Use Chi-square Test to Seek Linguistic Typology Implicational Universals about Tone of Languages in Chinese Mainland

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Keywords: Tone Type, Language, Dialects, Implicational Universals, Chi-square Test.

Abstract. This article based on the Chinese mainland in the 345 kinds of languages and dialects (including the minority national language, Chinese and their dialects). Author collate and conduct research typology. Based on the principle of Greenberg, but propose to use chi-square test method to study implicational universals between some representatives tone type, at last, the article draw some conclusions.

Introduction

This paper includes the study of Chinese dialects and minority languages. Earlier research on the typology of the main tone Ian Maddieson’s papers named "Universals of Tone" and Moira Yip's book named "Tone" and so on. In her paper, Ian Maddieson considered that one language have five flat tone at most. In tonal languages, the more level tones, the greater the occupied areas of the pitch will be. Mid pitch is the common on the contrary, high pitch is not common. He also believes that if there is tortuous tone in a language, then there also will be flat tone. In her book, Moira Yip think that if there are only two tones in some languages, often two opposing flat tone, rather than a rise and fall of the tone type. She also said that in a language, the phenomenon of the high low (HL), mid low (ML), high mid (HM) types demotion existence is rare. Mr. Luo Anyuan’s book named "Chinese Language tone Overview" Research on Chinese territory tone language monographs (Ethnic Publishing House, 2006) and so on. He believed that tone can be divided into single tone and complex tone. Single tones have only one tone value, and complex tones are make up the value of two or more tone values. Tortuous tune can be divided into three forms: gradually sliding, jumping crossing type and the mid stop type. He believes that the language in China, only a tone value of 214 in La Jia language tune tune (such as "tøq214 Cave") is part of the stop-style, is a complex tone, both with glottal and a brief pause. Mr Lu used software to measure the argument. Professors. Liu Lili research on Chinese tones as well as Mr Lu. Her book named "Chinese Tone Study" (Nanjing Normal University Press, 2004). The book has reviewed the 20th century Chinese tones case studies, but it hasn’t given up booklist about the research of Chinese Tone in the 20th century at the end of the book. Mr. Guo Jinfu also has study Chinese tones base on the perspective of the overall experimental phonetics. His book named "Chinese tone and intonation explore" (Beijing Language and Culture College Press, 1993). Mr. Xin Shibiao studied the tones of Chinese dialects comparative, too. His book named" A Comparative Study of language tones southeast in China" and so on.

This article summarizes 345 kinds of languages and dialects in Chinese mainland, with some representation. Implicational universals implies an important concept in linguistic typology, it has rich content, in general, it is to explore the intrinsic relationship between certain language features. Currently, the authors have not seen a similar study overall tone about the languages and dialects in chinese mainland.

Material Source

Maybe some scholars doubt the reliability typological research material, so the material collected
in this article, are only part of the paper collected papers on core journals, books are only part of the authority to select the national language publishers, then it as much as possible to ensure that the referenced material accuracy of the description language or dialect.

1. Paper materials are from the journal "Fang Yan", "Minzu Yu Wen", "Studies in Language and Linguistics", for example: Huang Xiaodong "Linhai Dialect"; Dai Qing Xia, Li Jie "Le Pragmatic General", Deng Haifeng "Hunan dialect Xin Tian Sha Tian Voice Characteristics" such as more than one hundred papers, due to space limitations, not individually listed.


It is noted that this study only the word of the tune, because Tone Sandhi more complex, due to objective conditions, not involved.

Selection Criteria:
Chinese dialects each including a large dialect, and several dialects times dialect income, while the national language is based on "Chinese language" directory, combined with Jiang Zhi and Ju Namkung series "Phonological Inventories of Tibeto-burman Languages" (The Regents of the University of California, 1996), combined with reports of each language papers, including dialects of all ethnic language groups.

Some people might ask, for a variety of investigative materials, how screening? Author’s screening principles as follow:

1. The same place when there is a language or dialect survey materials to repeat, select the latest survey materials.

2. The same place when there is a language or dialect survey materials to repeat, but a considerable period of time, choose a relatively detailed description of equipment.

3. Various languages investigation materials, complement each other.

Seeking the Implicational Universals by Chi-square Test

In this context, the introduction of mathematical statistics, independence chi-square test in the way of attempts to authors in another paper, the introduction of independent chi-square test methods using SPSS (Statistical Product and Service Solutions) software for mathematical statistics inspection, as this approach to test whether the correlation between two or more elements. There may be a question: hypothesis testing data processing requirements for multi-continuous data, why is that it is available in this chi-square test? To be noted that there are three kinds of chi-square test were no difference assuming chi-square test, chi-square test assuming a normal distribution and independence chi-square test, chi-square test of independence which is for count data, the so-called count data refers to data obtained by enumeration, such as a group of students to get out of the statistical quantity. Perhaps it was the question: with the assignment approach, the resulting data is not necessarily render normal, why can chi-square test? In fact, this paper, chi-square test of independence assumption, the object does not have to comply with the applicable normal.

Measure: If the existence of a language or dialect of the tone type, that is, to assign one, otherwise assign 0 to the last after all the assignments completed, respectively, of the total number of statistical value, then the chi-square test.
Such as:
1. If the same tone type appears twice in the language or dialect, or more than twice as Qinghai Ledu Dialect type of tune up tune appears twice, adjusted values were 13, 34, on assignment, only Qinghai Ledu dialect to tune up the assignment in this column is 1, the other similar case is also handled like this.

2. No longer falling tone down subdivided into high, medium drop, low-down, etc., because of falling tone is more common in various languages or dialects, and the same language or dialect is often at the same time there are several falling tone, and taking into account rising and falling tone may occur due to various investigators, such as differences in the sense of hearing large error, so this is no longer subdivide.

3. For the tortuous tune, the authors were divided they into falling rising tone, falling flat tone, rising flat tone, flat falling tone, flat rising tone, rising falling tone.

After the assignment was: low flat tone A133 B212, mid flat tone A207 B138, high flat tone A284 B61, rising tone A297 B48, falling tone A326 B19, falling-rising tone A72 B273, falling flat tone A7 B338, rising flat tone A2 B343, flat falling tone A8 B337, flat rising tone A15 B330, rising falling tone A29 B316, and fall flat tone, flat tone, flat falling tone, flat rising tone, rising falling tone assignment obtained totality are less than 30, taking into account to achieve a certain number, get out before reliable conclusions, it is discarded.

So these are some testing about low flat tone, mid flat tone, high flat tone, rising tone, falling tone, falling rising tone six kinds of tone:

The first group

**Low Flat Tone and Mid Flat Tone**

Hypotheses:
The emergence of low flat tone isn’t relate to the emergence of mid flat tone in the H0
The emergence of low flat tone is relate to the emergence of mid flat tone in the Hα

Treatment of spss as follows:

<table>
<thead>
<tr>
<th>Cases</th>
<th>Valid</th>
<th>Missing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
<td>N</td>
</tr>
<tr>
<td>low flat tone * mid flat tone</td>
<td>345</td>
<td>100.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

**Low Flat Tone * Mid Flat Tone Crosstabulation**

<table>
<thead>
<tr>
<th>mid flat tone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>exist</td>
<td>86</td>
</tr>
<tr>
<td>without</td>
<td>121</td>
</tr>
</tbody>
</table>

| Total         | 207   | 345   |

33
Table 3. Chi-Square Tests.

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>1.960(b)</td>
<td>1</td>
<td>.162</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction(a)</td>
<td>1.656</td>
<td>1</td>
<td>.198</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>1.972</td>
<td>1</td>
<td>.160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisher's Exact Test</td>
<td></td>
<td></td>
<td></td>
<td>.176</td>
<td>.099</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>1.954</td>
<td>1</td>
<td>.162</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>345</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 53.20.

This is the chi-square test results table, and the related research, mainly to see the first line of "Pearson Chi-Square" final calculated chi-square (Chi-Square) value of 1.960. As pearson chi-square test was used for two-dimensional table row and column variables perform hypothesis testing independence. Degrees of freedom (df) is 1,1.960 , it is less than 0.05 level of significance table value 3.84, so it refuses to agree with that the emergence of low flat tone isn’t relate to the emergence of mid flat tone in the H0,but it receives that the emergence of low flat tone is relate to the emergence of mid flat tone in the Hα.

Conclusion: the emergence of low flat tone is relate to the emergence of mid flat tone.

The second group

**Low Flat Tone and High Flat Tone**

Hypotheses:
The emergence of low flat tone isn’t relate to the emergence of high flat tone in the H0
The emergence of low flat tone is relate to the emergence of high flat tone in the Hα

Treatment of spss as follows: "Pearson Chi-Square" final calculated chi-square value of 7.562, it is greater degrees of freedom (df) 0.05 1:00 significance level of table values 3.84, so it refuses to be agree with that the emergence of low flat tone is relate to the emergence of high flat tone in the H0,but it receives that the emergence of low flat tone isn’t relate to the emergence of high flat tone in the Hα.

Conclusion: the emergence of low flat tone isn’t relate to the emergence of high flat tone.

The third group

**Low Flat Tone and Rising Tone**

Hypotheses:
The emergence of low flat tone isn’t relate to the emergence of rising tone in the H0
The emergence of low flat tone is relate to the emergence of rising tone in the Hα

Treatment of spss as follows: "Pearson Chi-Square" final calculated chi-square value of 3.095, it is less than the degrees of freedom (df) 1:00 0.05 level of significance table value 3.84, so it refuses to be agree with the emergence of low flat tone isn’t relate to the emergence of rising tone in the H0, but it receives that the emergence of low flat tone is relate to the emergence of rising tone in the Hα.

Conclusion: the emergence of low-lying and rising tone appear relevant.

The fourth group

**Low Flat Tone and Falling Tone**

Hypotheses:
The emergence of low flat tone isn’t relate to the emergence of falling tone in the H0
The emergence of low flat tone is relate to the emergence of falling tone in the Hα
Treatment of spss as follows: "Pearson Chi-Square" final calculated chi-square (Chi-Square) is .107, it is less degrees of freedom (df) 1:00 0.05 significance level table values 3.84, so it refuses to be agree with that the emergence of low flat tone isn’t relate to the emergence of falling tone in the H0, but it receives that

the emergence of low flat tone is relate to the emergence of falling tone in the Hα.
Conclusion: the emergence of low flat tone is relate to the emergence of falling tone.

The fifth group

**Low Flat Tone and Falling Rising Tone**

Hypotheses:
The emergence of low flat tone isn’t relate to the emergence of falling rising tone in the H0
The emergence of low flat tone is relate to the emergence of falling rising tone in the Hα

Treatment of spss as follows, "Pearson Chi-Square" final calculated chi-square (Chi-Square) is .229, it is less degrees of freedom (df) is 1 .05 level of significance table value 3.84 , so it refuses to be agree with that the emergence of low flat tone isn’t relate to the emergence of falling rising tone in the H0, but it receives that the emergence of low flat tone is relate to the emergence of falling rising tone in the Hα.

Conclusion: the emergence of low flat tone is relate to the emergence of falling rising tone.

**Conclusion**

To see more clearly, the relevant conclusions are put together as follow:
1. the emergence of low flat tone is relate to the emergence of mid flat tone.
2. the emergence of low flat tone isn’t relate to the emergence of high flat tone.
3. the emergence of low-lying and rising tone appear relevant.
4. the emergence of low flat tone is relate to the emergence of falling tone.
5. the emergence of low flat tone is relate to the emergence of falling rising tone.

It can be find out something like these: During the 5 conclusions, 4 of them are concerned,1 of them aren’t unconcerned.
Concerned:
1. low flat tone and mid flat tone;2. low flat tone and rising tone;3. low flat tone and falling tone;4. low flat tone and falling rising tone;

Unconcerned:
low flat tone and high flat tone

Discussion: why do that low flat tone isn’t relate to high flat tone, however they are familiar in language. It need to be further studied.

**References**


