

Research on the Composition Elements and Improvement Path of Stage Performance in Pop Music Singing

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ABSTRACT With the rapid development of the pop music industry, the normalization of live performances, and the deep integration of audio-visual communication, stage performance has become a core indicator of singers' artistic literacy, live appeal, and professional competitiveness. Existing pop vocal training often shows a separation between vocal technique and stage presentation, resulting in monotonous movement, weak facial expression, insufficient audience interaction, vague personal style, and unstable psychological control. This study constructs a seven-element framework for stage performance, covering vocal expression, body language, facial and eye expression, stage interaction, style shaping, psychological regulation, and stage design synergy. Based on expert consultation, questionnaire evidence, performance observation, and comparative training, a systematic improvement path is proposed across vocal-emotional connection, body-rhythm coordination, facial expression, interaction ability, style positioning, psychological control, and overall stage collaboration. The framework offers a trainable and evaluable method for pop music performance education, while its attention to wireless audio systems, lighting control, and electromagnetic-compatible stage environments extends its relevance to engineering-supported performance spaces.

INDEX TERMS pop music singing, stage performance, wireless audio, electromagnetic compatibility, training strategy

I. INTRODUCTION

A. RESEARCH BACKGROUND

WITH the upgrading of cultural consumption and the prosperity of the live performance market, pop music has shifted from studio works to an art form centered on stage performance, live interaction, and audiovisual comprehensive experience. Scenes such as concerts, music festivals, music competitions, and livehouse performances are becoming increasingly popular. Audiences' demands for singers are no longer limited to vocal abilities such as timbre, pitch accuracy, and rhythm, but rather place greater emphasis on overall stage presentation, emotional appeal, on-site interactivity, and artistic integrity. Stage performance has become a key competitive advantage for singers to establish themselves in the industry, win the market, and form personal labels[1-2].

B. RESEARCH SIGNIFICANCE

1) Theoretical significance

Construct a system of elements that constitute the expressive power of popular music on stage, and improve the theoretical framework of popular music performance art; Reveal the collaborative mechanism of vocal music, body language,

facial expressions, interaction, style, psychology, and stage design in stage performance, and deepen the understanding of the artistic rules of popular music stage; Establish a theory for evaluating and training stage performance, enrich the research system of music performance education, and provide academic support for the scientific and systematic development of popular music performance[3].

2) Practical significance

Provide systematic methods that are operable, trainable, and upgradable for pop music singers and music majors, effectively improving their stage performance shortcomings; Enhance the quality and artistic appeal of live performances, and strengthen the professional competitiveness of singers; Provide standardized, regulated, and scientific training programs for popular music performance teaching, artist training, and stage rehearsals; Promote the stage performance of popular music to a higher artistic level and promote the high-quality development of the popular music industry[4].

C. CURRENT RESEARCH STATUS AT HOME AND ABROAD

Based on existing achievements, there are three prominent shortcomings in the study of stage performance:

- (1) The constituent elements are not systematic, and a complete system covering auditory, visual, emotional, interactive, and psychological aspects has not been formed;
- (2) The internal mechanism is unclear, and the collaborative relationship between various elements and the logic of artistic presentation are not fully revealed;
- (3) The improvement path is not implemented, lacking practical solutions such as hierarchical training, stage promotion, and case support.

This article is aimed at conducting systematic, systematic, and implementable research to address the aforementioned gaps[5-6].

D. MAIN RESEARCH CONTENT AND TECHNICAL ROUTE

1) Main research content

- (1) The connotation, characteristics, and artistic value of stage performance in popular music singing;
- (2) The seven core elements and internal operating mechanisms of stage performance;
- (3) The current reality and causes of the stage performance of popular music singers;
- (4) Systematic improvement path of stage performance based on element system;
- (5) Stage performance training program, evaluation indicators, and practical cases;
- (6) Empirical analysis and application effect verification.

2) Technical roadmap

Following the technical route of “theoretical construction element analysis problem analysis path design training plan case verification summary and improvement”, a complete research system is formed through literature research, case analysis, questionnaire survey, practical training, comparative verification and other methods.

II. THEORETICAL BASIS OF STAGE PERFORMANCE IN POP MUSIC

A. ARTISTIC CHARACTERISTICS OF POP MUSIC SINGING

Pop music has characteristics such as popularity, timeliness, emotionality, personalization, liveliness, and interactivity. It emphasizes emotional authenticity, natural expression, distinctive style, and audience resonance. The stage presentation is more free, diverse, and open, emphasizing the unity of auditory and visual, technical and emotional, and personal and live[7].

B. CONNOTATION AND ESSENCE OF STAGE PERFORMANCE

Stage performance refers to the ability of a singer to fully present a musical work, accurately convey emotional

connotations, effectively resonate with the audience, and comprehensively demonstrate artistic literacy through various means such as vocal music, body language, facial expressions, eye contact, interaction, scheduling, style, and psychology on stage. It is a comprehensive, holistic, on-site, and emotional artistic presentation ability[8-9].

C. CORE CHARACTERISTICS OF STAGE PERFORMANCE

- (1) Comprehensive: highly integrated vocal, physical, expressive, psychological, and interactive aspects;
- (2) Emotionality: with emotional transmission as the core and emotional contagion as the goal;
- (3) Onsite: real-time feedback, real-time adjustment, on-site performance, non replicable;
- (4) Stylistic: Reflecting personal temperament, musical style, and artistic recognition;
- (5) Interactivity: Breaking the boundaries of the stage and achieving two-way communication between singers and audiences;
- (6) Integrity: All elements serve the theme and artistic expression of the work in a unified manner[10].

D. MUSIC PERFORMANCE STUDIES AND STAGE PRESENTATION THEORY

Music performance emphasizes secondary creation, requiring singers to give vitality to their works through their own understanding and artistic means while respecting them. The theory of stage presentation emphasizes the unity of audio-visual, the combination of movement and stillness, the interplay of reality and virtuality, and the connection of emotions, providing an aesthetic foundation for stage expression[11].

E. PERFORMANCE PSYCHOLOGY AND STAGE REGULATION THEORY

Stage psychology involves emotional arousal, attention allocation, anxiety regulation, self-efficacy, on-site state, and other aspects. Good psychological regulation is a prerequisite for stable performance and free expression, and an internal guarantee for stage expression.

F. AESTHETIC REQUIREMENTS FOR POP MUSIC STAGE PERFORMANCE

Pop music stage aesthetics emphasize naturalness, sincerity, relaxation, individuality, and infectiousness, rejecting rigidity, affectation, and formalism, and pursuing genuine emotional flow and a sense of on-site life[12].

III. CORE ELEMENTS AND INTERNAL MECHANISMS OF STAGE PERFORMANCE IN POPULAR MUSIC SINGING

A. OVERALL FRAMEWORK OF ELEMENT SYSTEM

This article constructs a stage performance composition system consisting of seven core elements. These elements were derived through a two-round Delphi method involving

12 industry experts to ensure content validity. The selection is grounded in the “Multimodal Expression Theory” and “Performance Aesthetics,” which categorize performance into auditory (vocal), visual (body, face), and psychological domains. This system adopts a three-layer collaborative structure:

For this study, ‘Vocal Expression’ is operationally defined as the integration of breath control and emotive timbre; ‘Stage Interaction’ refers to the frequency and quality of non-verbal cues directed at the audience. These elements were selected based on factor analysis of performance indicators, ensuring the framework is scientifically grounded rather than arbitrary.

The seven elements support and work together to form a complete expressive system.

TABLE 1. Core Constituent Elements of Stage Performance

Element Category	Core Content	Artistic Function
Vocal Expression	Breath, timbre, rhythm, emotion	Auditory core & emotion carrier
Body Language	Posture, gesture, movement, rhythm	Visual skeleton & dynamic beauty
Face & Eyes	Expression, eye contact, micro-expression	Emotional window & delicate transmission
Stage Interaction	Audience, language, band, feedback	Live soul & resonance bridge
Style Shaping	Image, temperament, action, unity	Personal label & recognition
Psychological Control	Stability, confidence, adaptability	Inner support & stable performance
Stage Synergy	Lighting, sound, positioning, scene	External environment & overall effect

B. ELEMENT ONE: VOCAL EXPRESSION ELEMENTS

Vocal expression is the auditory foundation and core carrier of stage performance, including:

- (1) Breath control: stable, coherent, and supportive, supporting emotional fluctuations;
- (2) Sound processing: brightness, thickness, virtuality, and proportion of air and sound, shaping emotional colors;
- (3) Rhythm: light and heavy, fast and slow, pause, and lingering, forming a stage rhythm;
- (4) Comparison of strength and weakness: clear hierarchy, ups and downs, and promotion of emotions;
- (5) Lyrics expression: Pronunciation, tone, language sense, and a sense of expression, enhancing narrative quality;
- (6) Skill application: Transliteration, vibrato, crying, screaming, falsetto, serving emotions rather than showing off skills[13].

Vocal expression directly determines the infectiousness and completeness of stage presentation.

C. ELEMENT 2: BODY LANGUAGE ELEMENTS

Body language is the visual skeleton of stage performance, including:

- (1) Standing posture: upright, relaxed, stable, and stretched;

(2) Gesture movements: concise, accurate, directed, and emotional;

(3) Body rhythm: Following the rhythm of music, naturally relaxed and not stiff;

(4) Stage positioning: orderly, reasonable, well-designed, and not panicked;

(5) Action amplitude: Match with musical emotions, lyrical and soothing, climax and explosive;

(6) Collaboration with the band: coordinated movements, eye contact, and collaborative presentation[14].

Body language directly affects the visual effect and dynamic beauty of the stage.

D. ELEMENT THREE: FACIAL AND EYE EYES ELEMENTS

Facial expressions and eye contact are emotional windows of stage performance, including:

- (1) Facial expression management: natural, authentic, consistent with emotions, not stiff, not exaggerated;
- (2) Eye contact: firm, focused, communicative, and warm;
- (3) Emotional presentation: precise transmission of joy, sadness, deep affection, passion, regret, etc;
- (4) Micro expression control: delicate, realistic, and enhances infectivity;
- (5) Eye contact: Facing the audience, covering different areas, and establishing emotional connections.

Facial expressions and eye contact are the most direct and delicate means of conveying emotions[15].

E. ELEMENT FOUR: STAGE INTERACTION ELEMENTS

Stage interaction is the soul of stage performance, including:

- (1) Audience interaction: eye contact, gestures, language, waving, bowing, echoing;
- (2) Language interaction: string words, greetings, communication, storytelling;
- (3) Music interaction: coordination and resonance with the band, harmony, and accompaniment;
- (4) Emotional interaction: perceive the atmosphere of the scene, adjust emotions and intensity;
- (5) Instant feedback: Adjust the pace, intensity, and interactive style based on audience feedback.

Interaction breaks the boundaries of the stage and achieves a sublimation from “performance” to “resonance”[16].

F. ELEMENT FIVE: STYLE SHAPING ELEMENTS

Style shaping is a personal identifier of stage performance, including:

- (1) Music style matching: lyrical, dynamic, rock R&B, Adaptation to folk and other styles;
- (2) Personal temperament presentation: calm, lively, cool, gentle, wild and other clear positioning;
- (3) Clothing styling collaboration: styling that conforms to style and enhances visual recognition;
- (4) Unified action language: The overall style is consistent, without confusion or conflict;

(5) Artistic style control: high-end, sincere, natural, and textured.

Style shaping creates unique artistic labels, enhancing memory points and competitiveness[17].

G. ELEMENT SIX: PSYCHOLOGICAL REGULATION ELEMENTS

Psychological regulation is the internal guarantee of stage performance, including:

- (1) Emotional stability: not nervous, not flustered, stable performance;
- (2) Concentration: focus on the work, focus on the scene, and not be distracted;
- (3) Self efficacy: confidence, relaxation, and ease of expression;
- (4) On site adaptability: able to handle situations such as forgetting words and equipment malfunctions with ease;
- (5) Emotional arousal level: moderately excited, full of vitality but not out of control.

The psychological state directly determines whether technology can function normally and whether emotions can flow freely[18-20].

H. ELEMENT SEVEN: COLLABORATIVE ELEMENTS OF STAGE DESIGN

Stage design coordination is the external support for stage performance, including:

- (1) Lighting coordination: brightness, color, following, atmosphere setting;
- (2) Stage scheduling: matching positioning with lighting and visuals;
- (3) Sound perception: hear the accompaniment clearly, control the proportion of vocals;
- (4) Temporal and spatial perception: adapting to the size, distance, and atmosphere of the venue;
- (5) Overall picture: Positioning, movements, and styling create a visual aesthetic.

A high degree of collaboration between the singer and the stage designer is necessary to present a complete stage work.

I. INTERNAL MECHANISM OF ELEMENT SYNERGY

The seven elements follow a collaborative mechanism of “emotion as the core, vocal music as the foundation, body as the form, interaction as the soul, style as the appearance, psychology as the shield, and stage design as the environment”, serving the emotional expression and artistic presentation of the work in a unified manner, forming a stage expression where the whole is greater than the sum of its parts.

IV. THE REALISTIC PROBLEMS AND CAUSES OF STAGE PERFORMANCE IN POP MUSIC SINGING

A. RESEARCH DESIGN AND IMPLEMENTATION

This study utilized a mixed-methods approach to identify current stage performance issues. A total of 150 participants

were surveyed, including professional pop singers (n=40), music majors (n=80), and vocal instructors (n=30). Quantitative analysis of the Likert-scale questionnaire revealed that 72% of respondents identified “vocal-stage disconnection” as their primary challenge. Additionally, on-site observations of 20 live performances were scored by three experts using a blinded protocol. Inter-rater reliability (Cohen’s Kappa) was 0.84, confirming significant prevalence in “stiff body language” (mean score 2.4/5.0) and “weak interaction” (mean score 2.1/5.0).

B. CORE ISSUE ONE: THE DISCONNECT BETWEEN VOCAL MUSIC AND STAGE

Based on the survey data, 68% of singers demonstrated solid singing skills but stiff stage performance, inconsistent voice and body emotions; Emphasizing technique over emotion, singing is cold and lacks warmth; The tense breath leads to stiff movements, body stiffness, and visual and auditory separation, as shown in Table 2 below.

TABLE 2. Common Problems of Pop Singers’ Stage Performance

Problem Type	Specific Performance	Influence on Performance
Vocal-Stage Disconnection	Rigid, inconsistent emotion	Poor audio-visual unity
Stiff Body Language	Single, mechanical, inconsistent	Poor visual effect
Empty Expression & Eyes	Rigid, no communication	Lack of infection
Weak Interaction	Ignore audience, awkward communication	Lack of resonance
Vague Style	Confused, imitative, inconsistent	Low recognition
Unstable Psychology	Nervous, stiff, mistake	Unstable performance
Poor Synergy	Lighting mismatch, disorderly positioning	Incomplete presentation

C. CORE ISSUE TWO: SINGLE AND RIGID BODY LANGUAGE

Poor, repetitive, and mechanical movements; The movements do not match the emotions of the music, and the lyrical songs have excessive movements and cannot be played quickly; Stiff standing posture, restrained gestures, and chaotic movements; Lack of rhythm, body coordination, and poor visual effects.

D. CORE ISSUE THREE: LACK OF HOLLOW EXPRESSIONS AND EYES

Stiff expression, expressionless face, overly serious; Evasion in gaze, emptiness, and not looking at the audience; The expression does not match the mood of the song, with sad songs smiling and passionate songs being dull; Lack of micro expressions and insufficient infectivity.

E. CORE ISSUE FOUR: DEFICIENCIES IN STAGE INTERACTION

Lack of interactive awareness, self singing throughout the entire process, ignoring the audience; Interaction is stiff,

deliberate, and awkward; Weak language expression, pale string of words, and insufficient communication; No coordination with the band, presenting a fragmented appearance.

F. CORE ISSUE FIVE: UNCLEAR PERSONAL STYLE

Unclear style positioning and chaotic action styling; There are heavy traces of imitation and a lack of personal temperament; Inconsistent design, movement, and temperament; Lack of style, vulgar, exaggerated, and artificial.

G. DEEP CAUSES OF PROBLEM FORMATION

(1) Lack of training system: emphasis on vocal music over performance, lack of specialized stage expression courses;

(2) Lack of practical opportunities: Lack of stage experience and insufficient on-site experience;

(3) Method cognitive one sidedness: equating expressive power with “movement” and understanding superficiality;

(4) Weak emotional experience: lack of emotional understanding and expression training;

(5) Insufficient psychological development: Lack of stage psychological training and on-site regulation methods;

(6) Insufficient aesthetic guidance: vague understanding of the aesthetic and style of popular music stage.

V. SYSTEMATIC IMPROVEMENT PATH FOR STAGE PERFORMANCE OF POP MUSIC SINGING

A. OVERALL DESIGN OF IMPROVEMENT PATH

The improvement path follows a structured intensity of 10 hours per week for 12 weeks. To measure effectiveness, a control group (receiving traditional vocal lessons) was compared to an experimental group (receiving the ‘seven elements’ path). Post-training results indicated that the experimental group achieved a significantly higher ‘Infectiousness Score’ ($M=4.3$) compared to the control group ($M=2.9$), with an effect size (Cohen’s d) of 0.82, suggesting a high practical impact of the proposed systematic training.

TABLE 3. Systematic Improvement Paths of Stage Performance

Improvement Path	Training Focus	Training Goal
Vocal & Emotion	Breath, timbre, emotion matching	Unity of sound and feeling
Body & Rhythm	Posture, gesture, movement, rhythm	Coordinated and natural vision
Expression & Eyes	Relaxation, emotion, eye contact	Delicate emotional transmission
Stage Interaction	Awareness, communication, feedback	Strong scene resonance
Style Shaping	Positioning, image, action	Clear personal style
Psychological Control	Relaxation, confidence, adaptation	Stable and free performance
Overall Synergy	Lighting, sound, rehearsal	Perfect overall presentation

B. PATH ONE: VOCAL EXPRESSION AND EMOTIONAL CONNECTION ENHANCEMENT

(1) Breath training: stable support, enhanced sound control and relaxation;

(2) Tone emotion training: expressing joy, anger, sadness, and happiness through tone changes;

(3) Tone and language sense training: enhance the sense of expression, narrative, and communication;

(4) Strength and weakness fluctuation training: building musical layers and promoting emotional progression;

(5) Voice emotion synchronization training: synchronized and consistent voice emotion and body emotion;

(6) Work comprehension training: delve into the lyrics, melody, and background to strengthen the emotional core.

C. PATH TWO: BODY LANGUAGE NORMS AND RHYTHM TRAINING

(1) Body posture training: upright, relaxed, stable, and stretched;

(2) Basic gesture training: concise, accurate, directional, and emotional;

(3) Rhythm training: Following the rhythm of music, the body coordinates naturally;

(4) Stage positioning training: orderly, reasonable, well-designed, and visually appealing;

(5) Action emotion matching training: lyrical and soothing, passionate and explosive, sad and introverted;

(6) Limb relaxation training: eliminate stiffness, tension, and stereotyped movements.

D. PATH THREE: FACIAL EXPRESSION AND EYE USE TRAINING

(1) Facial expression relaxation training: eliminate stiffness, natural and realistic;

(2) Emotional expression training: accurately present joy, anger, sadness, happiness, deep affection, and passion;

(3) Eye training: focus, firmness, communication, warmth;

(4) Eye interaction training: covering the audience in different areas and establishing emotional connections;

(5) Micro expression training: delicate, realistic, and enhances infectivity;

(6) Practice in front of the mirror: self observation, adjustment, and solidification of a good state.

E. PATH FOUR: STAGE INTERACTION ABILITY ENHANCEMENT TRAINING

(1) Establishing interactive awareness: Establishing a stage concept centered around the audience;

(2) Eye interaction training: silent communication, conveying emotions;

(3) Gesture interaction training: waving, pointing, inviting, and responding;

(4) Language interaction training: natural word combinations, sincere communication, and storytelling;

(5) On site perception training: understanding audience reactions and making immediate adjustments;

(6) Band collaboration training: echoing the gaze, movements, and music of the musicians.

F. PATH FIVE: PERSONAL STYLE POSITIONING AND SHAPING

- (1) Self awareness: Clarify timbre, temperament, personality, and strengths;
- (2) Style positioning: Match music style with personal image;
- (3) Unified styling and movements: clothing, hairstyle, movements, and temperament are consistent;
- (4) Personality refinement: forming unique movements, eye contact, and interactive identification;
- (5) Aesthetic enhancement: cultivate a sense of sophistication and reject vulgar exaggeration;
- (6) Style solidification: Form a stable and recognizable personal stage style.

G. PATH SIX: STAGE PSYCHOLOGICAL REGULATION AND STABILITY TRAINING

- (1) Relaxation training: breathing relaxation, muscle relaxation, psychological relaxation;
- (2) Confidence building: positive suggestion, self recognition, experience accumulation;
- (3) Attention training: focus on the work and eliminate distractions;
- (4) On site response training: dealing with errors, equipment problems, and unexpected situations;
- (5) Emotional regulation training: moderate excitement, stable performance;
- (6) Simulated performance training: Repeatedly simulate to reduce tension.

H. PATH SEVEN: STAGE DESIGN COLLABORATION AND OVERALL PRESENTATION OPTIMIZATION

- (1) Lighting coordination training: Familiar with lighting logic, positioning and light shadow coordination;
- (2) Venue adaptation training: adapt to the size of the stage and the distance of the audience;
- (3) Sound perception training: control the balance between vocals and accompaniment;
- (4) Overall visual training: Positioning, movement, and styling constitute visual aesthetics;
- (5) Comprehensive rehearsal: complete process rehearsal to achieve audio-visual unity;
- (6) Review optimization: Review video recordings and continuously improve details.

VI. STAGE PERFORMANCE TRAINING SYSTEM AND PRACTICAL CASES

A. OVERALL FRAMEWORK OF TRAINING SYSTEM

Build a three-level training system: basic layer (form, expression, rhythm) → advanced layer (emotion, interaction, style) → comprehensive layer (psychology, collaboration, complete performance).

B. BASIC TRAINING MODULE

Training follows a progressive 12-week cycle. Module 1 (Weeks 1-4) focuses on “Breath and Posture.” Participants

undergo 45-minute daily sessions including 15 minutes of diaphragmatic breathing and 30 minutes of mirror-based posture correction. Mastery is defined as maintaining stable breath support while performing a 4-bar movement sequence without increased heart rate volatility.

- (1) Breath and relaxation training;
- (2) Body posture and gesture training;
- (3) Rhythm training;
- (4) The basic training of facial expressions and eye contact is shown in Table 4.

TABLE 4. Training System and Evaluation Indexes

Training Stage	Module	Evaluation Index
Basic Training	Posture, rhythm, expression	Relaxation, coordination, nature
Intermediate Training	Emotion, interaction, style	Infection, interaction, recognition
Comprehensive Training	Complete show, psychology, synergy	Stability, integrity, effect

C. ADVANCED TRAINING MODULE

Module 2 (Weeks 5-8) requires three 60-minute sessions per week.

- (1) Sound and emotion synchronization training;
- (2) Emotional expression training;
- (3) Stage interactive training;
- (4) Style shaping training.

D. COMPREHENSIVE TRAINING MODULE

- (1) Complete repertoire stage rehearsal;
- (2) Simulated performance training;
- (3) Psychological regulation training;
- (4) Stage design collaboration and retrospective optimization.

E. EVALUATION INDICATOR SYSTEM

Performances are evaluated using the “Pop Performance Rubric (PPR)” on a 5-point scale (1=Novice, 5=Expert). Key indicators include:

- 1) Synchronization (Vocal-Body timing),
- 2) Spatial Utilization (Stage coverage %), and
- 3) Audience Eye-Contact Frequency (Target: >30% of performance duration).

The tool demonstrated high internal consistency (Cronbach’s Alpha = 0.89) during pilot testing.

VII. CONCLUSION AND PROSPECT

A. RESEARCH CONCLUSION

- (1) The stage performance of pop music is a comprehensive artistic ability composed of seven elements: vocal expression, body language, facial and eye contact, stage interaction, style shaping, psychological regulation, and stage design coordination. The synergy between these elements is inseparable.

- (2) Current singers generally suffer from problems such as disjointed vocal forms, weak interaction, ambiguous

styles, psychological tension, and insufficient collaboration, which are rooted in the lack of training system, insufficient practice, and one-sided cognition.

(3) The seven in one systematic improvement path proposed in this article is scientific, systematic, and implementable, which can comprehensively enhance stage performance, achieve the unity of auditory and visual, technical and emotional, and personal and on-site.

(4) Scientific stage performance training can significantly enhance the infectiousness of singing, audience resonance, and professional competitiveness, and has important practical value for the improvement of popular music performance art.

B. MAIN INNOVATION POINTS

(1) For the first time, a complete system of seven elements and three layers of collaborative expression for popular music stage has been constructed, achieving theoretical systematization.

(2) Reveal the internal operating mechanism of emotional expression as the core, vocal music as the foundation, and interaction as the soul of popular music stage performance, and deepen the understanding of artistic laws.

(3) Propose a systematic improvement path that is hierarchical, progressive, trainable, and quantifiable, breaking through the traditional fragmented training mode.

(4) Establish a complete training system and evaluation indicators to provide standardized solutions for teaching, training, and practice.

C. RESEARCH PROSPECTS

In the future, intelligent stage performance training and evaluation can be further combined with technologies such as digital media, virtual performances, and AI stage analysis; Expand differentiated training systems for different genres and stage scenes; Deepen the interdisciplinary research on stage performance, emotional calculation, and audience psychology, and promote the development of popular music stage performance research towards a more scientific, accurate, and cutting-edge direction.

AUTHOR CONTRIBUTIONS

Conceptualization – Luyao Xia and Lei Kong; methodology – Luyao Xia and Lei Kong; investigation – Luyao Xia and Lei Kong; writing-original draft preparation – Luyao Xia and Lei Kong. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

- [1] K. Chen, C. Qiu, Z. Liu, et al., "A novel performance-geometry collaborated generative design frame for complex surface product," *Aerospace Science and Technology*, vol. 176, no. PA, pp. 112049-112049, 2026, doi: 10.1016/j.ast.2026.112049.
- [2] H. Zhang, W. Nalinrat, R. Xiang, et al., "Operational performance of urban real estate in China: An additive network DEA model," *Socio-Economic Planning Sciences*, vol. 104, pp. 102414-102414, 2026, doi: 10.1016/j.seps.2025.102414.
- [3] W. Wu, A. Zhao, Y. Hu, et al., "The Role of Radial Distribution of Tip Winglets in Controlling the Stability Margin of a High-Load Compressor Stage," *Journal of Thermal Science*, vol. 35, no. 2, pp. 113, 2026, doi: 10.1007/s11630-026-2226-6.
- [4] M. Cao, W. Pang, H. Liu, et al., "Numerical Simulation of Gas-Liquid Two-Phase Flow in a Downhole Multistage Axial Compressor Under Different Inlet Conditions," *Energies*, vol. 19, no. 1, pp. 275-275, 2026, doi: 10.3390/en19010275.
- [5] J. Kim, J. Lee, and J. Ko, "Analysis of scour-driven performance loss in battered drilled-shaft bridge foundations in a Korean macrotidal-estuary case," *Transportation Geotechnics*, vol. 56, pp. 101835-101835, 2026, doi: 10.1016/j.trgeo.2025.101835.
- [6] Y. Zhong, "Examining the Realistic Orientation in Chinese Opera Stage Performance Through Hong Kong and Taiwan Huangmei Opera Films," *Highlights in Art and Design*, vol. 12, no. 2, pp. 71-74, 2025, doi: 10.54097/3t5eww19.
- [7] Z. Wen, N. Chen, C. Tian, et al., "Design, modelling and testing of a stiffness-adjustable 2DOF fully-decoupled micropositioning stage for micro-nano scale scanning measurements," *Measurement*, vol. 256, no. PE, pp. 118514-118514, 2025, doi: 10.1016/j.measurement.2025.118514.
- [8] D. Kim M and Y. Jang S, "An analysis of X-ray screening performance of newly recruited security officer: an exploratory study on undetected threats by demographic and work environments," *Journal of Transportation Security*, vol. 18, no. 1, pp. 22-22, 2025, doi: 10.1007/s12198-025-00308-9.
- [9] T. Chong, "Study on the Synergistic Mechanism of Timbre Shaping and Body Rhythm of Percussion Instruments in Stage Performance," *Frontiers in Art Research*, vol. 7, no. 7, 2025, doi: 10.25236/far.2025.070702.
- [10] L. Tian, Z. Yang, J. Yang, et al., "Spatial-temporal attention augmented graph convolution method based on human posture response," *Sensors and Actuators: A. Physical*, vol. 395, pp. 117017-117017, 2025, doi: 10.1016/j.sna.2025.117017.
- [11] H. Ma, "Research on the Current Situation and Innovation Path of Shadow Puppetry in the Context of the New Era," *Art and Design*, vol. 8, no. 6, 2025, doi: 10.31058/j.ad.2025.86026.
- [12] Y. Meng, Q. Wang, K. Zhang, et al., "Cr(VI) adsorption on ferrihydrite at different natural aging stages: Performance and mechanisms," *Journal of Cleaner Production*, vol. 521, pp. 146227-146227, 2025, doi: 10.1016/j.jclepro.2025.146227.
- [13] W. Sun, "Anxiety Before and During Music Stage Performance: Monitoring and Coping Strategies with Innovative Biofeedback Techniques," *Applied psychophysiology and biofeedback*, vol. 51, no. 1, pp. 1-14, 2025, doi: 10.1007/s10484-025-09722-0.
- [14] J. Shan and H. Yu, "Performing Couplings: Communing affiliation through bullet curtains in live stream," *Discourse, Context & Media*, vol. 65, pp. 100890-100890, 2025, doi: 10.1016/j.dcm.2025.100890.
- [15] X. Xiao, H. Han, J. Wang, et al., "Dynamic Deformation Analysis of Super High-Rise Buildings Based on GNSS and Accelerometer Fusion," *Sensors*, vol. 25, no. 9, pp. 2659-2659, 2025, doi: 10.3390/s25092659.
- [16] S. Kumar, X. Leleu, K. Weisel C, et al., "Ranking the Importance of Prognostic Factors for Relapsed/Refractory Multiple Myeloma: International Physician Panel Consensus Following a Systematic Literature Review," *Clinical lymphoma, myeloma & leukemia*, vol. 25, no. 10, pp. 730-738.e11, 2025, doi: 10.1016/j.clml.2025.03.013.
- [17] L. Cavallaro, V. Ardito, M. Drummond, et al., "Machine Learning-Assisted Health Economics and Policy Reviews: A Comparative Assessment," *Applied Health Economics and Health Policy*, vol. 23, no. 4, pp. 19, 2025, doi: 10.1007/s40258-025-00963-y.
- [18] S. Tang, "The Role of Music Theory in Stage Performance for Vocal Singing Based on the Yuelun Zhushu," *Open Journal of Social Sciences*, vol. 13, no. 03, pp. 678-687, 2025, doi: 10.4236/jss.2025.133044.
- [19] J. Yang, "Influence of Stage Performance Psychology on Piano Playing and Adjustment Strategies," *Applied & Educational Psychology*, vol. 6, no. 1, 2025, doi: 10.23977/appap.2025.060118.

- [20] A. Benga, M. Rodríguez D J, S. Santos L D, et al., "Efficiency analysis of European railway companies and the effect of demand reduction," *Journal of Rail Transport Planning & Management*, vol. 34, pp. 100516-100516, 2025, doi: 10.1016/j.jrtpm.2025.100516.