THE PITCH ANALYSIS OF IMPERATIVE SENTENCES IN STANDARD CHINESE

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ABSTRACT

The present study investigates the intonational pattern of imperative sentence, especially those having intensive mood, such as ordering and forbidding in Standard Chinese. Grouping the sentences by length and focusing on the fundamental frequency, this paper tries to provide a description of pitch patterns of Chinese strong imperatives. Comparing to the declarative sentence, the pitch contour of the imperative sentence with strong mood is wholly raised, where the sentence stress rises more seriously, and the pitch range is compressed. The raising phenomenon has nothing to do with tonal differences or length of the sentence. The strong mood even changes the third tone to a rising tone when it is at the sentence final or in a one syllable sentence.

Index Terms— pitch, imperatives, strong imperatives, fundamental frequency

1. INTRODUCTION

Previous study of Chinese imperative sentence mainly discusses the classification of the imperative mood, e.g., according to the meanings and functions in the communication Fan [1] divides the imperative sentences into thirteen types, specifically, ordering, forbidding threatening, and joking etc. For the study of the intonation pattern of Chinese imperative sentence, Gao Meishu[2] assumes that the bottom line of imperative sentences forms a convergence pattern and bears a small fluctuation, the low point of the bottom line shows higher pitch register than the corresponding statements. Furthermore, Fang J. [3] points out that, mood is shown through intonation, stress, verb and auxiliary. When expressing direct and strong commanding, intonation is relatively low.

Although the above analysis has reported the functional classification and phonetic analysis of imperative sentences on some aspects, systematical investigation of pitch patterns of imperative sentences with different tonal combinations and various numbers of syllables have far from been clearly stated. Therefore, the present research aims to find some regulations of the intonation pattern of Chinese imperative sentences, especially the pitch pattern of the strong imperative sentences with ordering and forbidding moods

being involved. These sentences are also constructed with various tonal combinations and sentential lengths.

2. DESIGN OF THE ACOUSTIC EXPERIMENT

2.1. Aim and scope

The design of the study is to find out the intonational regulations, especially the pitch aspect of Chinese strong imperative sentences by conducting acoustic analysis with the fundamental frequency (F_0) as the parameter.

2.2. Methodology

2.2.1 Stimuli

The stimuli are strong imperative sentences and their corresponding declarative sentences. For the sake of comprehensiveness, such elements as the number of Chinese syllables, tones, and syntactic structures have been taken into consideration. According to different number of Chinese characters, four groups have been divided, from mono to four. Moreover, except for the mono-syllabic word, within each group several common syntactic structures have been taken into consideration. All together 611 sentences serves as the final stimuli of recording.

2.2.2 Subjects

Four native Chinese who major in broadcasting, aged 20-26, were invited as subjects. Two were female, two male.

2.2.3 Recording procedure

Recording was conducted in a sound-proof booth at the phonetics Laboratory in the Chinese Academy of Social Sciences. The subject was seated comfortably in front of a computer monitor that was controlled by an outside computer. The microphone (C4000B) was placed by the side of the monitor, approximately 1 foot away from the subject's lips. In each trial, the outside experimenter pressed the "Next" button displayed on the screen and the target sentence was displayed on the screen. In case of any mistake, the subject was asked to repeat the sentences. All sentences appear twice in the material list. They were recorded and saved directly into computer through sound recording software CASSRecorder as "wav" file.

2.2.4 Perceptual experiment

After recording, in order to make sure the accuracy of the original research material, a perceptual experiment has been conducted in Tianjin Normal University. Eleven college students from northern area of China were chosen as subjects. Their task was to judge sentence types through listening. In order to reduce the amount of data, only 240 sentences (60 declarative sentences and their corresponding strong imperative sentences from two speakers) were chosen randomly as the stimuli for the perceptual experiment. For each sentence, the subjects were given four choices, declarative, interrogative, strong imperative and exclamation. With the help of a perceptual program, the answers were automatically recorded as text-files into the computer. After checking, the sentences with the accuracy above than 85% were selected as the final stimuli for annotating.

2.2.5 Annotation and data extraction

Data annotation was conducted through the program of Praat (<http://www.fon.hum.uva.nl/praat/>). Speech was first labeled by automatic segmentation software, and then the syllable boundaries were modified manually. Before extracting the data, the manual refinement of the pitch tier was conducted in order to ensure the accuracy of the data. The F_0 values were extracted by a Praat script with 10 sampling points for each syllable. SPSS was used to get the means of F_0 and the One-Way ANOVA (extracting both low point and high point of each syllable for each sample) has been conducted to examine the differences of the maximum and minimum values of each syllable.

3. PHONETIC REALIZATION

The phonetic realization of the strong imperative sentence will be investigated with fundamental frequency (F_0) as parameter. Specifically, this part examines two aspects of the effect upon F_0 pattern of strong imperative sentence through comparing with the corresponding declarative sentence. They are 1) the manner of effect, specifically taken to mean *rising* or *lowering* of F_0 by imperative mood, and 2) the condition of effect, which means whether the lowering or rising imposes the effect on *H* or *L* tones. The fundamental unit we apply to describe these effects is the underlying tonal feature of each syllable, H or L following Yip [4]. So for the tonal features of the four citation tones of SC are, HH for tone 1, LH for tone 2, LL (H) for tone 3 and HL for tone 4; specifically, we render each syllable separately to divide it into its original tones and in this manner to observe the performance, rather than deal with a single syllable as the descriptive unit.

Monosyllabic group

Figure 1 shows the pitch contour of the syllable “Chi1” (Eat!) in both declarative and imperative sentence. The pitch range of the declarative sentence is around 13 ST, and that of the strong imperative one is 15-17 ST. Fig.2 is the F_0 contour of the syllable “Pei2” in both declarative and strong imperative sentences. The pitch range of declarative

sentence is 7 ST (6- 13ST), and that of the strong imperative one is also 7 ST (9-16) ST.

Figure 1 F_0 means of “Chi1 (HH)” (Eat!)

Figure 2 F_0 means of “Pei2 (LH)” (Pay for it!)

From Figure 1, it is demonstrated that the H tones of syllable “Chi1” are higher in imperative sentence than in the declarative one. Specifically, the two H tones of the syllable rise obviously. The raising phenomenon of the pitch contour is obvious. It can be shown as $HH \rightarrow H^{\wedge} H^{\wedge}$ (“ $\wedge$ ” stands for pitch register rising). Results of One-way ANOVA demonstrate that the pitch range of “Chi1” is significantly influenced by imperative mood, specifically, $P_{max}=0.00$ and $P_{mix}=0.00$.

Fig.2 is the F_0 contour of the syllable “Pei2” in both declarative and strong imperative sentences. The pitch range of declarative sentence is 7 ST (6- 13ST), and that of the strong imperative one is also 7 ST (9-16) ST. It can be shown as $LH \rightarrow L^{\wedge} H^{\wedge}$. From Figure 2, it is assumed that the rising tone of strong imperative sentence is relatively higher than the declarative one. And in the latter part of the syllable, there is a tendency of rising more significantly. Thus, the H tone of the syllable “Pei2” observes greater magnitude of rising. It can be shown as $LH \rightarrow L^{\wedge} H^{\wedge}$. Results of One-way ANOVA demonstrate that the pitch range of “Pei2” is significantly influenced by imperative mood, specifically, $P_{max}=0.00$ and $P_{mix}=0.00$.

Figure 3 F_0 means of “Gun3 (LL (H))” (away!)

Figure 4 F_0 means of “Fang4 (HL)” (Go (Let go!))

On the whole, the pitch of strong imperative sentence is higher than the declarative one. Specifically, the pitch of declarative sentence shows the regular contour tendency of Tone 3, first falling and then rising. It is a typical realization of Tone 3 in citation form. On the other hand, the pitch of strong imperative sentence presents a tendency of rising only, similar to the rising Tone 2, but not the same. By observation, declarative sentence keeps the tendency of a contour Tone 3, first falling and then rising. However, the strong imperative sentence shows the tendency upward to a rising tone. It can be shown as $LLH \rightarrow L^{\wedge} L^{\wedge} H^{\wedge} \rightarrow L^{\wedge} (L^{\wedge}) H^{\wedge}$. Results of One-way ANOVA demonstrate that the pitch range of “Gun3” is significantly influenced by imperative mood, specifically, $P_{max}=0.00$ and $P_{mix}=0.00$.

In the above Figure 4, comparing with the syllable “Chi1” which has H tone only, the syllable “Fang4” has two tonal

targets, namely, H tone and L tone. The starting point of the H tone of “Fang4” is higher in imperative state, and the effect of the imperative can spread to the very end of the syllable. The pitch range of the declarative sentence is 12 ST (4-16ST), and that of the strong imperative one is 11 ST (9-18 ST). The raising phenomenon of the pitch contour is obvious. It can be shown as $HL \rightarrow H^{\wedge} L^{\wedge}$. Results of One-way ANOVA demonstrate that the pitch range of “Fang4” is significantly influenced by imperative mood, specifically, $P_{\max}=0.00$ and $P_{\text{mix}}=0.00$.

Figure 5 is a picture of four tones with both declarative and corresponding strong imperative forms. Pitch rising can be clearly observed from the above figure, upper tonal register rise 2 ST and lower tonal register rises 5 ST. Furthermore, the compressing phenomenon is also obvious, 12 ST (4-16ST) for declaratives and 9ST (9-18ST) for imperatives

Figure 5 F_0 means of all the four tones (left panel is declarative, and right panel is strong imperative.)

By comparing the pitch registers of both declarative and imperative sentences in the Figure 5, the whole register of the four tones observes significant rising in the imperative mood, upper tonal register rise 2 ST and lower tonal register rises 5 ST. Furthermore, the compressing phenomenon is also obvious, 12 ST (4-16ST) for declaratives and 9ST (9-18ST) for imperatives

Disyllabic group

Disyllabic group contains 16 tonal combinations (excluding neutral tone). Due to the space limitations, only a few of them would be discussed which covering H and L tones for the first and second syllables.

Fig. 6 is the pitch contour of “Chuan2 Zhong1”, a LH+HH disyllabic combination, in both declarative and strong imperative sentences. The pitch range of the declarative sentence is 8 ST (7- 15ST), and that of the strong imperative one is 7 ST (10-17 ST). The raising phenomenon of the pitch contour is obvious.

Figure 6 F_0 means of “Chuan2 Zhong1” (Pass it to the middle!)

As a whole, the pitch register of the strong imperative sentence is obviously higher than the one of declarative sentence. Specifically, the starting point and the ending point of the L tone and H tone of “Chuan2” are raised obviously. For the second syllable, the pitch changes of the first H tone is more significant than the corresponding second H. The result of a previous perceptual experiment shows that to most testees (9 of 10), the second syllable

bears the pitch accent of the two. Thus, the reason for the unparallel rising is pitch accent. Results of One-way ANOVA demonstrate that the pitch range is significantly influenced by imperative mood, specifically, $P_{\max}=0.0005$ and $P_{\text{mix}}=0.0005$.

Figure 7 is the pitch contour of “Ta1 Qv4”, a tonal combination of HH+HL. Both declarative and strong imperative have been presented in the following picture. The pitch range of the declarative sentence is 15 ST (0-15ST), and that of the strong imperative one is 14 ST (4-18 ST). The raising phenomenon of the pitch contour is obvious.

Figure 7 F_0 means of “Ta1 Qv4” (Let he go!)

Comparatively speaking, in strong imperative sentence, the starting point and ending point of the first syllable are raised higher than those of the next HL syllable. And it is clear that the overall pitch contour of declarative sentence is lower than that of the strong imperative one. The result of a previous perceptual experiment shows that to all testees (10 of 10), the first syllable bears the pitch accent of the two. Thus, the reason for the unparallel rising is pitch accent. We conduct One-way ANOVA to examine the differences of the maximum and minimum values of the phrase “Ta1 Qv4” in imperative and declarative mood. Results demonstrate that the pitch range of it is significantly influenced by imperative mood, specifically, $P_{\max}=0.00$ and $P_{\text{mix}}=0.00$.

In the disyllabic group, pitch rising can be clearly observed from the above figures, and pitch range is compressed. Because of the pitch accent, two syllables rise differently.

Tri-syllabic group

Along with the increasing of the number of characters, types of tonal combination also diversified. Theoretically, there should be at least 60 types of tonal combinations. However, due to the time and material limitations, only several would be discussed in this part.

Fig. 8 is the pitch contour of “Ben4 (HL) dong1 (HH) bian_r0” in both declarative and strong imperative sentences. The pitch range of the declarative sentence is 10 ST (7- 17ST), and that of the strong imperative one is 9 ST (10-19 ST). The raising phenomenon of the pitch contour is obvious, and for the sake of clarity, be divided into five degrees. Results of One-way ANOVA demonstrate that the pitch range is significantly influenced by imperative mood, specifically, $P_{\max}=0.00$ and $P_{\text{mix}}=0.00$.

Figure 8 F_0 means of “Ben4Dong1Bian_r0” (Go eastwards!)

Generally speaking, comparing with the declarative sentence, the pitch register of the strong imperative sentence is an entire rising. As for the first HL syllable, it almost keeps a 3-ST paralleled rising from the starting point until the ending point. The pitch contour of the second HH syllable has a dramatic rising with the pitch changes of the first tone H being much more significant. The pitch rising of the last syllable is comparatively lower for being a neutral tone it is another case. One-way ANOVA test has been conducted to examine the differences of the maximum and minimum values of the phrase “Ben4 (HL) dong1 (HH) bian_r0” in imperative and declarative mood. Results demonstrate that the pitch range is significantly influenced by imperative mood, specifically, $P_{\max}=0.00$ and $P_{\min}=0.00$. The result of a previous perceptual experiment shows that to most testees (9 of 10), the second syllable bears the pitch accent of the three. Thus, the reason for the unparallel rising is pitch accent. Within this research, only 4 tones have been taken into consideration. Therefore, no more detailed description would be given to the last syllable.

Quad-syllabic group

With more characters, there are more diversified tonal combinations in this group, which is followed by more complicated phenomenon. Therefore, in order to keep the purity of research questions, there will not be much detailed discussion as the previous groups.

Figure 9 shows the pitch contours of “Quan2 Ti3 Qi3 Li4” in both declarative and strong imperative sentences. The pitch range of the declarative sentence is 16 ST (0-16ST), and that of the strong imperative one is 11 ST (7-18 ST). One-way ANOVA test has been conducted to examine the differences of the maximum and minimum values of the phrase “Quan2 Ti3 Qi3 Li4” in imperative and declarative mood. Results demonstrate that the pitch range is significantly influenced by imperative mood, specifically, $P_{\max}=0.00$ and $P_{\min}=0.00$.

Figure 9 F_0 means of “Quan2 Ti3 Qi3 Li4” (Everyone stands up!)

Clearly, the pitch register of the strong imperative sentence has a wholly rising when comparing to the declarative sentence. Close examination of the figure shows that the starting point and ending point of the first syllable in strong imperative sentence is higher than those in the declarative sentence, but not that dramatically rising as the second syllable. As for the third syllable, theoretically, there should be a rising part at the end of the syllable. However, in citation forms or simultaneous speech, Tone 3 usually loses the latter rising part. This phenomenon has also been testified in the strong imperative sentence. The last two syllables keep a paralleled rising from the starting point to the very end. The result of a previous perceptual experiment shows that to most testees (9 of 10), the last syllable bears

the pitch accent of the four. Thus, the reason for the unparallel rising is pitch accent. Moreover, the tone 3 in this phrase shows a different change from the one in mono-syllabic group.

4. CONCLUSION

Comparing to the declarative sentence, we got some observations for imperative sentence with strong mood. (1) The pitch contour of the strong imperative sentence is wholly raised, in particular, no matter tone differences they are raised significantly. And the raising phenomenon has nothing to do with tonal difference or length of the sentence. (2) Except for pitch rising, the pitch range is also compressed in the strong imperative sentences. (3) The syllable with highest pitch in declarative sentences always remains highest in strong imperative sentences. And the pitch accents remain the same. (4) Imperative mood induces more obvious influence on the F_0 locating at the accent-bearing position. (5) Tone3 will change to tone2 when the strong imperative mood dwells on the accented mono-syllabic tone3 syllable or the accented sentence-final tone3 syllable.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

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