

Phonemes of Xi'an Dialect and Statistic Study of Phonemic Combination Frequency

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Abstract. By using 3000 semantic units of Xi'an dialect from Characters Collection of Chinese Dialects as original database, the article calculates the frequency of initials, finals and tones, and also conducts a frequency statistic of the combination types of initials, finals and tones. Based on this study, the article probes into the syllable distribution, syllabic combination and the role of rhyme, offers a quantitative analysis of function of each phoneme and their combination capacity so as to provide fundamental data for the further study of phonemic theory study of Xi'an dialect.

1. Introduction

Phonemes are the smallest speech units to differentiate the semantic meanings in linguistic system. The number and type of phonemes vary from language to language. In Chinese-Tibetan languages, the syllabic form are all single characters with a single sound. The three major elements of speech system are initials, finals and tones. In these languages, some have more than 100 phonemes, some have about 20 – 30 phonemes. All these phonemes are very different from each other in terms of frequency, function and roles. Xi'an dialect belongs to Guanzhong dialect of Shaanxi, is the representative of Dongfu dialect of Guanzhong and that of Shaanxi dialect. Xi'an dialect is also one of the representative dialects in northwest China. The previous studies concerning phonemes of Xi'an dialect are mainly focusing on summary, differences and evolution of these phonemes [1, 2]. There are few studies of phonemes frequency and their functions. There are some statistical analysis of some phonemes concerning Chinese Putonghua, Beijing dialect and sporadic analysis of ethnic languages [3, 4]. The original database of this very study is Characters Collection of Chinese Dialects edited by the department of Chinese languages and literature and the division of language teaching of Beijing University [5]. The article calculate the frequency of initials, finals and tones of Xi'an dialect, and conducts a frequency statistic of the combination types of these initials, finals and tones so as to probe into the issues concerning its syllable distribution, types of syllable combination and the role of rhymes and tones.

2. Homographs Statistics

All the 3000 characters in Xi'an dialect correspond with 1016 syllables, and on average each syllable has 2.95 homographs. The syllables with most homographs are as follows: [tā21] (21 homographs), [ei21] (16), [tei55] (15) and [\$y55] (15). 331 syllables have just one corresponding characters and not homographs, and they cover 11.03% of all syllable types. 238 syllables have just two homographs and are 7.9% of all syllable types. The homograph numbers of all the syllables are shown in figure 1.

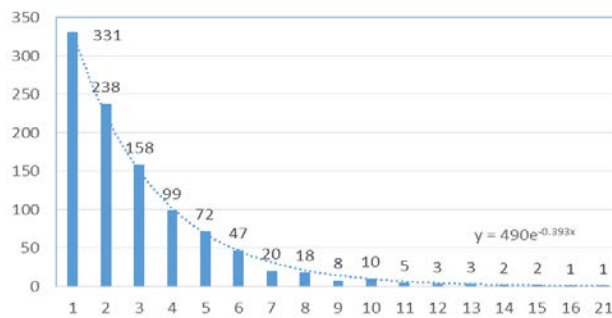


Fig. 1 Homograph Numbers of the Syllables in Xi'an Dialect

3. Frequency Statistics of Phonemic System

3.1 Frequency Statistics of Initials.

There are 27 initials in Xi'an dialect. Compared with Beijing dialect, there are more labial-dental affricates and fricatives, and many nasals in the initials of Xi'an dialect. The statistic results are as follows in table 1.

Table 1 Frequency of Initials in Xi'an Dialect

No.	Init.	Freq.	No.	Init.	Freq.	No.	Init.	Freq.	No.	Init.	Freq.
1	\$	313	8	te ^h	133	15	p ^h	101	22	v	42
2	te	237	9	k	133	16	ts ^h	98	23	pf ^h	38
3	ɕ	186	10	f	132	17	tɕ	94	24	ŋ	32
4	l	186	11	ts	131	18	k ^h	80	25	ŋ	31
5	x	148	12	t ^h	129	19	ɕ	77	26	n	28
6	t	143	13	s	128	20	pf	53	27	ʒ	22
7	p	137	14	m	114	21	tɕ ^h	54			

In terms of speech organs, laminal (anterior) phonemes have higher frequency, is 19.5% of all phonemes, and mid-apical ones are only 8.3%. In terms of speech manners, the most frequent ones are affricates and are 27.9% of all phonemes, and least frequent ones are laterals (only 6.2%) and nasals are 6.8%. Besides zero initial, the most frequent initial is [te] (7.9%). The least frequent initial is [ʒ] (0.77%).

3.2 Frequency Statistics of Finals.

There are 40 finals in Xi'an dialect. Finals of single vowel and finals of compound vowels are 1.3 and 1.4 times of those in Beijing dialect. However, the finals with nasal ending are less than half of those in Beijing dialect. The statistic results are as is in table 2.

Table 2 Frequency of Finals in Xi'an dialect

No.	Final	Freq.	No.	Final	Freq.	No.	Final	Freq.	No.	Final	Freq.
1	i	253	11	iau	94	21	ɿ	72	31	yɔŋ	23
2	u	199	12	uei	93	22	ian	68	32	uan	23
3	æ	189	13	uo	91	23	iou	59	33	yě	21
4	iæ	151	14	ei	87	24	uæ	57	34	yo	19
5	aŋ	130	15	uon	86	25	ɤ	46	35	ua	19
6	au	126	16	ě	86	26	ɿ	45	36	uæ	13
7	əŋ	125	17	æ	84	27	o	43	37	ye	12
8	ou	124	18	ie	75	28	uě	40	38	iæ	8
9	in	116	19	iě	73	29	ia	38	39	ə	5
10	y	96	20	a	73	30	yæ	38			

In Xi'an dialect, the finals with nasal ending are mainly [ŋ] and there are not any finals ended with [m] or [n]. There are 20 finals of compound vowels, and they correspond with 1237 characters (41.2% of all types). 12 finals with single vowel correspond with 1192 characters and covers 39.7% of all types. There are only 7 finals ended with nasal, the least frequent final, and cover only 19%.

3.3 Frequency Statistics of Tone.

The frequency statistics has been conducted in terms of the 4 tones in Xi'an dialect. The most frequent one is 24, the least frequent one is tone 4, and 21 and 53 come between them. The results are as in table 3

Table 3 Frequency Statistics of Tones in Xi'an Dialect

Tone Type	Ring Marking	Vertical Marking	Tone Value	Freq.	Percentage (%)	Example
Tone I	ˊ	ˊ	21	962	29.5	gao
Tone II	ˊˊ	ˊˊ	24	684	23.8	ping
Tone III	ˊˊˊ	ˊˊˊ	53	536	19.9	ding
Tone IV	ˊˊˊˊ	ˊˊˊˊ	55	818	26.9	jiao

4. Frequency Statistics of Phonemic Combination

The article has studied the combination relationship of all the 3000 syllables in Xi'an dialect. The value of frequency of these combinations shows the stability of the combinations. The higher the frequency is the higher level the syllabic structures have. The article has also conducted the calculation and analysis of the frequency of the combination of initial-final, initial-tone and final-tone.

4.1 Frequency Statistics of Initial-Final Combination.

In Xi'an dialect, the 27 initials and 39 finals can have 375 combinations. The most frequent combination is [fu], and it appears in 46 characters; the number of the least frequent combination is 28 and they only appear one character. The first 20 initial-final combinations are as in table 4.

Table 4 Frequency of Initial-Final Combination in Xi'an Dialect

No.	Comb.	Freq.	Percentage (%)	No.	Comb.	Freq.	Percentage (%)
1	fu	46	1.53	11	tsɿ	24	0.80
2	tei	44	1.47	12	pi	23	0.77
3	sɿ	37	1.23	13	ey	22	0.73
4	\$i	33	1.10	14	xuei	22	0.73
5	teŋCσ	32	1.07	15	eŋCσ	22	0.73
6	\$y	32	1.07	16	tɕɿ	21	0.70
7	te ^h i	30	1.00	17	teiau	21	0.70
8	li	30	1.00	18	teie	21	0.70
9	"ŋCσ	28	0.93	19	\$uei	21	0.70
10	ei	24	0.80	20	te ^h ŋCσ	20	0.67

4.2 Frequency Statistics of Initial-Tone Combination.

In Xi'an dialect, the 27 initials and 4 tones can have 108 combinations. These types of combination are complete, and all initials can go with all 4 tones. The most frequent combination is [te21]; the least frequent combinations are [k24] and [pf24], and they only appear one character. The first 20 initial-tone combinations are as in table 5.

Table 5 Frequency of Initial-Tone Combination in Xi'an Dialect

No.	Comb.	Freq.	Percentage (%)	No.	Comb.	Freq.	Percentage (%)
1	te(21)	95	3.17	11	s(21)	59	1.97
2	\$(24)	92	3.07	12	x(24)	57	1.90
3	\$(21)	91	3.03	13	t ^h (24)	55	1.83
4	te(55)	88	2.93	14	p(55)	54	1.80
5	\$(55)	81	2.70	15	e(55)	51	1.70
6	l(24)	79	2.63	16	p(21)	51	1.70
7	e(21)	77	2.57	17	\$(53)	49	1.63
8	t(55)	69	2.30	18	ts(21)	48	1.60
9	k(21)	66	2.20	19	x(55)	47	1.57
10	te ^h (21)	60	2.00	20	m(24)	43	1.43

4.3 Frequency Statistics of Final-Tone Combination.

In Xi'an dialect, the 39 finals and 4 tones can have 150 combinations. In all possible combinations, the most frequent combination is [i21]; the least frequent combinations are [\$ə53], [\$yē53], [\$ə55], [\$yōŋ55], [tewc02[*Ywə0/[*YgC0/[*[\$ə24] and [tə^hyo53] and they only appear one character. The first 20 final-tone combinations are as in table 6.

Table 6 Frequency of Final -Tone Combination in Xi'an Dialect

No.	Comb.	Freq.	Percentage (%)	No.	Comb.	Freq.	Percentage (%)
1	i(21)	89	2.97	11	uei(55)	45	1.50
2	i(55)	73	2.43	12	əŋ(21)	46	1.53
3	Ç(55)	62	2.07	13	əŋ(24)	41	1.37
4	u(55)	58	1.93	14	Ç(53)	39	1.30
5	i(24)	57	1.90	15	au(55)	39	1.30
6	u(53)	51	1.70	16	uo(21)	39	1.30
7	u(21)	52	1.73	17	u(24)	38	1.27
8	gÇ(55)	50	1.67	18	gÇ(24)	37	1.23
9	Ç(21)	51	1.70	19	Ç(24)	37	1.23
10	ei(21)	48	1.60	20	ie(21)	37	1.23

5. Summary

The article has conducted a frequency statistics of phonemes and phonemic combinations in Xi'an dialect. We have also ordered the phonemes and phonemic combinations in language system, and studied the function of phonemes in a quantitative way. The phonemic system of Chinese-Tibetan languages consists of initials, finals and tones, we can apply the same method to the calculation to other languages of Chinese-Tibetan language family. Thus, we can synchronically compare different dialects, and diachronically conduct quantitative study of the evolution of phonemic system.

Acknowledgements

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