Phonological Regularity of Written Phonetic Elements in Modern Mandarin

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Phonetic Compound（形声字xingshengzi）

- A “signific” part, which indicates meaning
- plus
- A “phonetic” part which indicates sound
- 妈 [ma1] = 女 (female) + 马 [ma3]

The Mandarin Syllable

- A syllable in Modern Standard Mandarin
- Consists of:
- An initial
- A final
- A tone

The Final

- The final can also be broken down into a medial (vowel), a nucleus (vowel) and an ending (vowel or consonant)

- Final = (M)N(E)

Mandarin Consonants

Source: Kratochvil (1968:25)	Labial	Labio-dental	Dental	Alveolar	Alveo-palatal	Palatal	Velar
stop	p, pʼ			t, tʼ			k, kʼ
nasal	m			n			(ŋ)
fricative		f	s		ʂ, ʐ(r)	ɕ	x
lateral				l			
affricate			ts, tsʼ		tʂ, tʂʼ	tɕ, tɕʼ	

Mandarin Vowels

ɿ i y(ü) u

e ə ɤ o

ɛ

a ɑ

Source: Cheng(1973:12)

Background Literature

- Xu Shen–說 文 解 字Shuo Wen Jie Zi (2nd cent. A.D.)
- Soothill-1911
- Karlgren-1916, 1923a, 1923b, 1926, 1940, 1949, 1958
- Wieger-1927/1965
- Astor-1970
- Zhou Youguang-周有光 1978,1980, 2003
- Kraemer-1980, 1991a, 1991b
- DeFrancis-1984
- Alber-1986,　１９８９

周有光 Zhou Youguang (1980)

汉字声旁读音便查 *Hanzi shengpang duyin biancha* (A handy look up for the pronunciation of phonetics in Chinese characters)

- Zhou analyzes characters in the Xin Hua Zidian (1971) based on Phonetic elements and sets up three categories of phonetic compound characters based on the similarity of the phonetic compound to the pronunciation of the phonetic itself.

- The 3 categories are:
- (1) Same pronunciation (同音 Tong yin), including same or different tones
- (2) Similar pronunciation (半同音 Ban tong yin) (similar phonemes)
- (3) Different pronunciation(异 音 Yi yin) (not as similar to the original phonetic pronunciation)

John DeFrancis (1984)

- DeFrancis also sets up three categories of phonetic compound characters based on the similarity of the phonetic compound to the pronunciation of the phonetic itself.

DeFrancis's 3 categories are:

- (1) "Complete identity" (same pronunciation including tone)
- (2) "Identity except for tones in some cases"
- (3) "Partial similarity in the segmental phonemes" (DeFrancis (1984))

Types of Phonological Patterning in Mandarin Characters

- Phonemic Congruence

  Characters share one or more phonemes
- Featural Congruence

  V's share features

  C's share features
- Initials and Finals: The Segment
- Segment Structure

  Patterning in arrangement of C's or V's
- Overall Patterns in the Written Language

Phonemic Congruence

Types of Character Phonetic Series Based on Phonemic Congruence (Kraemer 1980)

Seven Categories:

- Totally Perfect
- Segment Perfect
- Initial Perfect
- Final Perfect
- Tone Perfect
- Initial – Tone Perfect
- Final – Tone Perfect

Seven Categories of Phonetic Series Found in Wieger (Kraemer 1980)

579 Series Found + 63 (in Astor(1970))

For a Total of 642 Series

Out of 858 Series in Wieger(1927/1965)

Seven Categories of Phonetic Series Found in Wieger (Kraemer 1980)

Out of 858 Series in Wieger(1927/1965)

- Totally Perfect-124 (+63 in Astor(1970))
- Segment Perfect-192
- Initial Perfect-35
- Final Perfect-153
- Tone Perfect-40
- Initial – Tone Perfect-13
- Final – Tone Perfect-22

SOUND CLUES IN MANDARIN CHARACTER PHONETIC SERIES

- Example of 7 Categories of Character Phonetic Series
- based on周有光 Zhou Youguang (1980)
  汉字声旁读音便查 *Hanzi shengpang duyin biancha* (A handy look up for the pronunciation of phonetics in Chinese characters)

Totally Perfect

- 丈 [tʂɑŋ4] (zhàng-measure (land))
- is a phonetic in

  仗 [tʂɑŋ4] (zhàng-weapons)

  杖 [tʂɑŋ4] (zhàng-cane;stick)

Totally Perfect

- 庸 [iuŋ1] (yōng-) is a phonetic in
- 墉 [iuŋ1] (yōng-)
- 慵 [iuŋ1] (yōng-)
- 镛 [iuŋ1] (yōng-)
- 鳙 [iuŋ1] (yōng-)

Totally Perfect

- 贯 [kuan4] (guàn-) is a phonetic in
  惯 [kuan4] (guàn-)
  掼 [kuan4] (guàn-)

Segment Perfect

- 名 [miŋ2] (míng-) is a phonetic in
  铭 [miŋ2] (míng-)
  茗 [miŋ2] (míng-)
  酩 [miŋ3] (mǐng-)

Segment Perfect

- 困 [kʻuən4](kùn-) is a phonetic in
  悃 [kʻuən3](kǔn-)
  捆 [kʻuən3](kǔn-)
  阃 [kʻuən3](kǔn-)

Categories of Phonetic Elements-More Common Characters

- Examples based on 周有光 Zhou Youguang (1980)
  汉字声旁读音便查 *Hanzi shengpang duyin biancha* (A handy look up for the pronunciation of phonetics in Chinese characters)

Totally Perfect

- 成 [tʂʻəŋ2] (chéng-become)
- is a phonetic in

  城 [tʂʻəŋ2] (chéng-city)

Segment Perfect

长 [tʂɑŋ3] (zhǎng-grow) is a phonetic in

张 [tʂɑŋ1] (zhāng-surname, measure word)

Segment Perfect

马 [ma3](mǎ-horse) is a phonetic in

吗 [ma0] (ma-question word)
骂 [ma4] (mà-scold)
妈 [ma1] (mā-mother)

Segment Perfect

门 [mən2] (mén-door) is a phonetic in
们 [mən0] (men-plural)

Segment Perfect

方 [fɑŋ1] (fāng-place) is a phonetic in

房 [fɑŋ2] (fáng-house)
防 [fɑŋ2] (fáng-guard against)
访 [fɑŋ3] (fǎng-visit)
放 [fɑŋ4] (fàng-let go)

Initial Perfect

- 先 [ɕiɛn1] (xīan-first) is a phonetic in
- 洗 [ɕi3] (xǐ-wash)

- 你 [ni3] (nǐ-you) is a phonetic in
- 您 [nin2] (nín-you-polite)

Initial Consonant + Vowel (CV) Perfect

- 先 [ɕiɛn1] (xīan-first) is a phonetic in
- 洗 [ɕi3] (xǐ-wash)
- both share [ɕi-] xi-

- 你 [ni3] (nǐ-you) is a phonetic in
- 您 [nin2] (nín-you-polite)
- both share [ni-] ni-

Final Perfect

长 [tʂʻɑŋ2] (cháng)　张 [tʂɑŋ1] (zhāng). They share the final [ɑŋ] -ang .

方 [fɑŋ1] (fāng)　旁 [pʼɑŋ2] (páng) . They share the final [ɑŋ] -ang .

艮 [kən3,4] (gěn, gèn)　根 [kən1] (gēn) 很 [xən3] (hěn). They share the final [ən] -en .

Final Perfect with Related Initial Consonants

长 [tʂ‘ɑŋ2] (cháng-long)　张 [tʂɑŋ1] (zhāng-surname, measure word).

They share the final [ɑŋ] -ang .

The initial Consonants are [tʂ] zh and [tʂ‘] ch .

Both initial Consonants are alveopalatal

(retroflex) affricates. They differ only in the feature of aspiration. The consonant [tʂ‘] ch is aspirated, while the consonant [tʂ] zh is unaspirated.

Final Perfect with Related Initial Consonants

方 [fɑŋ1] (fāng-place)　旁 [p’ɑŋ2] (páng-side) . They share the final [ɑŋ] - ang .

The initial consonants are [f] and [p’] .

The initial consonant [f] is labiodental and the initial consonant [p’] is bilablial.

Final Perfect with Related Initial Consonants

艮 [kən3,4] (gěn, gèn -brusque;surname)

根 [kən1] (gēn-root)

很 [xən3] (hěn-very).

They share the final [ən] -en .

The initial Consonants are [k] g and [x] h .

- The consonants are both velars. They have the same place of articulation.

方 [fɑŋ1] (fāng) Series-Quantitative Analysis

方 [fɑŋ1] (fāng-place;square;just a moment ago) is a phonetic in

房 [fɑŋ2] (fáng-house)
防 [fɑŋ2] (fáng-guard against)
访 [fɑŋ3] (fǎng-visit)
紡 [fɑŋ3] (fǎng-spin)
仿 [fɑŋ3] (fǎng-imitate, copy)
放 [fɑŋ4] (fàng-let go)
旁 [p’ɑŋ2] (páng-side)

Quantitative Analysis

方 [fɑŋ1] (fāng-place) is a phonetic in

2 [fɑŋ2]
3 [fɑŋ3]
1 [fɑŋ4]
1 [pʼɑŋ2]

In DeFrancis's Texts, from DeFrancis Index Volume-approx. 1700 chars. (DeFrancis (1970))
8 characters total with individual pronunciations

1 Phonetic element with 7 phonetic compounds
6/7 = 86% Segment Perfect
1/7 = 14% Final Perfect

But 7/7 = 100% Final Perfect or Better

Quantitative Analysis

方 [fɑŋ1] (fāng-place) is a phonetic in

房 [fɑŋ2] (fáng-house)-3/4 phonemes are the same as 方 [fɑŋ1]=75%phonetic

防 [fɑŋ2] (fáng-guard against)-3/4= 75%phonetic

访 [fɑŋ3] (fǎng-visit)-3/4= 75%phonetic

紡 [fɑŋ3] (fǎng-spin)-3/4= 75%phonetic

仿 [fɑŋ3] (fǎng-imitate, copy)-3/4= 75%phonetic

放 [fɑŋ4] (fàng-let go)-3/4= 75%phonetic

旁 [p’ɑŋ2] (páng-side)-2/4= 50% phonetic

Thus the average phonetic rating of the phonetic element 方 [fɑŋ1] in the above 7 characters would be 71.4 percent phonetic.

方 [fɑŋ1] (fāng) Series-Quantitative Analysis

方 [fɑŋ1] (fāng-place;square;just a moment ago) is a phonetic in

枋 [fɑŋ1] (fāng)
邡 [fɑŋ1] (fāng)
鈁 [fɑŋ1] (fāng)
芳 [fɑŋ1] (fāng)
坊 [fɑŋ1] (fāng)
妨 [fɑŋ1] (fāng)
坊 [fɑŋ2] (fáng)
妨 [fɑŋ2] (fáng)
防 [fɑŋ2] (fáng)
肪 [fɑŋ2] (fáng)
魴 [fɑŋ2] (fáng)
房 [fɑŋ2] (fáng)
紡 [fɑŋ3] (fǎng)
仿 [fɑŋ3] (fǎng)
访 [fɑŋ3] (fǎng)
昉 [fɑŋ3] (fǎng)
舫 [fɑŋ3] (fǎng)
放 [fɑŋ4] (fàng)
旁 [p’ɑŋ2] (páng)
徬 [p’ɑŋ2] (páng)
[示]方 [pəŋ1] (bēng)

方 [fɑŋ1] (fāng) Series-Quantitative Analysis

方 [fɑŋ1] (fāng-place;square;just a moment ago) is a phonetic in

枋 [fɑŋ1] (fāng)
邡 [fɑŋ1] (fāng)
鈁 [fɑŋ1] (fāng)
芳 [fɑŋ1] (fāng)
坊 [fɑŋ1] (fāng)
妨 [fɑŋ1] (fāng)
坊 [fɑŋ2] (fáng)
妨 [fɑŋ2] (fáng)
防 [fɑŋ2] (fáng)
肪 [fɑŋ2] (fáng)
魴 [fɑŋ2] (fáng)
房 [fɑŋ2] (fáng)
紡 [fɑŋ3] (fǎng)
仿 [fɑŋ3] (fǎng)
访 [fɑŋ3] (fǎng)
昉 [fɑŋ3] (fǎng)
舫 [fɑŋ3] (fǎng)
放 [fɑŋ4] (fàng)
旁 [pʼɑŋ2] (páng)
徬 [pʼɑŋ2] (páng)
[示]方 [pəŋ1] (bēng)

Quantitative Analysis

方 [fɑŋ1] (fāng-place) is a phonetic in

6 [fɑŋ1]
6 [fɑŋ2]
5 [fɑŋ3]
1 [fɑŋ4]
2 [p'ɑŋ2]
1 [peŋ1]

22 characters total with indiv. Pronunciations (Zhou Youguang (1980))(Based on Xinhua Zidian (1971))

1 Phonetic element with 21 phonetic compounds

6/21 =29% Totally Perfect
12/21 = 57% Segment Perfect
2/21 = 10% Final Perfect
1/21 = 5%Ending ŋ Perfect
But 18/21 = 86%Segment Perfect or Better
21/21 = 100% Final Perfect or Better

Quantitative Analysis

方 [fɑŋ1] (fāng-place) is a phonetic in

6 [fɑŋ1] 4/4 phonemes are the same as 方 [fɑŋ1]=6 X 100%phonetic
6 [fɑŋ2] 3/4 phonemes are the same as 方 [fɑŋ1]=6 X 75%phonetic
5 [fɑŋ3] 3/4 phonemes are the same as 方 [fɑŋ1]=5 X 75%phonetic
1 [fɑŋ4] 3/4 phonemes are the same as 方 [fɑŋ1]=1 X 75%phonetic
2 [p'ɑŋ2] 2/4 phonemes are the same as 方 [fɑŋ1]=2 X 50%phonetic
1 [peŋ1] 2/4 phonemes are the same as 方 [fɑŋ1]=2 X 50%phonetic

22 characters total with indiv. Pronunciations (Zhou Youguang (1980))

1 Phonetic element with 21 phonetic compounds

Thus the average phonetic rating of the phonetic element 方 [fɑŋ1] in the above 21 characters would be 81% percent phonetic.

Rime Perfect (NE Perfect)

- In a rime perfect phonetic series, the characters share this same main vowel or nucleus (N) followed by the same final vowel or consonant ending (E).

Rime Perfect

- 门 [mən2] (mén-door) is a phonetic in
- 问 [uən4] (wèn-ask).

- They share the rime [ən] (-en) .

Rime Perfect: Underlying Forms

- 山 [ʂan1] (shān-mountain) is a phonetic in
- 仙 [ɕiɛn1] (xiān-immortal).

- They have the two rimes [an] and [ɛn]
- But they share the same ***underlying form*** of the rime (-an) (See Cheng 1973).

Rime Perfect: Underlying Forms

- 占 [tʂan1,4] (zhān-to divine; zhàn-to occupy) is a phonetic in
- 点 [tiɛn3] (diǎn- a point) and
- 店 [tiɛn4] (diàn-shop).

- They have the two rimes [an] and [ɛn.]
- But they share the same ***underlying form*** of the rime (-an) (See Cheng 1973).

Featural Congruence

Similar Vowel Features

- 是 [ʂʅ4] (shì-to be) is a phonetic in
- 題 [t’i2] (tí-topic) and
- 提 [t’i2] (tí-lift from above).
- They share the similar final vowels:
- [ʅ] (i) (in shi) and [i] (i)(in ti).
- The vowels [ʅ] , [ɿ] and [i] are high, unround vowels and can be considered allophones of the single phoneme -i (see Kratochvil 1968:28).
- Due to co-occurrence restrictions, [ʂ] takes only the back unround vowel [ʅ], while [t] takes only the front unround vowel [i].

Similar Vowel Features

- 是 [ʂɻ4] (shì-to be) is a phonetic in
- 題 [t’i2] (tí-topic) and
- 提 [t’i2] (tí-lift from above).
- C1 V / C2 V (V = i) (phonemic) same final V phonemically)
- [ʂɻ4] / [t’i2]
- (shi) / (ti)

Similar Vowel Features

- 是 [ʂɻ4] (shì-to be) is a phonetic in
- 題 [t’i2] (tí-topic) and
- 提 [t’i2] (tí-lift from above).
- Cheng(1973:14) considers [ɻ] and [[1 to be variants of a high unround central vowel ɨ and [i] to be a separate underlying high unround vowel. Using his phonemic analysis, we might express the pattern [ʂɻ4] [t’i2] as
- [ʂɻ4] C1 V1 [+high,-round]
- [t’i2] C2 V2 [+high,-round]

Similar Vowel Features

- 是 [ʂɿ4] (shì-to be) is a phonetic in
- 寔提 匙湜題堤騠醍　(Zhou (1980))
- 湜[ʂɿ2]
- 寔[ʂɿ2]
- 匙[ʂɿ0] [tʂʻɿ2]
- 題 [t’i2]
- 提 [t’i2] [ti1]
- 騠[t’i2]
- 醍[t’i2]
- 堤[ti1]

Similar Vowel Features

- 是 [ʂɿ4] (shì-to be) is a phonetic in
- 寔提 匙湜題堤騠醍

We see the pattern

- [ʂɿ4] [ʂɿ2] [ʂɿ0] [tʂ’ɿ2] [t’i2] [ti1] as

- [ʂɿ4,2,0] C1 V1 [+high,-round]
- [tʂ’ɿ2] C2 V1 [+high,-round]
- [t’i2] C3 V2 [+high,-round]
- [ti1] C4 V2 [+high,-round]

Similar Vowel Features

帶[tai4] (dài-to wear) is phonetic in

滯(tʂɿ4)（Zhou1980)

- We see the pattern
- [tai4] [tʂɿ4] as

- [tai4] C1 V1 [+low,-round] V2 [+high,-round]
- [tʂɿ4] C2 V2 [+high,-round]

Similar Vowel Features

- (滴) [ti] (dì) is a phonetic in

  滴[ti1] 嫡[ti2] 嘀[ti2] 镝 [ti1,2] 蹢[ti2][tʂʅ2]

  摘[tʂai1] 谪[tʂɤ2] (Zhou (1980))

- 滴[ti1]
- 嫡[ti2]
- 嘀[ti2]
- 镝 [ti1,2]
- 蹢[ti2][tʂʅ2]
- 摘[tʂai1]
- 谪[tʂɤ2]

Similar Vowel Features

- (滴) [ti] (dì)is a phonetic in

  滴[ti1] 嫡[ti2] 嘀[ti2] 镝 [ti1,2] 蹢[ti2][tʂɿ2]

  摘[tʂai1] 谪[tʂɤ2] (Zhou (1980))

We see the pattern

- [ti1] [ti2] [tʂɿ2] [tʂai1] [tʂɤ2] as

- [ti1,2]] C1 V1 [+high,-round]
- [tʂɿ2] C2 V2 [+high,-round]
- [tʂai1] C2 V3V1 [+low,-round] [+high,-round]
- [tʂɤ2] C2 V2 [+mid,-round]

Initial Consonant Features

Initials and Finals:The Segment

To look at the full segment pronunciation of characters in phonetic series in Modern Mandarin, one needs to recombine initials and finals (the segment), looking at their combinations and paying attention to their co-occurrence restrictions.

Initials and Finals

- In Chinese characters in Modern Mandarin, initial consonants are forming regular recurring patterns. Finals are also forming their own recurring patterns in the written language.

Overall Patterns: Initials vs. Finals

Initials	Finals
A	V
B	W
C	X
D	Y

Overall Patterns: Segments for Each Individual Phonetic Series

- Initials-Finals (Segments) for Each Phonetic Series
- A-V
- B-W
- C-X
- D-Y

Implications and Applications

- The phononological patterns of the writing system
- L1 language acquisition
- L2 language acquisition
- Language teaching / Pedagogy
- Psycholinguistics
- Neurolinguistic Processing of Chinese Characters

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谢谢 Xiexie.