

The effects of musical experience and training on the perceptual learning of Japanese pitch accent by Italian native speakers

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Abstract

My PhD study mainly aims at examining whether musical training and experience have any effects on the perceptual learning of Japanese pitch accent by native speakers of Italian with no prior knowledge of Japanese. Since high variability phonetic training (HVPT) is effective for learning Japanese pitch accent, I adopted it with two experimental variations: two categories of participants (musicians and non-musicians) further subdivided into two groups based on training input types (high and low variability). So far, I have conducted one online pilot experiment with HVPT for non-musicians, for whom training was effective, especially with low variability input. I conclude by providing a roadmap of future experiments and discussing the implications of this study for language teaching.

Index Terms: speech perception, pitch accent, Japanese, music, high variability phonetic training (HVPT)

1. Research motivation

Pitch is used not only in speech but also in music [1]. A considerable amount of literature has been devoted to examining whether musical training and/or experience facilitates the perception of linguistic pitch, for example [2], [3] and [4]. However, not many studies have investigated the effects of musical training or experience on lexical tone learning, and none investigate the effect of musical training or experience on Japanese lexical pitch accent learning.

Prior studies have obtained mixed results regarding the effect of musical training and/or experience on lexical tone learning with Mandarin Chinese, Cantonese, and synthesized stimuli (e.g. [5], [6], [7], [8]). In [5] and [6], musicians and non-musicians performed in a similar way after linguistic perceptual training. On the other hand, in [7] and [8], musicians outperformed non-musicians. Furthermore, [9] showed differences in the ability to discriminate lexical Thai tone between musicians based on absolute pitch. It would thus be interesting to further investigate the effect of musical training, experience, and absolute pitch on learning of the Japanese pitch accent.

With respect to perceptual learning, seminal studies [10] and [11] demonstrated the effectiveness of HVPT, i.e. “perceptual training [...] in which the auditory training stimuli include numerous samples, produced by multiple talkers, in varied phonetic contexts” [12, p. 209], and were followed by a lot of corroborating research. Studies [13] and [14] also found positive effects for HVPT in Americans with no prior experience learning Japanese pitch accent.

However, it is worth mentioning that the benefits of HVPT may be uneven for participants [15]. For instance, [16] and [17] showed that exposure to high variability (HV) input,

specifically with stimuli recorded by multiple talkers, was only beneficial for individuals with strong perception abilities.

To my knowledge, no one has examined whether HVPT has an effect on the perception of Japanese pitch accent by musicians compared to non-musicians, or whether HV input is more effective than low variability input (LV: stimuli recorded by a single talker) on perceptual learning of Japanese Pitch accent.

To fill these gaps, my PhD project aims primarily at examining whether musical training and experience have any effect on HVPT of Japanese pitch accent in native speakers of Italian with no prior knowledge of Japanese. With respect to the training, participants will be divided into two groups based on input types: HV input and LV input.

The reason I chose Italian native speakers as my experimental subjects is that Italian is very different from Japanese in terms of the accent system: Italian has stress accent, not lexical pitch accent [18]. It can be imagined that native speakers of Italian have difficulty identifying Japanese lexical pitch accent and it would be interesting to investigate whether the effectiveness of HVPT found in [13] and [14] for English native speakers is applicable to native speakers of another non-tonal language (Italian). I also aim to examine the possible effects of musical training and experience with HPVPT in these subjects.

There are four research questions.

- Do musicians outperform non-musicians in identifying Japanese pitch accent?
- After training, does the difference between the two groups decrease or increase?
- Is there any difference in the ability to identify Japanese pitch accent between musicians with absolute pitch and those without absolute pitch?
- Is HV input more effective for Italian musicians compared to non-musicians?

2. Methodology

2.1. HVPT experiment on Japanese pitch accent

The methodology is mostly based on [13] and [14]. The experiment consists of five phases (Table 1).

Table 1: *Five phases of the HVPT experiment.*

Phase	Session	Day	Duration (min)
1	Pretest	1	22
2	Training	1	20
		2	20

		3	10
3	Posttest (same as the Pretest)	3	22
4	Generalization test 1 (Gen-1) (Novel stimuli, familiar talker)	3	22
5	Generalization test 2 (Gen-2) (Novel stimuli and talker)	3	22

Three-alternative forced-choice identification tasks are administered in all phases, but feedback is given to participants only in the training phase.

There are three novel points compared to [13] and [14]:

- There are two categories of participants: musicians and non-musicians. (A third category, musicians with absolute pitch, will be added depending on the results of the absolute pitch test.)
- Further subdivision into two groups in the training phase: HV input group and LV input group.
- Online experiment using Gorilla software [19] (the original studies were conducted in a laboratory).

The stimuli are the same as in [13] and [14], i.e. seven Japanese sentences containing 36 target words, consisting of 12 triplets of words of the same phonemes but carrying one of three pitch patterns (1st-syllable accented, 2nd-syllable accented, and unaccented). The stimuli were recorded by six native Japanese talkers: three women and three men (recorded in wav form, Sampling rate: 44100 Hz, signed 32-bit PCM).

2.2. Absolute pitch test

This is mostly a replication of [20], [21] and [22]. The aim of this test is to identify musicians with absolute pitch.

Specifically, musicians who participate in HVPT experiment will be asked to listen to synthesized musical tones of three timbres (pure tone, piano, and classical guitar) and to identify the notes in the absence of a reference pitch.

3. Discussion of results so far

Pilot HVPT experiment was conducted with only four non-musicians as participants, two of which received HV input, while the other two received LV input. I piloted the experiment in this way in order to troubleshoot before adding the absolute pitch test. This was deemed necessary because in [13] and [14], training was conducted in a laboratory whereas my experiment is going to be conducted remotely using the Gorilla software.

Figure 1 shows mean scores for the pilot experiment, where the score was awarded for pitch accent identification accuracy. Posttest and generalization tests' scores are all higher than the pretest score. Gen-2 is worse than Posttest and Gen-1, but it was conducted with novel stimuli and talker. Training thus had a positive effect. Figure 2 illustrates score progress of each participant.

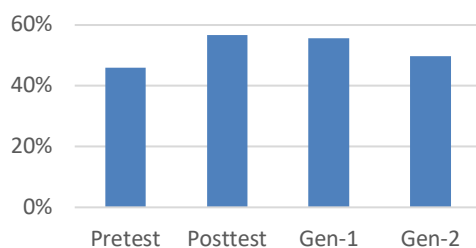


Figure 1: Participants' mean score.

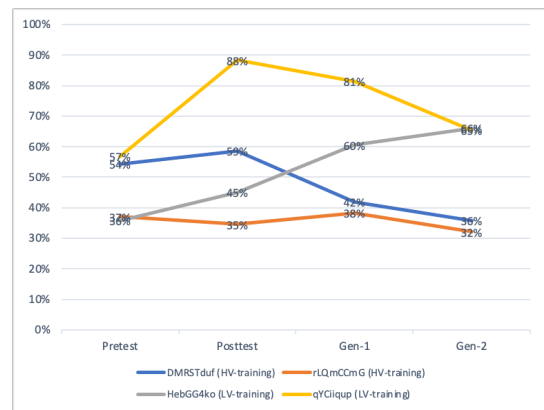


Figure 2: Score progress of each participant.

Three participants performed better in the posttest than in the pretest. But the two LV input group participants (grey and yellow) improved more than the two HV input group participants (blue and orange).

Taking the number of participants into account, this result cannot be generalized, but it is interesting that LV input was more effective than HV input for the non-musicians.

The absolute pitch test is yet to be completed.

4. Future work and road map

As far as HVPT experiment goes, the pilot study revealed that HVPT works online without any serious problems, so I will have to conduct the extended pilot experiment including musicians to see whether Gorilla can automatically activate the additional absolute pitch test for the musicians as identified by an initial questionnaire to all participants. As soon as I finish preparing the absolute pitch test, I will combine it with the HVPT experiment in order to conduct the extended pilot experiment, and then I will conduct the experiment proper.

5. Contributions of this research

Firstly, this study will contribute a novel aspect to the HVPT research literature by clarifying the effect of musical training and experience on HVPT for Japanese pitch accent.

Secondly, with respect to the implications for language teaching, if this project shows an effect of musical training/experience, this could be exploited when teaching pronunciation. By and large, many teachers do not attach importance to pronunciation aspects in their Japanese classes owing to shortage of time and adequate textbooks. However, acquisition of pitch-accent contrasts is important for second language learners of Japanese due to the distinctive and culminative-delimitative function of these contrasts [13]. Therefore, when we teach Japanese pronunciation, it would be useful to form classes according to learners' individual levels of musical experience/training in order to teach them in a more effective way. Also, if music can affect Japanese accent perception, it might be possible that Japanese songs would be a help to teach/learn Japanese pitch accent. In a future study, I would like to investigate whether songs help learners with Japanese pitch accent perception.

6. References

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