Yes/No Question Intonation in ʔayʔaǰuθəm[*]

Mary McCarthy
University of Alberta

Tyler T. Schnoor
University of Alberta

Abstract: The idea that stress and tone are not distinctive features in ʔayʔaǰuθəm has contributed to the relative scarcity of research on the prosody of the language (Watanabe 2003). However, recent studies find evidence of suprasegmental features in ʔayʔaǰuθəm interrogatives (Huijsmans 2017). Prosody research on yes/no interrogatives in other Salish languages finds no final rise in pitch (Jacobs 2007; Caldecott 2016), which is an exception to the theory that the final rise in interrogative sentences is universal (Ladd 1981). The proposed study investigates whether ʔayʔaǰuθəm patterns like other Salish languages. Another goal of the present study is to investigate whether the average vowel F0 is higher in interrogative vowels than in declarative vowels. Through a semi-scripted elicitation task, data were collected and then analyzed using ProsodyPro (Xu 2013). Our findings suggest that — like other Salish languages — ʔayʔaǰuθəm features a sentence-final drop in F0 and higher average vowel F0 in interrogative sentences.

Keywords: intonation, interrogatives, prosody, ʔayʔaǰuθəm, Salish

1   Introduction

ʔayʔaǰuθəm is a critically endangered language traditionally spoken along the Northern Georgia Strait in British Columbia. ʔayʔaǰuθəm is a member of the Central Salish branch of the Salishan language family and can be divided into two main dialects, Island and Mainland (Davis 2019). The present study uses data from the Homalco variety of the Mainland dialect of ʔayʔaǰuθəm, which is also spoken in the sister nations Tla'amin and Klahoose. The Mainland dialect is spoken by 47 fluent speakers who make up an aging population (First Peoples' Cultural Council 2018). The Island dialect was traditionally spoken in the K'ómoks community, however there are no longer any first language speakers living in the community.

Past language documentation projects have largely overlooked prosody above the word level due to the belief that it is a non-distinctive feature in the language (Watanabe 2003). However, recent studies suggest that changes in pitch are an important way of communicating stress in ʔayʔaǰuθəm (Watanabe 2003). The present study investigates whether ʔayʔaǰuθəm prosody patterns like Salish languages that do not feature a final rise in pitch at the end of yes/no interrogatives (Jacobs 2007; Caldecott 2016). Additionally, yes/no interrogative and declarative sentences are compared to determine whether the mean F0 is higher in questions than in answers.

2   Background

2.1   Stress and prosody in ʔayʔaǰuθəm

Primary word-level stress falls on the initial syllable in ʔayʔaǰuθəm. The assignment of secondary stress follows — with the exception of words containing certain suffixes — a left-aligned trochaic pattern in words that contain three or more syllables (Davis 1970; Watanabe 2003). Pitch is an important cue for stress, with stressed syllables possessing a higher pitch than unstressed syllables (Watanabe 2003).

Despite past research suggesting prosody is not distinctive, recent studies suggest that stress and tone work together to communicate meaning in ʔayʔaǰuθəm interrogatives. A preliminary study by Huijsmans (2017) found that declarative and wh-interrogative phrases have distinct prosodic contours, which warrants further research on the way intonation affects the communication of meaning in ʔayʔaǰuθəm. Further research found evidence of syntactic phrases mapping to prosodic phrases, which indicates a harmonious relationship between syntactic and prosodic constituents (Huijsmans 2018).

2.2   Question intonation in other Salish languages

Research on question intonation in other Salish languages has shown an absence of a final rise in pitch at the end of yes/no questions. A rise in pitch at the end of interrogative sentences is typically considered a universal feature across the world's languages (Greenberg et al. 1978).

Research by Jacobs (2007) investigated whether Sḵwx̱wu7mesh yes/no questions lacked a final rise in pitch. By comparing pitch across declarative and yes/no interrogative phrases, Jacobs (2007) found a consistent decline in pitch in both Sḵwx̱wu7mesh yes/no interrogative and declarative phrases. While both types of phrases demonstrated a drop in pitch, yes/no interrogatives possessed a higher pitch in the predicate of the phrase, which resulted in a steeper drop in pitch than declarative sentences. Caldecott (2016) also found phrase-final drop in St'át'imcets interrogatives. An additional finding of Jacobs' study on Sḵwx̱wu7mesh was that the mean vowel F0 in interrogative phrases was higher than in declarative phrases. In the present study, we aim to extend the research that has been done on interrogative intonation in other Salish languages to ʔayʔaǰuθəm.

3   Methodology

3.1   Language consultant

We worked with a member of the Homalco First Nation who is a first language speaker of ʔayʔaǰuθəm. All data was acquired in sessions that occurred twice weekly over three months. Our elicitation method involved conversations with the language consultant where the researchers took turns as a conversation partner. Both researchers are native speakers of Canadian English, with no prior knowledge of ʔayʔaǰuθəm.

3.2 Materials

Elicitation materials were prepared using modified storyboards from Totem Field Storyboards (Totem Field Storyboards 2023), an online resource providing elicitation materials for language documentation. A total of 48 images were compiled into a slideshow for presentation to the consultant. Each image was paired with an English question pertaining to an element in the scene (see Figure 1).

Figure 1: Example storyboard and question. Storyboard by Clarke and Ng (2015).

The images were taken from a variety of storyboards and although each storyboard originally created a narrative, the questions posed to the consultant were not associated with details of any specific story. Despite our focus on yes/no-questions, a small number of wh-questions were included to make the task less monotonous for the consultant.

3.3 Task

The task was modeled after Caldecott (2016) and consisted of two parts, each designed to elicit either an interrogative or a declarative sentence from the consultant. The ʔayʔaǰuθəm interrogative sentences were elicited by asking the consultant to translate English yes/no questions, which were written below the storyboard pictures. The consultant was instructed to direct these questions toward a researcher so that the researcher could respond in ʔayʔaǰuθəm. The content of the researcher's response was unimportant for the task, but the interaction was constructed in order to encourage a more natural exchange.

In separate sessions, declarative sentences were elicited to correspond to the interrogative sentences. These were elicited using the same slides that were used for the interrogative sentences, but focus was placed on the picture rather than the written prompt. A researcher would ask the ʔayʔaǰuθəm question translated in the previous session and the language consultant would give the corresponding answer guided by the picture on-screen.

The task is described as semi-scripted because the language consultant had the freedom to translate questions and formulate responses within the context of the given prompts. This flexibility was an attempt to elicit more natural intonation in recorded sentences. Although the most natural prosody would be collected by eliciting spontaneous speech in an unscripted task, doing so would increase the complexity of data collection and analysis. Thus, an investigation using more naturalistic data is left for future work.

4   Data analysis

Analysis of the data was carried out in two parts, one to answer each research question. First, the vowels were analyzed. Textgrids were created for each of the recordings using Praat (Boersma & Weenink 2022). Then, intervals were created in the textgrids for each of the vowels. Finally, a Praat script called ProsodyPro was used to extract mean fundamental frequency measurements of these vowels (Xu 2013), resulting in 176 declarative vowel tokens and 200 interrogative vowel tokens. In order to determine whether there was a statistically significant difference between the mean F0 of the vowels in interrogative and declarative sentences, a Welch unpaired t-test was conducted using R (R Core Team 2023).

The second research question was investigated through analysis of the fundamental frequency contour of the entire sentence, rather than the mean fundamental frequency of the vowels. These measurements were taken using the same script (Xu 2013). Adjustments were made to the F0 contour in order to compensate for differences in duration by normalizing the time dimension and aligning them to obtain maximum intonation information at the ends of sentences. After removing recordings that were noisy or included unwanted dialogue, F0 contours were extracted from 32 interrogative recordings and 37 declarative recordings. The F0 contours were analyzed using separate linear regressions for the two sentence types.

5   Results and discussion

The mean F0 was found to be higher for vowels in interrogative sentences ($M = 193.8$, $SD = 32.5$) than vowels in declarative sentences ($M = 183.5$, $SD = 35.4$), $t(374) = -2.9$, $p < .005$ (see Figure 2). This is in line with the findings of a study on the Sḵwx̱wu7mesh language (Jacobs 2007). The linear regression analysis of the full F0 contour shows a weakly negative correlation between F0 and time in both sentence conditions. In other words, F0 is generally lower at the end of a sentence than at the beginning of a sentence (see Figure 3). This finding goes against claims that there is a universal sentence-final F0 rise in interrogative sentences (Greenberg et al. 1978), but is in line with findings from other studies on Salish languages (Jacobs 2007; Caldecott 2016).
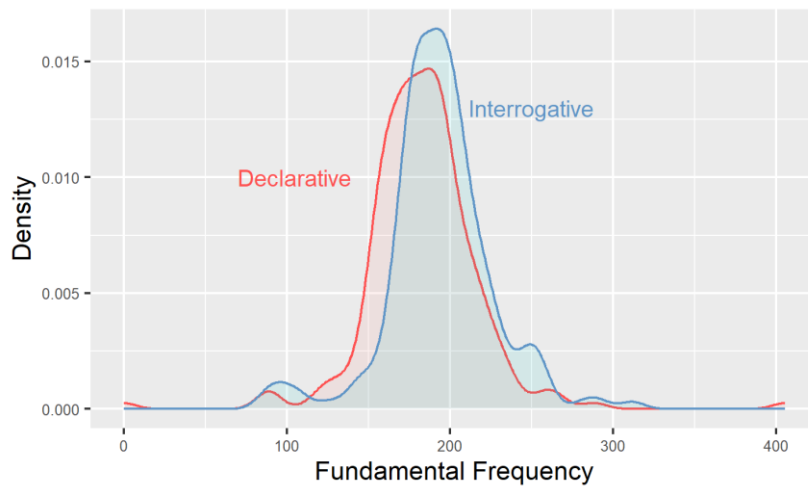
Figure 2: Density plots of declarative (red) and interrogative (blue) mean vowel frequency
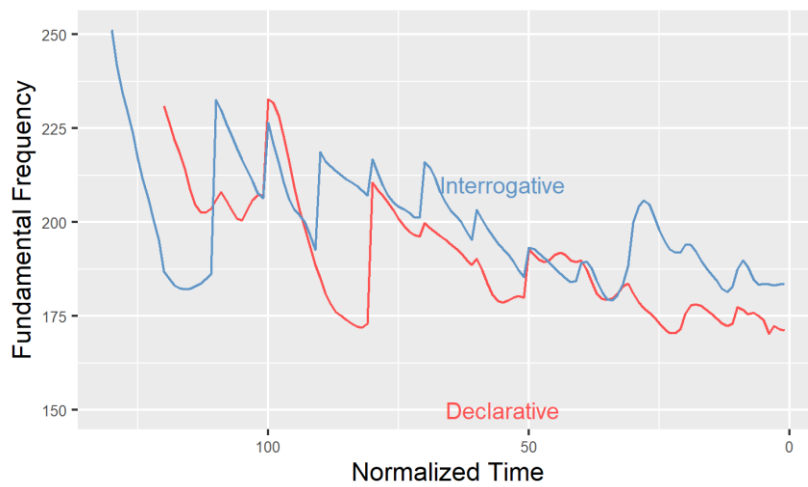

Figure 3: Plot of average intonation contours of declarative (red) and interrogative (blue) sentences by normalized time

6   Limitations and future research

The limited language skills of the researchers is a limitation of this study. Because the present study involves an investigation of sensitive, high-level prosodic factors, it was deemed important to include a conversation partner in the elicitation task. The authors filled this role due to limited access to speakers of ʔayʔaǰuθəm. Although the authors' limited knowledge of the language means

their abilities to sustain a natural conversation are also limited, the present methodology was the most practical way to proceed with data collection given the limited timeframe of the project.

The analysis of the F0 contour in the present study was a limited preliminary investigation of sentence-level prosody. The results of the linear regression analysis and descriptive measures suggest that the F0 is lowest at the end of the sentence, however, future research should incorporate balanced stimuli, a more careful experimental design, and more sophisticated statistical modeling. While no definitive conclusions can be drawn, our research provides a preliminary base for future research on the prosody of ʔayʔaǰuθəm.

7   Conclusion

The present study is a preliminary investigation of the sentence-level prosodic patterns of ʔayʔaǰuθəm, an area that is underrepresented in existing literature. Specifically, yes/no interrogative sentences were compared to their declarative counterparts in order to determine whether ʔayʔaǰuθəm patterns after other Salishan languages. The findings of the present study are consistent with those of other studies that find higher F0 in interrogative vowels and no sentence-final rise. However, further investigation is required to confirm that these patterns are generalizable to the language.

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