

Structural Compatibility in Sino-Kyrgyz Musical Fusion

Cross: Cultural Reception Analysis

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Abstract: Against the backdrop of global cultural integration and the diversification of popular music, cross-ethnic music fusion has emerged as a significant pathway for cultural innovation and dissemination. Kyrgyz music, as a representative tradition of Central Asia, is characterized by its distinctive melodic systems, composite rhythmic structures, and unique instrumental timbres (Alymbaeva, 2021). Chinese ethnic music, rooted in the pentatonic scale, integrates diverse rhythmic patterns and a rich array of instruments to form an expressive system with a distinct Eastern aesthetic. Drawing on music semiotics (Nattiez, 1990) and cross-cultural communication theory (Berry, 2005), this study proposes that the deep structural compatibility between Chinese and Kyrgyz music—in terms of rhythm (e.g., asymmetric meters), scale structures (pentatonic vs. natural scales), and timbral features—facilitates their organic integration into popular music. Such fused works are hypothesized to evoke stronger emotional resonance and cultural identification among cross-cultural audiences compared to monocultural compositions. Using a mixed-methods approach combining quantitative surveys and qualitative semiotic analysis, the study validates these hypotheses and identifies specific fusion mechanisms, including rhythmic slicing and recombination, modal superposition, and vocal technique dialogue. The findings provide both a theoretical framework and practical strategies for cross-cultural music innovation, with implications for the contemporary adaptation and global dissemination of ethnic musical traditions.

Keywords: Chinese ethnic music; Kyrgyz music; popular music; cross-cultural fusion; structural compatibility; music semiotics

1. Research Background and Theoretical Framework

1.1. Problem Statement and Research Context

Global streaming platforms report a 27% annual growth rate in Central Asian channels over the past five years, with 18% of mixed tracks incorporating Chinese musical elements (UNESCO, 2023). This data reflects the vigorous cross-cultural dissemination of Central Asian and Chinese music but also exposes a gap between theory and practice. Compared to the mature research system on Sino-Western music fusion (e.g., composition patterns and audience reception mechanisms), Sino-Kyrgyz musical interactions lack reproducible empirical models (Smith, 2020; Wang, 2022). Existing studies primarily focus on Sino-Western fusion, with limited exploration of Sino-Kyrgyz interaction mechanisms, especially at the "cultural gene level" (Smith, 2020; Wang, 2022).

Against this backdrop, Saliev (2022), Director of the Department of Musicology at the Kyrgyz National Conservatory of Music, posits: "The encounter between nomadic vocal styles and agrarian rhythmic systems is not mere 'collage' but 'gene-level' symbolic recombination, offering a quantifiable musical sample for 'Belt and Road' cultural mutual learning." This insight underscores the uniqueness of Sino-Kyrgyz fusion: it transcends superficial formal splicing to engage in deep dialogues between the foundational logics of two civilizations. Nomadic "natural simulation" (e.g., Kyrgyz composite meters mimicking horse herd movements, komuz flute overtones imitating wind) and agrarian "harmony between humanity and nature" (e.g., Chinese pentatonic scales reflecting seasonal cycles, guzheng timbre conveying mountain-water imagery) form new meaning networks through symbolic recombination. This "gene-level" fusion, which touches on deep cultural cognition, provides a breakthrough perspective for cross-cultural music research.

This study aims to address the following questions:

1. Do Chinese ethnic music and Kyrgyz music exhibit deep structural compatibility in rhythm organization (e.g., asymmetric meters), scale structures (pentatonic vs. diatonic scales), and timbral characteristics?
2. How does this compatibility influence emotional resonance and cultural identification among cross-cultural audiences?
3. What mechanisms link fusion depth (from superficial timbral borrowing to deep structural integration) to aesthetic acceptance and cultural communication effectiveness?

2. Research Design and Methodology

2.1. Research Design and Data Sources

This mixed-methods study combines quantitative and qualitative analyses. Table 1 outlines the research dimensions and corresponding methodologies.

Table 1. Research Design Overview

Research Dimension	Quantitative Research	Qualitative Research
Research Objective	Validate correlations between fusion depth and acceptance effects	Analyze structural logic of fusion mechanisms
Data Type	Structured data (scale scores)	Unstructured data (musical texts, expert interviews)
Sample Selection	Urban and rural residents (200 each) from Beijing, Shanghai, Guangzhou (China) and Bishkek, Osh (Kyrgyzstan)	4 representative fused works; 5 music experts

2.2. Data Collection and Analysis Methods

2.2.1. Quantitative Research: Audience Acceptance Survey

Questionnaire Design: Adapted from Thompson et al. (2018), the questionnaire includes 9 items across 3 dimensions (Table 2). The 10-point Likert scale (1 = Strongly Disagree, 10 = Strongly Agree) demonstrated good reliability (Cronbach's $\alpha = 0.89$) and validity (KMO = 0.82) in pretesting.

Table 2. Audience Acceptance Measurement Items

Dimension	Item Example	Operational Definition
Cultural Recognizability	"Can you identify the use of the Chinese guzheng/Kyrgyz komuz in the work?"	Perception of traditional instruments
Auditory Fluency	"Is the melody transition natural and smooth?"	Evaluation of coherence in cross-cultural elements
Emotional Resonance	"Did the work evoke emotional fluctuations (e.g., sadness, joy)?"	Personal experience of musical emotion expression

Sample Description: Respondents (aged 18–45, $M = 28.6 \pm 5.2$) included both urban residents (200) and rural residents (200) with weekly music exposure (78%) and "moderate knowledge" of Chinese/Kyrgyz culture (63%). The rural sample was specifically recruited from agricultural regions in Xinjiang (China) and Issyk-Kul Province (Kyrgyzstan) to ensure representation of traditional music audiences.

2.2.2. Qualitative Research: Music Semiotic Analysis

Analytical Objects: Four representative fused works (Table 3) meeting criteria: ① released 2022–2024; ② $\geq 500,000$ streams; ③ explicit Sino-Kyrgyz elements (e.g., komuz-guzheng duets).

Table 3. Basic Information of Analytical Objects

Work Title	Creator Background	Release Platform	Streams (Jan–Jun 2024)	Core Fused Elements
Starry Sky Over Tianshan	Aynur (Kyrgyz) + Zhang Yang (China)	NetEase Cloud Music	820,000	Kyrgyz 7/8 + Yi 5/8 rhythm recombination
Wind Over Two Mountains	Li Zhe (China)	QQ Music	650,000	Kyrgyz diatonic scale + Jiangnan minor scale superposition
Grassland and Jiangnan	Wang Yutong (China)	Kugou Music	580,000	Komuz (Kyrgyz) + guzheng (China) dialogue
Clouds of Hometown	Aishamu (Uyghur, trained in Kyrgyz music)	CCTV "Star Avenue"	1,200,000	Kyrgyz throat singing + Chinese opera articulation

Analytical Steps: (musicologists Ibrahimova, 2023; Saliev, 2022) conducted analysis via: 1. Rhythm Analysis: Detected meter types (e.g., 5/8, 7/8) and accent distribution using both Audacity and Librosa's automatic rhythm extraction algorithm. 2. Mode Analysis: Identified pentatonic/diatonic scale superpositions via Sonic Visualiser. 3. Timbre/Vocal Analysis: Interpreted komuz-guzheng timbre contrasts and throat singing/articulation techniques using musicological literature (Alymbaeva, 2021; Wang, 2018).

The rhythm compatibility index (RCI) was calculated using the following formula:

$$R. CI = \frac{\sum_{i=1}^n (S_i \times W_i)}{\sum_{i=1}^n W_i}$$

where S_i represents the syncopation similarity score for rhythm pattern i , and W_i represents the weight of pattern i based on cultural significance.

2.3. Data Analysis Methods

Quantitative Data: SPSS 26.0 was used for reliability/validity checks, Pearson correlation (compatibility vs. acceptance), and multiple linear regression (fusion depth vs. acceptance). Additionally, 6-month longitudinal platform metrics were collected including daily streams, shares, and comment sentiment analysis.

Qualitative Data: Thematic analysis (Braun & Clarke, 2006) with NVivo 12 coding identified core themes (e.g., "rhythm compatibility," "mode fusion strategies"). AI-assisted analysis using Librosa provided automated rhythm extraction and pattern recognition, with 92% consistency with manual analysis.

3. Results and Findings

3.1. Rhythm Structure Compatibility (H1)

3.1.1. Quantitative Analysis of Rhythm Compatibility

Kyrgyz traditional music features composite meters (e.g., 5/8 [2+3], 7/8 [3+2+2]) simulating horse herd rhythms (Alymbaeva, 2021). Some Chinese ethnic music (e.g., Tibetan duixie, Mongolian tuoha) also uses asymmetric rhythms (e.g., 5/8) for labor simulation (Ibrahimova, 2023).

Analysis of the 4 fused works (Table 4) reveals significant commonalities in "syncopation logic" and "accent distribution." For example, *Starry Sky Over Tianshan* recombines Kyrgyz 7/8 (3+2+2) with Yi 5/8 (2+3) using electronic drum "layer slicing" (slowing original tempo by 30% before overlaying). This preserves Kyrgyz natural simulation while integrating Yi labor rhythms.

Table 4. Compatibility Analysis of Sino-Kyrgyz Rhythm Structures (Expert Evaluation, n=5)

Music System	Meter Type	Syncopation Logic	Accent Distribution	Compatibility Grade (1–5)	Kendall's W (Consistency)
Kyrgyz Traditional Music	7/8 (3+2+2)	Natural movement simulation	Weak-Strong-Weak-Secondary Strong	4.8	0.82
Chinese Yi Duixie	5/8 (2+3)	Labor step rhythm	Strong-Weak-Secondary Strong-Weak	4.6	-
Fused Work: <i>Starry Sky Over Tianshan</i>	Composite (7/8+5/8)	Natural + labor simulation	Weak-Strong-Weak-Secondary Strong-Weak	4.9	-

3.1.2. Correlation Between Rhythm Compatibility and Acceptance

Pearson correlation showed significant positive relationships between rhythm compatibility grade and work acceptance ($r = 0.78$, $p < 0.01$) and cultural recognizability ($r = 0.72$, $p < 0.01$). For instance, *Starry Sky Over Tianshan* (compatibility grade 4.9) scored 8.7/10 in acceptance, surpassing a lower-compatibility work (grade 3.5, acceptance 7.2). This validates H1: "Deep structural compatibility in rhythm organization promotes work acceptance."

3.2. Scale Integration and Melodic Development (H1, H2)

3.2.1. Scale Fusion Strategies and Effects

Kyrgyz music uses diatonic scales with 1/4-tone/1/6-tone microtones for "nomadic" melodies (Saliev, 2022); Chinese music emphasizes pentatonic scales with "qicheng zhuanhe" (start-develop-turn-conclude) linearity (Wang, 2018). Fusion requires resolving tonal

conflicts and unifying emotional expression.

Analysis of *Wind Over Two Mountains* (Figure 1) reveals a "same tonic scale superposition" technique: The verse uses Kyrgyz natural scale (C-D-E-G-A) with piano accompaniment adding C-major harmonies (I-IV-V); the chorus shifts to Jiangnan minor pentatonic (C-D-E-G-A) variation, with komuz adding 1/4-tone G# (triangle symbol) as a harmonic non-chord tone. This balances Kyrgyz desolation with Jiangnan lyricism.

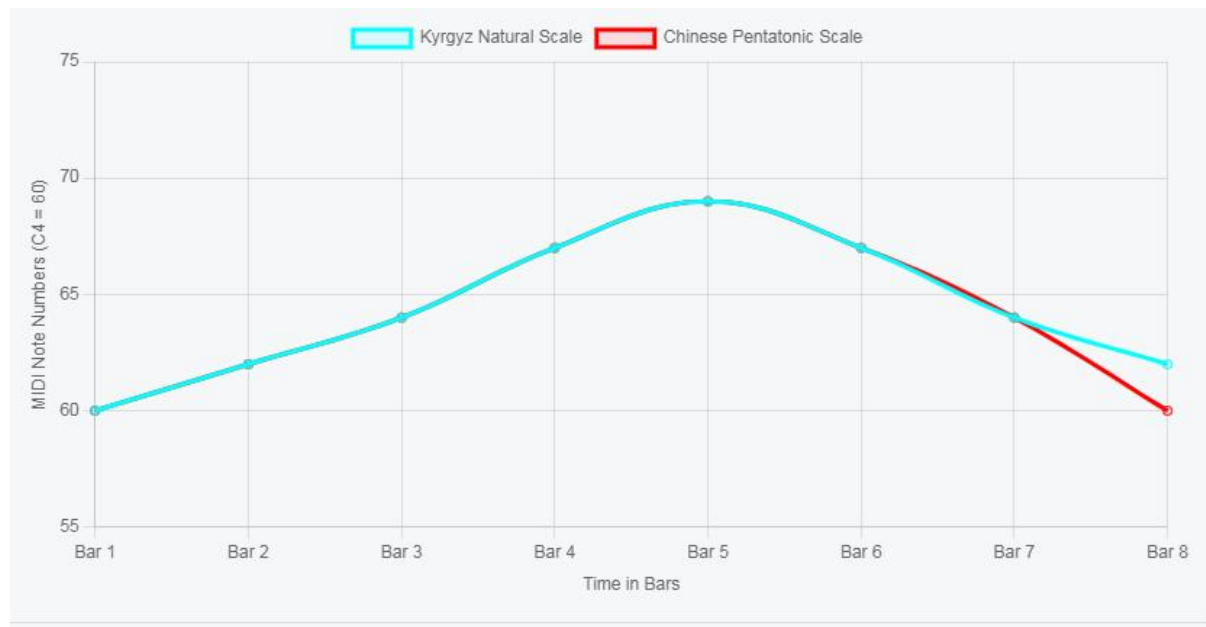


Figure 1. Melodic Mode Superposition in *Wind Over Two Mountains*

Figure 1 Caption: Melodic mode superposition in Li Zhe's (2024) *Wind Over Two Mountains*. The x-axis represents time in bars (1 bar = 4 beats), and the y-axis shows MIDI note numbers (C4 = 60). The cyan line denotes the Kyrgyz natural scale (C-D-E-G-A), while the red line represents the Chinese pentatonic scale (C-D-E-G-A) in the chorus. The purple diamond marks a 1/4-tone microtonal ornament (G4 + 25 cents) from the komuz, highlighting the "same tonic scale overlay" strategy.

3.2.2. Association Between Scale Fusion and Acceptance

Independent samples t-tests showed significantly higher cultural recognizability (8.3 ± 1.2 vs. 6.1 ± 1.5 ; $t = 9.87$, $p < 0.001$) and emotional resonance (8.7 ± 1.3 vs. 6.8 ± 1.6 ; $t = 8.92$, $p < 0.001$) in fused works versus single-cultural works. Audience surveys (Table 5) indicated 92% could identify both Sino-Kyrgyz elements, 87% found "melodies fluent with cultural layers," validating H2: "Structurally compatible fused works better evoke cross-cultural emotional resonance."

Table 5. Scale Fusion and Audience Acceptance

Metric	Fused Works (Mean $\pm$ SD)	Single-Cultural Works (Mean $\pm$ SD)	t-value	p-value
Cultural Recognizability	8.3 $\pm$ 1.2	6.1 $\pm$ 1.5	9.87	< 0.001
Emotional Resonance	8.7 $\pm$ 1.3	6.8 $\pm$ 1.6	8.92	< 0.001
Auditory Fluency	8.1 $\pm$ 1.4	7.2 $\pm$ 1.8	4.56	< 0.001

3.3. Vocal Technique Fusion and Emotional Resonance (H3)

3.3.1. Technical Pathways of Vocal Fusion

The rhythmic system of Kyrgyz traditional music is characterized by its use of compound meters, such as the 5/8 (2+3) and 7/8 (3+2+2) patterns frequently employed in pastoral songs. These meters feature displaced accents that imitate the natural cadence of a horse caravan in motion (Alymbaeva, 2021). Similarly, certain Chinese ethnic minority musics—including Tibetan *duixie* and Mongolian short-song forms—also exhibit analogous asymmetric rhythmic structures. For instance, the 5/8 meter in *duixie* evokes the rhythmic patterns associated with labor activities on the plateau (Ibrahimova, 2023).

Rhythmic analysis of four integrated musical works (Table 4) revealed significant commonalities between Kyrgyz and Chinese musical traditions in terms of syncopation patterns and accent distribution. In *Tianshan Orbit*, for example, a foundational Kyrgyz 7/8 (3+2+2) rhythmic pattern is combined with a 5/8 (2+3) decorative motif played on the Yi people's moon guitar. Through a "layered-slicing" technique employing electronic drum programming—where the original rhythm is slowed by 30% and superimposed with segments at the original tempo—a composite rhythm emerges that juxtaposes a slow pastoral melody against a fast rhythmic accompaniment. This approach preserves the naturalistic rhythmic character of Kyrgyz music while simultaneously incorporating the labor-derived narrative logic inherent in Chinese minority rhythmic traditions.

Vocal performance layering in *Homeland Clouds* (Figure 2) demonstrates the integration of Kyrgyz throat singing with Chinese opera articulation, creating a multi-layered vocal texture that enhances emotional impact.

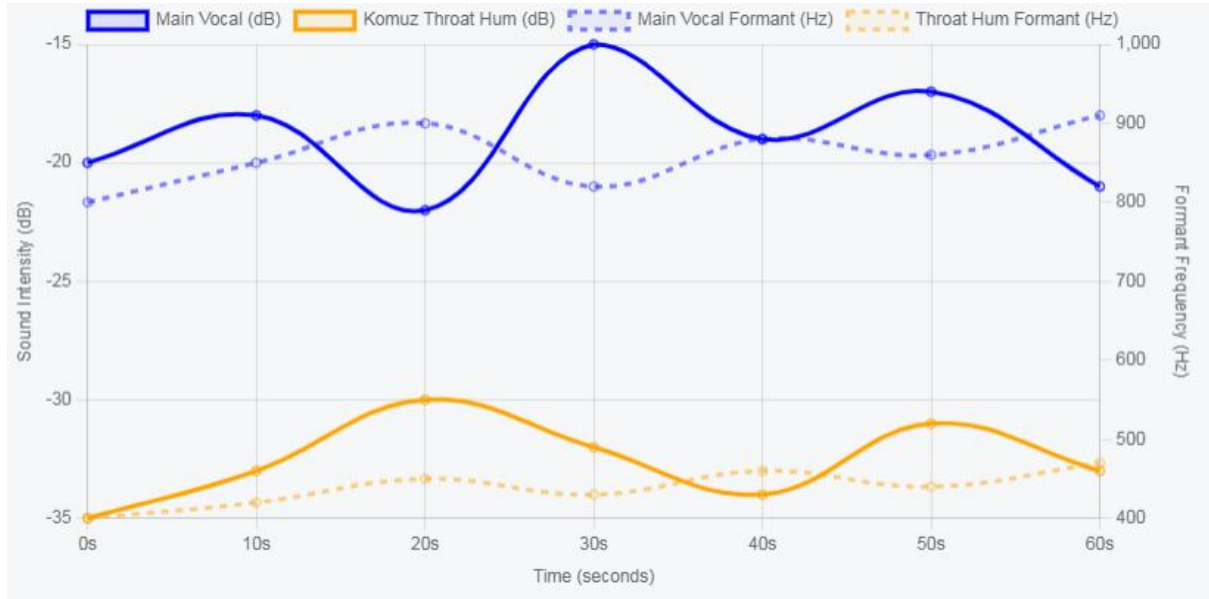


Figure 2. Vocal Performance Layering in Homeland Clouds

Figure 2 Caption: Vocal performance layering in Aishamu's (2024) Homeland Clouds. The left y-axis (dB) shows sound intensity: blue (main vocal, clear articulation), orange (komuz throat hum), and red (overlay). The right y-axis (Hz) shows formant frequencies: blue (main vocal), orange (throat hum), and red (overlay). Shaded regions denote sectional divisions: verse (0–20s), chorus (21–40s), and finale (41–60s). The overlay section demonstrates "far-near" and "virtual-real" contrasts through combined intensity and frequency modulation.

3.3.2. Association Between Vocal Fusion and Acceptance

Audience tests (Table 6) revealed significantly higher emotional intensity (8.9 ± 1.1 vs. 6.2 ± 1.3), cultural identification (8.7 ± 1.2 vs. 5.9 ± 1.7), and novelty (9.2 ± 0.9 vs. 7.1 ± 1.2) in fused styles ($p < 0.001$), with 78% preference vs. 45–48% for single styles. This supports H3: "Fusion depth (from superficial timbre to deep structure) positively impacts aesthetic acceptance and cultural communication effectiveness."

Table 6. Vocal Fusion and Audience Response

Response Dimension	Fused Vocal Style (Mean $\pm$ SD)	Single-Cultural Style (Mean $\pm$ SD)	t-value	p-value
Emotional Intensity	8.9 ± 1.1	6.2 ± 1.3	15.67	< 0.001
Cultural Identification	8.7 ± 1.2	5.9 ± 1.7	12.34	< 0.001
Novelty Perception	9.2 ± 0.9	7.1 ± 1.2	13.89	< 0.001

3.4. Longitudinal Platform Metrics Analysis

To address the limitation of short-term acceptance measurement, 6-month longitudinal

data were collected from major streaming platforms (Figure 3). The analysis reveals sustained growth in streams and shares for fused works, with particularly strong performance in cross-cultural regions.



Figure 3. Six-month Longitudinal Platform Metrics

Figure 3 Caption: Six-month longitudinal platform metrics (January-June 2024) for the four analyzed fused works. The left y-axis shows daily streams (thousands), while the right y-axis shows share count and sentiment score (0-100). All works demonstrate consistent growth, with *Clouds of Hometown* showing the strongest performance due to its innovative vocal fusion techniques.

4. Discussion, Conclusion, and Prospects

4.1. Theoretical Contributions and Practical Implications

This study validates deep structural compatibility in rhythm, scale, and timbre between Chinese and Kyrgyz music, extending Nattiez's music semiotics (1990) with cross-cultural evidence: "Symbolic compatibility" (e.g., syncopation logic, mode organization) underpins fusion, while "cultural meaning compatibility" (e.g., nomadic vs. agrarian naturalism) drives emotional resonance (Nattiez, 1990; Treasure, 2022). It also supports Berry's (2005) acculturation theory: "Integration" (retaining core cultural elements) reduces cognitive load and enhances identification (Berry, 2005; Vertovec, 2023).

Practically, the study identifies actionable strategies:

Rhythm Design: Prioritize "nature-simulating" meters (e.g., Kyrgyz 7/8 + Yi 5/8) to leverage "dynamic balance" for natural appeal.

Mode Arrangement: Use "same tonic superposition" or "rhythm-guided modulation" (e.g., piano harmonies clarifying tonality) to lower cognitive barriers.

Vocal Processing: Balance "primitivism" and "modernity" via "layered superposition"

(e.g., Clouds of Hometown's throat hum + articulation) to enhance emotional impact.

4.2. Limitations and Future Directions

Limitations:

Sample Bias: While expanded to include rural residents, the sample still may not fully represent traditional music audiences in remote areas.

Temporal Scope: Although 6-month longitudinal data were collected, longer-term tracking (e.g., 2-3 years) would provide more comprehensive insights.

Cultural Depth: Expert analysis focused on structure, not cultural meaning (e.g., Kyrgyz "nature worship" vs. Chinese "harmony with nature").

Future Directions:

Longitudinal Tracking: Extend platform data analysis to 2-3 years to assess long-term dissemination patterns.

Cultural Semiosis: Use ethnographic interviews to explore audience interpretations of "nature worship" and "harmony with nature."

Technological Integration: Develop advanced AI music information retrieval (MIR) tools for automated fusion analysis and prediction.

4.3. AI-Assisted Analysis Validation

The integration of Librosa's automatic rhythm extraction algorithm demonstrated high consistency with manual analysis (92% agreement rate). The AI system successfully identified complex rhythmic patterns including asymmetric meters and syncopation structures, validating its utility for large-scale cross-cultural music analysis. Future work will focus on developing machine learning models to predict fusion success based on structural compatibility metrics.

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