Increasing context: L2 Production of English intonation by L1 Mandarin and L1 Spanish speakers

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ABSTRACT

One of the uncontested linguistic uses of intonation is the marking of sentence-type. Intonation, however, can be a redundant cue to sentence type, as in English statements or absolute yes-no questions, or the only cue, as in declarative questions. We explore the realization of sentence prosody by advanced Spanish and Mandarin learners of English. Since the target-like realization of sentence prosody involves the acquisition of phonetic and semantic properties, we compared the production of statements, absolute questions and declarative questions of the experimental groups using an elicited imitation task and a contextual sentence production task that differed in the amount of contextual information provided. Both tasks yielded different patterns of cross-linguistic influence. In the elicited imitation task, differences were restricted to the phonetic realization of pitch accents. In the second task, syntactic (merger of two questions) and phonetic differences (pitch excursion size) emerged.

Keywords: intonation, second language acquisition, Mandarin, Spanish, English.

1. INTRODUCTION

While the intonational cues used to mark sentence type are largely similar cross-linguistically, phonetic and phonological differences have been identified [1]. Moreover, intonation can either be the only cue to sentence type, as in English declarative questions (e.g., *You are coming?*), or a redundant cue, as in absolute yes-no questions (e.g., *Are you coming?*). Thus, an English learner needs to acquire the semantic properties that differentiate these types of questions, in addition to the syntactic, phonetic and phonological properties of declarative questions (DQs), absolute yes-no questions (AQs) and statements (S). The goal of this paper is to explore the acquisition of English sentence type by native speakers of two typologically different languages: Mandarin (a tonal language) and Spanish (an intonational language). Mandarin and Spanish differ from English in that the two types of questions are syntactically identical. As opposed to Mandarin, Spanish only uses intonation to distinguish statements from questions (i.e., there is neither inversion nor use of question particles). Questions differ from statements in the height of the first pitch accent (PA) and in the final boundary tone (rising vs. falling) [2,3]. Mandarin questions can have a lexical marker (*ma*) at the end of the sentence with a rising boundary tone or be syntactically marked using the Verb-not-Verb structure [4]. There is no consensus, however, on whether questions differ from statements in the use of certain global cues, such as an expanded pitch range [5].

A central aspect of the acquisition of intonation involves using acoustic cues to convey meaning in the appropriate context. As such, we tested the participants' acquisition of sentence type in two contexts that differed in their communicative goals. In Experiment 1, participants performed a delayed repetition task involving de-contextualized sentences. In Experiment 2, they had to produce a sentence that was appropriate for a given context.

2. L2 ACQUISITION OF INTONATION: PREVIOUS RESEARCH & PREDICTIONS

Research has shown that the phonetic aspects of intonation (e.g., peak alignment patterns) are acquired almost exclusively by pre-puberty L2 learners [6,7]. Since we are studying adult learners, phonetic differences in the realization of the three sentence types are anticipated. Specifically, we expect L1 Spanish speakers to produce a higher first PA than the other two groups in AQs and DQs, given that a higher first PA distinguishes Spanish interrogatives from statements [2]. Mandarin speakers are expected to show a larger pitch excursion than controls in the nuclear contour (last pitch accent and boundary tone – NC-) of interrogatives, since one of the strategies to mark questions in the L1 is a sharp pitch rise associated with the particle word [4,5]. It has also been reported that speakers of tonal languages tend to assign a tone to the lexical words in the L2. For example, it has been observed that Mandarin learners of English associate a rising PA with the stressed syllable of the lexical word [8]. Thus, we anticipate patterns reminiscent of tonal preservation in the L2 speech of L1 Mandarin speakers; namely, we expect them to show the same type of PA across sentence types. Finally, most L2 research on intonation has focused on either read speech or delayed repetition tasks,

even though differences between controlled and semi-spontaneous speech have been reported in L1 research [9]. Building upon recent findings, which suggest that L2 learners show different prosodic patterns [10] depending on whether they have access to contextual meaning, we predict larger differences between groups in the contextualized task than in the delayed-repetition task, both in the use of syntactic features and phonetic cues to convey the semantic difference in question types.

3. METHODS

3.1. Participants

Three groups (6 participants per group) are included in the present investigation. The two experimental groups (L1 Mandarin, L1 Spanish) were advanced to near-native English speakers, as determined by their years of study, their self-report and the assessment of a native English speaker. They all resided in Canada at time of testing. The control group consisted of L1 Canadian English speakers. The characteristics of the groups are summarized in Table 1.

Table 1: Participant profiles. Age; AoA= age of onset of acquisition; LoR = length of residency; LoE= length of experience (in years)

Language	Age	AoA	LoR	LoE
English	26	NA	NA	NA
Mandarin	20.8	9.6	2.6	11.4
Spanish	27.6	12	6.8	15.6

3.2. Tasks and stimuli

Two tasks are reported in the present study. Experiment 1 was a delayed repetition task involving 10 stimuli per sentence-type (statements, AQs and DQs) plus 30 distractors. Stimuli consisted of short SVO sentences controlled for word-frequency; distractors included a variety of sentence types (e.g., wh-questions, exclamations). Stimuli were recorded by a female native speaker of Canadian English. They were presented aurally to participants, who listened to and subsequently repeated the target sentences. Utterances were recorded using a Marantz PMD-60 recorder and Audio Technica 831-CW lavalier microphone.

Experiment 2 tested the production of the same three sentence types. Participants listened to a short context which was designed to elicit the target sentences with minimal difference in the sequence of words, beyond the expected syntactic differences (e.g. *This is a raccoon; Is this a raccoon?; This is a raccoon?*). A total of six contexts were created per sentence type (=18 stimuli; no distractors). Participants heard the context and then their responses were recorded.

3.3. Data analysis

Target stimuli were extracted from the recordings and analysed with PRAAT. Utterances were transcribed and only the target-like responses were analysed. For each utterance, the first PA and the NC were labelled with ToBI, and analysed acoustically. We report the following measurements: (1) pitch range and slope of the first PA; (2) pitch range and slope of the NC. The pitch range was calculated as the difference between the maximum and minimum F0 value associated with the stressed syllable, while the slope was the result of the F0 difference divided by the duration of the PA or NC. Frequency measurements are reported in ERB.

4. RESULTS

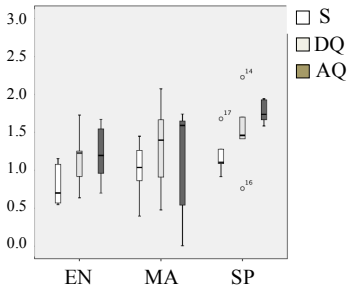
4.1. Experiment 1: Delayed repetition task

Experiment 1 constitutes the baseline for our comparison, since participants only repeated decontextualized sentences. Results show that the most frequent form of PAs across sentence types was L+H* (Statements: Eng=77%; Man=83%; Spa=77%; AQ: Eng=97%; Man=88%; Spa=76%; DQ: Eng=90%; Man=90%; Spa=73%). Groups did not differ in the proportion of the PAs selected, by sentence type or language. Different NCs for questions and statements were expected and found in all groups. In AQs and DQs, the preferred NC was L*H-H%, whereas a falling PA and a low boundary tone was the default realization in statements. No significant differences in the proportions of different NCs were found across groups.

Differences in the phonetic realization of PAs and NCs did emerge across groups. Figure 1 displays the F0 change in the first PA. Results of a 3x3 RM ANOVA with language as the between-subject factor and sentence type as the within-subject factor revealed a significant main effect of sentence type ($F_{(2,28)}$=6.3; p=.005) on the F0 change. However, the sentence*group interaction was not significant ($F_{(4,28)}$=.62; p=.62). Post-hoc Games-Howell tests confirmed that English and L1 Spanish speakers differed in the magnitude of the F0 change in AQs and DQs, which were largest among the latter group. Results of another 3x3 RM ANOVA yielded almost significant results for the main effect ($F_{(2,28)}$=3.09; p=.06), with L1 Mandarin speakers showing the least steep slope of all groups, probably due to the fact that these participants revealed the

largest duration for PAs, an issue that deserves further research.

Figure 1: Box plot of the F0 change in the first pitch accent (in ERB) across groups and sentence-types.



Results of a 3x2 RM ANOVA with language as the between-subject factor and sentence type (DQ vs. AQ) as the within-subject factor revealed no main effect of sentence type ($F_{(1,14)}$=1.02; p=.75) or of the interaction sentence type*group ($F_{(2,14)}$=1.09; p=.36) on the F0 change in NCs. Similar results were obtained for the slope; sentence type ($F_{(1,14)}$=.15; p=.94) or the sentence type*group interaction ($F_{(2,14)}$=1.69; p=.22) were not significant. This was largely due to the fact that all groups behaved differently (Figure 2): controls showed a larger F0 change in AQs than in DQs; L1 Mandarin speakers had a slightly lower F0 change in DQs than in AQs, whereas L1 Spanish speakers displayed similar values in both interrogatives.

Figure 2: Box plot of the F0 change (in ERB) in the nuclear configuration across groups and sentence-types.

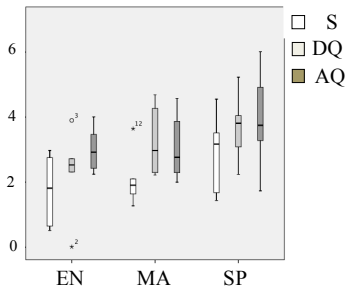
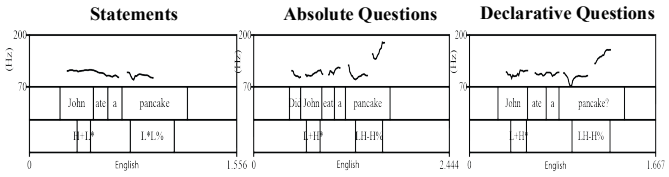
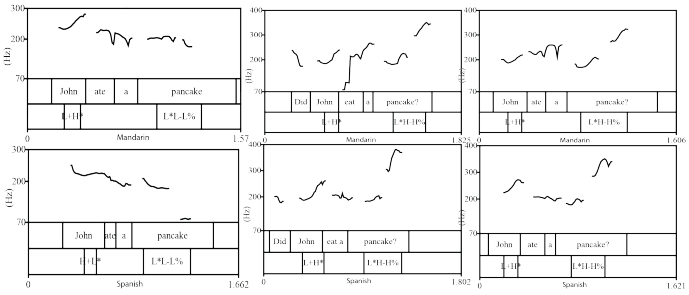


Figure 3 displays an example of the realization of each sentence type by a representative speaker of each group. In addition to the statistical differences reported, an additional contrast is observed: the more frequent use of PAs by the Mandarin speakers.

Figure 3: Statements, AQs and DQs as produced by a native speaker of each language.





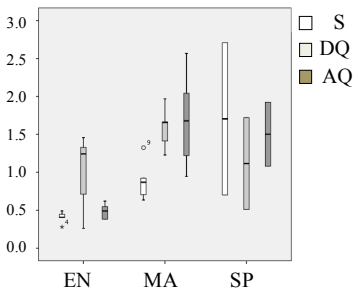
4.2. Experiment 2: Contextualized production task

A higher degree of variability in participants' responses was expected in this experiment given the open nature of the task. Participants in the control group produced the expected sentence types, albeit some realizations of AQs instead of DQs were found (11%). Non-target DQs represented a small proportion of the L1 Mandarin group (19%) but the majority of the tokens produced by L1 Spanish speakers (75%) were non-target-like. Since statistics were only calculated on target-like responses, the results of the Spanish group should be interpreted with extreme caution.

As concerns PAs, L+H* was the preferred type (with the exception of statements in the L1 Spanish group) but at a lower rate than in Experiment 1 (Statements: Eng=51%; Man=55%; Spa=39%; AQ: Eng=64%; Man= 71%; Spa=73%; DQ: Eng=56%; Man=67%; Spa=69%). NCs did not differ from those obtained in Experiment 1. Results of multiple chi-square comparisons revealed no significant differences across groups in the type of PAs or NCs selected.

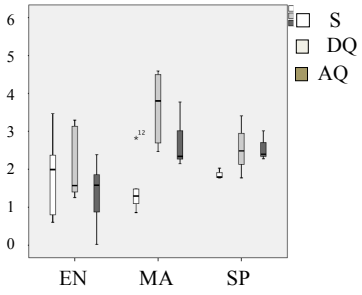
As opposed to Experiment 1, no differences emerged in the F0 change in the PA, largely due to the differences across groups (Figure 4). Results of a 3x3 RM ANOVA revealed no main effect of sentence type ($F_{(2,18)}$=2.13; p=.14) or of the sentence type*group interaction ($F_{(4,18)}$=1.7; p=.18) in the F0 change. Differences in the slope of the PAs were non-significant for sentence type (AQs: $F_{(2,18)}$=1.06; p=.36) and for the interaction of sentence type*group ($F_{(4,18)}$=1.3; p=.304).

Figure 4: Box plot of the F0 change (in ERB) in the first pitch accent across groups and sentence-types.



The final aspect of our analysis involves the phonetic realization of the NCs. Figure 5 displays the F0 change in sentence-final position and shows that learners differed from controls by producing a larger mean F0 change in questions and by displaying a larger contrast between questions and statements, due to the presence of rising contours in declaratives in the control group. Additionally, L1 Mandarin learners differed from controls by showing a larger F0 change in DQs than in AQs. Results of a 3x2 RM ANOVA confirmed this. Significant main effects were found for sentence type ($F_{(1,10)}$=6.04; p=.034) but the interaction of sentence type*group was not significant ($F_{(2,10)}$=.42; p=.66). A post-hoc Games-Howell test indicated that L1 Mandarin speakers differed from controls. No significant differences were found in the realization of the slope either for the main effect ($F_{(1,10)}$=2.5; p=.13) or the interaction ($F_{(2,10)}$=.46; p=.64), but controls and L1 Mandarin speakers revealed a clear tendency to produce a steeper slope in DQs than in AQs.

Figure 5: Nuclear configuration: F0 change (in ERB) across groups and sentence-types.



5. DISCUSSION AND CONCLUSION

Our results revealed interesting parallels with previous research. Phonetic differences in the realization of PAs and NCs were found in both tasks. L1 Spanish speakers presented the largest differences in Experiment 1. In particular, as predicted [2,3], this group did show a larger F0 excursion in the initial PA in both types of interrogatives, while L1 Mandarin participants did not differ from controls. Comparatively more frequent uses of PAs were observed in the L1 Mandarin group (Figure 3), but the type of PAs varied across sentence types, against our prediction [8]. In Experiment 2, the main phonetic difference across groups was found in the realization of NCs. L1 Mandarin speakers showed a larger F0 change than controls in both types of interrogatives, which is suggestive of cross-linguistic influence. In addition to phonetic differences, a high-rate of non-inverted DQs was observed in the L1 Spanish data, despite the fact that, as a group, they have been residing in an English-speaking country and studying English for longer (Table 1) than the Mandarin group. In general, these findings demonstrate that larger differences (syntactic level) and different patterns emerged in the contextualized experiment in both groups of learners, and to a smaller extent in the control group [9], which is consistent with recent findings [10]. Overall, our results suggest that task-types model cross-linguistic influence. In the elicited-imitation task, L1 Mandarin learners approached controls more closely, whereas L1 Spanish speakers transferred their realization of higher PAs in interrogatives. In Experiment 2, phonetic differences between L1 Mandarin learners and controls clearly emerged in the realization of NCs.

6. REFERENCES

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