Cross-cultural analysis of vibrato: 
A case study comparing erhu and violin playing styles

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Agenda

1. Introduction
2. Motivations
3. Dataset
4. Methodology
5. Results
6. Discussions
7. Conclusions
Introduction

- A cross-cultural comparative analysis of Chinese and Western musical performance style
- We focus on vibrato
- We choose erhu and violin as a case study
Motivations

We expect the vibrato characteristics will help reveal the differences in musical genre and instrumental styles:

- What are the vibrato characteristics of erhu players?
- What are the characteristics of violin players performing Chinese music?
- Is there any difference between the ways erhu players and violinists play vibratos when performing the same piece of music?
- Is there any difference within each instrumental group?
Erhu vs. Violin

Erhu
- Two strings
- Use both sides of bow hair
- Called ”Chinese Violin”
- Symbol of Chinese culture

Violin
- Four strings
- One bow with one side
- King of the orchestra
- Symbol of Western culture
Dataset-Performers

We collected 12 performances for the Chinese piece *The Moon Reflected on the Second Spring*

- Erhu(6): all from CD recordings
- Violin(6): three from CD recordings, one from C4DM Western Violin player, two from violin player’s website.

<table>
<thead>
<tr>
<th>Erhu</th>
<th>Violin</th>
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<tbody>
<tr>
<td>#</td>
<td>Performer</td>
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<tr>
<td>1</td>
<td>Guotong Wang</td>
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<tr>
<td>2</td>
<td>Jiangqin Huang</td>
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<td>3</td>
<td>Wei Zhou</td>
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<tr>
<td>4</td>
<td>Jiemin Yan</td>
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<td>5</td>
<td>Huifen Min</td>
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<td>6</td>
<td>Changyao Zhu</td>
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</tbody>
</table>
Figure: Chinese Notation

Figure: Western Notation

Play whole phrase: Erhu Violin
Play Vibrato: Erhu Violin Both
Notes selection criteria:

- No open string note
- The note should be of relatively long duration
- The note should be of high amplitude

Totally:

- We have 218 notes
- 204 notes have vibrato
Methodology

Vibrato parameters

- Vibrato rate
- Vibrato extent
- Vibrato sinusoid similarity
Methodology

Using Praat software to obtain fundamental frequency (f0)[Boersma2001].
Methodology

Get the vibrato rate and extent from f0
Methodology

Vibrato sinusoid similarity
Results

Erhu vs. Violin

Vibrato Rate

▶ Violin has faster vibrato rate than erhu
▶ Violin vibratos also have wider range than erhu
▶ Violin performers demonstrate more variability in vibrato rate
Results

Erhu vs. Violin
Vibrato Rate

Mean Vibrato Rate

Vibrato Rate (Hz)

Performer
Mean Vibrato Rate

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Results

Erhu vs. Violin

Vibrato Extent

- Erhu performers tend to play vibratos with larger extents than violin performers.
- Erhu has wider vibrato extent ranges than violin for all extent values.
- The vibrato extent varies more widely among erhu performers.
Results

Erhu vs. Violin
Vibrato Extent

Mean Vibrato Extent

Vibrato Extent (Semitone)

Performer

Mean Vibrato Extent

Vibrato Extent (Semitone)

Performer
Results

Erhu vs. Violin
Vibrato Sinusoid Similarity

- The vibrato shape of erhu performers is much more similar to a sinusoid than that of violinists.
- No relationship between sinusoid similarity and other parameters has been found after doing the Pearson correlation analysis.
Results

Erhu vs. Violin
Vibrato Sinusoid Similarity

![Vibrato Sinusoid Similarity Chart]

Sinusoid Similarity

Performer

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Discussions

- Vibrato performance styles are more dependent on musical instrument than musical genre.
  - The violin players’ vibrato rates and extents were consistent with those reported in the literature for Western music, although the music is traditional Chinese.
  - i.e. Performers did not adapt to Chinese music style.
- The background of the violin players may not exert a larger influence on the vibrato style.
  - The U.S. and Japanese violinists each showed the same vibrato characteristics as the Chinese violinists.
Discussions

- The significant differences in vibrato extent may result from the left hand movements.
  - For violin, the lower left arm of the player angles up to the finger board and the vibrato movements are lateral along the horizontal finger board.
  - For erhu, the lower left arm of the player is more or less horizontal, and the vibrato movements are up and down along the vertical strings. It may allow larger vibrato movements.
- Demo
Discussions

- The absence of a fingerboard may give erhu performers more flexibility to create wide vibratos.
  - When a violin player presses the string, the string touches the fingerboard.
  - However, when an erhu player presses the string, nothing else is touched.
Conclusions

The most dominant factors affecting the differences in vibrato style in erhu and violin playing maybe:

- The physical form of the instrument.
- And how it is played.

Within each instrument group, individual players also have individual characteristics.
Thank you


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