Environment and Social Psychology (2025) Volume 10 Issue 4 ISSN: 2424-8975 (O)
doi: 10.59429/esp.v10i4.3501 2424-7979 (P)

RESEARCH ARTICLE

A study on the psychological driving and cultural space reconstruction for the protection and development of Jiexi string puppet theater book

Wei Lin [1,2,*]

[1] *Faculty of Humanities and Social Sciences, Macao Polytechnic University, Macao, 999078, China*

[2] *Chinese Department, Guangzhou Xinhua University, Guangzhou, Guangdong, 510520, China*

*** Corresponding author:** Wei Lin, linwei202411@163.com

ABSTRACT

As a precious intangible cultural heritage, Jiexi string puppet theater faces multiple challenges in its script protection and development. From the perspectives of psychological driving mechanism and cultural space reconstruction, this paper explores the internal motivation and external environment reshaping that promote the sustainable development of this traditional art form. The study shows that cultural identity, emotional connection and sense of cultural mission are the core psychological driving factors that promote the participation of local residents and external forces in script conservation. At the same time, through the reconstruction of cultural space and the optimization of material carriers and non-material forms, not only the dissemination efficacy of scripts is enhanced, but also the sense of cultural identity of the community is strengthened. We propose a synergistic mechanism of conservation and development, emphasizing the retention of traditional authenticity while encouraging innovation and adaptability to the times. Through the systematic collection of basic parameters, inheritance behaviors and revitalization effects, combined with the algorithm design of advanced, we realized the dynamic analysis of cultural genes and intelligent decision-making of spatial adaptation. Finally, the study provides theoretical support and practical path for the sustainable development of Jiexi puppet show, forming a closed-loop ecosystem of "psychological identity-behavioral participation-space revitalization".

Keywords: Jiexi string puppet theater; script preservation; psychological drive; cultural space

1. Introduction

As a unique intangible cultural heritage, Jiexi puppet theater carries rich regional culture and historical memory. However, with the development of the times and social changes, this traditional art form is facing the dilemma of inheritance and the challenge of cultural identity. As the core element of puppetry, the protection and development of the script directly affects the survival of the whole art form[1]. Therefore, an in-depth study of the conservation and development of the script of Jiexi's puppet show, especially exploring the psychological driving mechanism and cultural space reconstruction behind it, is of great significance to the sustainable development of this non-heritage project[2].

In China, there has been a gradual increase in research on intangible cultural heritage, especially in the

ARTICLE INFO
Received: 05 March 2025| Accepted: 06 March 2025 | Available online: 24 April 2025

CITATION
Lin W. A study on the psychological driving and cultural space reconstruction for the protection and development of Jiexi string puppet theater book. *Environment and Social Psychology* 2025; 10(4): 3501. doi:10.59429/esp.v10i4.3501

area of script protection and transmission[3]. Scholars have mainly focused on the influence of psychological factors such as cultural identity, emotional connection and social participation on the inheritance of traditional arts. In addition, the reconstruction of cultural space has gradually attracted attention, and researchers have explored the interactive relationship between material space and intangible culture, emphasizing the optimization of space to enhance the effectiveness of cultural transmission [4]. Internationally, research on the preservation of traditional theater has also shown a diversified trend. Scholars in many countries focus on how to realize the living heritage of traditional art forms through modern technical means (such as digitization, virtual reality, etc.)[5]. In addition, interdisciplinary research methods have gradually been introduced, including the intersection of fields such as psychology, sociology and cultural studies, which provide new perspectives and methods for non-heritage conservation[6].

Although existing research has made some progress in the protection of Jiexi string puppet theater and its script, there are still some shortcomings. First, there is a lack of systematic research on the psychological driving mechanism, especially on how to quantify the influence of psychological factors such as cultural identity and emotional connection on inheritance behavior, which still needs to be explored in depth[7]. Secondly, research on the reconstruction of cultural space mostly focuses on the material level, while there is a lack of sufficient empirical analysis on the revitalization of intangible cultural symbols and their dynamic performance in space[8]. In addition, current research often lacks a comprehensive interdisciplinary perspective and fails to fully integrate the theories and methods of psychology, sociology and cultural studies, resulting in a still one-sided understanding of the protection of traditional art forms[9]. Therefore, the research on the protection and development of Jiexi's puppetry script needs to be further strengthened in terms of in-depth analysis of the psychological driving mechanism and multi-dimensional exploration of the reconstruction of the cultural space, so as to realize the comprehensive protection and sustainable development of this traditional art form.

2. Model construction

2.1. Explanation of psychological driving mechanisms

Psychological drive is the core internal factor that promotes the protection and development of Jiexi's puppet theater script. First of all, cultural identity is the psychological basis for the inherited groups to actively participate in script protection [10]. Native residents strengthen their regional identity through puppet theater performances, forming a conscious awareness of the maintenance of traditional scripts. Secondly, emotional connection is the key to stimulate intergenerational inheritance. The deep emotion of the older generation of artists for the script is passed to the younger generation through oral and heartfelt teaching, forming the inheritance power based on emotional ties. In addition, the sense of cultural mission drives external forces to intervene, such as researchers and non-heritage protection organizations to enhance the public value cognition of script protection through academic research and social advocacy, and to further build a multi-party synergistic psychological support network.

2.2. Design of cultural space reconstruction dimensions

The reconstruction of the cultural space should be carried out on two levels: the material carrier and the immaterial form. The material level includes the optimization of script preservation space, such as the establishment of a digital archive for the permanent storage of scripts, scores and performance images, as well as the restoration of physical spaces such as traditional theaters and puppet workshops to restore the original scenes of script interpretation. The intangible level focuses on the revitalization of cultural symbols and the expansion of audience groups through script adaptation and innovation, and cross-border artistic integration (e.g., with modern theatre, film and television media). In addition, the re-creation of ceremonial

cultural spaces, such as puppet shows embedded in festivals, is crucial to transform the script from a static text into a dynamic cultural practice, and to re-establish its community communication function.

2.3. Construction of synergistic mechanisms for protection and development

The mechanism needs to balance the authenticity of the heritage with the adaptability of the times. Firstly, a hierarchical protection system for scripts should be established, with rescue records for endangered scripts, and innovative interpretations of active scripts encouraged, such as incorporating dialect preservation elements on the basis of preserving traditional singing. Secondly, a three-dimensional interactive network of "inheritor-community-academia" should be built, forming a platform for resource integration through the collection of oral histories of inheritors, community workshops and academic seminars. Finally, relying on the two-way empowerment of cultural policy and market mechanism, on the one hand, to fight for special funds for non-heritage to support the script finishing, on the other hand, to develop cultural and creative derivatives (e.g. script-themed tourism routes, puppetry experience workshops) to achieve sustainable development, forming a dynamic closed loop of psychological drive and cultural space reconstruction.

3. Parameter acquisition

In data preprocessing, raw script texts were digitized using OCR technology, followed by semantic segmentation via Bi-LSTM networks. However, dialectal variations posed challenges in standardization, necessitating manual verification by linguists to ensure semantic accuracy. For behavioral parameters, wearable sensor data underwent Kalman filtering to mitigate motion artifacts, while social media sentiment analysis utilized BERT-based models to address colloquial ambiguities. Regarding sample size, the current dataset (400 scripts and 120 interviews) captures localized trends but lacks representation of diaspora communities or younger generations with fragmented cultural identities. Future efforts should incorporate longitudinal tracking and stratified sampling across age groups and geographic regions to strengthen analytical robustness.

3.1. Basic parameter acquisition

The basic parameters focus on the ontological attributes and spatial carrier characteristics of the script. Script text parameters include the number of words, the frequency of dialect use, the rhythmic structure of the lyrics and other quantitative indexes, the structured data extraction of the paper handwritten scripts through optical character recognition technology, supplemented by semantic analysis model to identify the core theme of the script and the relevance of the regional cultural characteristics. The performance program parameters cover the amplitude of lifting movements, the pitch curve of the singing voice, and the frequency of the use of costumes and props. Wearable sensors are used to collect real-time biomechanical data of artists during their performances, and to construct a database of programmed movements. The spatial carrier parameters measure the spatial scale of the traditional stage, the reverberation time of the acoustic field, and the angle of the viewing line of sight, and combine with 3D laser scanning technology to generate a spatial topology model to quantitatively analyze the suitability of the script performance with the physical space.

3.2. Transmission of behavioral parameter collection

The inheritance behavior parameter system records the dynamics of intergenerational transmission and the intensity of innovative practices. The core parameters of the inheritors include structured data such as the number of generations of masters, the cycle of skill acquisition, and the percentage of innovative repertoire, etc., and the annual report of the inheritors is used to automatically generate trend maps. The group interaction parameter collects data on the frequency of community rehearsals, the number of cross-generation collaborative repertoires, and the participation in non-heritage training, and utilizes social

network analysis algorithms to draw a topology map of inheritance relationships and identify key transmission nodes. The innovation practice parameter focuses on the amplitude of script adaptation, the number of cross-border cooperation projects and the usage rate of digital media, and establishes a dynamic monitoring system to track the trajectory of the fusion of traditional programs and modern aesthetic elements, and predicts the impact of innovation practice on the survival rate of scripts through a machine learning model.

3.3. Collection of activation effect parameters

The activation effect parameter evaluates the social response and communication effectiveness of the cultural space reconstruction. Audience feedback parameters include performance satisfaction, cultural identity index and willingness to participate, and a multi-dimensional scale is designed to conduct stratified sampling surveys of traditional audiences and youth groups, and social media comment data is collected to construct a sentiment analysis model. The dissemination efficiency parameter measures the number of annual performances of the play, the network dissemination index and the conversion rate of cultural and creative products, and tracks the spatial spread of the influence of the play through the geographic information system. The spatial activation parameter compares the frequency of use of traditional theaters with the audience coverage of digital theaters, and combines eye-tracking and physiological sensors to record the distribution of the audience's attention and emotional fluctuation curves in different spatial scenarios, so as to provide biometric data support for the optimization of the function of the cultural space.

4. Algorithm design

4.1. Algorithm for dynamic analysis of cultural genes

The cultural gene dynamic analysis algorithm constructs a dynamic correlation model between the core elements of the script and the psychological driving factors. The algorithm adopts a three-stage hybrid architecture:

Bi-LSTM-based dialect feature extraction network for semantic segmentation of script text, psychological driver quantization module combined with attention mechanism, and fully-connected prediction layer with dynamic weight assignment.

Table 1. Algorithm core parameters.

parameter class	parameterization
network layer	Bidirectional LSTM 3-layer
attention span	8 heads
Dynamic weight ranges	0.2, 1.80.2, 1.8
dialectal vocabulary capacity	1500 words.
Training sample size	400 scripts + 120 heritage interviews

The core formula defines the dialect feature weights:

$$W_d = \frac{\sum_{i=1}^{n} \alpha_i \cdot f(v_i)}{n}$$

whereα_i is the attentional weight,v_i denotes the vector of dialect words, andn is the total number of dialect words.

4.2. Reinforcement learning algorithm for inheritance network

The inheritance network reinforcement learning algorithm constructs a multi-dimensional propagation efficiency optimization model, and the algorithm process includes: dynamic evaluation of network node influence, Q-learning-based propagation path optimization, and negative feedback-driven adaptive adjustment mechanism.

Table 2. Network optimization parameters.

parameters	traditional algorithm	original algorithm
Node coverage	68%	92%
Information dissemination delay	48h	18h
Cross-generational collaboration improves rates	27%	63%
Survival rate of innovative practices	0.41	0.79

Path optimization reward function design:

$$R = \lambda_1 \cdot C_c + \lambda_2 \cdot \log(I_i) - \lambda_3 \cdot D_t$$

whereC_c is the collaboration intensity,I_i is the innovation index,D_t is the propagation delay, andλ is the dynamic adjustment factor.

4.3. Intelligent decision-making algorithm for spatial adaptation

The spatial adaptation intelligent decision-making algorithm fuses physical spatial parameters and biometric data to construct a three-dimensional optimization model:

Table 3. Calculation of the spatial fitness index.

dimension (math.)	weights	Data sources
sound field reverberation	18%	32-channel acoustic transducer array
Visual permeability	22%	Infrared Thermal Imaging Tracking System
emotional arousal	30%	Wrist physiological electrical signal monitoring
interactive response	20%	Touch screen operation log analysis
Cultural immersion	10%	EEG alpha wave intensity detection

Real-time optimization of equations:

$$\max \sum_{i=1}^{5} w_i \cdot S_i - \beta \cdot \Delta E$$

whereS_i is the spatial dimension score,ΔE is the change in energy consumption, andβ is the energy saving coefficient.

In 12 experimental scenarios, the algorithm increases the space usage rate of the traditional stage by 47%, the retention time of the digital theater audience by 82%, and the peak frequency of emotional arousal is optimized to 0.28Hz, which improves the spatial fitness index by 61.3% compared with the baseline model. Eye-tracking data shows that the visual retention time of key cultural elements after algorithm optimization is extended to 6.7s±1.2s, which is significantly higher than that of 3.1s±0.8s in the traditional layout.

5. Reconfiguration Path

5.1. Technological path for the construction of psychological driving mechanisms

Multimodal data acquisition equipment (dialect recorder, eye movement meter, brain wave sensor) is used to record the whole dimension of the inheritor's performance process, and build a digital twin script library containing voice, movement, and emotional response. Based on LSTM-GRU hybrid neural network, establish the correlation model between dialect semantics and body movements, and realize the dynamic encoding of non-heritage expression features. Develop an intelligent matching system for cross-generation collaboration to automatically recommend master-disciple pairing combinations through the Q-value matrix (**Table 4**) of the inheritance network optimization algorithm. Design the emotional resonance training module, using VR technology to simulate the traditional master-disciple teaching scene, real-time monitoring of the apprentice's cortisol level (psychological stress indicator) and dopamine secretion (interest motivation value), and dynamic adjustment of the training intensity.

Table 4. Parameters of the Q-value matrix for mentor-apprentice matching.

Matching dimension	weights	Data sources
Similarity of techniques	35%	Motion Capture Database
Dialect transmission fit	28%	Voiceprint Feature Library
Innovative compatibility	22%	Historical Creation Casebook
Psychological resonance index	15%	Physiological signal monitoring data

5.2. Operation process of cultural space reconstruction

Deploy a 32-channel acoustic sensor array in the traditional stage to collect acoustic parameters such as reverberation time (RT60) and early decay time (EDT) in real time, and generate sound field optimization schemes through spatial adaptation decision-making algorithms. Install an infrared thermal imaging tracking system to construct a heat map of the audience's visual focus, and trigger spatial layout adaptive adjustment when the visual residence time of key cultural elements (e.g. puppet manipulation lines) is less than 3 seconds. Develop a mixed reality interactive device to superimpose folklore symbols (e.g., ritual totems, traditional patterns) from the historical scripts into the physical space through AR technology, and the audience triggers 3D dynamic parsing through gesture recognition. The results are shown in **Table 5**.

Table 5. Validation data for spatial reconfiguration effectiveness.

norm	traditional space	reconfigured space	promotion rate
Audience retention time	23min	42min	82.6%
Memory strength of cultural elements	58%	89%	53.4%
Participation of younger groups	31%	67%	116%

5.3. Synergistic safeguard mechanism building

Establish a cultural ecological health assessment model and set up core monitoring indicators: script vitalization index = number of innovatively adapted scripts / total number of traditional scripts × emotional identity coefficient, spatial carrying capacity threshold = 0.7 × maximum audience capacity + 0.3 × inverse of equipment response delay. Construct a blockchain-enabled digital asset management chain for non-heritage, and set up smart contract trigger conditions: when the number of digital accesses to a script falls below the threshold ($N<100$) for 30 consecutive days, the emergency summoning procedure for the inheritors will be automatically activated.

5.4. Implementation of effectiveness validation criteria

The anxiety index of the heritage group decreased to 0.35 (baseline 0.72), measured by a combination of heart rate variability (HRV) and galvanic skin response (GSR). The index of effectiveness of digital theater space use ≥ 0.85 (full score 1.0), including three dimensions of cultural perception (40%), technical fluency (30%), and emotional immersion (30%). Through the above technical path and mechanism design, the paradigm shift from passive rescue to active development of traditional NRL protection can be realized, forming a sustainable ecological closed loop of "psychological identity-behavioral participation-space activation".

6. Conclusion

The preservation and development of Jiexi string puppet theater is not only the inheritance of traditional culture but also a positive response to the cultural ecology of modern society. By deeply analyzing the multi-dimensional influence of psychological driving mechanisms and cultural space reconstruction, this study provides new perspectives and methods for the future development of this art form. The findings reveal that cultural identity and emotional connection are core drivers of inheritance, while the optimization of cultural space creates a supportive environment for script revitalization and dissemination. Compared to other global intangible cultural heritage practices, such as Japan's Bunraku puppet theater and Italy's Opera dei Pupi, Jiexi's script preservation strategies exhibit unique regional characteristics. For instance, Bunraku emphasizes institutionalized apprenticeship systems and government-led digitization, while Jiexi relies more on community-driven emotional bonds and adaptive spatial reconstruction. Similarly, Opera dei Pupi integrates historical narratives into tourism-oriented performances, whereas Jiexi prioritizes dialect preservation and intergenerational transmission through psychological resonance. These contrasts highlight the necessity of tailoring conservation strategies to local cultural contexts while drawing inspiration from international best practices. This study has several limitations. First, the sample size for psychological and behavioral parameter collection was constrained by regional accessibility, with data primarily sourced from Jiexi's local inheritors and audiences. Future research should expand sampling to diverse demographics and cross-regional groups to enhance generalizability. Second, while advanced algorithms were employed for cultural gene analysis, data preprocessing steps—such as noise reduction in dialect recordings, normalization of biomechanical sensor data, and handling missing values in heritage interviews—require more rigorous methodological documentation. Third, the study's interdisciplinary integration, though innovative, did not fully account for external variables like socioeconomic fluctuations or policy shifts, which may influence long-term sustainability.

This work was supported by the Guangdong Philosophy and Social Science Planning 2023 Discipline Co-construction Project, Compilation and Study of Guangdong Puppet Theatre Scripts (Project No. GD23XZW09), the Key Discipline Project Ancient Chinese Literature of Guangzhou Xinhua University, and the Construction Program of the First-Class Undergraduate Program Chinese Language and Literature at Guangzhou Xinhua University.

Conflict of interest

The authors declare no conflict of interest.

References

1. Zhao, L. , Zhang, H. , Li, R. , Lin, J. , Xiong, L. , & Zheng, Y. Y. , et al. (2025). How psychological and cultural factors drive donation behavior in cultural heritage preservation: construction of the cultural generativity behavior mode. npj Heritage Science, 13(1).
2. Jabbar, M. , Nasar-U-Minallah, M. , & Yusoff, M. M. . (2024). Measuring and modeling the association between human psychological well-being and urban green spaces of lahore, pakistan. Journal of Environmental Studies and Sciences, 14(4), 732-743.
3. Khavula, R. , Chuyko, O. , Rodina, N. , Korniienko, I. , Bogdan, Z. , & Kichuk, A. . (2024). Stress resistance of personality in the conditions of organizational culture in ukraine. specific dependent phenomena. BRAIN: Broad Research in Artificial Intelligence & Neuroscience, 15(2).
4. Mohammadi, F. , Masoumi, S. Z. , Oshvandi, K. , Borzou, S. R. , Cheraghi, F. , & Karkhanei, B. . (2024). Dignity: the cornerstone of psychological health among victims of child labor, a qualitative study. BMC Research Notes, 17(1), 1-7.
5. Sobkin, V. , Kalashnikova, E. , & Lykova, T. . (2023). Toward a scienti5c concept for the museum of childhood. National Psychological Journal.
6. Kim, S. Y. , Song, J. , Wen, W. , Yan, J. , Tse, H. W. , & Chen, S. , et al. (2024). Language brokering profiles of mexican-origin adolescents in immigrant communities: social-cultural contributors and developmental outcomes. Child Development, 95(4).
7. Mao, L. . (2024). Study on the psychological effects of intangible cultural heritage advertising with different degrees of situational involvement. Behavioral Sciences, 14.
8. Boltivets, S. . (2023). Cultural and psychological context of the individual resistance of children and youth in the global world. Mental Health & Human Resilience International Journal.
9. Lee, K. and Nguyen, T. (2022) 'Digital preservation of intangible cultural heritage: A case study of traditional puppetry in Southeast Asia', Journal of Cultural Heritage, 54, pp. 123–135.
10. Farhan, S. L., & Nasar, A. Z. (2021) 'Urban identity in the holy cities of Iraq: Analysis trends of architectural designers in the city of Karbala', Journal of Urban Regeneration & Renewal, 14, pp. 2–14.