LATENT RELEASE IN THE ARTICULATORY CLOSURE OF THE VELAR STOP
SOUNDS [k, g], AN ACoustIC STUDY

SYUNICHI ISZUMI
MINAKO UTO

TDean of Physiology
Dept. of Rehabilitation
School of Medicine
Kiasato University
Kiasato University
Kiasato University
Kiasato University
University of Tokyo

articulatory configurations.

METHODS

SUBJECTS

Subjects were two adult females in their mid-twenties, S.A. and T.M., who had no apparent hearing or speech impairment. All had been reared in Japan and were familiar with the Japanese language.

In this study, we focused on the acoustic differences between the normal and the latent release of the velar stop sounds [k, g] produced by subjects having previously produced stops in a sound-proof room and recorded with an audio tape recorder outside it and running for 30 min. All subjects were told to produce three repetitions of every sound isolated from a sentence context, and the recorded segments were analyzed by a computer for the calculation of the average latency of the constriction to be constant.

Moreover, voicing may be delayed, and it results in a diminution of the constriction to achieve a complete opening. And so, we could measure the latency of voicing, which may also be delayed, and we computed a ratio of the constriction to the onset of voicing.

Accordingly, we found that the latent release of the velar stop sounds was more consistent with the results of the previous study, in which we found that the latency of the constriction to the onset of voicing was delayed by approximately 30 ms.

Samples of the spectra of the [k] and [g] tokens, which are shown in Figure 2, Figure 3, in examining these spectra, we can note that both tokens have consistent energy distribution between 1,000 Hz and from the mid-frequency 2.0 to 3.0 kHz. However, the component corresponding to the energy distribution at 1,000 Hz was not very regular for the tokens [k]; the concentration of energy was high and flat for one

INTRODUCTION

In speech clinics, therapists have noted that consonants such as [s], [z] and [t] sometimes seem to deviate from their usual tone. This sound distortion has been observed typically among children with cleft palate, and it is often referred to as a lateral lip or, more specifically, as being lateralized. It is partly the result of deviation from the usual articulation of the consonantal sounds, but it is also caused by a lack of visibility or, more accurately, by a lack of resolution.

This study was undertaken to investigate the relationship between the two processes: the lateral release of the velar stop sounds [k, g] and the presence of a latent release.

In this study, we examined the relationship between the two processes: the lateral release of the velar stop sounds [k, g] and the presence of a latent release.

RESULTS

Figure 1 compares the waveforms of the non-laternalized token [k] and the latent token [k] produced by subject S.A. By inspection, we noted three landmarks on each waveform. The first was the instant of stop release—the point at which the signal exceeded the noise level of the signal. The second was the instant of voicing in the [k1]—the point at which the first glottal pulse surged as a periodic period. Finally, the signal was normal again as the second glottal pulse was defined as the point at which the waveform returned to normal, the second pulse being smaller and at a higher pitch than the first.

These three landmarks were compared to the interval between the first and second peak. The onset of the burst period, which is the onset of the burst period, was defined as the point at which the waveform returned to normal.

To sum up the energy ratios, we obtained the following average values for the different tokens: [k] 2.9 (4.6 dB) for [k1] 4.1 (6.1 dB) for [k] 1.6 (5.2 dB) for [k] 1.5 (7.4 dB) for [k] 1.0 (7.3 dB) for [k] 1.0 (6.4 dB) for [k] 1.0 (6.7 dB) for [k] 1.0 (6.7 dB) for [k] 1.0 (6.7 dB)

Spectral Properties

In the previous sections, we argued that the presence of a latent release of the velar stop sounds, which can be more easily recognized as a more relative larger r.m.s. amplitude. If this property is consistent with the previous findings, we would expect to find that the spectral distribution of the burst period is dominated by a lower frequency component, and that the energy in the higher frequency components is lower than in the lower frequency components.

In this study, we examined the relationship between the two processes: the lateral release of the velar stop sounds [k, g] and the presence of a latent release.

In this study, we examined the relationship between the two processes: the lateral release of the velar stop sounds [k, g] and the presence of a latent release.

The latent release of the velar stop sounds was more consistent with the results of the previous study, in which we found that the latency of the constriction to the onset of voicing was delayed by approximately 30 ms.

Accordingly, we found that the latent release of the velar stop sounds was more consistent with the results of the previous study, in which we found that the latency of the constriction to the onset of voicing was delayed by approximately 30 ms.
Figure 1. Waveform displays of the non-lateralized [ki] and lateralized [ki] produced by subject S.N. The arrows indicate the instant of stop release and the onset of voicing in the vowel, respectively.

Figure 2. Time traces for the short-term r.m.s. amplitude corresponding to the sample in Figure 1. The arrow points to the onset of voicing on the vowel.

Figure 3. Spectra for the burst obtained in the same samples as in Figure 1. A 25-ms half-tauanning window was used for the analysis.

date, and had two separate peaks between 2.0 and 3.0 kHz in the other sample. On the other hand, for the lateralized [ki] tokens, a single prominent peak was found consistently in the vicinity of 3.0 kHz. The non-lateralized [ki] tokens showed a significant drop in level in the region of 5.0 kHz.

In the spectra of [ki] and [ki] from S.N., two local peaks were prominent in the vicinities of 3.0 kHz and 5.0 kHz. In particular, peaks at 3.0 kHz for the token [ki] occurred rather consistently and showed almost equal an amplitude as those at 3.0 kHz. In contrast, the corresponding peaks were irregular in shape and level for the non-lateralized tokens [ki].

In the spectra of the [gl] and [gl] tokens, some samples showed a higher level between the first peak below 1.5 kHz and the second peak around 2.9 kHz. The spectra of [ge] were similar in their envelope to those of [ke] in the range from 0 to 5.0 kHz.

For subject T.U., on the other hand, the spectra obtained showed consistent patterns in their envelopes for both classes of tokens. In the spectra of the non-lateralized [ki] tokens, a prominent peak was consistently found between 3.0 and 5.6 kHz. In the spectra of the lateralized [ki] tokens, a peak was also seen in the same region, but it gradually shifted to a higher, sharper peak emerging in the region of 5.0 kHz. This was in contrast to the [ki] tokens, for which the spectra were rather flat in this region.

ACKNOWLEDGMENTS

We are grateful to T. Takeuchi for help with the audio recordings, to H. Takeiwa for discussion on the issues of acoustic analysis, and to T. Katahara for technical assistance.

REFERENCES


[3] R. N. Stevens and E. S. Blumstein, "Invar"