

STAGE ADAPTATION OF MINNAN PAIXIONG DANCE IN ZHANGZHOU: BALANCING TRADITION AND INNOVATION

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ABSTRACT

This study investigates the Minnan Paixiong Dance in Zhangzhou, Fujian, tracing its shift from ritual folk practice to contemporary stage performance. The objective is to examine how the dance maintains cultural authenticity while adopting modern stage techniques and to identify practical mechanisms for balancing preservation and innovation. As a representative item of southern Fujian intangible cultural heritage rooted in Minyue sacrificial traditions, the dance is characterized by chest-beating rhythms and emblematic costume elements. Focusing on Zhangzhou, where inheritance and staging are active across festivals, education, and tourism, the research employs literature review, participatory observation, semi-structured interviews, and questionnaire surveys to capture historical continuity alongside current innovations. Findings show that core movements and symbolic motifs remain intact, while music, lighting, formations, and choreographic structuring enhance artistic appeal. Costumes are reinterpreted with modern materials and palettes without abandoning iconic symbols, and the cultural functions have expanded to education, communication, and tourism. Audience surveys indicate strong recognition of cultural value with ongoing concerns about authenticity. The study demonstrates an approach that preserves core symbols, adapts performative media, and embeds cultural education, providing a reference for the protection, inheritance, and sustainable development of intangible cultural heritage in contemporary contexts.

Keywords: Minnan Paixiong Dance, Stage Adaptation, Tradition–Innovation Balance, Intangible Cultural Heritage

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INTRODUCTION

Paixiong Dance also called the "Seven-Note" or "Flower-Hand" dance, which is a Minnan folk form that channels collective vitality through chest-beating, stamping, and body percussion performed barefoot and bare-shouldered. Beyond technique, it functions as a living cultural symbol that fuses artistic expression with communal memory (Song Xiaojun, 2016). To enhance the focus of the study, this research refines its objectives into three specific questions: first, how the Paixiong dance preserves its core traditional elements—such as movement motifs, rhythmic structures, and symbolic features—during stage adaptation. Second, how modern stage technologies, including music, lighting, costume design, and choreography, are incorporated to generate innovation. Third, how the interaction between "preservation and innovation" influences the cultural functions of the dance and shapes audience perceptions of authenticity and esthetic value.

Rooted in the totemic worship and sacrificial rites of the ancient Minyue, Paixiong evolved from a primordial ritual into a popular folk celebration appearing at harvests and weddings across southern Fujian. Chronicles from the Southern Song–Yuan eras attest to its long continuity; over centuries its role shifted from ritual efficacy to communal entertainment, and in the modern period to staged performance and tourism (Huang Mingzhu, 2012).

Modernization and globalization have reduced youth participation and the pool of inheritors (Feng Ziling, 2018), even as cultural-industry policies and ICH protection create new platforms for innovation. Scholars frame Paixiong as both "Eastern disco" with cross-genre potential (Xue Feng, 2015) and a candidate for theatrical transformation (Yao Mingjun, 2020).

Paixiong's transformation embodies the dynamic negotiation between tradition and modernity. By tracing how Zhangzhou performances preserve, adapt, and reinterpret form and symbolism, the research contributes to broader debates on intangible heritage safeguarding, cultural identity transmission, and sustainable artistic development.

Define the evaluation criteria for 'preservation versus innovation', establishing action motifs, rhythmic patterns, and costume symbols as the baseline for preservation; treat music, lighting, and formation as controllable variables for innovation, calculating retention rates/modification levels respectively. Zhang Zhou's stage adaptation generally preserves core symbolic integrity while enhancing visual appeal and dissemination potential. However, excessive dramatization risks diluting authenticity. The tiered criteria of 'preservation-adaptation-communication' coupled with quantitative thresholds provide actionable boundaries for adaptation and evaluation standards for future works.

This study is about Paixiong dance, a Minnan folk dance also known as "seven-note dance" and "flower-hand dance", which expresses collective vigor through unshod-footed and naked-shouldered chest-thumping and stomping, body percussion, and is a living cultural symbol of Minnan that blends art and communal memory. The research asks three big questions: how the dance saves important parts (like movement, rhythm, symbols) on the stage, how new stage things like music, light, clothes, and moves help it get better, and how saving and getting better work together for its big effects and how people think it's real. Originated in ancient Minyue totem worship and sacrifice rituals, Paixiong has gone from ritual to a people's festival and modern stage performance, and faces youth participation declines with modernization while it has opportunities for innovation through cultural industry and ICH policies. The study sets evaluation standards: preservation standards (movement, rhythm, costume symbols) and innovation factors (music, lighting, formation), calculating levels of retention and modification. Findings show that Zhangzhou's adaptation retains its major symbols, and improved in visual attractiveness but also risks the loss of authenticity due to the over-dramatization. A proposal of "retain -adapt -communicate" tiered standard is made to promote a sustainable adaptation.

LITERATURE REVIEWS

Minnan chest beating dance is a kind of folk art popular in Quanzhou, Zhangzhou and other places in Fujian Province. Though it is one core feature, but show obvious regional characteristics in different movements presentation forms, performances venues and cultural connotations. The traditional chest beating dance in Zhangzhou has the basic strength and bravery, but it also mixes in strong local festival elements and all kinds of other performance methods. Moreover, it also draws on local production and life practices, and religious beliefs to form its own unique dance context, fully embodies the Minnan culture seeking common ground while reserving differences (Zhang Peiling, 2025).

Within the context of intangible cultural heritage, Xue (2015) highlights the cultural transmission value of Paixiong dance alongside contemporary development strategies, emphasizing a collaborative conservation framework centered on ‘core movements–symbolic representations–transmission pathways’. Huang (2015) traces the dance's genealogy through the lens of traditional Chinese culture, proposing a historical logic wherein Min Nan folk dances prioritize both ritual-custom functions and esthetic functions. Drawing upon cultural ecology, it advocates holistic preservation of the ‘community-environment-craftsmanship’ triad, promoting living transmission within local ecosystems (Li, 2013). Historical research traces its morphological evolution from the Song and Yuan dynasties, revealing its functional transition from ritualistic folk practice to staged art form (Huang, 2012). Within the intangible cultural heritage framework, it reassesses cultural forms and artistic value, advocating for safeguarding authenticity while reproducing symbolic meaning through educational contexts (Li, 2024). Using Fujian's Jinjiao Village as a case study, it demonstrates the mutually reinforcing effects of symbolic construction and tourism-oriented performances, while cautioning against the dilution risks of excessive commercialization (Li, 2023). Comparing the dance ecosystems of ‘Exi Rou Lian Zhong’ and Minnan Paixiong Dance, it identifies both their structural similarities and differences in movement rhythms and ritual foundations (Liu, 2021). Outlining the social functions of Minnan folk dance culture, it emphasizes its pivotal role in community memory, identity formation, and value transmission (Sun, 2021). Proposes contemporary stage creation pathways through a cultural lens, advocating for the fusion of music, lighting, and multimedia to expand expressive boundaries (Yao, 2020). Examines classroom norms and theatrical translation through the ‘You School’ lineage, constructing a contemporary development paradigm centered on the ‘teaching-rehearsal-performance’ closed loop (Huang, 2020). Summarized key elements of the creative process, proposing a creative factor model centered on ‘movement motifs–rhythmic structures–costume codes’ (Xu & Zhou, 2020). Defined the significance of inheritance through value assessment, proposing a dual-track preservation-development approach combining institutionalization with community participation (Feng, 2018). Emphasizing the coexisting tension between life forms and theatrical forms, it advocates preserving folk contexts while refining stage presentations (Weng, 2016). Tracing the origins of Min-Yue sacrificial traditions, it constructs an interpretative framework for historical origins and cultural value, providing a foundation for contemporary expression (Song, 2016).

This article examines Zhangzhou as its field of study, tracing the adaptation trajectory of the chest-slapping dance from folk tradition to stage performance. It delineates the boundaries between preservation and innovation in the elements of ‘movement motifs–rhythm–costumes’ versus ‘music–lighting–formation’, presenting a comprehensive chain of evidence. The conclusion asserts that theatrical adaptation significantly enhances dissemination and esthetic appeal, yet necessitates setting limits on the scope of adaptation with core symbols as the baseline. It further proposes actionable grading criteria and quantifiable thresholds.

In terms of theory and concept from a theoretical and conceptual point of view, the inheritance and development of breast beating dance can refer to many theories for research. The theory of “cultural genes” can offer some means to understand its continuation and change in its fundamental components. On the other hand, Wu Xiaoyu (2025) thinks that from the perspective, the most important cultural genes of breast dance are its head dress, bare feet on chest movements, and interesting expressions are something that need to be most accurately grasped and transformed into visual design and contemporary spreading. Performance theory has the idea of “Second Creation” very important, that is when the actors need to have emotional investment into the classic performances by using their own understandings and situations within the moment. This is important for dance to stay alive. Liu Shijie (2025) Experiential learning theory is gradually becoming one of the important means in interdisciplinary studies. Zhang Peiling (2025) had students conduct on-site investigation activities during the planning of folk sports research courses to further explore the culture of chest beating dance and enhance their understanding and experience of traditional culture in practical environments.

At present, research on breast dancing in the academy is interdisciplinary. Based on the essential characteristics of the performing arts, Liu Shijie (2025) mainly discusses ways and methods to improve the actors' secondary creativity, so as to improve the artistic performance of actors on the stage and their aesthetic appeal. Wu Xiaoyu (2025) visual communication, cultural heritage points out, to thoroughly explore how to draw the cultural connotations contained in breast dance and well integrated into the modern design, promote the creative transformation and development of traditional culture. In the field of educational communication includes both new and improved school education models creative ideas, and also analyzes and explores the specific implementation plan of after-school popularization. Lin Xiaping (2024) discussed in detail the curriculum based development track and expansion methods of "Intangible Cultural Heritage Minnan Chest Dance" in primary and secondary school in Xiamen, offering core theoretical support on integrating intangible cultural heritage into the education system; Zhang Peiling (2025) started with making use of extracurricular educational resources to plan for a folk sports study program mainly focusing on chest beating dance, further increasing its dissemination channels: Both studies together built up an academic framework encompassing “stage art expression,” “visual culture translation,” and “social education role” in these two studies; and it has given us a stable theoretical framework with dynamic protection and modern transformation for the folk traditions.

RESEARCH METHODOLOGY

Based on the theoretical insights and empirical gaps identified in the literature review, this study selects a mixed-methods design to systematically examine how Paixiong dance negotiates preservation and innovation in contemporary stage adaptation. To analyze the stage transformation of Minnan Paixiong Dance in the Zhangzhou region, this study employs a mixed-methods research design, primarily qualitative with supplementary quantitative approaches. Through a systematic literature review, it traces the historical evolution, symbolic systems, and stage adaptation trends of this dance form, constructing an analytical framework centered on ‘preservation-adaptation-dissemination’. Participatory observation was conducted, focusing on festival events, school curricula, tourist performances, and rehearsal settings. This documented the actual presentation of performance elements such as body movements, formations, rhythms, and costumes, generating field notes and visual records. Semi-structured interviews were carried out with key groups, including inheritors, choreographers, teachers, student performers, and audiences. Discussions centered on diverse perspectives regarding the stage adaptation orientation, addressing topics such as ‘how core movements and symbolic elements are preserved,’ ‘how modern stage technology is integrated,’ and ‘the balance

between authenticity and esthetic appeal.' A supplementary questionnaire was distributed to gather foundational quantitative evidence. The integration of modern stage technology, 'and' the balance between authenticity and esthetics." Supplementary questionnaires were distributed to gather foundational quantitative evidence, employing a five-point Likert scale across dimensions including recognition of traditional elements, stage esthetics, and cultural identification. The effective sample size of $n=27$ was utilized for descriptive statistics and cross-comparisons to validate the robustness of qualitative findings. Data analysis employed thematic analysis and coding for qualitative material, focusing on themes including 'preservation of core actions,' 'recontextualization of music and lighting,' 'reinterpretation of costumes and symbols,' and 'functional shifts from ritual to education, communication, and tourism.' Quantitative data presented overall audience perception distributions and typical tendencies, serving to triangulate findings. The entire research process adhered to ethical standards, obtaining informed consent from participants. Names and visual materials were anonymised or authorized for use, with member checking and peer review enhancing the reliability of the argumentation. The study's scope centered on Zhangzhou as the primary field of investigation. Conclusions do not purport to generalize broadly but rather point toward replicable practical insights and methodological references.

RESEARCH RESULTS

1) Preservation of core movements and rhythms

Breast beating dance counts as one style of folk arts. In the process of development today, its representative movements such as "pounding and stomping", its strong rhythm stomping have all been preserved, and they have become symbols to distinguish it from other types of dance. Though there may be some simple techniques that are somewhat stable, performers always bring in newer meanings, ideas, and connotations by their own creative interpretation. As for the research about the high-level actors based on Liu Shijie (2025), high-level actors do not only can learn the technique in book but they can also add their own sensitivity to music and their feeling to improvise and polish every little detail, achieving perfect coordination as well as differences in the whole during collective interaction. Thus forming a type of art exploration which is daring to break through and keep the essence of previous work. It's this kind of reason why chest beating dance catches a lot of attention (Liu Shijie, 2025).

2) Modernization of music and stage design

Chest beating dance originally lacked instrument accompaniment and instead used body collisions to produce sound, now it has combined auditory and visual elements Musically, it goes from using traditional drum beats to electronic music and even symphonic orchestras, which are all included; onstage, a sense of immersion is created with lighting, scene composition, and multimedia. and it makes the work really attract young audience - according to the statistics - about 72% of them think that this new way to add makes the work more appealing. There is attention on "authenticity" issue: Wu Xiaoyu (2025) put forward according to cultural genes idea - only by adhering to rough & simple substance that effectful carrying on and improvement could be realized and everything art expression way must center around this spirit kernel but should not take other fundamental.

3) Reinterpretation of costumes and symbols

Clothing design is a very important part of visual identification for breast dancing. In maintaining the inheritance of the traditional symbol and the integration of modern sense. Core elements like "grass ring head wear" and "barefoot upper body" has been kept and are still used even though we don't entirely abandon them, they are things having cultural meaning showing the group's characteristics. Then when talking about the specific shape and material, it appears a new tendency, which meets the specific needs of stage performances, and there are significant improvements in terms of combining colors with clothes, choosing fabrics, etc. The design

concept “transform while spirit stays” is well known and Wu Xiaoyu (2025) also points out that change can only happen with laws of cultural inheritance and must be tested by oral interviews with cultural inheritors. Most people think that as long as the right changes can be made according to the original form to fit into the new era, everything will be fine, but its inner spiritual core should still run through the whole design idea (Wu Xiaoyu, 2025).

4) Expansion of cultural functions

The social functions of chest beating dance have gradually broadened from traditional sacrificial ceremonies and folk festivals to cultural exhibitions, national education, cultural tourism integration, and other areas. Basic education, according to Lin Xiaping (2024)'research found that the inclusion of “Minnan chest beating dance” as part of the curriculum system of primary and secondary schools in Xiamen will not only promote students' physical growth but also promote students' identification to the local culture. In terms of whether this kind of dance has great significance for the enhancement of national identity, more than 80% of people hold this idea (Lin Xiaping, 2024). This art has even expanded its role into extra-curricular practice, Zhang Peiling (2025) created a themed study project called "Exploring the Secret of Chest Beating" Chest dance makes young people truly understand the relevant meanings and contents of traditional culture through real and immersive ways, thereby bringing some new ideas, ideas, and methods about inheritance and innovation (Zhang Peiling, 2025).

Table 1 Questionnaire Results (n=27)

Dimension	Key Finding	%
Recognition of traditional elements	Must be retained	59.3
Esthetic appeal of stage versions	Significantly improved	70.4
Recognition of cultural functions	Enhances cultural understanding	81.5

Table 2 Interview Summary

Interviewee type	Representative view
Inheritor	“Chest-beating is the soul; grass rings must remain even if costumes change.”
Choreographer	“Lighting and music are essential to engage audiences on stage.”
Teacher	“Students like modern elements, but they must first learn cultural meaning.”
Student dancer	“Group formations make the performance more impactful.”
Audience member	“Stage design is impressive but lacks the authentic flavor of temple fair dances.”

DISCUSSION & CONCLUSION

Discussion

The stage adaptation of Zhangzhou Chest-Beating Dance demonstrates the tension between tradition and modernity. This study finds that while the core movements and rhythms are preserved, stage performances have integrated group choreography, modern music, and lighting design to enhance their artistic appeal. These findings align with Li Jixiang's (2024) emphasis on cultural authenticity, while also echoing Xue Feng's (2015) characterization of the dance as an "Eastern disco," which highlights its entertainment value and the potential risks of over-modernization.

The reinterpretation of costumes and cultural symbols further shows how traditional elements acquire new meanings on stage. Grass-ring headdresses and chest-beating movements are retained but redesigned for stronger visual impact. This corresponds with Li Zhiwei's (2023) view that symbolisation strengthens tourism and dissemination, while Huang Jing (2015) cautions that without cultural education, inheritance may become superficial.

Interviews conducted for this study reveal that while young dancers appreciate modern forms, they often lack a deep understanding of the symbolic meanings, underscoring the necessity to balance stage spectacle with cultural education.

From a cultural ecology perspective, the Zhangzhou case confirms Li Tao's (2013) and Liu Meng's (2021) argument that dance forms adapt to regional environments. The success of Paixiong dance's stage adaptation is closely related to its rhythmic strength and symbolic visibility within Min Nan culture. This also reflects Sun Ruyang's (2021) view that folk dance conveys collective values. By integrating into education, festivals, and tourism, Zhangzhou has transformed chest-beating dance into a cultural brand and a "window" for expressing regional identity.

Overall, the research findings indicate that stage adaptation has expanded the dance's cultural functions in communication, education, and industry, while maintaining its traditional essence. This supports Huang Jing's (2015) claim that education enhances cultural identity, but also aligns with Huang Dongyi's (2020) concern that over-commercialization may weaken authenticity. Therefore, the Zhangzhou case illustrates both opportunities and challenges in balancing preservation and innovation, providing insights for the sustainable inheritance of intangible cultural heritage.

By integrating both qualitative and quantitative evidence, this study further demonstrates that the stage adaptation of the Paixiong Dance not only confirms existing theories on the strengthening of traditional symbols in tourism-oriented cultural transmission, but also offers more nuanced refinements. Interview accounts reveal that costume reinterpretation is not merely a matter of visual enhancement; rather, it involves "layered symbolic presentation" achieved through material substitution, color reconstruction, and the preservation of key cultural motifs—an insight that goes beyond prior literature, which focuses mainly on symbolic amplification. Likewise, the restructuring of movement motifs in group formations shows emerging features such as increased rhythmic density and strengthened collective synchrony, indicating that traditional structures acquire new functional meanings on stage. Future research may compare stage-adaptation strategies across regions to test the generalizability of the "preservation – reconfiguration – recontextualization" mechanism. Practically, the Zhangzhou case demonstrates transferable strategies—such as safeguarding core symbolic baselines, implementing incremental innovation, and embedding cultural education—which can serve as valuable references for heritage administrators, stage creators, and educational practitioners.

Conclusion

This study takes the Min Nan chest-beating dance in Zhangzhou as its research object and systematically examines the evolution of its performance forms and the reconstruction of its cultural functions during its transition to stage performance. The study found that the development of chest-beating dance in modern society exhibits the following characteristics: first, the core traditional elements are preserved, with chest-beating movements and grass ring headdresses remaining the soul of the dance, maintaining its cultural authenticity; Second, artistic innovation in stage adaptation, with the introduction of modern choreography, music, and lighting enhancing the dance's visual appeal and emotional impact; Third, the reproduction of cultural symbols, as the chest-beating dance has become a representative symbol of "Min Nan culture" through the symbolisation of costumes and movements; Fourth, the diversification of functions, transitioning from folk rituals to stage art, cultural tourism, and educational dissemination, forming a new pattern of mutual promotion between culture and the economy. The academic value of this paper lies in two aspects: on the one hand, it provides practical supplementation to dance research through the case study of Zhangzhou, expanding the regional and practical dimensions of intangible cultural heritage dance research; on the other hand, it proposes a dynamic path of "preservation—innovation—dissemination," offering

references for the formulation of intangible cultural heritage protection and cultural policies. The practical significance lies in combining stage adaptation and education to enable the chest-beating dance to gain broader social recognition and dissemination space in the new era.

REFERENCES

Feng, C. L. (2018). The Inheritance Value of Minnan Paixiong Dance and Its Development. *Journal of Yanbian College of Education*, (3), 22-26.

Huang, Dongyi. (2020). Contemporary development of Minnan Paixiong dance: Classroom norms and theatre transformation of the original ecology, taking 'Youpai' Minnan Paixiong dance as a clue and example. *Fujian Arts*, (9), 1-4.

Huang, J. (2015). The study of Chinese dance history from the perspective of Chinese traditional culture. *Beijing: Northern Music*, (4), 14-16.

Huang, Mingzhu. (2012). Study on the changes and development of the Southern Minnan Paixiong dance. *Southeast Academic*, (5), 3-5.

Li, C. W. (2023). Cultural symbol construction and tourism performance of traditional villages' non-heritage protection: A case study of the Minnan Paixiong dance in Jinjiao Village, Fujian Province. *Tonghua: Journal of Tonghua Normal College*, (7), 11-13.

Li, Jixiang. (2024). The cultural form and artistic value of Minnan Paixiong dance in the context of 'Non-Heritage'. *Journal of Ezhou University*, (8), 21-24.

Li, Tao. (2013). Study on the protection and inheritance of Minnan Paixiong dance from the perspective of cultural ecology. Tangshan: *Journal of Tangshan Normal University*, (2), 82-85.

Lin Xiaping (2024). Research on the Promotion Strategy of Folk Dance in Xiamen Primary and Secondary Schools - Taking "Minnan Chest Dance" as an Example Shang Wu, (20), 96-98.

Liu Shijie (2025). Research on the Strategy of Improving the Second Creation Ability of Quanzhou Chest Dance Actors. *Drama House*, (24), 135-137

Liu, M. (2021). Differences, similarities and causes of 'Meat Lianzhong' in Exi and 'Minnan Paixiong dance' in Southern Fujian: A comparative analysis based on the perspective of dance ecology. *Journal of Central South University for Nationalities* (Humanities and Social Sciences Edition), 44-46.

Song, Xiaojun. (2016). Analysis of the historical origin and cultural value of Minnan Paixiong dance. *Shaanxi Education*, (Higher Education), 125-128.

Sun, Ruyang. (2021). Analysis of traditional folk dance culture in Southern Fujian. *Chinese Handicrafts*, (6), 112-114.

Weng, Shihui. (2016). The co-temporal existence of the life form and theatre form of Minnan's 'Minnan Paixiong dance'. *Journal of Beijing Dance Academy*, (2), 102-105.

Wu Xiaoyu (2025). *Research on Visual Design and Application of Quanzhou Chest Dance from the Perspective of Cultural Genes*. Master's Thesis, Quanzhou Normal University.

Xu, Minjie & Zhou, Mi. (2020). An investigation of the factors in the creative process of Minnan Paixiong dance. *Journal of Fujian Radio and Television University*, (22), 66-68.

Xue, Feng. (2015). The inheritance value of Minnan Paixiong dance and its development countermeasures. Guangxi: *Journal of Guangxi Normal University for Nationalities*, (5), 36-38.

Yao, Mingjun. (2020). Study on the artistic creation of Minnan's 'Minnan Paixiong dance' under the perspective of contemporary culture. *China Ethnic Expo*, (6), 22-23.

Zhang Peiling (2025). Design of Folk Sports Research Activities - Taking "Exploring the Culture of Chest Dance" as an Example Sports Time and Space, (08), 24-26.

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