# Acoustic Cues of Morphological Contrast Focus in Taishanese

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# 1  Purpose

There are several acoustic strategies that languages use to convey focus. In most non-tonal languages, like Spanish (Face 2002) and Korean (Jun & Lee 1998), the pitch contour of an utterance will vary depending on whether it is focused or non-focused. This is often times also companioned changes to the duration and intensity across the utterance (Rump & Collier 1996). Tonal languages, on the other hand, do not behave neatly as a class with respect to focus. Some languages, like Standard Chinese, act very much like the non-tonal languages. Others like Cantonese do not have significant changes to the pitch contour, and rely solely on duration and intensity as markers of focus.

Aside from the strategies used to convey focus, speakers may also choose at which grammatical level they assign focus. For example, in instances of sentential focus an entire noun phrase may receive focus. It is feasible that any semantically meaningful sub-part of a speech utterance can receive focus, however, individual languages may have grammatical rules for establishing focus on some levels.

Taishanese, also known as Hoisanva or Toisanese, is a Siyi dialect of Chinese. The dialect is often referred to as the language of choice for early Chinese-American immigrants, as many of the first Chinese immigrants during the California Gold Rush were of Taishanese descent (Lee 2007). Taishanese has often been categorized as an accented or 'country' version of Cantonese, however Szeto (2000) suggests that the languages are only 31% mutually intelligible. In fact, many phonological phenomena in Taishanese have no equivalent in either Cantonese or in Standard Chinese (Yue-Hashimoto 1971).

Because of this, it is unclear whether the strategies of focus in Taishanese would be the same as in Cantonese, or whether they would follow a non-tonal pattern as in Standard Chinese (Face 2002; Hsu 2008; Jun & Lee 1998). The rich morphology of Taishanese also provides an ideal environment for testing morphological contrast focus, that is, focus at the level of the morpheme that establishes a notion of contrast or correction within an utterance. This study uses the morphologically strong set of kinship terms in Taishanese to examine the strategies the language employs to establish contrast focus.
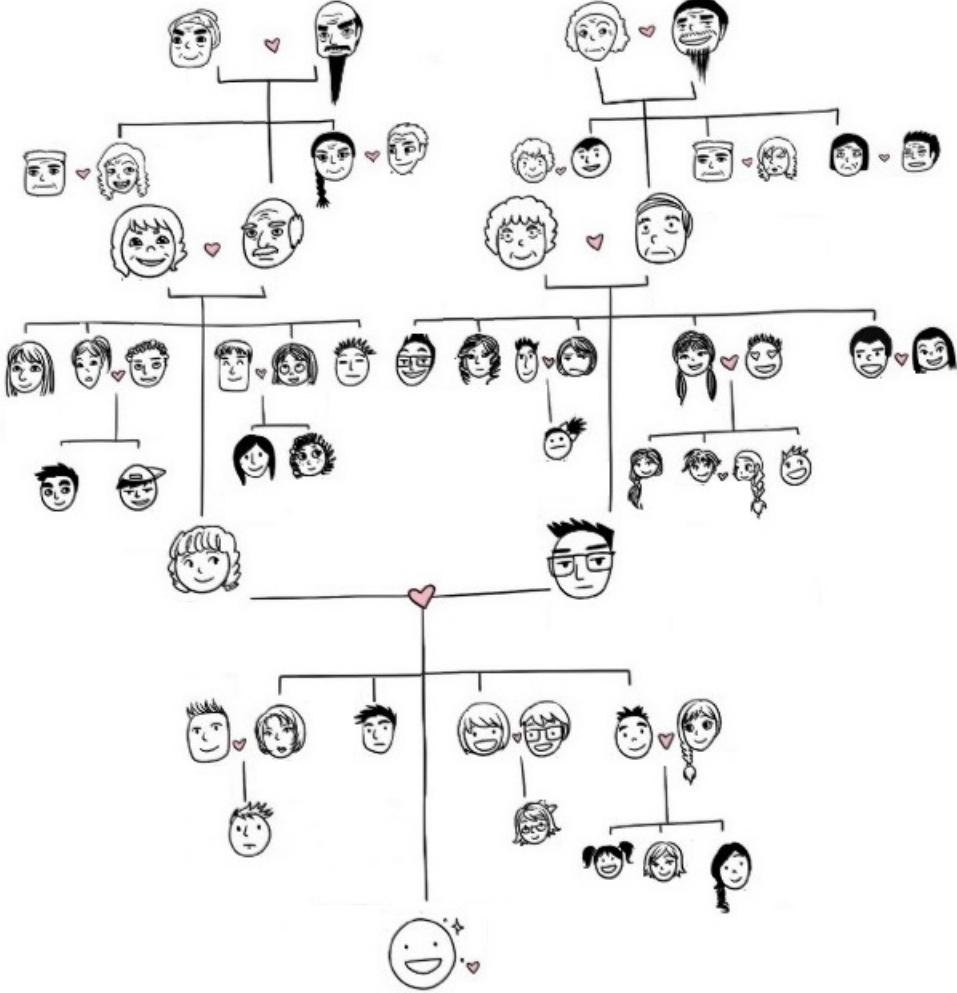
# 2  Hypothesis

$H_0$: There is no significant relationship found between focus placement and either pitch, duration, or intensity.

$H_1$: As in non-tonal languages, (Face 2002; Jun & Lee 1998; Rump & Collier 1996), pitch changes according to with focal placement, altering the tonal contour of the utterance.

$H_2$: Contrast focus in Taishanese will follow a similar pattern to Cantonese, where tonal f0 is not affected (Man 2002), but duration and intensity serve as prosodic markers of focus (Wu & Xu 2010).

Figure 1: Family Tree Test Figure (from Youtube: OffTheGreatWall)

# 3 Procedure

## 3.1 Experimental Design

To isolate an activity where contrast focus would naturally occur, the study focuses on the lexical kinship terms in Taishanese. Kinship relations are composed of one or more morphemes, and can change according to formality.

A speaker was asked to look at a printout of Figure 1, and identify the formal kinship term for each person, assuming that they represent the lowest person on the tree, and that persons are arranged by age from youngest to oldest (left to right). This task was recorded, and speech utterances are used as a baseline representing non-focused words in the dataset. In cases where the speaker was unfamiliar with the word for a particular kinship term (e.g. elder maternal great-aunt), it was removed from the subsequent activity and replaced with a relationship the speaker was familiar with.

Then, the speaker was given a kinship term, and the experimenter pointed to a person on

Figure 1, and asked if that kinship term matched the person that was being pointed at. They responded in sentences loosely of the form "Yes, that is ⟨KINSHIP-TERM⟩", or "No that isn't ⟨KINSHIP-TERM1⟩, it's ⟨KINSHIP-TERM2⟩", although the actual sentences varied considerably in form. An example response is shown in Figure 2.
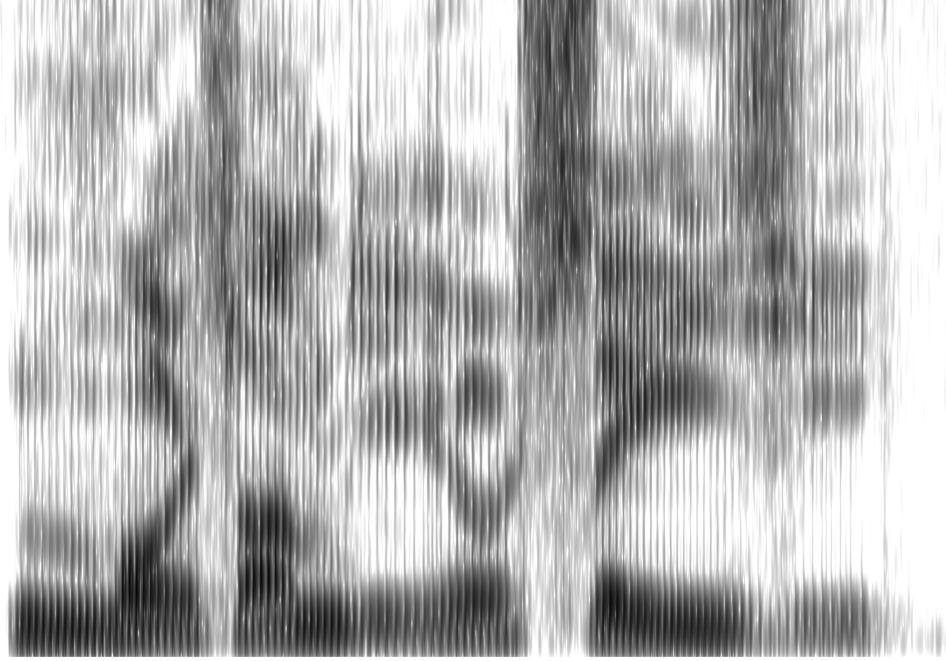


Figure 2: /mʰoi ɬɑm ji ə ɬei ji/ "Not the second-eldest aunt but third-eldest aunt."

The elicitation set was designed to obtain pairs of words which differed across only one morpheme in the same position. During testing, some elicitations were changed to match words the speaker was familiar with (see discussion above). The set is given in Table 1. The order of elicitations was randomized at test time. Also included in the data set are speech utterances which mimicked the form, but were performed outside of the test activity.

The speaker was a male, native Taishanese speaker in his 70s. He has lived in the United States for most of his life, and does not speak the language often anymore. Speech samples were recorded on a MicroMic C520 Vocal Condenser Microphone (head-mounted style) with a Zoom H46 Recording device. Audio files were sampled at 44.1 kHz and encoded in 16 bit. The recording space was a sportswear warehouse on a non-working day, with minimal interfering noise.

All files (sound files, elicitations, etc.) can be found at `github.com/SaraBlalockNg/553-labs/final`.

## 3.2   Analysis

Speech samples were analyzed using Praat and python. The researcher manually extracted the morpheme and rime space[1] for each lexical item in the set, and labeled them as contrast-

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[1]The use of 'rime space' here is a bit of a misnomer. What is actually included in this measure is the rime, plus any nasal or approximant onsets. Including these onsets in the rime space allows for less error in

Table 1: Test Elicitations

| idx | What researcher said | What researcher pointed at |
|---|---|---|
| 1 | gɤ moi | gɤ moi |
| 2 | ɬei ji | ɬei ji |
| 3 | oi dei | oi dei |
| 4 | ɬɑm ji | ɬɑm ji |
| 5 | ŋei gu | ŋei gu |
| 6 | oi dei | gɤ moi |
| 7 | ɬɑm ji | ɬei ji |
| 8 | hoŋ ə moi | hoŋ ə moi |
| 9 | hoŋ ə moi | hoŋ ə dei |
| 10 | tʃuŋ sik˺ | tʃuŋ sik˺ |
| 11 | hoŋ ə dei | hoŋ ə moi |
| 12 | hoŋ ə moi | gɤ moi |
| 13 | oi bɑk˺ | oi gu |
| 14 | gɤ moi | oi dei |
| 15 | ɬɑm gu | ɬɑm gu |
| 16 | ŋei gu | oi gu |
| 17 | oi gu | oi gu |
| 18 | oi gu | ŋei gu |
| 19 | ɬei ji | ɬɑm ji |
| 20 | hoŋ ə dei | hoŋ ə dei |
| 21 | oi bɑk˺ | oi bɑk˺ |
| 22 | oi bɑk˺ | oi gu |
| 23 | oi gu | oi bɑk˺ |
| 24 | ɬei ji | ɬei ji |
| 25 | oi gu | oi gu |

focused or non-focused. The beginning of the morpheme was dined as the nearest zero crossing to the change of energy for initial morphemes, or the transition midpoint between segments for word-internal morphemes. The beginning of the rime was defined as the zero crossing nearest to the start of periodicity of the vowel, erring on the conservative side. The completion of rimes and morphemes was defined as the sharp loss of energy for word-final constructions, and the transition midpoint between segments otherwise.
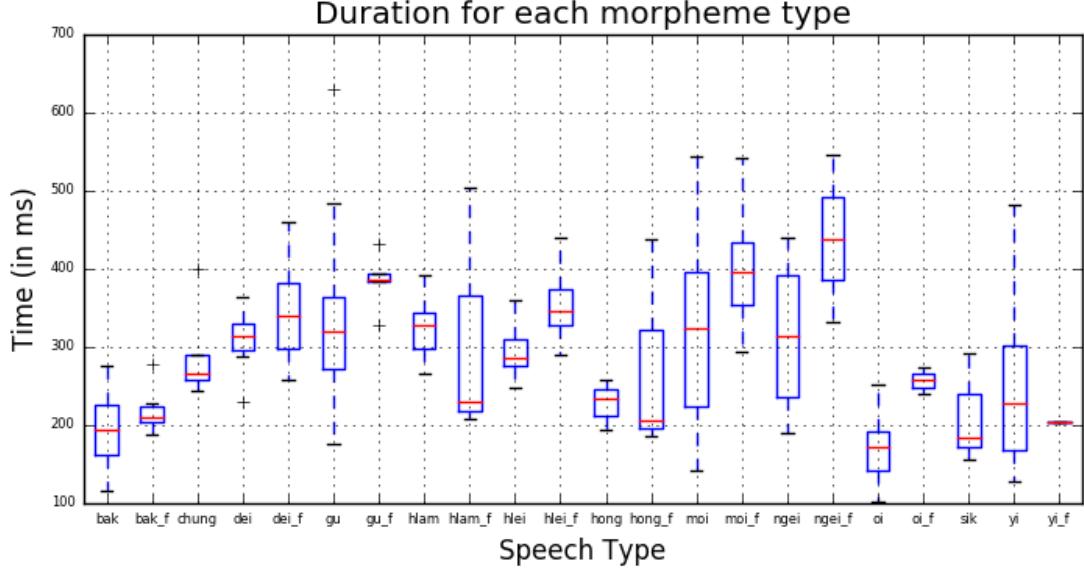
Using these heuristics, the files were annotated via TextGrid. The duration of each morpheme was calculated from these TextGrids using the `PraatIO` package for Python (Mahrt 2016). Following precedent from Wu & Xu (2010), the intensity and duration of the rimes were normalized for time, each data point was associated to a z-score.

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segmentation, without dire consequence to the measurements themselves.

# 4    Results

Figure 3 shows the duration for each tested segment, where focused segments appear to the right of their non-focused counterparts (where they exist).

Figure 3: Durations



While there are select pairs where the mean values of the contrast-focused and non-focused morphemes have very different values, there is no pair for which the difference is significant.

Figures 4-13 show the normalized intensity of each morpheme for which there is at least one focused sample, where the values in purple cubic splines of the non-focused samples, and the turquoise have a contrast-focused context.
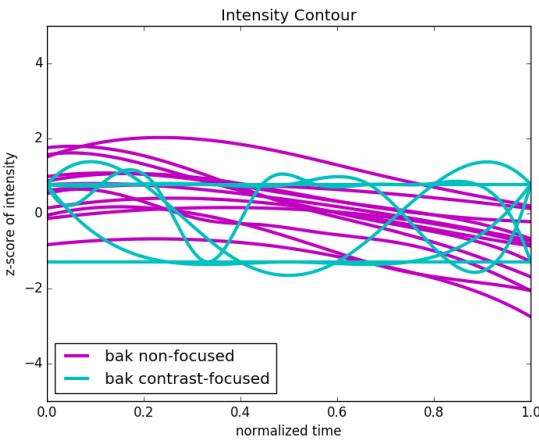


Figure 4: [bɑk˺]
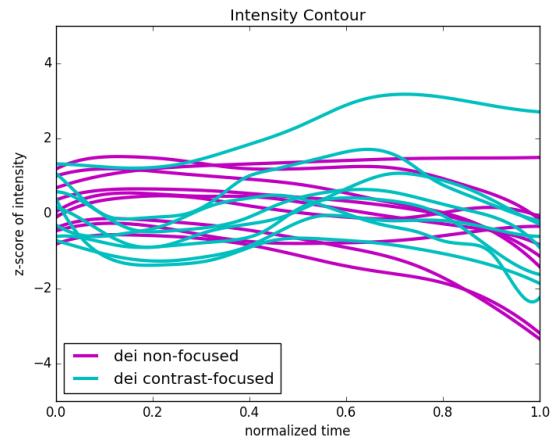


Figure 5: [dei]
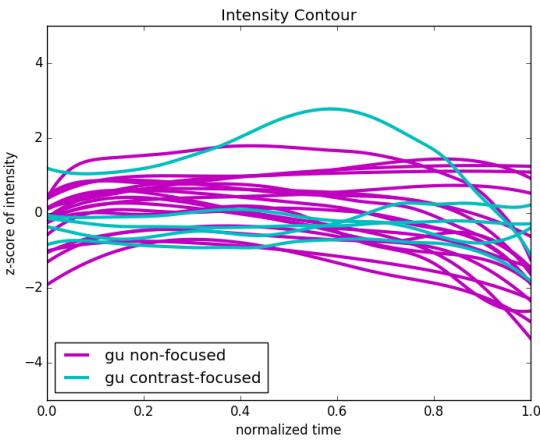
Figure 6: [gu]



Figure 7: [ɬam]



Figure 8: [ɬei]
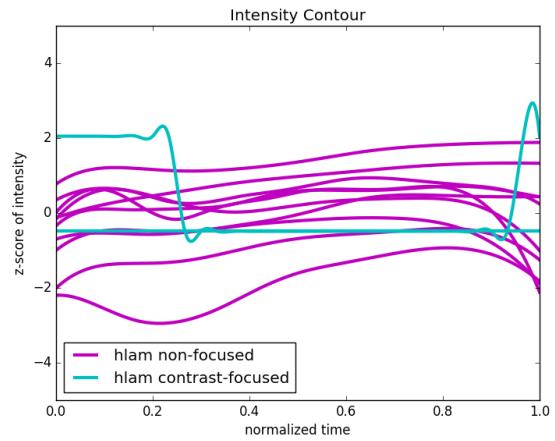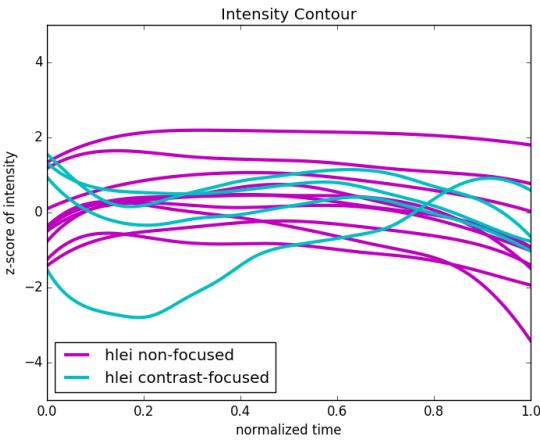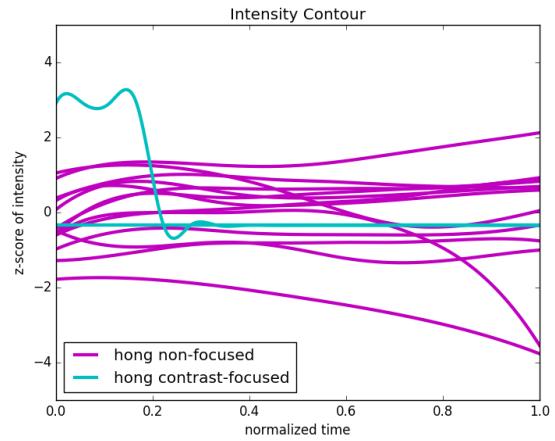


Figure 9: [hɔŋ]
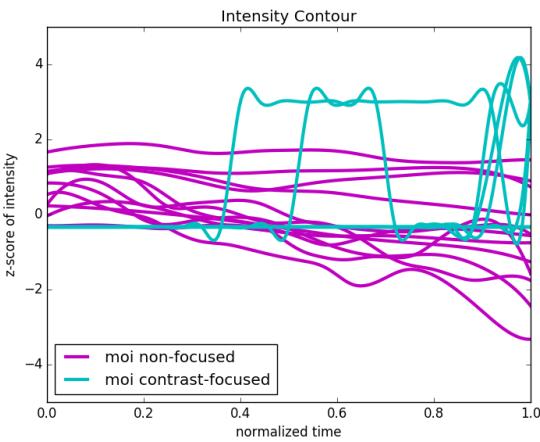


Figure 10: [moi]
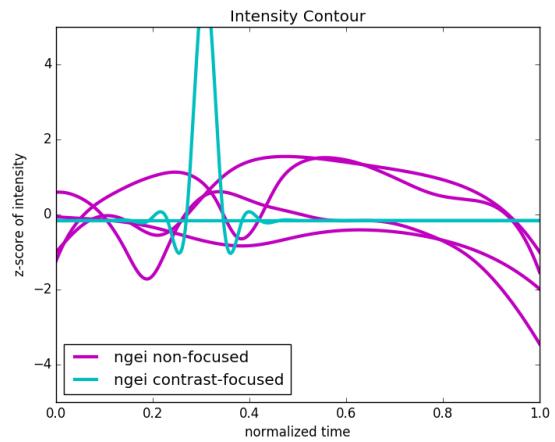


Figure 11: [ŋei]
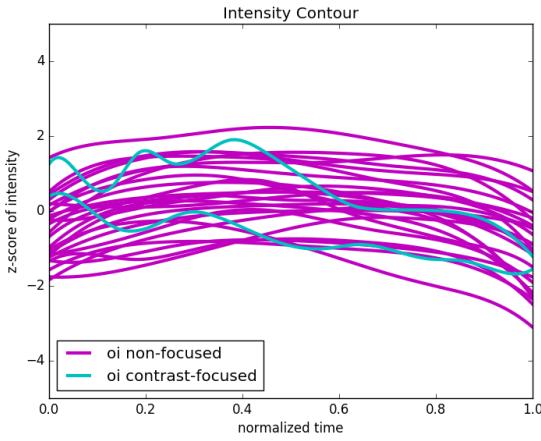
Figure 12: [oi]
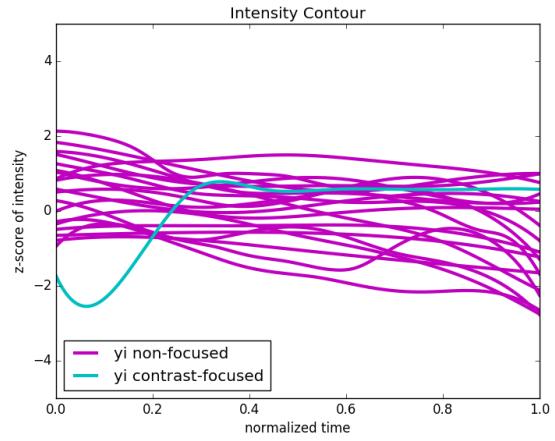


Figure 13: [ji]

For some morphemes, like [ɬei], the intensity contour is has an impressionistic difference. For others like [gu], the intensity contours are virtually the same across the two conditions.

Figures 14-23 show the values for tone in the same format.
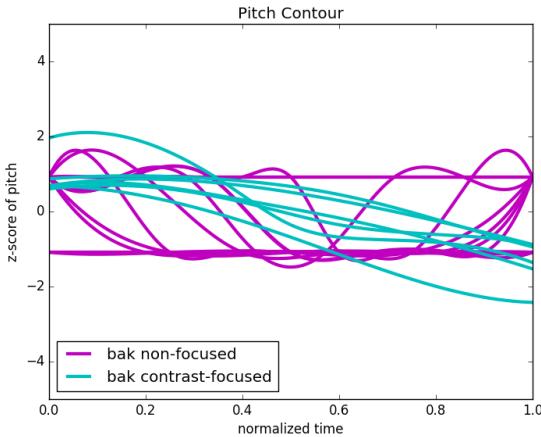


Figure 14: [bɑk˺]
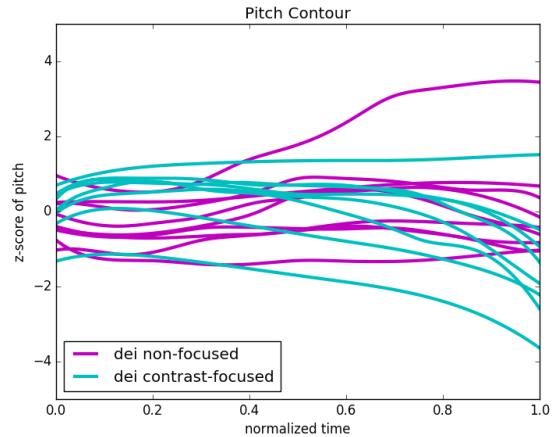


Figure 15: [dei]
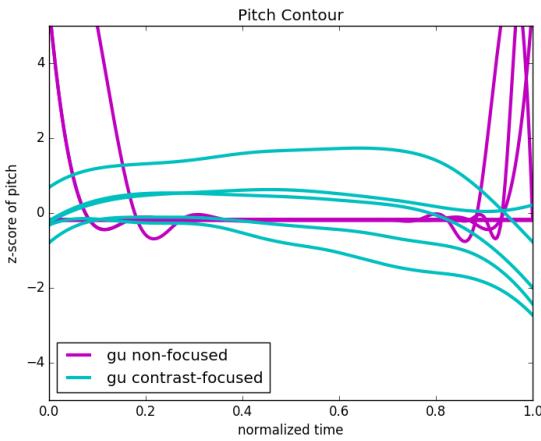
Figure 16: [gu]
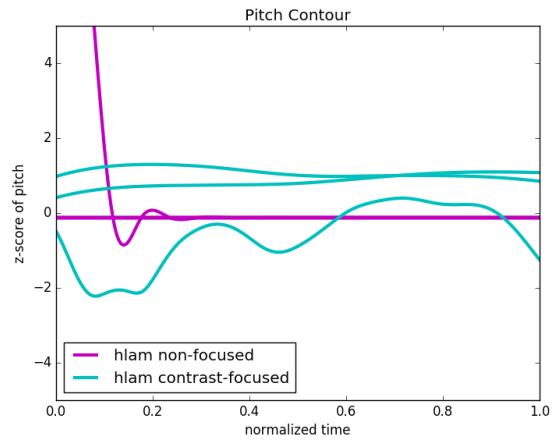


Figure 17: [ɬam]
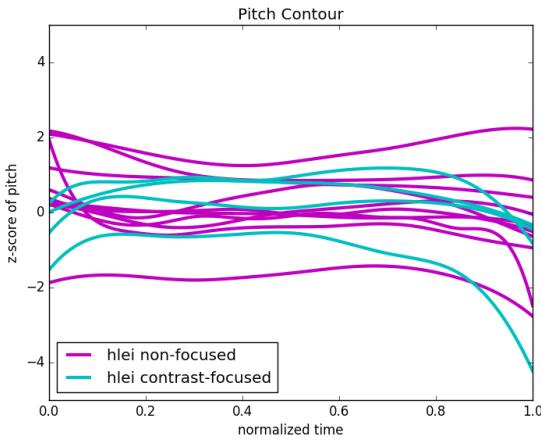


Figure 18: [ɬei]
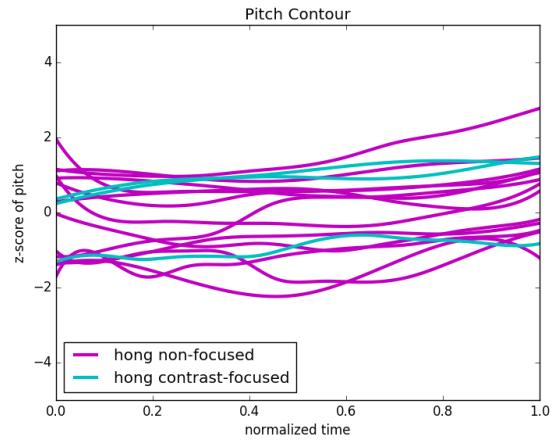


Figure 19: [hɔŋ]
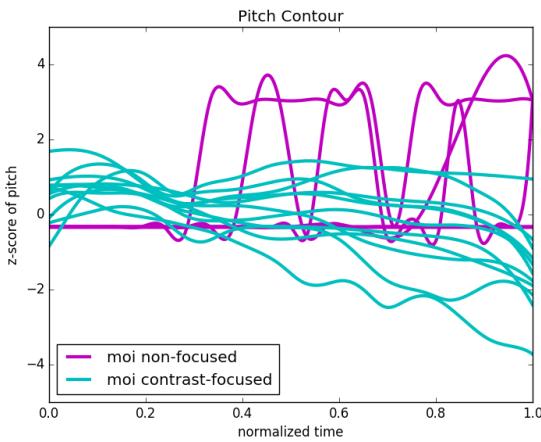


Figure 20: [moi]
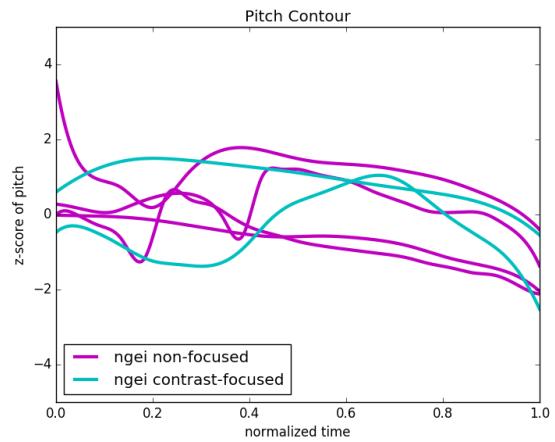


Figure 21: [ŋei]
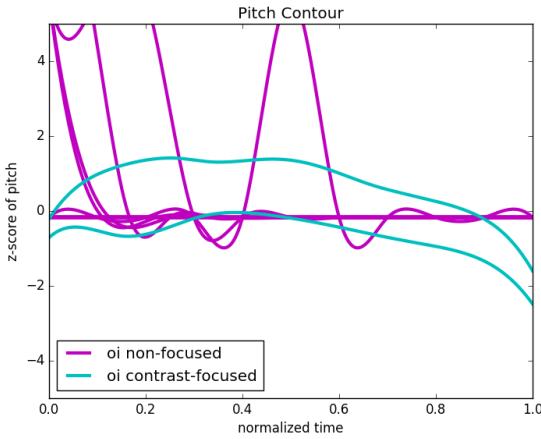
Figure 22: [oi]
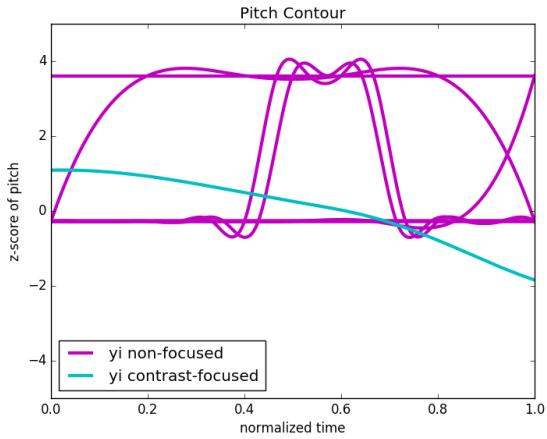


Figure 23: [ji]

Again, we see that for pitch, the contrast-focused samples have a qualitatively different contour, but there isn't a systematic relationship to be found between tone contour and focus.

# 5   Conclusion

This study set out to determine whether changes in tone, duration, or intensity could serve as acoustic measures of contrast focus in Taishanese. Unfortunately, the data does not support any sort of pattern in this respect, and the null hypothesis cannot be rejected. Moving forward, I hope to rework this experiment to include a large sample size, with greater limitations on the influence of the researcher on the subjects' speech.

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