /o, u/ very likely the F2 difference lead to a variety of perceptions of the original /l/. For example in /lu/, French subjects reported some identifications of /l/ as a vowel, mainly /y/. Our observations reinforce the importance of F1 as a relevant cue for /l/, and the incidence of the relative distance between formants frequencies of both components.

Introduction

In this work we explored a consonant with formant characteristics like /l/ which seems to be more independent of the following vowel than the stops (Gurlekian, 1985). When /l/ is produced at initial position, formants show stability and energy with close characteristics to the vocalic sounds in both Argentine Spanish and Canadian French languages. At this point some questions arised: how autonomous is a consonant /l/ when presented without transitions?. That is, could it be identified only on the basis of its stationary segments when presented in combination with a vowel to give a CV percept?. To start with, we used natural vowels to explore how several formant structures differentially affect the identification of various natural /l/ structures produced by the same subject. Moreover by testing this idea with the French phonological vowel system we could follow the changes in response more finely than if we were synthesizing intermediate values for the Spanish vocalic continuum.

Experimental Procedure

Analysis of the Argentine Spanish and Canadian French /l/ was already performed in several works (Guirao, 1987, Jacques, 1991). A male speaker of Argentine Spanish and

a male speaker of Canadian French pronounced CV syllables . Then we measured the formant frequencies of /l/ used to create the stimuli for the identification tests which are shown in Table I.. We used the LPC method to estimate the frequency values which were measured at the stationary portion of /l/.

Argentine Spanish /l/ in CV syllables								
	l(i)	l(e)	l(a)	l(o)	l(u)			
F1	270	270	290	270	250			
F2	1800	1700	1700	1700	1700			
F3	3200	3100	3400	3200	3200			

Canadian French /l/ y CV syllables									
	l(i)	l(e)	l(ɛ)	l(a)	l(α)	l(o)	l(u)	l(y)	l(∅)
F1	270	290	310	360	340	270	270	270	270
F2	2000	2000	1900	1800	1700	1800	1700	1800	1700
F3	2800	2800	2800	2700	2700	2400	2000	2200	2400

Table I. Formant Frequency values for /l/ measured in CV syllables for a Argentine Spanish Speaker (top) and a Canadian French Speaker (bottom).

To prepare the stimuli to be presented to the Spanish listeners, we combined the stationary /l/ portion of /li/ with each one of the vowels previously edited without transitions. We repeated the same procedure for stationary portions of /l/ taken from /le, la, lo, lu/ producing in this way 25 stimuli. Other 10% of stimuli, formed by two vowels, were added to give a total of 33 different stimuli. Each of these stimuli was repeated 4 times and presented at random for identification every 4 seconds. Subjects received the instruction to identify a sequence of sounds formed by either a vowel, two vowels or a consonant /l/ plus a vowel.

In the case of the French Subjects, the procedure was similarly repeated. Here, because of the 9 vowels used, 81 stimuli were produced. Additional stimuli formed by VV sequences were added to complete 108 stimuli.

Results

(Please PUT HERE: Table II And Table III.)

Table II. Identification percentages for Argentine Spanish Subjects. Identifications as CV on top, as VV in the middle and V at bottom. Each set of stimuli in a column was created by combination of a /l/ segment taken from a particular V, and each of the five Spanish vowels. +, 0 and - indicates More Confident, Confident and Regular. All symbols for vowels are identical to phonemes.

Table III. Identification percentages for Canadian French Subjects. Identifications as CV on top, as VV in the middle and V at bottom. Each set of stimuli in a column was created by combination of a /l/ segment taken from a particular V, showed between parenthesis, and each of the nine French vowels. MC, C and R indicates More Confident, Confident and Regular. Vocalic symbols not identical to phonemes are: E for /ɛ/, A for /α/, ou for /u/, u for /y/, and eu for /ø/.

As shown in Table II, Spanish subjects showed a response pattern very similar for all /l/'s in combination with the five vowels. They gave more than 95 % responses correct as /li/ and /le/ and more than 85% responses as /lu/ when any /l/ (taken from li, le, la, lo, lu) was combined without transitions with vowels /i/, /e/ and /u/ respectively. Responses as /la/ and /lo/ were about 60% correct even when /l/ extracted from /a/ and /o/ were combined with this same vowels. When combined with /a/ and /o/ about 40% responses were VV and V.

French subjects responses did not show a regularity as mentioned for Spanish subjects responses. Identifications as two vowels and one vowel were distributed across all sequences combinations. Vowels /e/ and /y/ -indicated as *u* in the tables-, were frequent percepts for the /l/ segments. Due to lack of integration with the vowel, some answers reported, were only the vocalic sound. Other percepts were due to the /l/ segment alone: for instance in /lo/ subjects answers were /e/.

Conclusions

These preliminary results showed a clear pattern of responses in the identification tests for Spanish. They showed that natural /l/ segments with low F1 and high formants can be clearly identified in the vocalic /i, e, u/ context without transitions. In the case of /o, a/ the F1 difference made a perceptual cut with the following vowel, leading to a variety of perceptions of the original /l/ mainly as vowel /i/, or nothing, like in the case of the perception of the remaining vowel.

For French subjects the combination of /l/ with a vowel without transitions decreased the identifications of CV's. The most striking observation is that the /l/ segment is heard as a vocalic sound when the subjects responses were only a vowel. When they identified two vowels they perceived a greater variety of vocalic sounds than the Argentine listeners. When the consonant-vowel integrity is lost, or the cues for consonant detection are missing, /l/ is heard as a vowel most of the time.

References

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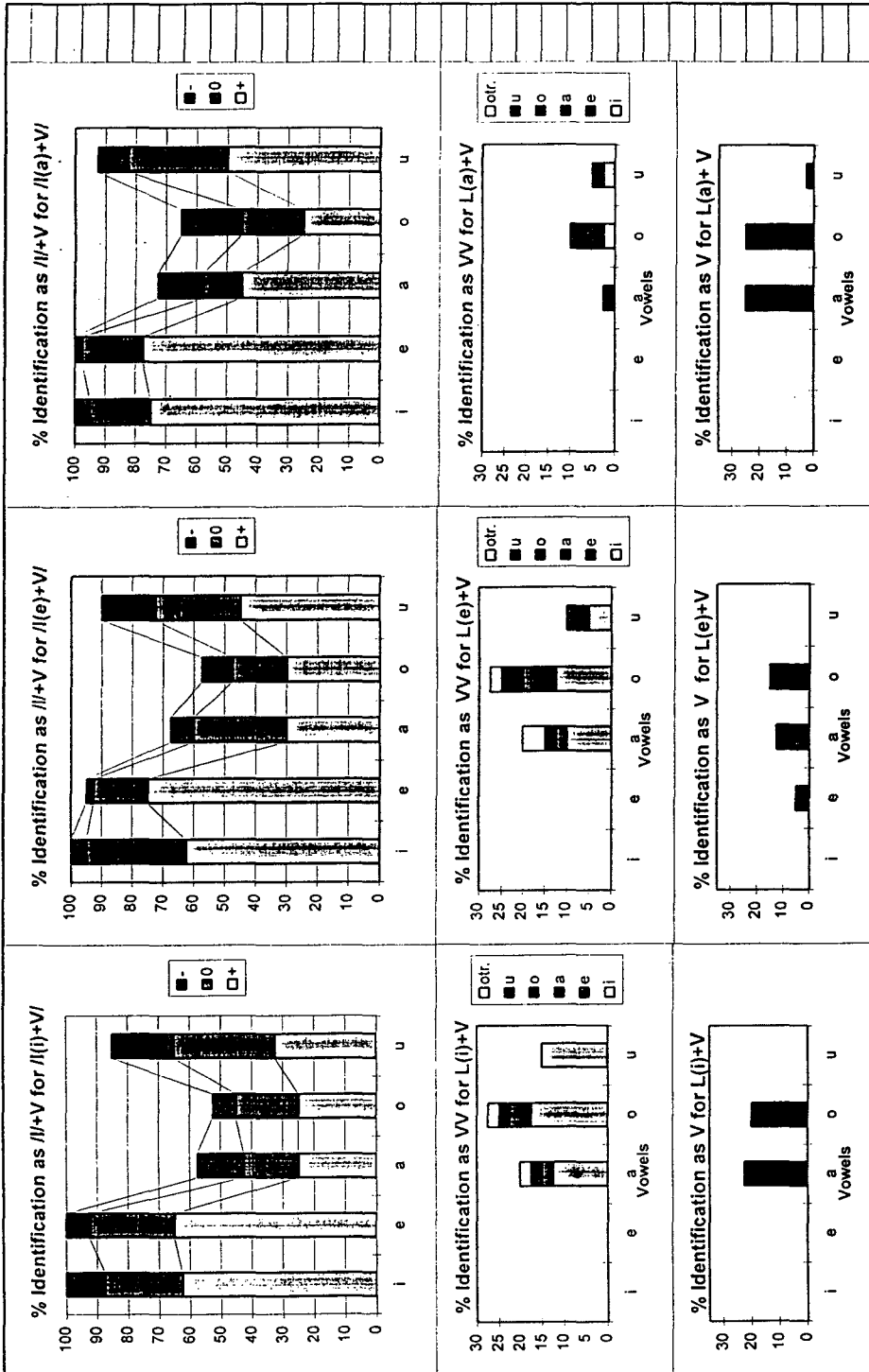


Table II (a)

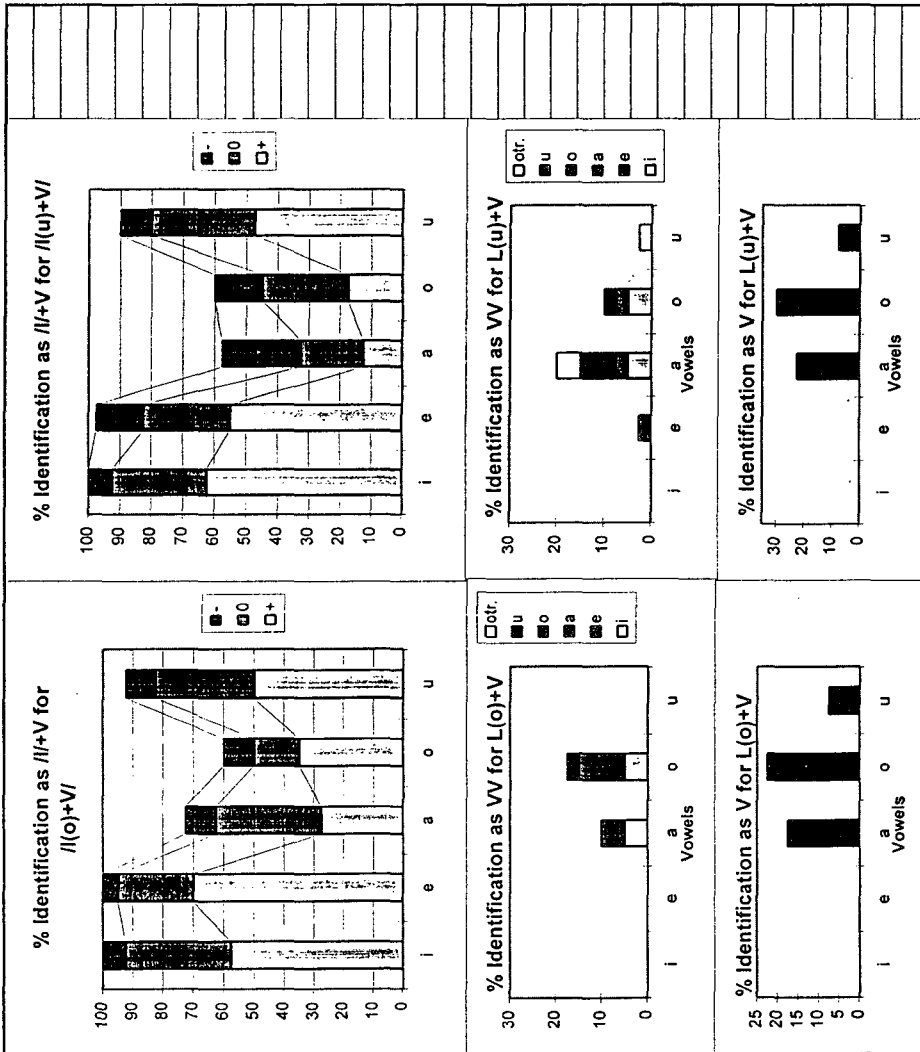


Table II (b)

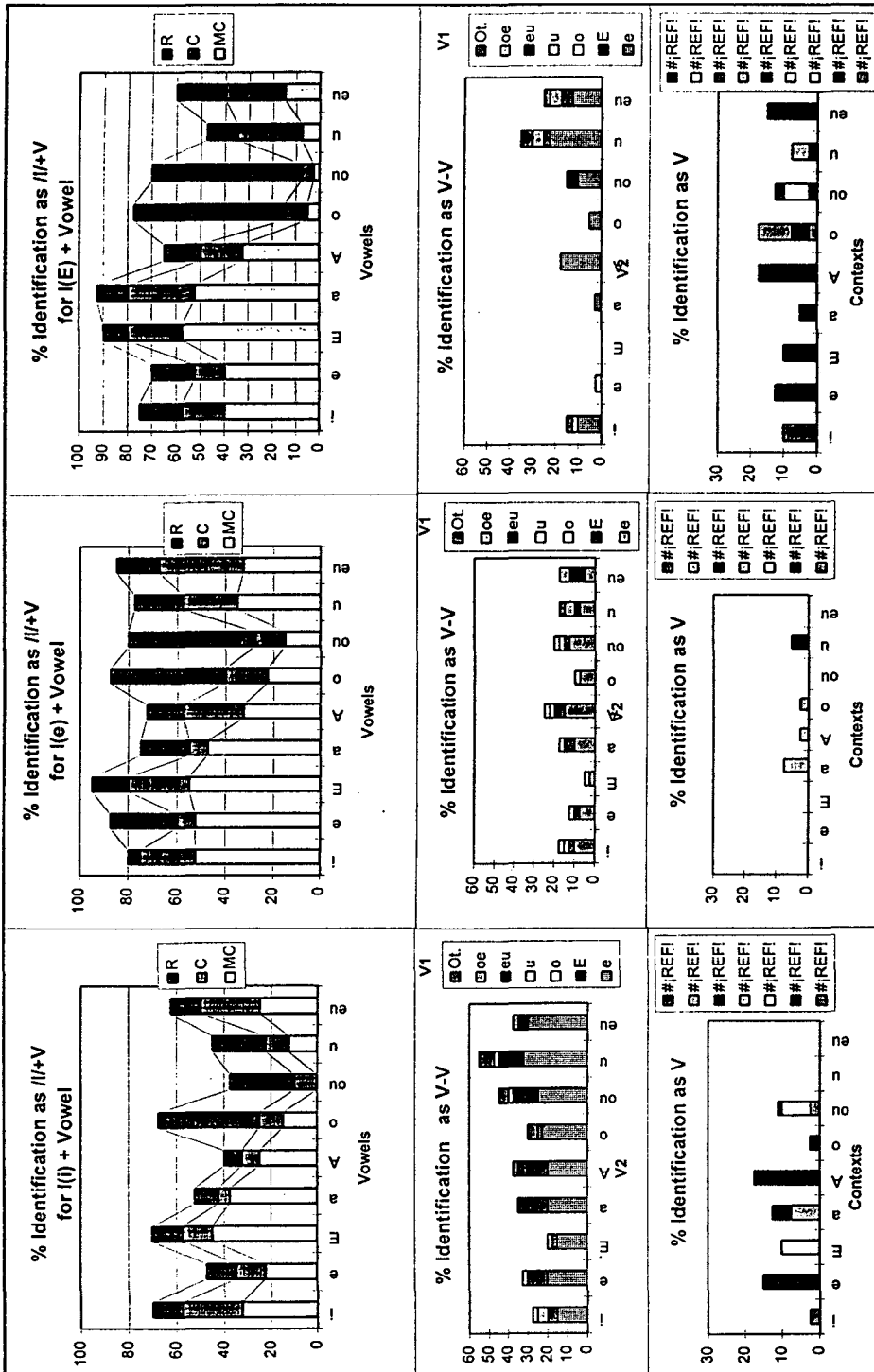


Table III(a)

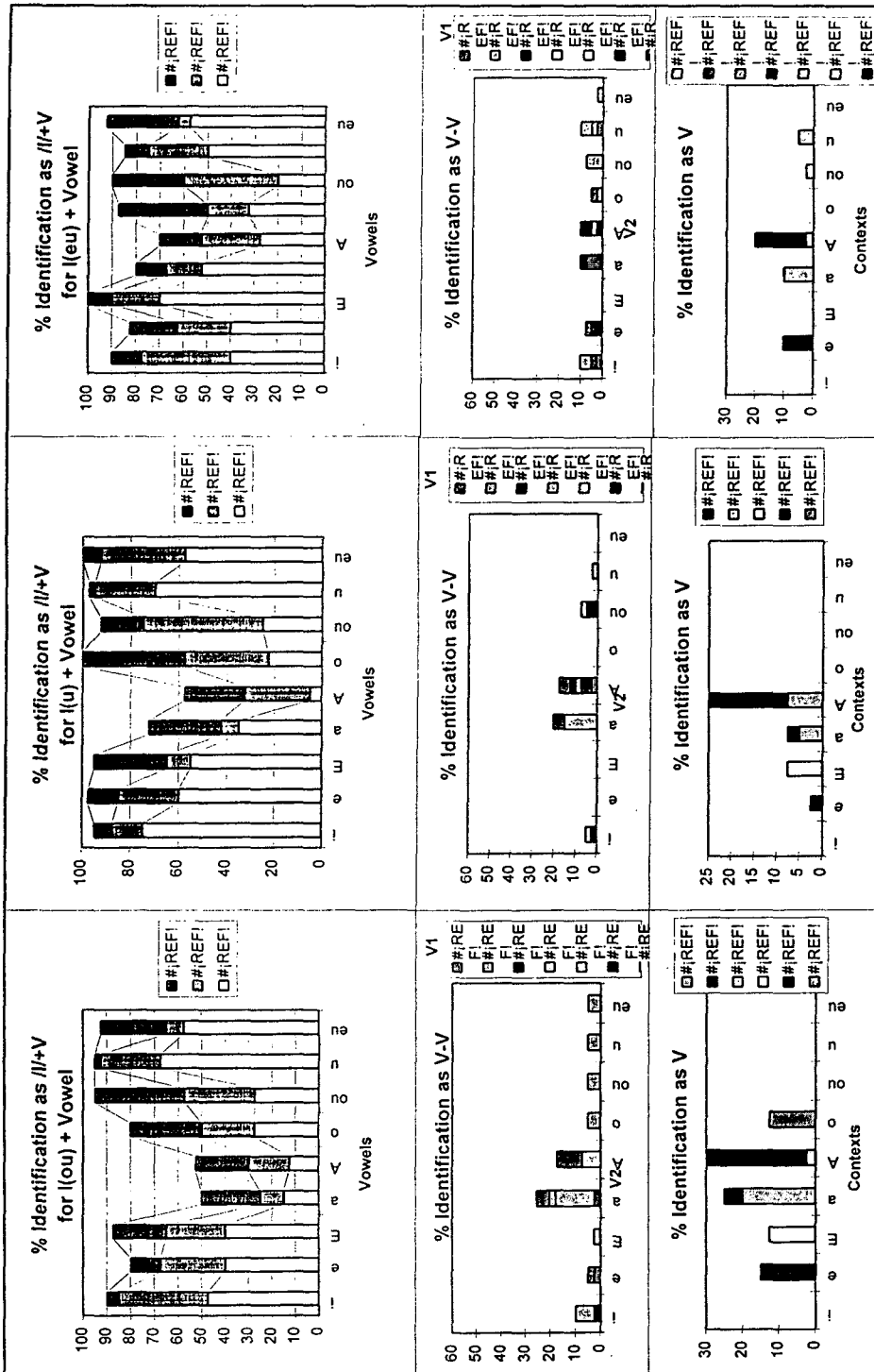


Table III(c)