

# “Body Genes” Get to be Seen: A Study of Living Heritage Transmission of Baima Tibetan Dance in Digital Field Work

Sha Liao, Ting Zhang, Ruoshui Sun

Sichuan Preschool Educators College, Mianyang 621000, Sichuan, China

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**Abstract:** This study addresses the widespread issue of “preserving the form but losing the essence” in the digitization of dance-related intangible cultural heritage. Taking the Baima Tibetan dance as a case study, it constructs a methodological framework that integrates “digital fieldwork” and “body genes.” Moving beyond mere movement documentation, the research interprets the living cultural logic of dance through three levels: form, style, and semantics. It reveals that the “body genes” of Baima Tibetan dance are embedded in stable structures such as a low center of gravity, collectivity, and ritualistic nature, as well as embodied experiences like force application, breath, and spirit, elements that cannot be fully quantified. The core value of digital technology lies in serving as a medium for observation, interpretation, and dissemination, driving digitization from a technical “form-preserving” approach toward a cultural “essence-sustaining” one. This transformation turns digital outcomes into creative resources that revitalize traditional heritage in contemporary contexts.

**Keywords:** Baima Tibetan dance keywords; Body gene; Digital fieldwork; Intangible cultural heritage; Living transmission; Lightweight AI

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## 1. Introduction

In the context of cultural digitization, the preservation of intangible cultural heritage in dance is shifting from static archiving to dynamic transmission. While current digital technologies, such as motion capture, can preserve physical movements, they often exhibit a tendency to “emphasize technology over culture”<sup>[1]</sup>, failing to capture the intrinsic spirit and cultural context of dance. Taking the Baima Tibetan dance as an example, deeply rooted in ritual and community practices, merely extracting movement forms through digitization risks preserving form while losing essence. To address this, this paper adopts the “digital fieldwork” perspective, proposing “body genes” as a methodological intermediary. Using the Baima Tibetan dance as a case study, it establishes a three-tier analytical framework encompassing “form–style–semantics” to identify and extract culturally distinctive movement-culture complexes, thereby exploring a practical pathway from technical “form preservation” to cultural “living continuity.”

## 2. Digital practices in the field: An identification framework for the “Body Genes” of the Baima Tibetan dance

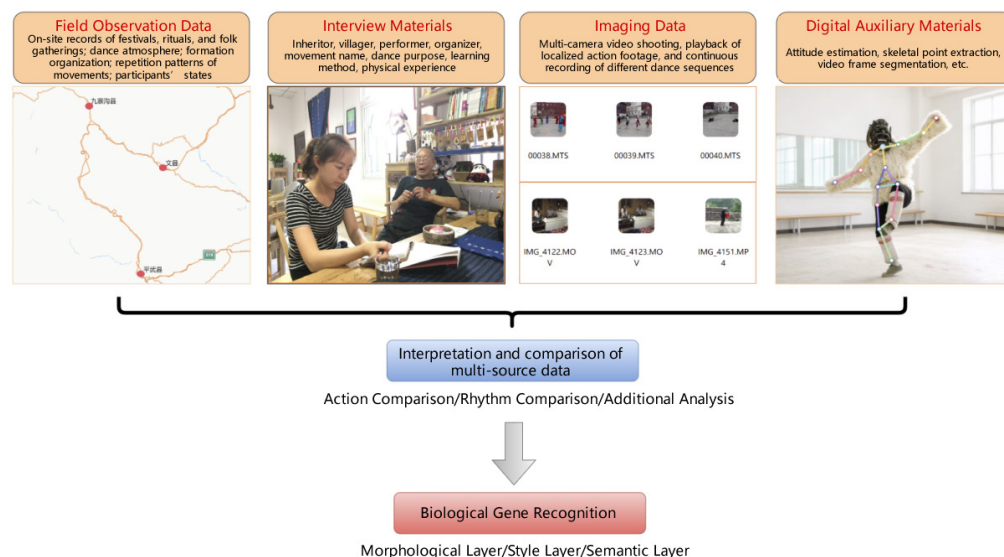
### 2.1. The Grundton of the body: The Baima Tibetan dance as a cultural practice

The Baima Tibetan dance emerged within a unique natural environment, religious system, and communal lifestyle. Its significance extends far beyond mere physical performance for audience appreciation; it constitutes a cultural practice deeply intertwined with rituals, festivals, blessings, and social interactions. Compared to stage-based dances, it exhibits distinct local characteristics and ceremonial qualities. Research categorizes its forms into three types: the ritualistic “Tiao Caogai,” the festive “Yuanyuan Dance,” and the expressive mimetic “Zao Dance.” Despite their functional differences, all three share common bodily characteristics: a low center of gravity, steady movements, rhythmic and compact footwork, and restrained yet expressive physical language. Dancers operate within an environment shaped by collective rhythm, formation coordination, and ambient atmosphere, a context that prevents the dance from being reduced to a mechanical repetition of movements. The dance’s “resemblance” and “dissimilarity” lie more in the bodily expressions, rhythmic organization, and underlying cultural sensibilities conveyed through its movements. Thus, the “body gene” proposed in this paper essentially represents a holistic meaning carrier shaped by the dance’s genre, cultural function, and physical temperament.

### 2.2. Multi-source cross-verification: Data construction from village sites to digital screens

This study adheres to the methodological principles of qualitative research in the digital age, integrating digital fieldwork with embodied traditional fieldwork and incorporating digital tools into long-term field investigations<sup>[2]</sup>. The researchers conducted decades-long observations of festivals, ritual documentation, interviews with cultural inheritors, on-site recording, and follow-up on teaching applications in villages such as Pingwu and Jiuzhaigou in Sichuan. Consequently, the study focuses not only on what the dances accomplish but also on understanding why they are performed in this manner.

The materials employed by the research institute primarily fall into four categories: field observation data, interview transcripts, visual recordings, and digital auxiliary materials generated through lightweight AI tools for pose estimation and skeletal point extraction. During collection and analysis, these four categories of materials mutually reference and corroborate each other, collectively forming a comprehensive network that constitutes the empirical foundation of this study (Figure 1).



**Figure 1.** Schematic diagram of the composition and mutual verification relationships of research materials on the Baima Tibetan dance.

### 2.3. Three-layer analysis: Construction of a “Form–Style–Semantics” analytical framework

This article divides the “body gene” analysis framework into three interconnected levels, which constitute the core framework for examining bodily genes.

The first layer is the morphological layer. It primarily analyzes directly observable action characteristics, including gait, posture, rhythm, center of gravity transfer, spatial trajectory, and formation relationships. This layer addresses how dance movements are expressed.

The second layer is the stylistic layer. It transcends the external form of movements, focusing on the intrinsic attributes manifested during execution—such as the force application technique, breathing rhythm, tension-relaxation cadence, bodily temperament, and mimetic characteristics. This layer addresses those qualitative factors that cannot be quantified but determine whether a dance style is “authentic” and “vibrant.”

The third layer is the semantic layer. Dance movements are understood within their cultural context, recognizing that ritual functions, cultural symbolism, and group order comprehensively shape them. This layer addresses the question of “why movements are organized in this manner.”

This paper employs a hierarchical framework of “form, style, and semantics” to avoid the biases of focusing solely on movements or engaging in abstract cultural discourse. This approach aligns with the fundamental principle of digital preservation of intangible cultural heritage, which requires capturing both the contextual knowledge underlying performances and their digital records<sup>[2, 3]</sup>. The concept of “body genes” aims to establish an analytical framework that is both grounded in practice and explanatory power-rich by integrating bodily perception with cultural interpretation based on movement observation.

## 3. Deconstructing the “Body Gene”: A hierarchical examination of morphology, style, and semantics

### 3.1. External manifestations: Spatial dynamic grammar of knee bending, vibration, and circling movements

The morphological layer of the “body genes” is woven together from elements such as knee flexion, tremors, lateral movement, circular motions, and rhythmic progression with stability. Knee flexion serves as the fundamental core movement, endowing the dance with a sinking, substantial visual quality and a dynamic foundation; the resulting subtle, continuous tremors create rhythmic undulations in the body, infusing vitality into its steadiness. Spatially, steady lateral movement and centripetal circular motions form the basic formation logic, within which dancers respond to one another, collectively maintaining a ritualistic spatial order. These observable and recordable movement characteristics constitute the foundational elements identifying this traditional dance form (**Figure 2**).



**Figure 2.** Schematic diagram of the morphological characteristics of the “body genes” in the Baima Tibetan dance.

However, the physical movements alone cannot fully capture the cultural essence of dance. What truly brings it to life is the stylistic layer beneath the movements—the intangible elements such as force application techniques, breathing rhythms, and expressive breath control that defy complete quantification. The power generation emphasizes building energy in the lower body, transmitted through the waist and hips, resulting in an internalized yet restrained force. Breathing serves not merely as physiological support but functions as an intrinsic driving force deeply integrated with movement rhythm and knee flexibility. Furthermore, the emotional depth, bodily posture, and seamless breath transitions inherent in each movement collectively form the tangible experience that distinguishes authentic performance from mere imitation. Consequently, Baima Tibetan dance fundamentally differs from conventional movement databases: while its physical forms can be captured, its unique sense of power, respiratory dynamics, and artistic expression cannot be fully translated into technical parameters. This constitutes the core dimension that digital research must strive to understand and interpret.

### **3.2. Internal transmission: An embodied style system of power generation, breathing, and expressive artistry**

However, the movement forms alone cannot fully convey the cultural essence of the Baima Tibetan dance. What truly brings the movements to life are the underlying principles of force application, breathing rhythms, and the expression of spirit and energy—these embodied characteristics, which cannot be fully quantified by data, represent the most elusive yet culturally distinctive aspects of human physical heritage.

The first aspect concerns the methodology of force application. In the Baima Tibetan dance, the utilization of power is not mechanical output but rather a directional and controlled bodily coordination. The second aspect involves the intrinsic connection between breathing and rhythm. In this dance form, breathing serves not merely as physiological support but as the internal driving force behind movements. The concepts of “spiritual essence,” “breath intervals,” and “tension-relaxation dynamics” are not abstract rhetorical devices but rather the emotional quality, bodily posture, and transitions manifested during movement execution. The authenticity of a performance often lies not in the precise replication of movement contours but in the indescribable, embodied experience. Consequently, Baima Tibetan dance fundamentally differs from conventional movement databases: while its movements can be extracted and its skeletal structure modeled, its unique sense of force generation, respiratory rhythm, and spiritual essence cannot be fully translated into technical parameters. This paper, therefore, categorizes it as a “bodily genetic” stylistic layer—a dimension that, though challenging to quantify precisely, serves as the key source for identifying the cultural characteristics of this dance and represents the core dimension requiring integrated approaches for close observation, understanding, and interpretation in digitalization processes.

### **3.3. Contextualization: The semantic meaning of actions in ritual logic and cultural rules**

The cultural essence of the Baima Tibetan dance is primarily manifested in how the movements are organized, arranged, and constrained. In this sense, the “semantics” of the dance becomes an integral part of its bodily DNA.

Dances are intrinsically linked to their specific context, function, and cultural identity. The significance of movements derives not merely from their external forms, but more crucially from their position within the overall movement sequence and their functional roles. When separated from this sequence, movements lose their original cultural context. Moreover, dance sequences exhibit both stability and flexibility: fundamental progression patterns and key elements cannot be arbitrarily altered, lest the dance forfeit its cultural legitimacy within the community; yet individual details and situational responses may be adjusted according to specific contexts. It is precisely this distinction between fixed and adaptable elements that establishes the cultural norms of dance. Ritual logic exerts profound influence over movement organization—why do formations adopt enclosed configurations? Why does rhythm unfold progressively? These questions must be examined in light of the sacrificial rituals, symbolic systems, and communal perceptions underlying the dance. Thus, the Baima Tibetan Dance stands as a distinct cultural expression rather than a mechanical combination of steps and expressions. The authentic Baima Tibetan Dance constitutes a cohesive bodily order meticulously woven through cultural

principles.

#### 4. Activation path: The creative transformation of “Physical Genes” in inheritance

“Digital preservation of traditional dance must recognize this principle: while implementing conservation measures, it should consistently prioritize the training of inheritors, education for young people, and public awareness initiatives<sup>[4]</sup>.” Building on the previous analysis of the “body gene” across three dimensions, this paper explores its potential for revitalized inheritance through three approaches—teaching support, creative generation, and public dissemination (Figure 3).

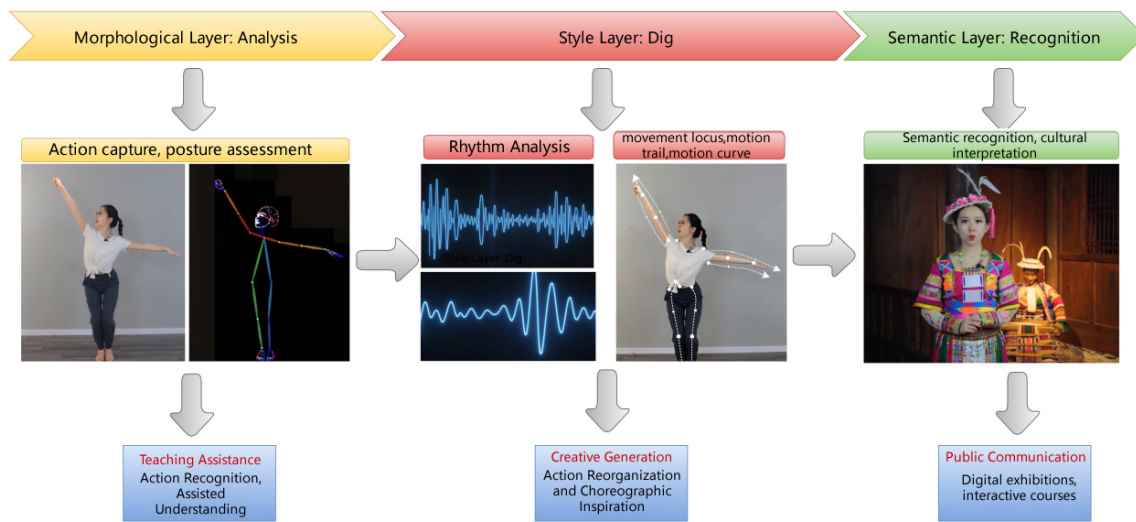


Figure 3. Hierarchical analysis of “Body Genes” and pathway map of live transformation.

##### 4.1. Teaching assistance: From action imitation to a digital bridge for “Body-Bearing”

When traditional teaching methods face challenges, the supportive value of digital tools becomes evident. Building on the hierarchical analysis of “physical genes”<sup>[4]</sup>, the primary approach of digitally-assisted instruction involves motion recognition and key point guidance. By visually organizing typical gaits, rhythmic transitions, and spatial relationships, beginners can more quickly grasp the fundamental grammar and structural logic of dance.

However, digital instruction should not merely focus on teaching the physical movements themselves; instead, it should guide learners into a state of full bodily engagement. This means that digital tools must employ layered prompts, detailed point-by-point explanations, and context-specific demonstrations to help learners understand how the body sinks, how force is transmitted, and how breathing synchronizes with the rhythm. Although these bodily principles cannot be fully encoded digitally, through the effective integration of visual comparisons, slow-motion replays, key-frame annotations, and oral guidance from experienced practitioners, digital instruction can still bring learners as close as possible to the embodied essence of dance.

##### 4.2. Creative generation: Human-machine collaborative creation under cultural rule synergy

The “biological genes” can be regarded as a creative matrix governed by intrinsic principles and cultural constraints. It is not merely a collection of isolated movements, but rather a complex entity shaped by form, style, and cultural norms. Creative practice should not focus solely on external postures, but rather encompass the underlying logic of force application, spatial relationships, and cultural grammar. Only through this approach can “borrowing” evolve into a creative transformation rooted in deep dialogue with traditional heritage. In intangible cultural heritage dance choreography, human-machine collaboration does not mean technology replacing creators, but rather enabling technology to participate in

creative generation within a framework of coexisting cultural rules. This rule-based coexistence ensures that technological innovations remain bound by the dance tradition's cultural boundaries, determining which movement combinations are permissible and which ritualistic elements must be preserved as fundamental constraints during the creative process. Technology may explore new possibilities for movement sequences and simulate novel rhythmic and spatial relationships, inspiring creators; however, it cannot substitute cultural judgment nor transcend the community's established guidelines regarding what is permissible or impermissible.

#### **4.3. Public communication: Digital narratives from visual perception to contextual immersion**

The concept of “body genes” offers a new digital narrative framework for public dissemination of intangible dance heritage, shifting the focus from mere “motion presentation” to profound “contextual interpretation.” Leveraging the visualization, interactivity, and interconnectedness of digital technologies, communication transcends simple movement display by constructing a layered understanding framework centered on bodily dynamics and cultural norms, enabling audiences not only to observe “how dances are performed,” but also to comprehend “why they are performed this way,” thereby accessing the ritual logic and communal memory underlying the movements. For the Baima Tibetan dance, this means guiding viewers from merely “observing movements” to “engaging with its cultural context,” allowing them to appreciate its bodily significance as a dialogue between humans, deities, nature, and the community. The ultimate value of digital dissemination lies not in expanding audience reach, but in reshaping cognitive pathways, facilitating a genuine transition from superficial “display” to deep-level “inheritance.”

### **5. Conclusion**

In summary, this study examines the Baima Tibetan dance as a case study to validate the feasibility of the “body gene” as a mediating concept linking movement documentation with cultural interpretation. The research reveals that the core challenge in dance digitization lies not in technical precision, but in the research paradigm's failure to capture the profound interplay between bodily experience and cultural semantics. Ultimately, the Baima case demonstrates that in an era dominated by technology, the fundamental challenge of intangible cultural heritage digitization lies in leveraging digital means to restore its bodily essence as “living authenticity.” Future development must establish a dialectical relationship between technological innovation and artistic authenticity<sup>[5]</sup>. The “body gene” framework and practices explored in this study represent a concrete attempt to bridge this dialectical relationship, aiming to advance digitization from a mere “technique” of preservation to a “way” of revitalization—ultimately safeguarding the enduring vitality of intangible bodily expressions and cultural heritage in contemporary contexts.

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### **Disclosure statement**

The authors declare no conflict of interest.

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