

A Frequency Statistics Research of Phoneme and Phoneme Constitutions in Hefei Dialect

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1. Introduction

Phoneme is a smallest phonetic unit which can distinguish the meaning of word in the language system. Different languages have different number and type of phonemes. Sino-tibetan languages are all syllable ways with single character and tone, initials, finals and tones as three main factors of phonemic system. One language is more than 100 phonemes, or less than 20-30 phonemes, the frequency, function and position of each phoneme are different in the language. Hefei dialect belongs to the Jianghuai mandarin language Hongchao dialects, from the point of listening and intonation, Hefei dialect is a typical mixed accent, tone is hard. Hefei dialect with tone features of north generosity, also have the south obscure pronunciation and words system, at the same time; it also retains a considerable number of ancient Chinese pronunciation and vocabulary based on the modern Chinese. Hefei dialect retains entering tones, which as the representative of the Jianghuai mandarin language. Previous research of Hefei dialect is mainly concentrated on the phonemic induction, difference evolution. 'The liaison and modified tone of Hefei dialect and the optimization theory analysis of trisyllabic sequences neutral tone', using the method of experimental phonetics and the latest theory of phonology are used to make description and phonetic system analysis on the two phenomena, a unified interpretation with principle has obtained. Results show that marked constraint conditions "lower tone" is applicable to continuous modified tone and suitable for phonetic system analysis of trisyllabic sequences neutral tone, therefore there is close relation between the two[1]. 'Ni Lai initial are read [z] initials in the Hefei dialect phenomenon research" think Ni Lai initial today read [z] initials are resulted from high vowel in Hefei dialect [2]. Statistics and functional studies of phonemic frequency is less, Mandarin Chinese, Beijing dialect, and sporadic minority languages have some statistical analysis of phoneme [3][4]. We use "Chinese dialect vocabulary" edited Chinese language & literature linguistics of Peking University as corpus, the frequency of Hefei dialect initials, finals and tones are calculated, and the initials, combined types initials, finals and tones are made frequency statistics. The syllable distribution of Hefei dialect, syllable combined type and tone status questions are discussed.

2. Frequency Statistics of Phonemic System

There are 21 initials, 41 finals and 5 tones in the Hefei dialect system, occurrence frequency of initials, finals and tones are made statistics of Hefei dialect in 3000 words.

2.1 Statistics of Homophones

Hefei dialects 3000 words are corresponding to 941 syllables; the number of homophone of each syllable is 3.19. The most syllables of homophone is [tʰɿ rising tone], 22 homophone "雌、瓷、慈、磁磁石、辞、词、祠、堤、题、提、啼、蹄、齐、脐、奇奇怪、骑骑马、祁、鳍、其、旗、棋、麒". [tɿ53] and [ʃɿ53] have 21 homophones, there are 313 syllables without homophone, accountings for 10.4% of the total number of syllables, 194 syllables have two homophone.

2.2 The Frequency Statistics of Initials

The initials of Hefei dialects are simpler from the type, but all have distribution in the pronunciation parts and methods, nasal and lateral voice type are especially simple, [n/l] discernable phenomenon exists. Hefei dialect with 22 initials, the average frequency is 142.9. From the place of articulation, the highest frequency was blade-palatal, it accounts for 17.2% of the total frequency of initials, the second are dorsal and blade-alveolar, it accounts for 16.4% and 15.6% of the total frequency, respectively, the lowest occurrence frequency is labiodental, it accounts for 3.3%; The articulation place of initials are relatively complete in Hefei dialect, and frequency distribution is relatively balanced, difference is not obvious. From the point of articulation manner, the highest frequency was affricate, it accounts for 29.1% of the total frequency, the second are fricative and plosive, it accounts for 24% and 23.6%, and the lowest occurrence frequency is nasal sound, it accounts for only 3.8% of the total frequency. From a single initials, except for the zero initial, the highest occurrence frequency is lateral apical [l], it accounts for 7.17% of the total frequency, the second is blade-palatal voiceless affricate [tɕ], it accounts for 6.4% of the total frequency, the lowest occurrence frequency is blade-palatal voiced affricate [z], it accounts for 2.23% of the total frequency, the initial frequency are shown in Table 1.

Table 1 Initials frequency in Hefei dialects

order number	initia l	frequenc y	order number	initia l	frequenc y	order number	initia l	frequenc y	order number	initia l	frequenc y
1	ʃ	372	7	p	141	13	tʰ	116	19	f	98
2	l	215	8	t	137	14	m	113	20	kʰ	80
3	te	213	9	k	134	15	tʰ	112	21	z	67
4	tɕ	192	10	ɕ	130	16	s	112			
5	ɕ	168	11	tɕʰ	127	17	teʰ	111			
6	x	146	12	ts	117	18	pʰ	99			

2.3 The Frequency Statistics of Final

There are 41 finals in Hefei dialect, the highest frequency of monophthong finals up to 1541, which exceed 1/2 of the frequency of total finals, the second is compound vowel finals 889, it accounts for 29.6% of the total frequency, the lowest frequency of tail vowel and final of nasal sound is 570, it accounts for 19%. The types of tail vowel and final of nasal sound are abundant, [ə] and [i] as finals of the essential vowel in a compound vowel, they have very good corresponding relation in [n] and [ŋ]. From the four breath characteristics of finals, the highest occurrence frequency is opening mouth, it accounts for about half of the total frequency of finals, and the second is the equal-toothed breath, it accounts for 25.6% of the frequency, the lowest frequency is rhymes containing a rounded front vowel, it accounts for only 6.73% of the total frequency; The proportion of frequency distribution is disparity in the four breath, the difference is obvious. Finals [ɿ] occurs 197, it accounts for 6.6% of the total frequency of finals, and frequency of finals are shown in Table 2:

Table 2 Finals frequency in Hefei dialects

order number	final	frequency	order number	final	frequency	order number	final	frequency	order number	final	frequency
1	ɿ	197	12	io	95	23	ieʔ	56	34	yeʔ	22
2	in	186	13	e	85	24	ɿ	49	35	in	21
3	ən	165	14	ɛ	81	25	ueʔ	47	36	ua	18
4	u	163	15	ui	79	26	əʔ	46	37	ue	16
5	æ	158	16	ue	78	27	yī	45	38	i	15
6	iī	151	17	ioʔ	77	28	uā	42	39	uā	13
7	əŋ	137	18	y	73	29	a	39	40	ie	13
8	ɔ	125	19	ō	70	30	uən	33	41	ye	1
9	ɐʔ	125	20	iā	69	31	yɐʔ	33			
10	ā	109	21	iu	58	32	yn	28			
11	u	98	22	uoʔ	57	33	ia	27			

2.4 The Frequency Statistics of Tone

Frequency statistics of Hefei four tones are carried out, the highest frequency is falling tone, high and level tone are close to rising tone, the lowest frequency is falling-rising tone and entering tone, the frequency is closer, the statistics of tone frequency as shown in the Table 3.

Table 3 Tone frequency statistics in Hefei dialect

tone kind	ring method	Vertical mark method	tone pitch	frequency	ratio(%)	example
falling tone	□□	□	53	832	27.7	快
high tone	□□	□	212	616	20.5	高
rising tone	□□	1	55	586	19.5	唐
falling-rising tone	□□	□	24	503	16.8	胆
entering tone	□□	1	4	463	15.4	急

3. The Combination of Phoneme

The sound-rhyme, sound-tone and rhyme-tone of Hefei dialect, and frequency of these three phoneme combination are made calculation and analysis.

3.1 The Sound-rhyme Combination

The phonology combination number 41 initials and 21 finals are 387 in Hefei dialect, the sound-rhyme combination of the average frequency is 7.8. The highest frequent [tɕ I] appear in 44 syllables; and only one sound-rhyme combination includes [kiŋ], [fɔ], [sa], [k^huā] 35 etc. The combination frequencies of sound-rhyme are in descending order, first 20 sound-rhyme combination as shown in Table 4.

Table 4 Sound-rhyme combination frequency in Hefei dialect

number	sound-rhyme	frequency	number	sound-rhyme	frequency	number	sound-rhyme	frequency	number	sound-rhyme	frequency
1	ʂɿ	52	6	teī	33	11	ʂy	25	16	te ^h in	21
2	ts ^h ɿ	45	7	ʂin	32	12	tsɿ	24	17	xue	20
3	tsɿ	44	8	ʂiī	29	13	ein	23	18	ʂən	20
4	tein	39	9	ʂue	27	14	fu	22	19	te ^h iī	19
5	sɿ	33	10	tsən	25	15	teio	22	20	ts ^h ən	19

3.2 The Sound-tone Combination

The combination number of 21 initials and 5 tones are 101 in Hefei dialect, except the initials [k], [ts], [t], and [tɕ] don't collocate 55 rising tone, the rest of the 17 initials can and collocate [high and level tone 212], [rising tone 55], [falling-rising tone 24], [falling tone 53], entering tone 4 rules collocation, that is to say, Hefei 3000 syllables combination, there is no initial [k55], [ts55], [t55] and [tɕ 55] collocation 4 kinds of circumstances. The highest occurrence frequency [ʂ55] appears in 119 syllables. Tone combination frequencies are in descending order, the first 20 combination tone as shown in Table 5.

Table 5 Frequency of sound-tone combination in Hefei dialect

number	sound-tone	frequency	number	sound-tone	frequency	number	sound-tone	frequency	number	sound-tone	frequency
1	\$ rising tone	119	6	tɕ falling tone	67	11	tɕ ^h rising tone	54	16	ɕ falling tone	48
2	\$ falling tone	91	7	t falling tone	64	12	x rising tone	52	17	ts falling tone	47
3	l rising tone	86	8	te high level tone	63	13	\$ high level tone	52	18	ɕ high level tone	46
4	te falling tone	73	9	p falling tone	58	14	K high level tone	50	19	X falling tone	45
5	\$ falling-rising tone	68	10	tɕ high level tone	57	15	t ^h rising tone	48	20	l entering sound	44

3.3 Rhyme-tone Combination

The combination relationship of initials and finals in 3000 syllable in Hefei dialect, the combination number of 39 finals and 5 tones is 137 in Hefei dialect. Finals [ɤʔ], [əʔ], [iɤʔ], [Iəʔ], [uɤʔ], [yɤʔ], [yɤʔ], [yəʔ], [ye] can only collocate entering sound 4, but cannot collocate high and level tone 212, rising tone 55, falling-rising tone 24, falling tone 53; except the finals [ɤʔ], [əʔ], [Iɤʔ], [Iəʔ], [uɤʔ], [yɤʔ], [yɤʔ], [yəʔ], [ye], the remaining 30 finals cannot collocate entering sound 4, but they are fully able to collocate high and level tone 212, rising tone 55, falling-rising tone 24, falling tone 53. [ɤʔ entering tone] the highest frequency appears in 125 syllables. Rhyme-tone combination frequencies are in descending order; the first 20 rhyme-tone combination as shown in Table 6.

Table 6 Rhyme-tone combination frequency in Hefei dialect

number	rhyme-tone	frequency	number	rhyme-tone	frequency	number	rhyme-tone	frequency	number	rhyme-tone	frequency
1	ɤʔ entering tone	125	6	ieʔ entering tone	56	11	iɪ falling tone	52	16	ɿ rising tone	46
2	iaʔ entering tone	77	7	in high level tone	56	12	ueʔ entering tone	47	17	əŋ high level tone	45
3	ɿ falling tone	75	8	in rising tone	56	13	u falling-rising tone	47	18	o falling tone	43
4	u falling tone	58	9	ən high level tone	54	14	ən falling tone	47	19	æ rising tone	41
5	uaʔ entering tone	57	10	æ falling tone	53	15	əʔ entering tone	46	20	e falling tone	40

4. Conclusion

The phoneme of 3000 morpheme and phonological combination frequency are made statistics in Hefei dialect, the status of phoneme and phonological combination in language system are sorted, phonological function are made quantitative research, the function pattern of the phoneme is obtained in the structure, the research results provides the basic data for function of phoneme in the language system further.

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