Bilateral perception of Spanish and Japanese word accent by L2 learners

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INTRODUCTION

In **Spanish**, stressed syllables are **longer**, **louder** and have a **higher f_0** than unstressed ones, and are aligned with a peak that can be displaced into the first half of the following syllable [1]. In **Japanese**, accented moras have the **same length** as unaccented ones, and the accent is aligned with a **pitch fall** in the following mora [2].
This difference can be problematic for non-native speakers, who are **influenced by their L1 cues when interpreting L2 contrasts**, particularly those which share similarities with L1 categories; and even when higher-level perceptual processes are changed, lower-level processes can still interfere with them [3].
When an experiment was conducted on **Japanese students of Spanish** (JSS) [4], results showed that **their perception of Spanish stress was heavily dependent on sentence intonation**: while their performance in isolation was like that of native speakers, in question-final context it was below random level. This was compatible with them using L1 cues to interpret L2 contrasts. They also performed better with paroxytone words.
It was hypothesized that **a similar experiment with Chilean students of Japanese** (CSJ) would show similar results (worse with questions than in isolation), as they would also apply their L1 cues and be subject to similar effects of sentence intonation.
Simultaneously, a modified version of the original study took place with more speakers and to test students at different levels of proficiency. These are the **partial results** of these tests. The **tests were run online** using LimeSurvey software [5].

SPANISH TEST

PARTICIPANTS

Experimental group: JSS from the Kantō region, without extended stays in Spanish speaking countries and different levels of proficiency. (n=33)
Control group: Chilean native speakers. (n=13)

SENTENCE CONTEXTS

(as per [4], although sentences are new):

isol	<blank>
qfin	¿dijo la palabra <blank>?
qint	¿dijo la palabra <blank> de nuevo?
sint	dijo la palabra <blank> de nuevo
sfin	dijo la palabra <blank>

KEYWORDS

12 keywords (4 trios) [1, 4]:

	1st	2nd	3rd
/mediko/	médico	medico	medicó
/numero/	número	numero	numeró
/limite/	límite	limite	limité
/balido/	válido	valido	validó

RESULTS

- No effect of years of study.
- There was a significant effect of sentence type for Japanese ($F_{(4,7915)}$=694.79; p<0.001) and Spanish ($F_{(4,3115)}$=72.60; p<0.001), but results were distributed unlike in the previous study [Fig.1].
- There was a main effect of stimulus for Japanese ($F_{(2,7913)}$=216.34; p<0.001), with paroxytone words being identified correctly more often than the rest [Tabs.1, 2]. This was also in the previous study, and likely due to this being the default position in Spanish. This effect was also found for Spanish speakers ($F_{(2,3113)}$=29.56; p<0.001).
-There was a significant interaction for the Japanese group ($F_{(8,7905)}$=388.73; p<0.001).

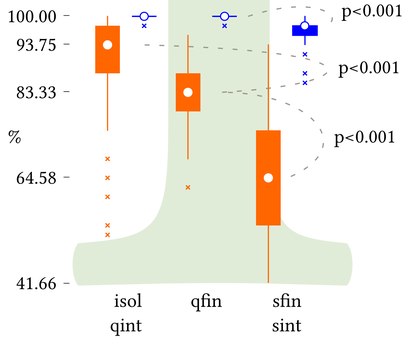

Figure 1. Aggregated percentage correct responses of Japanese (orange) and Chilean (blue) participants to the Spanish test.

	1st	2nd	3rd
isol	6.07	5.11	3.91
qint	4.03	5.31	4.20
qfin	5.24	4.21	1.54
sint	1.64	3.28	2.21
sfin	0.43	3.20	2.46
mean	3.48	4.22	2.86

Table 1. Mean *d'* values for each accented syllable per sentence context. Higher values indicate better identification.

	Chilean			Japanese		
	1st	2nd	3rd	1st	2nd	3rd
1st	1038	2	0	1952	435	253
2nd	26	1014	0	140	2316	184
Non	15	10	1015	187	469	238

Table 2. Overall confusion matrices for native speakers of Spanish (left) and CSJ (right).

JAPANESE TEST

PARTICIPANTS

Experimental group: CSJ without extended stays in Japan with different levels of proficiency (n=10)
Control group: Japanese native speakers from the Kantō region. (n=8)

still recruiting!

SENTENCE CONTEXTS

isol	<blank>も
qfin	あの<blank>も?
qint	あの<blank>もと言いましたか
sint	あの<blank>もと言いました
sfin	あの<blank>も

KEYWORDS

12 keywords (2 trios; 3 pairs):

	1st	2nd	Non
/kaki/	蛎	垣	柿
/haɕi/	箸	橋	端
/hana/		花	鼻
/momo/	腿		桃
/kami/	神	髪	

RESULTS

- No effect of years of study (as of yet).
- There was a main effect of sentence type ($F_{(4,1795)}$=9.975; p=0.04).
- There was a main effect of accent type ($F_{(2,1793)}$=220.83; p<0.001) for both trios (t=-3.97, df=28, p<0.001) and pairs (t=-3.45, df=28, p<0.01), with unaccented words being the most difficult and first accented the easiest across contexts as shown in Table 4. Table 3 shows that, overall, unaccented words (which are not a part of the Spanish accentual system) tended to be interpreted as final-accented.

	Trios			Pairs			
	1st	2nd	Non	1st	2nd	Non	
1st	240	0	0	240	0	0	Japanese
2nd	6	233	1	1	238	1	
Non	0	15	225	0	2	238	
1st	234	24	42	248	19	33	Chilean
2nd	66	175	59	68	189	43	
Non	73	141	86	63	88	149	

Table 3. Confusion matrices for trios and pairs of the Japanese test for Japanese native speakers (above) and CSJ (below).

a.

	Pairs		
	1st	2nd	Non
isol	3.55	3.09	0.99
qint	2.18	0.76	0.87
qfin	3.25	1.23	0.54
sint	2.64	1.34	0.57
sfin	3.45	1.67	0.52
mean	2.60	1.34	0.67

b.

	Trios		
	1st	2nd	Non
isol	3.25	1.55	-0.04
qint	2.94	2.30	-0.14
qfin	3.90	2.13	0.60
sint	2.56	1.70	-0.30
sfin	3.10	1.78	0.38
mean	3.24	1.74	0.24

Table 4. Mean *d'* values for each accented syllable per sentence context for the Japanese test. Higher values indicate better identification. Zero indicates random level.

DISCUSSION

As expected, results of the **Spanish test showed some contexts being more difficult**; **but against expectations, the contexts that were more difficult** (for both groups) **were not interrogations**. It was expected that their final rising intonation would disguise the f_0 cue for stress, but there seem to be other cues at work. Table 5 shows this doesn't seem to be duration, but there are other cues that remain to be examined (eg. vowel quality [6] and intensity). Figure 2 shows the normalised f_0 curves per context. A clue comes from Table 1, which shows that **while it is proparoxytone words that bring the scores down in *sfin* and *sint*; oxytone words do so in *qfin***.
In the **Japanese test,** on the other hand, the effect of sentence type was relatively minor, and performance varied according to accent type more than anything else: **unaccented words were commonly mistaken for final-accented**. The behaviour of the pitch curve for unaccented words shown in Figure 2 can explain this, particularly in light of the complete lack of duration cues, which are prevalent in Spanish [Tab.5].
These results are telling, in that they show how **L1 influence on L2 perception for CSJ and JSS behaves differently because of the different availability of L1 cues**, but they are still very partial due to low participant numbers. As these increase, results will become more reliable.

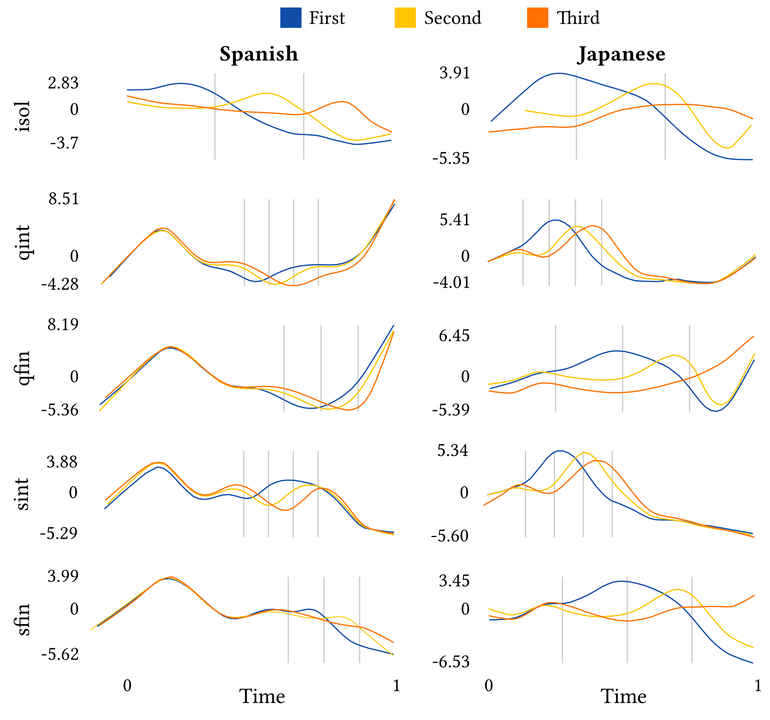

Figure 2. Time normalised pitch tracks for all contexts for both Spanish and Japanese. showing different patterns for all three Spanish and Japanese accent types. Colors indicate the syllable bearing the accent. f_0 values are in semitones in reference to the sentence mean.

	Spanish			Japanese		
	1st	2nd	3rd	1st	2nd	3rd
isol	1.23	1.32	1.21	0.96	1.00	1.15
qint	1.43	1.33	1.34	1.03	1.01	1.03
qfin	1.39	1.42	1.30	1.09	1.04	0.90
sint	1.43	1.36	1.28	1.11	0.97	1.10
sfin	1.45	1.38	1.16	1.08	1.02	1.12
mean	1.39	1.36	1.26	1.05	1.01	1.06

Table 5. Syllable duration as a ratio of accented to unaccented, for all contexts and both languages.

REFERENCES: [1] Llisterri, J. , Machuca, M.J., de la Mota, C., Riera, M., and Ríos, A. (2005). La percepción del acento léxico en español. In *Filología y lingüística. Estudios ofrecidos a Antonio Quilis,* volume 1, pages 271-297. Madrid. **[2]** Labrune, L. (2012). *The Phonology of Japanese.* Oxford University Press, New York.; **[3]** Iverson, P., Kuhl, P., Akahane-Yamada, R. and Diesch, E. (2003) *A perceptual interference account of acquisition difficulties for non-native phonemes.* Cognition, volume 87, pages 47-57; **[4]** Kimura, T., Sensui, H., Takasawa, M., Toyomaru, A., and Atria, J.J. (2012). *Influencia de la entonación oracional sobre la percepción del acento español por estudiantes japoneses.* Estudios de Fonética Experimental, volume XXI, pages 11-42. Barcelona; **[5]** LimeSurvey Project Team / Carsten Schmitz (2012). *LimeSurvey: An Open Source survey tool (v.1.92)* [Computer Program]. LimeSurvey Project, Hamburg; **[6]** Ortega-Llebaria, M., Prieto, P. (2010) *Acoustic Correlates of Stress in Central Catalan and Castillian Spanish.* Language and Speech, volume 54(1), pages 73-97.