L1 Influence and task effects in the realization of sentence types by Inuktitut-English sequential bilinguals

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Abstract

This paper explores the role of cross-linguistic influence and task type in the realization of pitch accents and nuclear contours across English sentence types (statements, absolute questions and declarative questions) by sequential Inuktitut-English bilinguals. In Inuktitut, intonation is mainly a cue for phrasing; i.e., boundary tones are mapped to finality vs. continuity in turn-taking [1,2]. Questions are morphologically marked [3], and while a rising intonation may also be used, it is not always present. In contrast, English absolute questions are syntactically marked, whereas the difference between statements and declarative questions is purely prosodic. Participants performed two tasks: a delayed imitation task, and a contextualized production task. Results revealed that bilinguals differed from controls in the type and phonetic realization of the first pitch accent (but not the nuclear contour), displaying a reduced use of pitch. In the semi-spontaneous task, bilinguals differed from controls in the number of non-target-like realizations, particularly in contexts that prompted declarative questions. We argue that these findings demonstrate clear patterns of prosodic and morpho-syntactic cross-linguistic influence, as well as the importance of incorporating contextual information as a variable [4].

Index Terms: sentence types, English, Inuktitut, bilinguals.

1. Introduction

The intonation of early and sequential bilinguals has been of interest recently. Studies have consistently revealed non-native patterns in the speech of bilinguals, which may include differences in peak alignment [5], the selection of the appropriate contour in a given pragmatic context [6], or transfer of tonal patterns from the L1 into the L2 [7], among others. Very little is known, however, about the prosody of bilinguals whose L1 is one of the many indigenous languages spoken in the Americas. Most of the work in this area has concentrated on the intonation of Spanish-Quechua bilinguals, which have revealed patterns of cross-linguistic influence in read [8,9] and semi-spontaneous speech [10]. Here, we are particularly interested in exploring the realization of statements (Ss), declarative (DQs) and absolute questions (AQs) in the production of English-Inuktitut bilinguals. Inuktitut is an Eskimo-Aleut language spoken in the North-Eastern coast of Canada. Like other languages of the same family, Inuktitut is a polysynthetic language, and differs from English regarding its prosodic typology; i.e., English is an intonational language, whereas Inuktitut is a language with a limited use of intonation, and could be classified as a non-stress, non-pitch accent language [2].

In English, the three sentence types illustrated in (1) differ in word order and in their intonational patterns: DQs and AQs have a final rise (either a low or high rise), whereas Ss are typically have a final falling contour [11,12]:

(1) Mariana is going to the conference. (S)
    Is Mariana going to the conference? (AQ)
    Mariana is going to the conference? (DQ)

Although AQs and DQs are both questions, they are not appropriate in the same context. DQs are not expected to occur in an out-of-the blue context, but in situations where there is shared information between the speaker and the listener [13]. In such contexts, the question is used to indicate that the event is not expected [14] and it may also have a mirative interpretation [15]. Thus, AQs and DQs differ in terms of their syntax, and the context in which they are expected to occur. No differences in the realization of the first pitch accent (PA) have been reported [11], and, although nuclear contours (NCs) for both questions display a rise in North American English [11,16], there is some discussion regarding whether AQs and DQs differ in the type of rise [17] or regarding the frequency of low and high rising contours [12].

In Inuktitut, statements and questions are marked by the presence of a different mood (Indicative vs. Interrogative [3,18]), as illustrated in (2):

(2) tusaq-**tunga**. 'I hear'
    tusaq-**pungaa**? 'Do I hear?'

Researchers [3,19] suggest that the Interrogative mood marking may be disappearing from some dialects, and merging with the Indicative mood. Crucially, although word order is flexible [3], differences in word-order may convey emphasis, but not a change in sentence-type. However, sources consistently indicate that, across varieties, questions are marked by lengthening, as in the Interrogative morpheme, *pungaa* [2]. Much less is known about how pitch is used in this language family. Of the Eskimo-Aleut languages, West Greenlandic [20] and Unangan [21] have been experimentally described using the Autosegmental-metrical model. Although differences have been reported, authors agree that there is limited evidence of the use of pitch to mark lexical prominence. The variety investigated here has been partially described acoustically in [2]. According to this source, a rising pitch may be used together with lengthening to mark interrogative utterances. However, final rising contours are also used to hold a turn and to indicate that the speaker has not finished talking, as opposed to final falling contours, which mark the end of a turn. Moreover, [2] found that pitch is only used at the end of an intonation domain; specifically,

utterances in Inuktitut (see [2] and Figure 3 below) are characterized by a flat intonational contour with tonal movements restricted to the last two syllables in the utterance. Based on these morphosyntactic and prosodic differences, Inuktitut-English bilinguals need to learn that AQs require syntactic inversion, as opposed to DQs, and that pitch is used not only at the end of an utterance, but also in association with lexically stressed syllables. Moreover, since DQs appear in a more restricted discourse context when compared to AQs, it is expected that bilingual speakers will be less sensitive than controls to the discourse conditions that prompt DQs, and thus, to the contextual distribution of AQs and DQs. Previous studies on the L2 acquisition of intonation [4] have shown that prosodic differences are also sensitive to the type of task, with L2 learners diverging from controls to a larger extent in tasks that require access to contextual meaning than in more controlled tasks (e.g., reading or sentence imitation). Thus, we also expect that bilinguals will differ more from controls in a contextualized production than in a sentence imitation task.

In summary, this project seeks to answer two general research questions: (1) Do Inuktitut-English bilinguals differ from English monolinguals in their production of sentence types? (2) Are group differences larger in a contextualized production task than in a sentence repetition task?

Regarding the first question, we expect bilinguals to rely on syntax rather than intonation to mark sentence types, given that inversion is an unambiguous marker of sentence type in English, and that rising contours in Inuktitut can be used to either mark sentence type or to hold a conversational turn. We also expect a more restricted use of intonation in general in Inuktitut, given that previous studies reported an absence of PAs in a given prosodic domain [2]. As concerns the second question, we expect group differences to be smaller in the sentence imitation task than in the contextualized production task, as previously found in [4]. Moreover, we expect bilinguals to have difficulty determining the contextual distribution of AQs and DQs.

2. Methods

2.1. Task and stimuli

Participants completed two production tasks that differed in the degree of contextual information. The first was a sentence imitation task (SI), which involved 10 target stimuli per sentence type (e.g., *Sarah watered the flowers. Did Sarah water the flowers? Sarah watered the flowers?*) plus 30 distractors. Stimuli were recorded by a female speaker of Canadian English and were played to participants using a PPT presentation. The second task was a contextualized production experiment (C), in which participants heard a scenario and produced a sentence appropriate to the context. Scenarios were recorded by the same speaker who recorded the stimuli for the SI task. There were a total of six scenarios per sentence type.

2.2. Participants

Table 1 summarizes the profiles of the two groups included in the study. Bilingual speakers were first exposed to Eastern Canadian Inuktitut at home, where either both parents (10/13 participants) or one parent (3/13) were speakers of the language. They constitute a fairly homogeneous dialectal group, coming from South Baffin (N=8), Nunatsiavut (N=3), North Baffin (N=1) and Churchill (N=1). The participants

reported using Inuktitut in their daily lives, although in different social settings and to different extents. All participants were educated in English and reported using English at rates that ranged from 25% to 90% of their daily interactions.

Table 1: *Participants' profiles. Note: AoA = Age of onset of acquisition of English; LoE = Length of Education in English*

Group	Age	AoA	LoE
L1 English (N=15)	25	n/a	n/a
L1 Inuktitut (N=13)	35	5	10

2.3. Procedure and data analysis

Monolinguals were tested in Toronto and bilingual speakers were tested in Ottawa in English. The testing procedure was the same for both groups and included two testing sessions, where the SI and C tasks were interspersed with other experiments.

Data were recorded using a Marantz PMD561 recorder and a unidirectional condenser microphone, and analyzed using Praat [22]. Target and non-target realizations were identified and target realizations were labeled using the ToBI guidelines for American English [23]. We annotated the first PA and the final nuclear contour (PA plus boundary tone). The initial and final F0, in addition to the maximum and minimum F0 associated with the first PA and the NC were measured in ERB. We calculated the F0 change within each tonal event (F0max-F0min). We also calculated the proportion of F0 change from the beginning of the utterance to the maximum F0 value associated with the first PA in order to determine whether the F0 changed over the initial portion of the utterance. Binomial and linear mixed effects models were calculated with R [24] using the package lme4 [25]. Fixed effects for Language (E, I), Task (SI, C) and Stimulus Type (AQ, DQ, S), and their interactions were entered into the model. All models were fitted first with a maximal random effects structure (i.e., random slope and intercept for Participant and Item). Random slopes were then removed stepwise. In all cases, and given space restrictions, we report the best model, resulting from model comparisons, and we only indicate significant results.

3. Results

3.1. Correct answers by task

Before conducting an analysis of the type of PAs and the acoustic parameters used by each group, it is important to highlight that non-target-like realizations were expected and observed in the C task. We considered a non-target-like realization any utterance that was not consistent with the contextual prompt (i.e., production of an AQ when a DQ was expected). Figure 1 displays the number of errors by speaker within each language group, and reveals some interesting group differences. First, all participants in the Inuktitut group displayed three or more errors in this task, whereas six of the controls displayed no errors and the remaining nine participants displayed very few errors. The mean number of errors in the bilingual group was 5.8 vs. 1.3 in the control group. Second, for both groups, errors were more frequently found in the context that prompted a DQ.
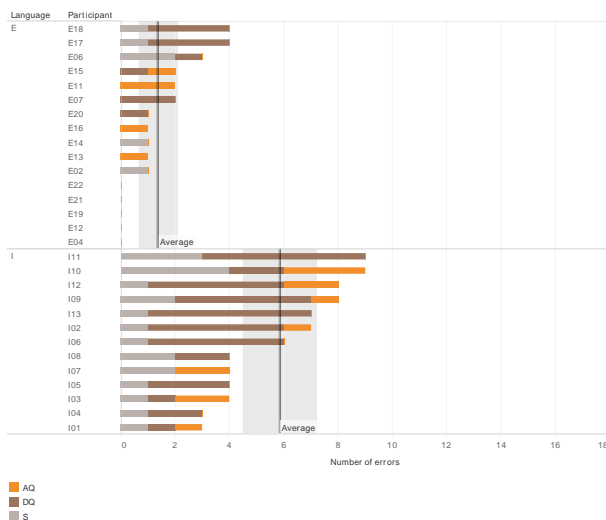
Figure 1: *Total number of errors in Task 2 (C task) by language and participant. Vertical lines indicate the mean; boxes show 95% confidence intervals.*

3.2. Type of pitch accents

To facilitate the comparisons between groups and between tasks, we grouped the PAs and the nuclear contours into rises (H*, L+H*) and falls (L*). To determine whether groups significantly differed in the proportion of rising vs. falling PAs, we ran several binomial mixed effects models using a treatment coding (0= falls; 1= rises) for the dependent variable. Results indicated that groups significantly differed in their proportion of rising PAs, with bilinguals displaying a lower proportion than controls (β=-1.5, z=-2.2, p=.02). Interestingly, a significant two-way interaction between Language*Sentence type suggests that bilinguals had more rising accents in statements than in the other sentence types (β=-1.1; z=2.6; p=.007). Finally, both groups had a significantly higher proportion of rising accents in the sentence repetition task than in the contextualized production task (β=1.24; z=4.6; p<.0001).

Next, we explored whether there were any significant differences in the proportion of rising and falling nuclear contours across contexts and sentence types, with a series of binomial mixed effects models, with the same variables and the same coding as in the previous model. The only significant difference was a higher proportion of rising contours in statements by the bilinguals compared to the controls (β=2.3, z=-2.4, p=.01). This is consistent with the fact that rising contours are also used in statements in Inuktitut to hold a turn.

3.3. Pitch change in pitch accents and nuclear contours

Figure 2 displays a typical F0 contour in the three sentence types, as produced by an Inuktitut-English bilingual, and illustrates the characteristic flat pattern observed in pre-nuclear positions.
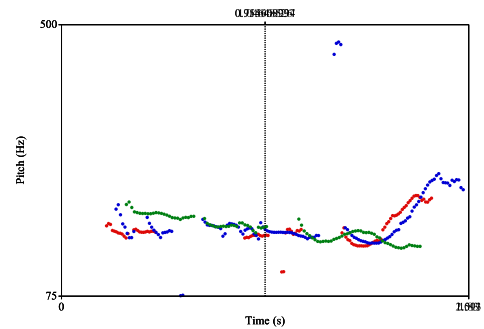

Figure 2: *F0 contour of an S (green), AQ (red) and DQ (blue), as produced by participant I11 in the SI task.*

Figure 3 displays the results obtained for the proportion of pitch change from the beginning of the utterance to the F0 maximum associated with the first PA across sentence types. Recall from section 2.3 that we measured the percent variation between the initial F0 value of the utterance and the maximum F0 value associated with the first PA. Thus, if the PA is a rising accent, we expect a positive difference, and if there is no pitch movement in the first part of the utterance, we expect a value close to 0. The results indicate that while bilinguals displayed very little variation across sentence types, controls appear to have had a larger difference in DQs than in the other two sentence types. To determine the significance of these differences, we fitted a linear mixed effects model with pitch change as the dependent variable. Results revealed a significant main effect of Task (the proportion of pitch change was significantly higher in the SI than in the C task; β= 5.3; t=5.7; p<.0001), and a significant Language*Sentence Type interaction (the proportion of pitch change was significantly lower in DQs for bilinguals than for controls: β= -7.4; t=-3.5; p=.0005). No differences were found between AQs and Ss.

Figure 4 displays the tonal change within the nuclear contour, which includes the last PA and the final boundary tone, and shows more variability in the C than in the SI task, particularly for the control group. To determine whether nuclear contours were realized differently between groups and tasks, we ran linear mixed-effect models with pitch change as the dependent variable. Results revealed that the realization of nuclear contours was similar for both groups. As was the case with PAs, there was a significantly larger pitch change in the SI than in the C task for both groups (β=17.5; t=-8.9; p<0.0001). Additionally, a significant Language*Sentence type interaction was found; i.e., Inuktitut speakers produced a significantly smaller pitch change in statements than controls (β= -9.2; t=-2.7; p=.007).
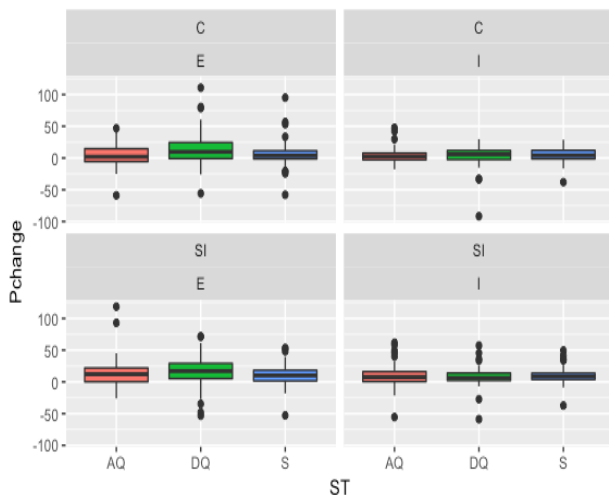
Figure 3. *Boxplots displaying the percentage of F0 change from the beginning of the utterance to the max value associated with the first PA in each sentence type. Results are organized by task (Top: Contextualized task; bottom: sentence imitation task) and speaker group (Left: L1 English; Right: L1 Inuktitut).*
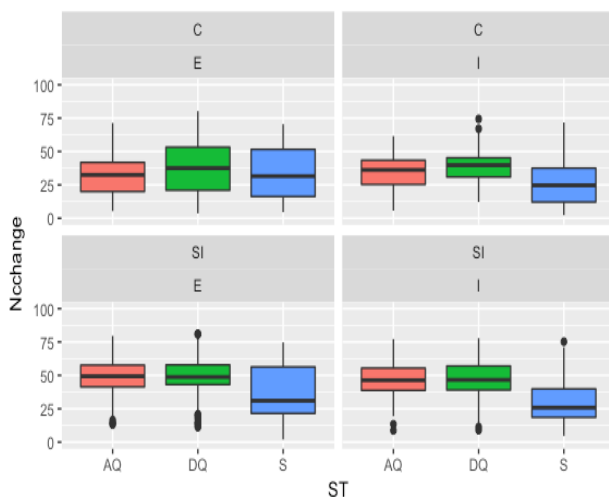

Figure 4. *Boxplots displaying the percentage of F0 change associated with the nuclear contour, in each sentence type. Results are organized by task (Top: Contextualized task; bottom: sentence imitation task) and speaker group (Left: L1 English; Right: L1 Inuktitut).*

4. Discussion and Conclusion

Our results revealed small, but consistent differences in the syntactic and prosodic realization of sentence types between groups. As concerns the realization of the first PA, bilinguals had a higher proportion of falling patterns than controls across sentence types, and displayed a significantly smaller F0 change in DQs than controls. Groups were most similar overall in their realization of nuclear contours; however, bilinguals had a higher proportion of rising patterns than controls in Ss, and a smaller F0 change. Regarding the second research question, on the one hand, we found that bilinguals differed from controls in the number of non-target-like realizations in the C task. This was especially the case in

contexts that prompted a DQ, and, to a lesser extent, in contexts that prompted an S response (Figure 1). On the other hand, between-group differences in pitch patterns were not larger in the C task than in the SI task. Indeed, a non-significant Language*Task interaction suggests that the type of task did not have an additional impact on the differences between groups in their realization of PAs and NCs. However, both groups showed a significantly larger pitch change in the SI than in the C task, suggesting the possibility of imitation of the pitch patterns observed in the stimuli used, and highlighting the importance of using a combination of controlled and more spontaneous tasks [12,28,29].

These initial results suggest a possible influence of the L1, based on the lack of pitch movement in the initial PA and the number of non-target-like realizations in contexts that prompted a DQ. In such contexts, AQs were produced instead, which may be attributed to the fact that questions in Inuktitut are morphologically marked. To confirm the influence of the L1, though, additional steps need to be taken. First, speaker variables should be explored to determine whether the proportion of use of English or the years of education played a role. Both groups differed in age and level of education, as controls either had or were pursuing a university degree, whereas only one of the bilinguals had a university degree [26]. Second, it is necessary to compare the performance of Inuktitut-English bilinguals with monolingual English speakers of the same geographical area to identify the characteristics of the input to which bilinguals were exposed. Third, we may also want to explore the possibility suggested by [27], that bilingual Native American and Canadian First Nations speakers maintain their prosodic features to signal ethnicity. Finally, to achieve a better understanding of the interplay between syntactic and prosodic typological differences, it is important to analyze additional structures, such as the realization of corrective focus. This latter structure is particularly interesting, since corrective focus on the subject, verb or object can be marked in English by the presence of a pitch accent. If pitch movements in Inuktitut are restricted to the end of a prosodic domain, bilinguals should experience difficulty focalizing subjects or objects. This is indeed what preliminary results are showing [30].

5. Acknowledgements

6. References

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