



How do the French perceive tonal accent in Japanese? Experimental evidence

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ABSTRACT

We studied how French subjects learning Japanese perceive tonal accent under different experimental conditions. The perceptual experiment included 3 tests using 3-, 4-, and 5-syllable words with different tonal accents. In Test 1, the stimuli were presented in isolation, in Test 2, words were extracted from short sentences, and in Test 3, the target stimuli were embedded in a carrier sentence with 4 syllables preceding and following the target word. Ten French students participated were asked to detect the "high-low" tone change in the words. The average score was 66% for Test 1, 49% for Test 2, and 45% for Test 3. Japanese subjects obtained an average score of 86%. The results suggest that the perception of tonal accent is language-dependent.

1. INTRODUCTION

More and more often in foreign language teaching, oral aspects of language are being considered crucial, and language laboratory exercises have become a major part of foreign language curricula. French students learning Japanese tend to apply the prosodic rules of their native language to Japanese. The question that arises, then, is whether a purely articulatory transfer is taking place.

Various studies have shown that the way in which the sounds of a foreign language are segmented is conditioned by the learner's native language [1], [2] & [4]. Moreover, non-native speakers may be more or less "deaf" when it comes to perceiving the intonation features of a foreign language [3]. The present study addresses the

question of how French-speaking learners of Japanese perceive tonal accent.

2. EXPERIMENT I

This perceptual experiment on tonal accent included three tests: isolated words (Test 1), words extracted from short sentences pronounced with a declarative or interrogative intonation (Test 2), and words placed in a carrier sentence (Test 3).

Words composed of 3 to 5 moras (syllables) with different tonal accents were used. Since only the transition from a high tone (H) on one mora to a low tone (L) on the following mora is phonologically significant, the tonal accents studied were LHnL and HLn (n: repetition factor). The LHn pattern was also included in the tests as distractor stimuli. For each tonal accent pattern, two words were selected from the vocabulary frequently found in Japanese textbooks for beginners and advanced beginners. The total number of stimulus words was 24, including three distractors.

The tests were administered in a soundproof room. Stimulus presentation was controlled by a PC-compatible computer equipped with a mouse, a screen, two loudspeakers with amplifiers placed on either side of the screen at a distance of 50 cm from the subject, and a keyboard for the experimenter.

The stimuli were presented in a predefined random order (same order for all subjects on a given test). Each stimulus was presented twice, separated by one second. The subject was allowed to listen to the stimulus twice. The clock for measuring reaction time was started when the stimulus was presented the first time. Before each test, the subject was trained on a sequence of five similar stimuli.

Once the test had begun, the subject listened to the stimuli and then answered by clicking one of five boxes on the screen, each representing a mora (from left to right). An additional button was provided for cases where the subject did not know what to answer or did not perceive a falling tone.

Two groups of subjects with different backgrounds were tested: 10 undergraduate students from the Japanese department and 10 graduate students from the phonetics department. All had normal hearing.

2. 1. Test 1

In Test 1, tonal accent in Japanese was presented in its simplest form, i.e. in isolated words. The subjects were instructed to listen to each word and then locate the syllable (mora) with a falling tone, i.e. to locate the first low mora following a high mora.

The following factors were tested in an analysis of variance: student group, word length (3 to 5 moras), and location of tonal accent (location of the last high mora). With subjects as the random factor, the dependent variable was the relationship between their responses and the linguistic norm.

The analysis indicated no significant difference between the Japanese-learning students and the phonetics students. On the other hand, the word length factor was highly significant ($F_{0.95}(2,19)=10.78, p<.001$), as was the location of the tonal accent in the word ($F_{0.95}(3,19)=24.74, p<.0001$).

As Table 1 and Figure 1 show, performance was better on short words. The tonal accent on mora 2 was easier to identify. The tonal accent on the penultimate of 5-mora words was particularly difficult.

2. 2. Test 2

The Test 2 stimuli were words extracted from very short sentences pronounced with a declarative or interrogative intonation. The stimuli were recorded by a woman speaker in order to enhance expressiveness. The subject's task was identical to the one used in the preceding experiment.

Moras	Errors	%	N
3	21	26	80
4	28	37	120
5	75	47	160
Total	124	34	360

Table 1. Errors by word length.

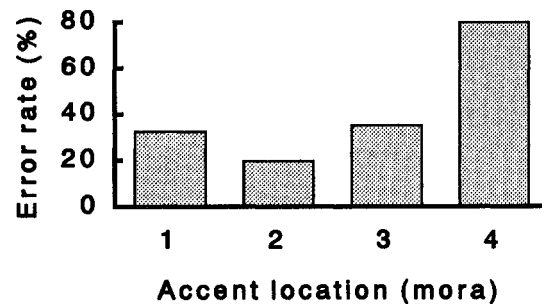


Figure 1. Errors by location of tonal accent

The analysis of variance yielded a significant effect of word length ($F_{0.95}(2,120)=15.41, p<.001$) and tonal accent location ($F_{0.95}(3,72)=27.47, p<.0001$).

The total number of errors increased: 185, versus 124 for Test 1. The tendency to misperceive tonal accent in long words and when located on the second to last mora was also greater, as Table 2 and Figure 2 show.

Moras	Errors	%	N
3	29	36	80
4	45	38	120
5	111	69	160
Total	185	51	360

Table 2. Errors by word length.

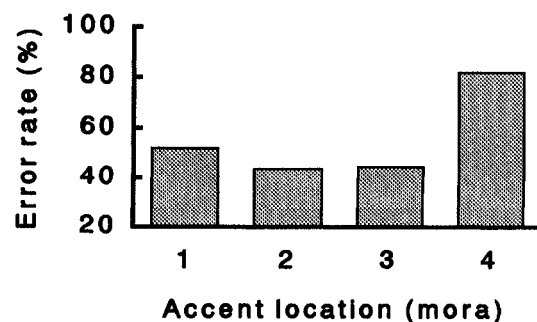


Figure 2. Errors by location of tonal accent

2. 3. Test 3

In Test 3 the stimuli were embedded in a carrier sentence "watashiwa ... toitta", meaning "I said ..." (the suspension points represent the word to be judged). The instructions were identical to those in the other two tests.

As above, statistically significant differences were obtained for word length ($F_{0.95}(2,120)=21.01, p<.001$) and tonal accent location ($F_{0.95}(2,72)=20.17, p<.0001$).

The findings of Tests 1 and 2 were thus confirmed. In other words, the total number of errors increased once again, with a greater number of incorrect answers on long words and on words with the tonal accent on the penultimate. However, performance on 3-mora words was relatively stable across tasks (see Table 3 & Figure 3) .

Moras	Errors	%	N
3	26	33	80
4	68	57	120
5	103	64	160
Total	197	55	360

Table 3. Errors by word length.

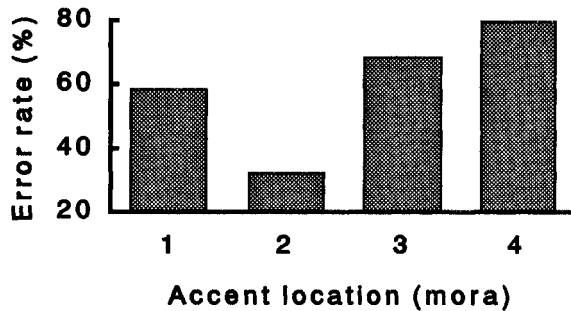


Figure 3. Errors by location of tonal accent

3. EXPERIMENT II

Japanese subjects were tested on the same stimuli using a non-computerized procedure. Test 1 and Test 3 items were downloaded onto a cassette with a one-second interval between the two repetitions of each stimulus, and a seven-second interval between the second repetition and the next stimulus. Subjects were not given the opportunity to hear the stimuli a second time. There were ten Japanese subjects, three from Tokyo, three from

Kansai, and four from Kyushu. All were students who had been living in France for 10 months.

The total number of errors was much lower, but did not decrease to the dramatic extent expected of native speakers. The overall detection rate was 85.5% for isolated words and 86.6% for words in context.

The analysis of variance on the correct responses indicated that only the tonal accent factor was significant ($F_{0.95}(3,195)=4.86, p<.001$). There was a tendency on Test 1 to misperceive words beginning with a high tone.

Unlike the French subjects learning Japanese, the Japanese subjects showed no notable effect of word length or of tonal accent on the penultimate of 5-mora words.

4. DISCUSSION

The subject's task increased in difficulty from Test 1 to Test 3, and the number of errors rose accordingly ($F_{0.95}(2,228)=10.98, p<.0001$). The pronounced increase in speech rate may partially account for this phenomenon. The following table summarizes the speech rate increase across tasks.

Test	1	2	3
Duration (ms)	230	199	173

Table 4. Mean duration of moras in test stimuli

The difficulty the French subjects had performing Test 3 can be explained by (1) the speech rate, which was relatively high for foreigners, and (2) the masking effect of the moras surrounding the target (884 ms and 851 ms for the pre- and post-targets masks, respectively).

The pitch peak on the second syllable was perceived the best by the French, especially when it occurred in short words (3 moras). The same effect would probably also occur for the Japanese, since this is a universally used pitch curve. On the other hand, regardless of the presentation conditions, the falling pitch pattern on the second to last mora was practically never perceived. The tonal accent effect was statistically significant for the three tests pooled

($F_{0.95}(3,228) = 38.52, p < .0001$). The fact that this tendency did not exist for the Japanese seems to indicate that the perception of tonal accent is highly conditioned by the subject's native language.

5. CONCLUSION

It appears obvious from our perceptual tests of tonal accent that French and Japanese subjects react quite differently to the same stimuli.

Thus, the accentual interference often noted in French-speaking individuals is not solely articulation-based - it also seems to stem from their perceptual habits.

From a teaching standpoint, language students should be taught "how to listen" to the prosody of a foreign language, so they can learn it with the ears of native speakers.

REFERENCES

- [1] Cutler, A., Mehler, J., Norris, D. G. & Segui, J. (1986): "The syllable's different role in the segmentation of French and English", *Journal of Memory and Language*, 25, 385-400.
- [2] Kubozono, H. (1989): "The mora and syllable structure in Japanese: evidence from speech errors", *Language and Speech*, 32(3), 249-278.
- [3] Lepetit, D. (1989) "Cross-linguistic influence in intonation: French/Japanese and French/ English", *Language Learning*, 39(3), 397-413.
- [4] Otake, T., Hatano, G., Cutler, A. & Mehler, J. (1993): "Mora or syllable? Speech segmentation in Japanese", *Journal of Memory and Language*, 32, 358-378.

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