

A Pilot Study on Perception of Spanish Stress by Japanese Learners of Spanish

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Abstract

Japanese learners of Spanish sometimes fail to perceive the stresses when listening to Spanish utterances. Results of a perceptual experiment with 270 stimuli and 64 informants (43 Spanish and 21 Japanese) reveal that Spanish speakers perceive the stresses correctly almost every time, whereas Japanese speakers tend to fail to do so when the word is pronounced with rising intonation. The cause of this is the difference in phonetic realizations of Spanish stresses and those of Japanese accents. Japanese learners should be taught that the Spanish stressed syllables are not always pronounced with a high pitch.

Index Terms: Spanish, stress, perception, intonation, Japanese learners of Spanish

1. Introduction

In Spanish the stress positions are lexically determined and there are many sets of Spanish words that are distinguished only by their stress positions: e.g. número (number *noun*) - numero (*stress on the syllable* “-me-”; I number) – numeró (he numbered). The same holds true for Japanese, although there are much fewer sets of words distinguished solely by their accents: e.g. Sátoo (a family name) – satóo (sugar) – satoo (*unaccented*; drinker).

Japanese differs from Spanish in being a “pitch accent” language, rather than a “stress accent” one, as is the case with many European languages. A falling pitch from the accented mora to the subsequent mora characterizes Japanese accent. This pitch pattern is not affected by the intonation pattern of the whole utterance, thus in the family name “Sátoo”, for example, the first mora is pronounced with a higher pitch than the following two morae, even in a rising intonation of an interrogative utterance [1, 2]. Incidentally, the accent bearing unit in Japanese is a mora rather than a syllable, and the words Sátoo, satóo and satoo are all trimoraic words.

In Spanish, on the other hand, the stressed syllables are not always pronounced with a higher pitch than the adjacent syllables, and the real pitch pattern is affected by the overall intonation pattern [3, 4, 5].

Because of this difference in phonetic realization of the accents, Japanese learners of Spanish often fail to perceive the stress position when listening to Spanish utterances. This study aims to determine which factors make it difficult for Japanese learners to perceive the stress correctly, and to make a suggestion to improve the teaching of Spanish pronunciation to them.

2. Method

A perceptual experiment was performed, first in Salamanca (Spain) in February 2010, and then in Tokyo (Japan) in April 2010.

2.1. Materials

A list of 54 sentences was made, with each sentence containing a target word. There are 6 different contexts where the target word may appear. In the following list of the contexts, a letter X represents the target word.

- (1) Isolated (*Isol* henceforth): X.
- (2) Affirmative-final (*Aff-fin*): Dijo la palabra X. (He said the word X.)
- (3) Affirmative-non-final (*Aff-nonfin*): Dijo la palabra X la semana pasada. (He said the word X last week.)
- (4) Negative-non-final (*Neg-nonfin*): No dijo la palabra X la semana pasada. La dijo ayer. (He didn't say the word X last week. He said it yesterday.)
- (5) Interrogative-final (*Q-fin*): ¿Dijo la palabra X? (Did he say the word X?)
- (6) Interrogative-non-final (*Q-nonfin*): ¿Dijo la palabra X la semana pasada? (Did he say the word X last week?)

All the target words are trisyllabic of the form CVCVCV. For the context (1), the following 24 words were used, of which those without English translation are nonce words. By Spanish orthographic rules, the words listed here without accent mark have their stress on the second syllable.

- límite (limit *noun*) - limite (I limit *subjunctive mood*) – limité (I limited)
- médico (doctor) - medico (I cure by medicine) – medicó (he cured by medicine)
- número (number *noun*) - numero (I number) – numeró (he numbered)
- válido (valid) - valido (I validate) – validó (he validated)
- ládebo - ladebo - ladebó
- lúguido - luguido - luguidó
- máledo - maledo - maledó
- núlibo - nulibo – nulibó

For each of the contexts (2)-(6), the following 6 words were used, only the first 3 of which are meaningful Spanish words.

número - numero - numeró
 núlido - nulido - nulidó

In total there are 54 sentences (1 context x 24 words + 5 contexts x 6 words). The list of the 54 sentences was recorded with a PCM recorder (SONY PCM-D1) using a stereo microphone (SONY ECM-MS957) in the Phonetics Laboratory of Sophia University, Tokyo, Japan, by a male native speaker of European Spanish, from Cuenca. The informant read the entire list of sentences 5 times in random order, resulting in a total of 270 utterances. The stimuli were then sorted randomly once more, and concatenated in a wave-format digital audio file.

2.2. Subjects

In Salamanca 43 informants (13 male, 30 female) took part in the experiment. The majority of them came from the central part of Spain (Castilla y León: 25, Madrid: 7, Castilla La Mancha: 1), but some participants were from other parts as well (Extremadura: 4, Islas Baleares: 2, Cantabria: 1, Valencia: 1, Islas Canarias: 1, Canada: 1). All of them are native speakers of European Spanish. The informant born in Canada moved to Spain at the age of 3.

In Tokyo 21 female university students participated, 15 of whom came from Kanto Area, including Tokyo. The other participants came from other parts (Tohoku: 3, Kinki: 1, Kyushu: 1, Italy: 1). All of them are native speakers of Japanese, and are second, third, or fourth year students majoring in Spanish. None of them had stayed in any Spanish speaking country for more than 6 months. The informant born in Italy moved to Tokyo at the age of 5 and has always lived there since then.

2.3. Procedure

The informants in Salamanca listened to the wave-format file through headphones in a classroom of Centro Cultural Hispano-Japonés of Salamanca University. Each session could contain up to 4 participants at a time. The classroom was not soundproof and sometimes noises from outside were heard, but they were not so loud to interrupt or affect in a fatal way the experiment.

The informants in Tokyo listened to the same file through headphones in a soundproof CALL room of Seisen University, Tokyo. All the 21 participants were gathered in the room at the same time, and the experiment was conducted in only one session.

In both of the two experiments, the informants were asked to mark one of three possibilities as seen in Figure 1 each time they listened to a stimulus, without leaving any items unanswered.

1	¿Dijo la palabra _____ la semana pasada?	<input type="checkbox"/> núlido	<input type="checkbox"/> nulido	<input type="checkbox"/> nulidó
2	¿Dijo la palabra _____ la semana pasada?	<input type="checkbox"/> núlido	<input type="checkbox"/> nulido	<input type="checkbox"/> nulidó
3	_____.	<input type="checkbox"/> Número	<input type="checkbox"/> Numero	<input type="checkbox"/> Numeró
4	No dijo la palabra _____ la semana pasada. La dijo ayer.	<input type="checkbox"/> número	<input type="checkbox"/> numero	<input type="checkbox"/> numeró

Figure 1: Sample of the answer sheet.

Two recesses, each one five minutes long, were provided in the session, after number 90 and number 180, to prevent the informants' fatigue.

3. Results

3.1. Native speakers vs. Japanese learners

Table 1 compares the number of correct responses by the Spanish subjects and the Japanese subjects. Spanish subjects perceive the stressed syllables correctly in 262.51 out of the total of 270 stimuli, which is a very high rate of correct perception. The *t*-test demonstrates that the Spanish subjects perceive the stresses more accurately than the Japanese ones with a statistically significant difference.

	Spanish	Japanese
Number of subjects	43	21
Mean correct reactions	262.51	216.52
SD	9.07	22.85

$$t = 11.54 \quad df = 62 \quad p < 0.01$$

Table 1. Comparison of correct reactions to the total of 270 stimuli between native speakers of Spanish and Japanese learners of Spanish

We ran a Mann-Whitney's *u*-test and also found a significant difference between the two groups ($u = 19.5$, $z = 6.19$, $p < 0.0001$).

3.2. Native speakers' responses

Figure 2 shows the numbers of the Spanish subjects who answered correctly in response to the 270 stimuli divided according to the contexts. It can be seen that the different contexts do not cause any significant difference in their stress perception. The result of one-way ANOVA applied to the same data is shown in Table 3, which demonstrates the validity of this observation.

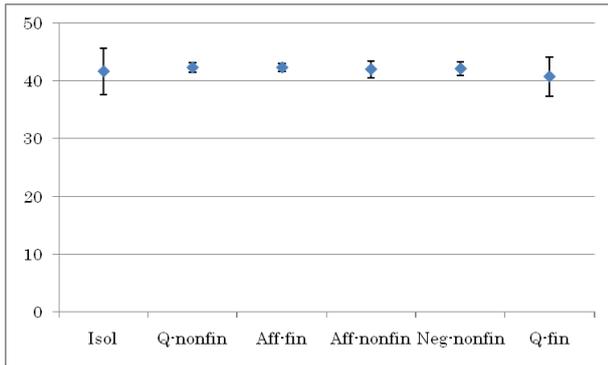


Figure 2: Number of the Spanish subjects who perceived correctly the stress (Mean \pm SD). (N=43)

Source of variation	Sum of squares	df	Mean square	F	p
Context	56.19	5	11.24	1.22	0.30
Error	2439.80	264	9.24		
Total	2495.99	269			

Table 3. ANOVA of the effect of context on correct stress perception by the Spanish subjects

3.3. Japanese learners' responses

3.3.1. Overall results

Unlike the Spanish subjects, the accuracy of our Japanese informants showed differences depending on the context in which the target word appeared, as shown in Figure 3. Table 4 shows the results of one-way ANOVA on this data, which proves this difference to be statistically significant.

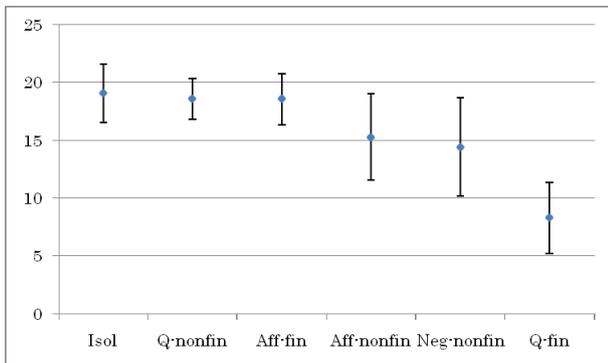


Figure 3: Number of the Japanese subjects who perceived correctly the stress (Mean \pm SD). (N=21)

Source of variation	Sum of squares	df	Mean square	F	p
Context	3222.62	5	644.52	77.64	<.0001
Error	2191.53	264	8.30		
Total	5414.15	269			

Table 4. ANOVA of the effect of context on correct stress perception by the Japanese subjects

3.3.2. Three groups of intonational contexts

A close observation of Figure 3 reveals that the six contexts used in the experiments could be collapsed into three,

since little difference is seen between the first three contexts that appear in the left part of the graph, nor is there a big gap between the contexts *Aff-nonfin* and *Neg-nonfin*. This observation is shown to be true by Table 5 and Table 6, which demonstrate that there is significant difference neither between *Isol*, *Q-nonfin* and *Aff-fin*, nor between *Aff-nonfin* and *Neg-nonfin*.

Source of variation	Sum of squares	df	Mean square	F	p
Context	9.34	2	4.67	0.84	0.43
Error	985.57	177	5.57		
Total	994.91	179			

Table 5. ANOVA of the effect of context on correct stress perception by the Japanese subjects (for only three contexts: *Isol* / *Q-nonfin* / *Aff-fin*).

	<i>Aff-nonfin</i>	<i>Neg-nonfin</i>
Number of stimuli	30	30
Mean correct reactions	15.30	14.43
SD	3.72	4.27

$$t = 0.84 \quad df = 58 \quad p = 0.41$$

Table 6. t-test of the effect of context on correct stress perception by the Japanese subjects (only for *Aff-nonfin* and *Neg-nonfin* contexts).

This regrouping can be justified not simply by the homogeneity of results, but also in terms of intonation patterns. See the next section.

4. Discussion

When regrouped as above, it becomes clear that the context does cause an effect on the Japanese learners' perception of the stressed syllables, as can be seen in Figure 4 and Table 7. The subjects show high rates of correct identification of the stressed syllables when the target word appears in contexts *Isol*, *Aff-fin* and *Q-nonfin*. However, this rate decreases in *Aff-nonfin* and *Neg-nonfin* contexts, and shows a sharp decline in *Q-fin* context.

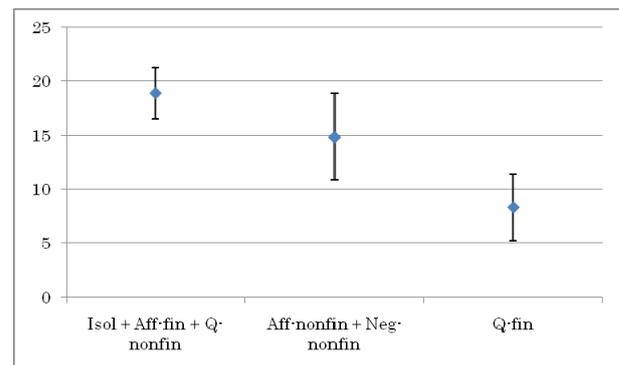


Figure 4: Number of the Japanese subjects who perceived correctly the stress, with the contexts regrouped into three (Mean \pm SD). (N=21)

Source of variation	Sum of squares	df	Mean square	<i>F</i>	<i>p</i>
Context (regrouped)	3202.01	2	1601.00	193.24	<.0001
Error	2212.14	267	8.29		
Total	5414.15	269			

Table 7. ANOVA of the effect of context on correct stress perception by the Japanese subjects, with the contexts regrouped into three.

Obviously this difference in the level of difficulty is caused by the intonation patterns in which the target word appears. In *Isol* and *Aff-fin* positions, the word is put in falling intonation pattern, and thus the stressed syllable is pronounced with a higher tone than the adjacent syllables. This is a favorable situation for Japanese speakers.

On the contrary, the *Q-fin* context makes for the least favorable situation, since in Spanish yes-no questions, as is the case in the interrogative sentences used in the present experiment, the final part of the utterances usually shows a rising intonation pattern, in which the “upside-down” pitch contour arises: the stressed syllable pronounced with the lowest pitch, except in the cases where the last syllable is stressed [3]. This makes it extremely difficult for Japanese speakers to detect the stress.

Our Japanese informants showed a high rate of correct responses to the *Q-nonfin* stimuli. The stimuli have the form: ¿Dijo la palabra X la semana pasada? The sentences of this type are usually divided into IPs (Intonation Phrases) when they are uttered, and there is a tendency that, when the rising intonation appears at the end of the utterance, the last part of the first IP shows a falling pattern [6], the same pattern as in *Isol* and *Aff-fin* positions.

Also in the case of *Aff-nonfin* and *Neg-nonfin* contexts, the target word comes at the end of the first of the two IPs that constitute the utterance. But now the final intonation pattern is, irrespective of whether it is affirmative or negative, always falling, and therefore the pattern at the end of the first IP, where the target word appears, is often, though not always, rising. This explains the Japanese subjects’ rate of correct responses between the two extremes.

5. Concluding remarks

In Spanish the F0 pattern of an utterance is determined by a combination of lexical stresses and intonation patterns. In Spanish classes in Japan, the stress assigning rules are usually taught in beginner level classes, but the influence of the overall intonation pattern on the realization of the stresses are rarely taught. This results in Japanese learners having the impression that native speakers of Spanish sometimes put stresses on the wrong syllables. It is recommended that the Japanese learners of Spanish should be taught, in some stage of their learning, about the difference between the phonetic realizations of Spanish stresses and those of Japanese accents.

The present paper is no more than a rough report of the results of the experiment we performed. In order to obtain more useful suggestions for the teaching of Spanish pronunciation to Japanese learners, it will be necessary to examine in more detail the relations between the real F0 patterns of the stimuli and the tendencies of the Japanese learners’ reactions to them, a project we are planning to realize shortly.

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