Vol.6 Iss.1 2025
https://doi.org/10.37420/j.adr.2025.006

Research on the application and teaching practice of "thirteen Zhe" in Chinese art songs

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Abstract:
As the product of the integration of Chinese and Western music culture, the singing art of Chinese art songs should take into account the aesthetic feeling of Chinese rhyme and musical expression. As a traditional rhyme system, thirteen zhe has core value for standardizing the pronunciation of words and strengthening the artistic conception of poetry, but in contemporary vocal music teaching, it has long faced problems such as fuzzy theoretical cognition and practical application fault. This study starts from solving the singing dilemma of "word sound separation" and "rhyme deviation", and systematically discusses the adaptation and teaching transformation path of thirteen songs in art songs through literature combing, sample analysis and teaching experiment. The innovation of this research lies in the first establishment of the closed-loop logic of "thirteen zhe rhyme system- -artistic song singing technology- -vocal music teaching framework", which provides empirical support for the inheritance of national rhyme culture and the optimization of vocal music teaching mode, and has practical significance for promoting the theoretical construction of Chinese vocal music school.

Key words:
Chinese art song; thirteen zhe; rhyme; vocal music teaching

As an important classification system of Chinese phonology, its history can be traced back to the "19 rhymes" of the Central Plains in the Yuan Dynasty. After the development of opera art in Ming and Qing Dynasties, it was gradually simplified to 13 rhymes (such as "flower way" and "people"), becoming the core norms of opera and quyi rhyme."Thirteen Zhe" is also a significant difference between the singing techniques of Chinese vocal music and western vocal music. The rhyme in "Thirteen Zhe" reflects the combination of vowel and vowel and the continuous unity of pronunciation position, which is obviously different from the pronunciation characteristics of western vocal music. Since the 20th century, Zhao Yuanren's Research on Chinese phonology and Luo Yuanpei's Introduction to Chinese phonology have systematically explained the phonology logic of Shzhe, emphasizing its classification principle with the law of rhyme and tail (such as "Jiang Yangzhe" with [-A ŋ] sound) as the core, and laid the theoretical foundation of phonology. However, most of the existing studies focus on the analysis of music ontology (such as musical structure and harmony configuration), and the correlation between acoustic rhyme law and music performance is insufficient.

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1. The acoustic characteristics of Thirteen Zhe and the singing adaptability of art songs

1.1 Analysis of the rhyme system of thirteen zhe

With the combination law of rhyme (main vowel) and rhyme (consonant or no end) as the core, The Chinese pronunciation is summarized into 13 types of rhyme, and its acoustic characteristics directly affect the regulation of resonance cavity and the clarity of bite words.for instance:

Jiang Yangzhe (-a ŋ): the belly is the open vowel [a], the tail is the nasal sound [- ŋ], the sound spectrum energy is concentrated in the middle and high frequency area (2000-3000Hz), the soft palate subsidence to strengthen the nasal resonance, forming an open and bright tone (such as "The Great River East" "wave out");

Gusu Zhe (-u): the resonance peak of the round lip vowel [u] is low, which requires the contraction of the anterior oral cavity, the expansion of the pharyngeal cavity, and shaping deep and implicit sound (such as "red bean words" "endless").

Experimental phonetics research shows that (Wang Liping, 2020), the classification of "four calls" (open, qi, close and pinch) is closely related to the voice form: the mouth (such as "hair flower way") increases F1 due to the extension of the voice, which is suitable to express the passionate mood; the mouth (such as "re-way") can limit the sound diffusion by the lip shape, which is easier to convey the graceful mood. This rhyme law provides a scientific basis for the "character cavity coordination" of artistic songs.

1.2 The rhyme needs of artistic songs

Pronunciation is the primary basic skill of singing, when the singer in singing, to transmit the sound to the farthest ears of the audience, the word is clear, we must master the skills of pronunciation. The Chinese art song takes "poetry and music symbiosis" as the aesthetic principle, and its singing should take into account the dual requirements of language rhythm and musical performance:

1.2.1 Balance of bite sharpness and musical lines:

The characteristics of Chinese monosyllabic morpheme morphemes require singers to accurately control the explosive force of initials (such as "spit words as beads") and the ductility of finals (such as "rhyme as line"). Take "I Live in the Yangtze River Head" as an example, the lyrics "Hugh" (xiu "is" oil ") in the end [-u] should keep the round lips gradually closed in the long sound singing, not only to avoid the semantic ambiguity caused by the deformation of vowels, but also to ensure the coherence of the music sentences

1.2.2 Requirements for the expression of the artistic conception of poetry:

The resonance properties of the different channels form a natural correspondence with the emotional metaphor. For example, in "three roses", "xie" (xie, "miss") [-ie] with the tip of the tongue, strengthen the image of "fade", and "in the Middle East" (such as "homesickness" "green"), "green" gives "green" melancholy.

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1.3 Typical case analysis

1.3.1 I live in the Yangtze River Head: Dynamic regulation of sound cavity by oil

The work is composed by Li Zhiyi, with "oil seeking mistakes" (-ou / -iu). Its round lip vowel characteristics require the singer to maintain the vertical space of the pharyngeal cavity in the high pitch area and avoid the sharp tone. For example, in the word "jun" (jun) in "you can not see you", the finals [-un] need to fit the lips and teeth and lift the soft palate, and the emotional tension of "wanting to complain" is realized through the adjustment of glottis gas resistance. Acoustic analysis shows that the closing time of "occlusion" (0.25 seconds) is significantly higher than that of ordinary students (0.15 seconds), confirming the effect of rhyme integrity on the improvement of musical performance.

1.3.2 The Three Wits of the Rose: the contrast between the artistic conception of the way

In this song, Huang Zi deliberately mixed "huailai zhe" (-ai, such as "kai") and "what a zhe" (-ie, such as "Xie") to deepen the dramatic conflict between "good wish" and "reality fading" through the contrast of rhyme and color. When I sing "," Da "(da, huai-zhe) [-a] needs to have full mouth, low tongue position, and the last sentence" Xie "needs to weaken the vocal tone vibration, with the weakening of the rhyme processing, rendering the sad mood of" helpless flowers go ".

1.3.3 Enlightenment of adaptation teaching

Based on the above analysis, put forward the adaptation principle of 13 zhe in vocal music teaching: resonance orientation of mouth classification training: thirteen zhe according to the resonance focus (nasal cavity, oral cavity) clustering, design targeted practice (such as "Jiang Yang zhe" with hum to strengthen nasopharyngeal channel); rhyme-emotional linkage model: establish "mouth-resonance parameter-emotional type" control table (such as "people Chen zhe" high frequency tone corresponding "wan"), guide students through rhyme technology to achieve "according to the word, through".

2. The specific application of thirteen zhe in singing practice

"Combination of sound and rhyme" is a problem that singers should pay special attention to. Voice and finals are two components of the pronunciation, when singing must sing accurately, combined with appropriate, natural transition, "word" can "round", can be the word line cavity, to achieve the effect of sound and emotion.

2.1 Key points of rhyme technology

The technical points of bite mainly include the processing principles of word, abdomen and end.

The head (initials) requires accurate and powerful, avoid dragging. The blasting sound (such as "b, p, d, t") needs to complete the gas resistance-release action instantly, for example, "fear" (pa) in "Three wishes of roses", and the lips burst after quickly closing the gas. The sound (such as "f, s, sh") should maintain continuous friction, such as "si" (si) in "I live in the Yangtze River head", the tip of the tongue gently against the lower gums to form a fine seam.

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The word abdomen (rhyme abdomen) requires extended full, stable resonance focus. An accent (such as "a") lifts the soft palate and maximizes the oral volume. Closed accent (such as Gusu zhe "u") requires a small round hole in the anterior lip, and the pharyngeal cavity is expanded to compensate for the reduction of oral space.

The end (rhyme) needs to be clean and rhyme to avoid "eating words". The nasal rhyme end (such as "-ng") should close the nasal passage within 0.2 seconds before the end of the phrase to prevent the "hum". The vowel tail (such as "-i") should naturally attenuate, the tip of the tongue gradually stick to the back of the teeth to complete the sound.

Different mouth return rhyme skills are also different, see the following table:

The rut type	Return to the core skills	Classic case
Jiang Yang ruts	The soft palate was actively raised (Angle 30°), and the tongue root was retracted releasing nasal resonance	"The Great River East" "wave" (lang) word long sound processing
People Chen ruts	The tip of the tongue gently touches the upper gums, and the nasal sound continues until the mouth of the phrase	"Homesick" "ren" (ren) character of sadness
What oblique rut	The corners of the mouth to the sides, maintain the vowel "ie" narrow channel high frequency overtone	"Three Wings of roses" "thank" (xie) the end of the end
Middle East rut	The root of the tongue pressure expands the pharyngeal cavity, and the proportion of nasal resonance is controlled at 40% -50%	The reverberation effect of the word "sound" (shang eng) in "Yangguan Triassic"

2.2 The improvement path of vocal music expression

2.2.1 Strengthen the image of poetry through the choice of mouth

The space-time extension of huai laizhe (-ai): in the "head" (tou) of "I live in the Yangtze River head", by extending the "A" sound and gradually weakening the "i" sound, the sense of flow of the river and the long time of yearning are simulated

The tactful narrative of the word (-ian): "di" (di) in "Hongdou Ci" adopts "i- ɑ n" sliding to rhyme, and uses the anterior nasal tremor to show the visual association of the tears rolling.

2.2.2 Acoustic treatment of emotional expression

Bright track mouth (such as flower track): increase the F2 frequency to enhance the cheerful mood, suitable for the word "flower" in "snow search for plum".

Dark zhe mouth (such as gray pile zhe): reduce the frequency of F1, and add air sound (noise accounted for 15%), rendering the "tears" sense of repression.

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2.2.3 Integration strategy of Thirteen Zhe and Western bel canto

Dynamic balanced oral-to-pharyngeal cavity ratio adjustment for the resonance focus. Chinese singing: it is mainly oral resonance (60%), emphasizing the clarity of pronunciation; bel canto: by reducing the larynx (laryngnode sinking 1-2cm), the resonance center is moved to the pharyngeal cavity (increased to 50%), realize the integration of Chinese and Western timbre.

Compatibility training for respiratory support. Cooperation between "Qi Shen Tianjin" and "Diaphragmatic support": when singing Jiang Yangzhe, use "fast suction and slow breath" (inhale for 0.5 seconds, exhale for 6 seconds) to support the nasal resonance of Changle sentences; combined with bel canto's "chest and abdomen combined breathing method", realize breath flow control in "How to Think of him" and "ah".

Conflict resolution of the verbal habit. Soft treatment of warped tongue sounds (e. g. "zh, ch, sh"):

When singing Chinese art songs, the amplitude of the tip of the tongue is reduced by 30% to avoid destroying the "phonetic column coherence" required by bel Canto.

Smooth translation of the vowel transition. Extend the trilnion sliding time of "ao" (remote sequence) from 0.3 seconds to 0.5 seconds, approaching the coherence of the Italian "iau".

2.2.4 Teaching practice and training program

Dynamic simulation exercise:

Jiang Yangzhe: Read "Jiang-Yang-light" continuously, feel the linkage between the soft palate and the root of the tongue.

Gusu Zhe: hum the melody of "Virgin" with "u" to train the breath control in the state of round lips.

Chinese and Western fusion recommended:

"The Great River East" (Chinese art song): focus on training the combination of Jiang Yangzhe and bel Canto Legato (continuous sound);

"I live in the Yangtze River head" (new ancient poetry): practice oil to seek zhe "-ou" and Bel Canto (bel canto) half-acoustic skills matching.

The scientific use of thirteen zhe is the "genetic code" of Chinese vocal music singing. Through the fine technique of rhyme, the image of rhyme, and the organic integration of Chinese and Western singing, the singer can not only maintain the aesthetic characteristics of Chinese rhyme, but also expand the international dimension of artistic expression. This practice system provides a solution with both cultural depth and technical precision for vocal music teaching.

3. Construction of thirteen zhe training system in vocal music teaching

3.1 Teaching framework design

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3.1.1 Third-order progressive training model

Basis cognition stage (1-2 weeks):

Functional cognition of vocal organs: demonstrate the role of soft palate, tongue position and nasal passage in thirteen channels through anatomical map or 3D animation (Figure 1: vocal organ model).

Zhe mouth classification memory: according to the three categories of "wide, narrow, nasal" summarized three zhe (such as hair flower zhe belongs to wide sound, what is inclined to narrow sound), combined with dialect contrast to strengthen memory.

Skill Training Phase (3-6 weeks):

Single-track reinforcement practice: focus on the same in each class (such as Jiang Yangzhe), design "single-word phrase phrase complete paragraph" progressive training.

Example: Jiang Yangzhe long sound practice

River (Ji'an) Sunshine (yang guang) Great river east waves (da jiang dong qu lang tao jin)

Mixed track conversion training: in the songs such as "Red bean words" and so on, practice the fast return switch of "Middle East ruts" (such as "dripping enough" to "lovesickness, blood and tears").

Comprehensive application stage (7-12 weeks):

Linkage of poetry and vocal music works: combine the "Gusu Zhe" bite of "Fengqiao Night Park" with the melody of "Yangguan Sanfeng stack" to strengthen the artistic expression.

The practice of integrating Chinese and Western singing: the "grey track" is implanted in the bel Canto song "My Dear" to solve the problem of Chinese lyrics.

3.1.2 Common problems and solution strategies

problem types	Typical performance	solving strategies
The rhyme is not clean	Jiang Yangzhe "-ng" tail tape throat noise	Soft palate lifting training (including warm water gargle method) + nasal breath monitor feedback
Oral resonance is insufficient	The "a" sound is flat and lack of penetration	Bite the apple method (open the mouth to 45°) + vocal cord edge vibration practice
The rut is stiff	From "huai to zhe" to "people Chen zhe" when the sound	tongue twister speed exercise (such as "sell vegetables, change ginseng")
Emotional expression is single	"-ian" mechanical rhyme lack of sadness and joy change	Combined with the level and oblique design of ancient poetry, "strength and weak gradient of rhyme" (Figure 2: Strength mark spectrum example)

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4. Case study on teaching practice

4.1 Case context

Course name: The application of thirteen training in ancient poetry and songs

Teaching object: sophomore students of vocal music department of an art college (12, aged 19-21, Chinese native tongue)

Core problem: When students sing "Sanfeng" and "Maple Bridge Night Park", there is a phenomenon of "fuzzy rhyme and single emotional expression"; 70% of students have technical imbalance of "insufficient oral opening" and "nasal resonance abuse".

4.2 Curriculum design and implementation

4.2.1 Teaching Objectives

Skill goal: master 5 kinds of high frequency channels (Jiang Yang zhe, word zhe, Gusu zhe, hair flower zhe, human Chen zhe) rhyme skills.

Emotional goal: to achieve the matching expression of "rhyme-poetry artistic conception" through the analysis of mouth characteristics.

Innovation objective: Use visual tools to optimize the traditional oral heart teaching mode.

4.2.2 Teaching framework

Period: 8 weeks (2 hours per week, including 1 hour of practice recording)

Three-stage mode:

stage	content	Tools / Methods
Basic cognition	Track mouth classification and pronunciation anatomy principle	Picture + contrast recording
Special breakthrough	Single zhe intensive training (such as Jiang Yangzhe "nasal cavity-head cavity linkage")	Resistance blow tube practice
integrated application	Ancient poetry song "beauty · Spring flower autumn moon when" singing	Emotional marker spectrum + interdisciplinary figure design

4.2.3. Type of teaching fragments

Jiang Yangzhe Special lesson example:

Question introduction: play the recording of "waves" in "Great River East", pointing out that the nasal resonance of "-ang" is insufficient (measured 35%, target 45%);

Technical disassembly: soft palate sagging training: gargle with warm water, synchronously monitor the speed of nasal airflow; vocal cord edge vibration practice: with "hum turn open accent" to achieve the smooth

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transition from the nasal cavity to the head cavity.

Gamification consolidation: "return shooting" game: students need to quickly return to the Chinese characters (such as "Jiang, light, mang") on the screen within 10 seconds, and the correct rate is 90% to unlock the next game.

4.3 Analysis of teaching results

metric	Mean before teaching	Mean after teaching	Promotion rate
Return rhyme accuracy	68%	92%	+35.3%
Oral opening (vertical)	1.0cm	1.8cm	+80%
Emotional expression richness	Level 2.1	Level 3.9	+85.7%

Quantitative data comparison (before and after teaching evaluation)

Note: Emotional expression is graded according to level 4 of "mechanical-qualified-vivid-profound", and is blindly evaluated by 3 professional teachers.

4.4 Teaching reflection and improvement

4.4.1 Successful experience

Interdisciplinary integration breaks the bottleneck: opera cloud gesture (such as "palm") helps 80% of students to expand their oral opening;

Gamification maintenance motivation: the game utilization rate reached 100%, and the length of after-class independent training increased by 1.2 hours on average.

4.4.2 Problems to be improved

Insufficient coping with individual differences: no targeted scheme was designed for the rhyme interference of 3 dialect students (Cantonese and Hokkien);

Emotional-technical connection: some students pay too much attention to the degree of the soft palate, resulting in obvious mechanical sense of singing.

4.4.3 Optimization strategy

Stratified teaching: customized training program according to dialect area and resonance type (head cavity type / chest type);

Feedback mechanism: the introduction of "poetry image association training", such as Jiang Yangzhe corresponding to the "river surging" picture sense.

Through the closed-loop path of "problem diagnosis-technical disassembly-data verification", this case proves that the thirteen zhe training system can effectively solve the problem of Chinese vocal singing. In the future, we can further explore the deep integration of artificial intelligence (real-time word correction system)

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and traditional culture (such as guqin rhythm) in teaching, so as to provide a practical model for the construction of Chinese vocal music teaching paradigm.

5. Conclusion and outlook

This study proves through interdisciplinary empirical analysis that the thirteen zhe system has irreplaceable academic value and practical efficiency in improving the singing quality of Chinese art songs. The experimental data show that the "language-music dual-modal training model" based on the rules of rhyme can significantly improve the accuracy of rhyme, and realize the accurate matching of acoustic resonance and poetry rhythm by standardizing the acoustic parameters of Chinese pronunciation. With the help of rhyme emotional metaphor database, the adaptation problem of Western singing and Chinese language aesthetics is effectively solved. This provides a path for the modern transformation of traditional rhyme theory: the fusion strategy (the synergy of bel canto breathing support and opera rhyme technology)

The future research can be explored in the following two directions: expand the resource base of dialect rhyme, construct the transfer model of vocal music covering the six dialects of Cantonese and Wu; second promote the international comparative research, and establish the interpretation framework of Chinese rhyme aesthetics in the dissemination of "Belt and Road" art songs. These explorations will help to achieve the dual goals: to improve the theoretical system of the Chinese vocal music school at the theoretical level, and to solve the dual paradox of "challeability" and "solution" of Chinese art songs in the context of globalization at the practical level.

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