



Analysis of the Material, Timbre and Shape of Percussion Instruments in the Han Dynasty and Excavation of the Value of Music History

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ABSTRACT

As an important stage in the development of percussion instruments in the Han Dynasty, its design concept and material use have high archaeological value, taking the Han Dynasty percussion instruments as an example to study their music historical value, this paper uses a 4K microscope as a testing tool to analyze the material of percussion instruments, combined with RAW music software and visio drawing software to measure, and observes its timbre, shape, material and other indicators. The results show that the materials of percussion instruments in the Han Dynasty tend to be Hetian jade, bronze, porcelain, etc., and the timbre is mainly crisp and melodious, and the shape is coarse, simple and simple. The chimes are mainly bronze, iron, aluminium, etc., Hetian jade chimes, calcium, magnesium silicate, sodium aluminium silicate, sodium aluminium silicate, and other musical instruments such as celadon reeds, chicks, and siras are mainly wood fibers, lignin, animal fibres, and organic salts. Musical instruments such as chimes and chimes have a low sound frequency due to the low sound frequency of the material, so the shape is trumpet-shaped, and the timbre is low. The sound frequency of the drum, celadon reed, and the sound of the drum is high, showing diversified changes, and the shape is closed. Therefore, the percussion instrument of the Han Dynasty is an important symbol in the history of Chinese music and a turning point in the development of percussion instruments.

Keywords: Percussion Instruments, Materials, Timbre, Modeling Analysis, Music Historical Value.

INTRODUCTION

The Eastern Han Dynasty (25~220 AD) is one of the most important dynasties in Chinese history, and people have a unique aesthetic pursuit of music culture, which is reflected in court etiquette and sacrificial activities, other important occasions, and folk activities—one of the main popular musical instruments in the rituals. This paper focuses on analysing the material, timbre and shape of percussion instruments in the Han Dynasty and excavating the value of music history. The rapid economic development of the Han Dynasty society, frequent wars and trade with Western countries promoted the development of musical content, elements and rhythms, and realized the multi-ethnic integration of Han Dynasty music. In addition, the variety of rhythms and melodies of Western percussion promoted the deepening of the structure of Han Dynasty music. Since the music of the Han Dynasty was mainly performed for sacrifices and court performances, the content and form of the performance were single, and the integration of Western rhythms, musical instruments and creative concepts promoted the hierarchical development of music in the Han Dynasty. The change of dynasties in the Western Han Dynasty and the Eastern Han Dynasty also realized the musical integration between ethnic minorities and Han people, introduced Han Dynasty percussion from the court to the people, realized the popularization of music, accelerated the evolution of music, and updated the design concept of musical instruments. After research, this paper concludes that percussion instruments in the Han Dynasty have high aesthetic value, which is not only reflected in the details of the meticulous carving and polishing of the appearance of the instruments by the craftsmen of the

Han Dynasty but also in the exquisite skills of the artisans of the Han Dynasty and the adequate adjustment of timbre. In addition, percussion instruments in the Han Dynasty will also produce different timbre effects due to different materials. Through the application of different materials, the craftsmen of the Han Dynasty created many distinctive percussion instruments (Cui, Andriamahery, Ao, Zheng, & Huo, 2022), and played a certain role in promoting the enrichment of the music culture of the Han Dynasty. Overall, Han percussion instruments paid great attention to optimizing the structural design to improve the overall acoustics. Whether it is bronze percussion, bamboo percussion, or other percussion instruments, they can show the acoustic wisdom of Han Dynasty artisans and reflect their understanding of the properties of materials. At the same time, the advantages of structural design have also promoted the improvement of the ancient music performance strength of percussion instruments in the Han Dynasty to a certain extent and shown people a rich and distinctive acoustic effect. It can be seen that percussion instruments in the Han Dynasty played a promoting role in the enrichment of traditional Chinese music culture. From the perspective of cultural connotation and symbolism, the percussion instruments of the Han Dynasty also contain rich symbolic meanings (Gao, Wu, Zou, & Chen, 2022). For example, the chimes were applied to the court etiquette activities at that time, and the solemn and elegant shape of the bells also provided a good functional role for the sense of ritual and authority of the court at that time. For example, the Frequency of folk bamboo is $2658.42 \sim 2869.56$ Hz, producing a soft, clear tone, percussion instruments also played a profound role in the life of the Han Dynasty, which showed the simplicity and nature of folk life and provided a certain amount of energy for the richness of folk music. The Han Dynasty was an important event in the development of percussion instruments, integrating the advantages of bronze percussion instruments in the Qin Dynasty, such as style, function, etc., and expanding the materials of percussion instruments, such as Hetian jade, marble stone tools, etc., enriching the form and type of percussion instruments, and was a prosperous period for the development of percussion instruments in China. In addition, the trade and wars between the Han Dynasty and the Western Regions promoted the integration of Chinese and Western percussion instruments, especially the changes in the shape and material of bronze instruments. In addition, the fusion of Western percussion instruments with the chime and bell of the Han Dynasty laid the foundation for the emergence of orchestral instruments in the later period. Moreover, the Han Dynasty absorbed the advantages of the Qin Dynasty's musical instrument combination, improved the vocal range of percussion instruments, and enriched the performance content, performance form, and music card form of percussion instruments. The development of percussion instruments in the Han Dynasty was influenced by the characteristics of Western rhythms, which increased the rhythm of percussion instruments and promoted the development of Chinese percussion from singularity to diversification. Therefore, percussion instruments in the Han Dynasty played an important role in promoting the development of Chinese music content and form. In addition, the historical evolution of the Western Han Dynasty and the Eastern Han Dynasty has also promoted the development of percussion instruments of ethnic minorities and Han people, realized the improvement of musical instruments, realized the diversification of musical instruments, and promoted the development of percussion instruments of different ethnic groups. During the Eastern Han Dynasty and the Western Han Dynasty, the ethnic culture of the central and western regions was integrated with the non-traditional music elements of the Northwest Region, such as court music and sacrificial music, and the folk music of the eastern region was integrated to achieve diversified and multi-level percussion forms so that the music of the Han Dynasty developed from the court to the people, which not only popularized many musical themes for modern music but also laid the foundation for the development of modern music.

RESEARCH METHODS AND RESULTS

Research Methodology

In this paper, a 4K high-definition microscope is used as the research object to observe percussion instruments, mainly to observe the material, lustre and texture of percussion instruments, including porcelain Hetian jade chime, marble stone chime, celadon reed, Chinese drum, etc. Then, taking the sound resources published on the Internet as an example, the RAW software analysis was carried out to compare the timbre. The percussion instrument shapes drawn by the Viso software are compared and analyzed to find out the characteristics of the percussion instruments of the Han Dynasty. Examples of chimes, drums, and chimes are used for analysis. At the same time, the modern statistical software Spss 20.0 was used for statistical analysis to study the gaps in percussion material, timbre and shape in the Han Dynasty. Among them, the p-value of the indicators with differences is less than 0.5, and the representativeness of the survey literature is calculated by the impact factor, which is greater than 2.0. Literature on the material, timbre and shape of percussion instruments in the Han Dynasty was collected on CNKI, Wanfang and other websites. The impact factor of the literature was greater than 2.0, the time span of the literature was from 2014 to 2023, and the representativeness of the

literature was scored by 1 ~ 3 experts. Through the normal analysis, characteristics and validity of the literature, the results show that the normality is 0.852, the characteristics are greater than 0.5 and the validity is greater than 0.7, which shows that the obtained literature meets the actual requirements. In order to improve the accuracy of the research, the literature was investigated and evaluated, and the evaluation result was greater than 0.7, which further explained the effectiveness of collecting literature.

Materials for Percussion Instruments

The timbre of Han percussion instruments is likely to be influenced by the material. For example, bronze percussion instruments, such as chimes, can produce a brighter and crisper sound during the percussion process because of their relatively stiff and stable materials. For example, percussion instruments made of bamboo will show a soft and clear tone due to the flexibility and lightness of their material. For example, animal leather percussion instruments can form a thick drum surface because of their elastic material and strong toughness and then show a rich, complete, and reverberating timbre in the performance. The main percussion instruments in the Han Dynasty were bells and chimes, and bronze chimes and chimes were the mainstay, as well as porcelain Hetian jade chimes, marble stone chimes and other materials, so the materials of percussion instruments were abundant, and the summary results of specific materials are shown in Table 1.

Table 1. Materials of Percussion Instruments

Instrument Type	Name	Material	Ingredient
Combination Classes	Chimes, Chimes	Bronze (Composition: Copper, Iron, Tin, Lead), Hetian jade(Composition: Calcium Magnesium Iron Silicate, Quartz and Silicon Dioxide), Marble Stone (Composition: Silicate, Calcium Carbonate, Aluminum).	Copper, Iron, Lead, SiO ₂ , CaCO ₃ , Calcium, Magnesium, Silicate, Sodium, Aluminosilicate, Sodium-Aluminate
Solo	Tie, Drum, Bang, Yi	Stone, Cowhide, Wood, Ceramics, Bamboo	SiO ₂ , CaCO ₃ , Wood Fibre, Lignin, Animal Fiber, Organic Salts

As can be seen from Table 1, the main components of percussion instruments are metals and organic compounds, as well as relatively stable compounds, which can increase the elasticity and toughness of percussion instruments, thereby increasing the frequency of vibration and producing higher frequency sounds. Among them, the chimes and chimes are mainly bronze, and the low-frequency sound is mainly used to keep the sound rich. At the same time, the main components of Hetian jade chime are calcium magnesium silicate, sodium aluminium silicate, the substance has high stability, and the texture is hard, the vibration frequency of the surface is higher, and it emits a crisp sound. Bronze was a common material for percussion instruments in the Han Dynasty. Bronze is a more commonly used material in ancient Chinese percussion instruments. The texture of bronze material frequency is 741.32~782.42 Hz, so bronze is relatively hard, the sound is crisp, and the timbre effect is excellent, so it was widely used then. Bronze percussion instruments from the Han Dynasty include chimes and chimes. In the production of percussion instruments in the Han Dynasty, the Eastern Han Dynasty (25~220 AD) was keen to make chimes and chimes because of the unique timbre and tone of these two instruments. For example, chimes were a mainstream percussion instrument at that time, consisting of 5~12 bells together. Moreover, the chimes are made of bronze, and each chime is hung on a shelf and produces a unique tone and tone (Kader, Mahmudh, Han, Niaz, & Shoukat, 2022). Chimes always played a key role in court music during the Han Dynasty, and they were often used in music performances and ceremonial activities. Using a 4K electron microscope, the surface observation of percussion instruments in the Han Dynasty was carried out, and the observation factor was 4.5 times, and the results showed that the bronze material of the chime makes it very hard, and the sound effect is crisp and beautiful, which is the fundamental reason why the bronze instruments were reused at that time. Similarly, a 5.0-fold surface observation of the clay chime revealed many cracks on its surface, indicating that pottery was fired at a higher temperature at that time. The chime was also a common percussion instrument at the time and made of bronze. The material of the chime is thin, the shape is round, it generally needs to be used in pairs, and can produce a very crisp sound. The tone is excellent because of its crisp and moving timbre and the marble stone chime is often popularized by the music performers of the Han Dynasty, so it often appears in sacrificial ceremonies and other activities. The use of the chime shows that the Han Dynasty admired the excellent characteristics of bronze and made it into a distinctive percussion instrument through exquisite classical craftsmanship, as shown in Figure 1.

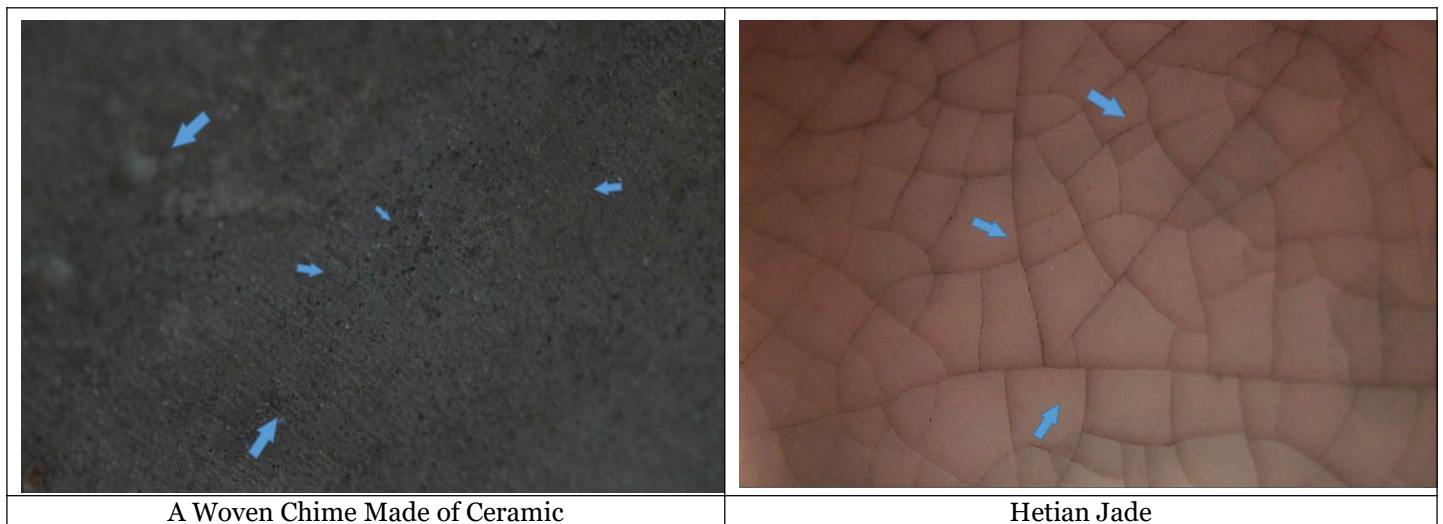


Figure 1. Braided Chimes of Different Materials

As can be seen from Figure 1, the braided chime used as ceramics contains copper sulfate, iron oxide, aluminium sulfate and other substances, and the particle diameter is large, and it is distributed in a mixed form, the surface is relatively rough, and it is finely polished. The braided chime made of Hetian jade is smoother, the material is harder, and there are large cracks on the surface, mainly calcium magnesium silicate, sodium aluminium silicate, sodium aluminium silicate and other substances do not have corrosion resistance, so there are certain cracks. The Hetian jade chime is more valuable and a musical instrument used in major ceremonies, songs and dances (Kati et al., 2023). Drums, drums, and drums are made from bamboo, a natural plant fiber material that is very light and tough and is widely used in a variety of percussion instruments such as drums and rattles. The Han Dynasty people often used local bamboo resources to make percussion instruments of different shapes. In this way, the musical expressions of the Han Dynasty were increased. Bamboo has always been a kind of production material in ancient Chinese music equipment, and it is essential, especially in the production of bamboo drums in the Han Dynasty, which has been fully used. Also known as bamboo drums, bamboo drums are percussion instruments made of bamboo. Generally speaking, bamboo drums are made of a hollow bamboo tube, and the ends of the barrel are also covered with animal skin and other films. During the performance, people can use their hands and sticks to hit the cylinder and membrane parts, producing a crisp, rhythmic sound. In the folk entertainment and religious ceremonies of the Han Dynasty, the bamboo slip drum also became one of the important musical instruments. In addition to the bamboo slip drum, the bamboo pan drum was also one of the essential bamboo percussion instruments of the Han Dynasty. The bamboo drum style is a percussion instrument formed by arranging multiple bamboo pipes together. Each bamboo tube is cut into segments of varying lengths (Liang, Ding, Zuo, Li, & Guo, 2023), resulting in a different pitch. The player a mallet to strike the bamboo pipes of different lengths to present different melodies. Based on this, the design of the bamboo drum in the Han Dynasty has been affirmed by people and has been widely used in various social activities and celebrations in the Han Dynasty. The people of the Han Dynasty were good at using natural resources to show their ability to innovate so as to improve the level of music culture and craft technology in ancient China, and were full of creativity in the Han Dynasty, and animal leather was used to make jian gu because it had a unique advantage in making jian gu, which could produce a solid and elastic sound effect. The drum surface is often made of animal leather. In the production of drum percussion instruments, animal leather is often used to make drum surfaces. The drum was an indispensable instrument at the time, and animal leather was of great value in making drum faces. When animal leather was used to make the drum surface of the Han Dynasty drum, it was found that it could make the timbre of the drum instrument very rich and show good resonance characteristics, which made the sound effect during the performance more rich and vivid (Lin et al., 2022). The use of wood materials made the sound performance of drum percussion instruments in the Han Dynasty more excellent, which was the ancients' pursuit and innovation of music. The Han Dynasty used animal leather to make drum surfaces, showing that people at that time had a deep understanding of the value of local natural resources and learned to make full use of local natural resources. In the Han Dynasty, animal leather was often used to make different drum surfaces, such as the drum surfaces of large and small drums. It can be seen that the people of the Han Dynasty respected the environmental resources very much and cherished them, and at the same time, the technical level of the Han Dynasty people was extremely high and exquisite (Liu et al., 2023).

Timbre Analysis of Percussion Instruments

Chimes, chimes, and drums were used as examples for timbre analysis, and the results are shown in Figure 2.

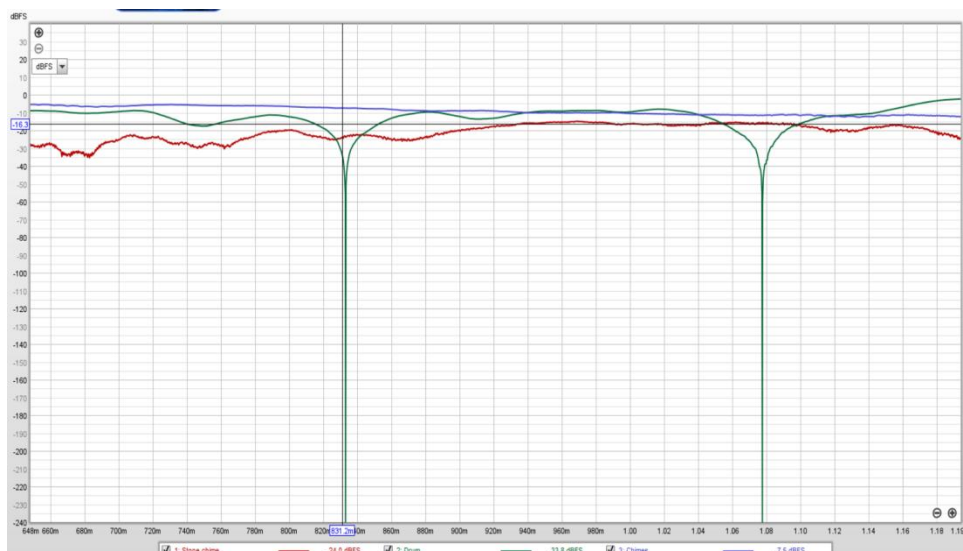


Figure 2. Timbre Comparison of Chimes, Marble Stone Chimes and Drums

By comparing the timbre of instruments of different materials, it will be found that the timbre of chimes and marble stone chimes is flat and almost similar. Among them, the timbre of the bronze chimes is more rich and low, and the timbre of the marble stone chimes shows irregular changes. The timbre of the drum shows great fluctuations. This shows that the music of bronze chimes and marble stone chimes has a limited scope of application, while the scope of application of building drums is even more extensive. The percussion instruments of the Han Dynasty formed a variety of percussion instruments according to the different materials, and the percussion instruments of the Han Dynasty also had different musical characteristics. First, bronze percussion instruments have been used to a certain extent because of the unique effect of their materials on timbre. First of all, the hardness and stability of the bronze material make the timbre of the bronze percussion instrument often crisp, bright and powerful, and this also makes the resonance effect of the bronze percussion instrument very obvious and has a very long sustain effect. In this way, the expressive power of the music performance can be enriched. Secondly, the bronze material can make the percussion instrument full of characteristic metallic texture (Tan et al., 2023), so that the sound of the music becomes very full and layered. It can be seen that the bronze percussion instruments of the Han Dynasty have a very crisp and bright timbre, which can show good sound effects, which makes them play a very important role in court music and ceremonial activities in the Han Dynasty. Moreover, because the bronze material has a high hardness and density, it also greatly improves the vibration transmission efficiency of the bronze percussion instrument, so that when the instrument is played, the instrument can respond quickly and accurately, resulting in a high-frequency sound, and then when multiple instruments are mixed, the sound of the instrument is still relatively clear, and it is not easy to be masked by the sound of other low-frequency instruments. Based on this, in the performance of court music in the Han Dynasty, bronze percussion instruments, such as chimes and chimes, could be used to play certain sections that accentuated rhythm and enhanced tone. In addition, because the bronze material can withstand relatively large vibration energy when people hit the bronze percussion instrument, the energy in the bronze instrument will continue to be transmitted, then gradually decay, and then form a long and continuous aftertaste. This feature makes the playing process of bronze percussion instruments very smooth, which can enhance their musical expression and influence, and can be applied when it is necessary to express more melodious music and a more solemn atmosphere. Moreover, this feature also makes bronze percussion instruments more suitable for the performance of some solemn ceremonial activities of the Han Dynasty, thus enhancing the solemn atmosphere of the event; Percussion instruments made of bamboo have a great timbre. First of all, the nature of bamboo is very light and flexible, so the timbre of percussion instruments made from it is often extremely pure and clear, full of soft timbre, and the timbre is relatively warm. For example, in the military song "Will Enter the Wine" in the Eastern Han Dynasty, when using percussion instruments made of bamboo, people can hear a more natural and fresh sound effect, which makes the music play lightly. The main thing is to play the timbre of bamboo, and through the crisp sound of bamboo, to describe the shouting and killing sound of war. Secondly, since bamboo is a material with a unique fiber structure when using bamboo to make percussion instruments, the timbre and pitch

can be adjusted in various shapes and sizes in the first part of "Shojin Sake", thereby increasing the diversity of percussion instruments. Among the bamboo percussion instruments of the Han Dynasty, the bamboo slip drum and the bamboo pan drum were very popular, and their timbre characteristics were very soft and clear, with a sense of warmth, and there was no very sharp (Tan et al., 2023), very high-frequency component. Another example is "Liuzuo Wind Percussion Music", bamboo slippery drums and bamboo row drums are suitable for playing more relaxed and bright, and are one of the representative repertoires of the Han Dynasty, especially the timbre and melody of playing music. In addition, Han Dynasty bamboo percussion instruments of different shapes and sizes have different timbres and pitches. Because bamboo can be easily made into percussion instruments of different shapes and sizes, this makes the variety of bamboo instruments used for percussion in the Han Dynasty very rich. For this reason, at the end of the Western Han Dynasty, "Jiang Jin Jiu" and "Liuzuo Wind and Percussion Music" could be played using different bamboo percussion instruments, and used to express their personal understanding and perception of music. It can be seen that the bamboo percussion instruments of the Han Dynasty had a certain influence on the musical expression of the army at that time, and also provided a lot of practical information for the study of military music creation in later generations. First of all, animal leather is more elastic and tough, and when animal leather is used to make the drum face of a percussion instrument, it can produce a deep and obvious resonance effect. As a result, percussion instruments made of animal leather will be played smoothly and will be able to produce a resonant, rich and full tone. Secondly, using different animal leathers to make the drum surface of the drum can also produce a variety of styles and sound effects, thereby improving the expressive power of percussion instruments (Yin, 2023). It can be seen that different materials will have different effects on the timbre of percussion instruments. Bronze percussion instruments deliver a clear, bright, and distinctly metallic sound. Comparing the drums made of different materials, the results are shown in Figure 3.

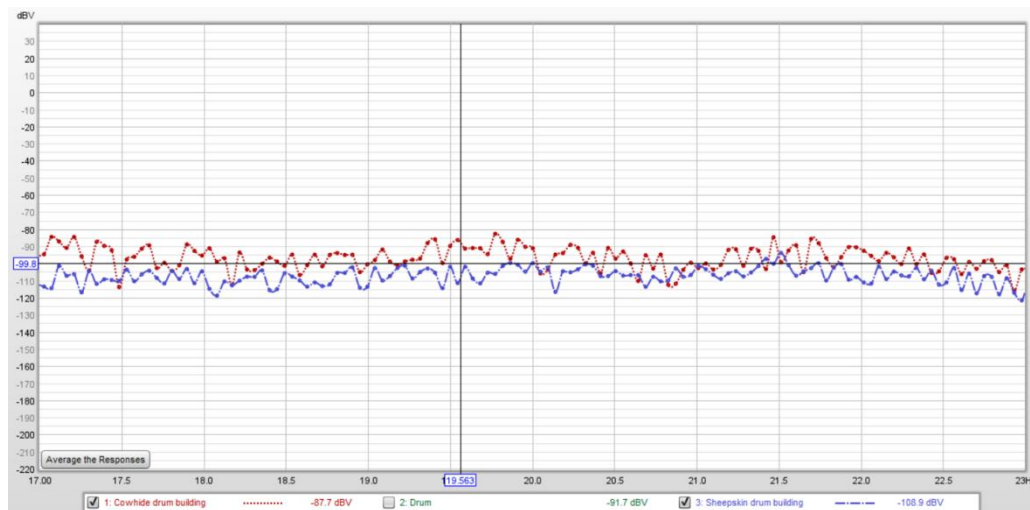
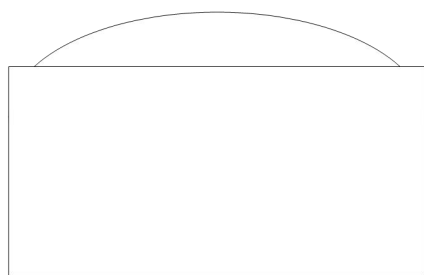
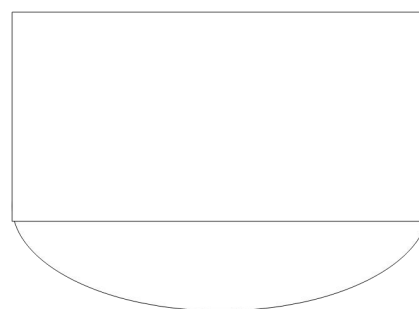


Figure 3. Drum Timbre of Different Materials

As can be seen from the results in Figure 3, there are also some differences in the construction of drums of different materials. Percussion instruments made of animal leather produce a rich, warm sound that can reverberate significantly. Because of its natural solid elasticity and high toughness, Han Dynasty percussion instruments made of animal leather have a wide sound wave when struck, bringing a sense of depth. This sound wave will also resonate in the drum cavity of the instrument and produce a rich sound. Through the analysis of percussion instrument material, we find that the material will cause the change of percussion timbre, but it has little influence on percussion loudness and propagation distance. Comparing percussion music with different shapes, we can find that the shape and structure of musical instruments will affect their loudness and transmission distance, as shown in Figure 4.



spreads far and has high audio frequency



Close propagation and low audio frequency

Figure

4. Results of Different Constructions with the Same Shape

As can be seen from [Figure 4](#), the same shape but a different structure will also make changes in sound intensity and frequency. This sonic characteristic can enhance the rhythm of the instrument and improve the sense of movement, so they are often used in the accompaniment of war and celebrations and arouse people's agitated emotions, which is easy to stimulate soldiers' enthusiasm to fight. In addition, the drum surface is made of different animal leather materials, which will also have different sound effects. For example, a cowhide drum can produce a deep, powerful sound when struck. If the drum surface is made of horseskin or sheepskin, it will make a crisp sound when struck because it is made of sheepskin, and horseskin is generally thinner. Based on this, the people of the Han Dynasty could choose the suitable Jiangu according to the musical needs of each occasion. Moreover, it also allowed Han artisans to adjust and control the sound quality and volume of percussion instruments according to the advantages of different animal leathers, which in turn affected the band's performance. Because of the different uses and performance environments, percussion instruments will also have different sound performances, so their timbre characteristics will be different. According to research, bronze percussion instruments were used mainly to show a solemn aura when performing court music. In folk celebrations, bamboo percussion instruments are more suitable for the scene's atmosphere, as the timbre is often more pleasant and cheerful. It can be seen that the difference in their timbre characteristics is closely related to the environment and use, and the factors also determine that the percussion instruments of the Han Dynasty had obvious differences in sound expression and emotional transmission effect (Durier et al., 2021).

Styling of Percussion Instruments

The impact of structure and shape. Different types of Han Dynasty percussion instruments will also significantly differ in structure and shape, affecting their timbre. For example, the Han Dynasty bell consisted of dozens to hundreds of bells of different sizes, each of which needed to be hung on a shelf, and their tones had their own characteristics (Yuan, Huang, Shen, & Liu, 2022), which could determine the final resonance effect of the chimes and improve their harmony. For example, a bamboo drum is made up of many bamboo pipes arranged in a neat row, each of which is cut to a different length to produce a different pitch. Based on this, the bamboo drum can play many different melodies. Comparing the shapes of percussion instruments such as chimes, celadon reeds, and drums, the results are shown in [Figure 5](#).

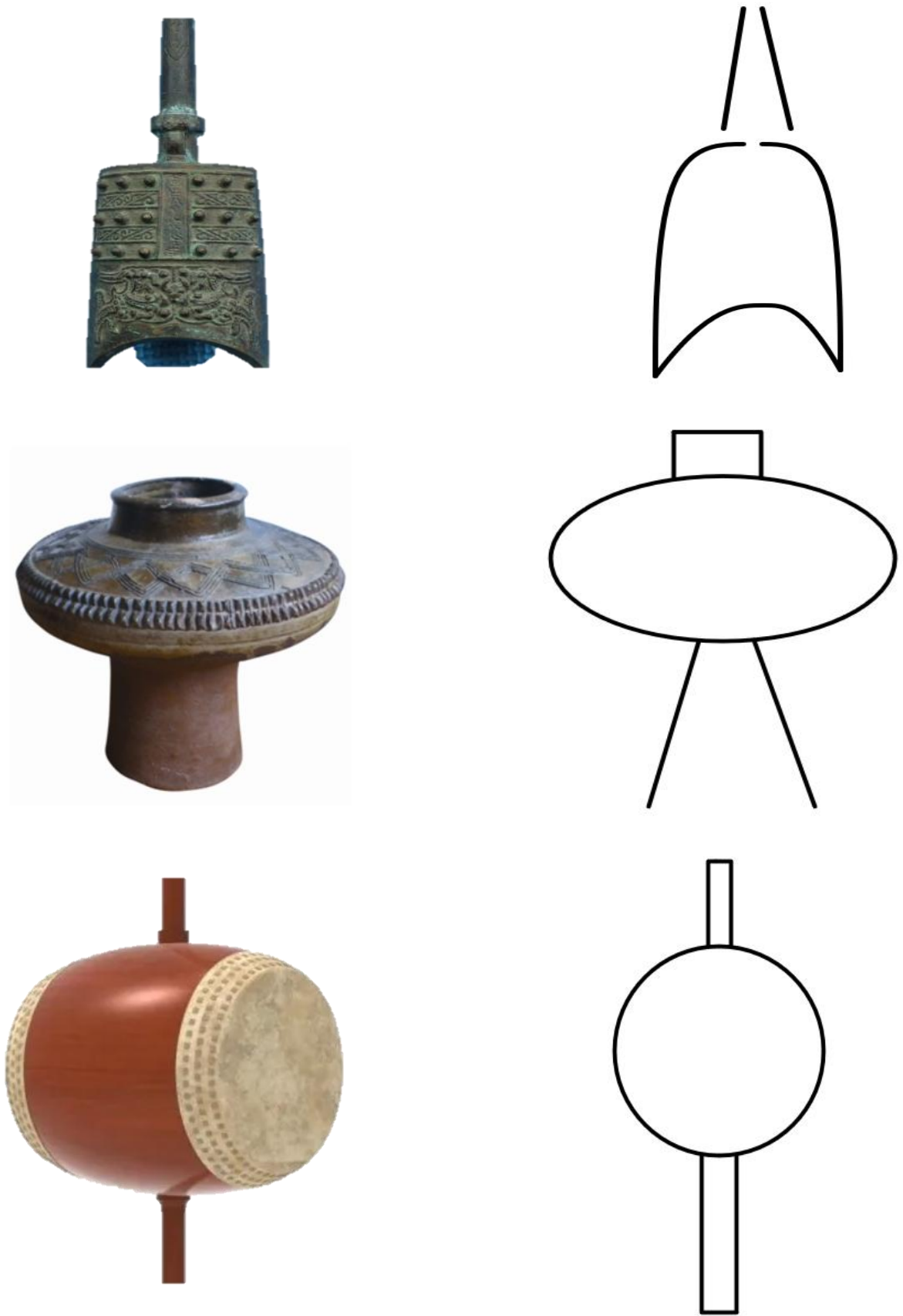


Figure 5. Shapes of Different Percussion Instruments

As can be seen from the shape of the percussion instrument in Figure 4, the shape of the percussion instrument in the Han Dynasty is basically similar, mainly in the middle of the circle, maintaining the effect of

sound. Among them, the shape of the chime is trumpet-shaped, mainly to increase the loudness of the sound. The main reason is that the chimes are made of bronze, so the sound frequency is low and the loudness is not high, so it depends on the shape of the trumpet for directional sound. The shape of celadon and drum is closed, mainly made of porcelain, clay, cowhide, etc., with high frequency and loudness. Therefore, the shape of Handa percussion instruments is closely related to the sound effects and use. The shape of percussion instruments in the Han Dynasty can also reflect the exquisite level of ancient Chinese instrument manufacturing technology and the diversity of musical culture at that time. First, the styling of percussion instruments in the Han Dynasty tended to be more practical and attached importance to aesthetic balance. For example, chimes are generally composed of many bells of different sizes and shapes, and they are generally hung on wooden shelves in a certain order, so they can often show symmetry and full harmony and order. In chimes, each bell is flattened and has an open bottom and a beam at the top for easy hanging (Guo & Radder, 2020). Moreover, the bell's body is generally decorated with delicate ornamentation, such as more traditional patterns like dragon and moire. The decoration can show the skill and skill level of the Han Dynasty craftsmen, and make the Han Dynasty percussion instruments show their unique aesthetic value. The Han Dynasty drums can also show their own styling characteristics. For example, drums in the Han Dynasty were generally composed of 1 cylindrical drum body + 2 ends of the skin. From the perspective of shape, the Han Dynasty drum generally adopts a more stable design, so it looks very simple. Moreover, its drum body is generally carefully carved and decorated, which can show good aesthetics to a certain extent. In addition, there will be many different patterns on the drum skin, which are exquisitely decorated and can reflect the aesthetic concepts of the Han Dynasty people, showing the profound national cultural connotation. In addition, the chime of the Han Dynasty was also very popular, and its shape was often very simple and elegant (Zhou et al., 2023), which could not only adapt to the performance needs of the time but also had a certain aesthetic height. At the same time, it is made of bronze, so the modelling is also very exquisite, and it is able to show many subtle details. In addition, there is a Han Dynasty percussion instrument called "Muyu", which also has a unique structure. The "Wooden Fish" percussion instrument is mainly composed of two wooden bodies of similar shape and size, and people can use their hands and sticks to hit the two wooden blocks to make them collide with each other and make a pleasant sound (Rehding, 2022), achieving a long reverberation effect. In addition, bamboo percussion instruments from the Han Dynasty also have a unique structure. For example, the structure of bamboo drum instruments in the Han Dynasty has a clever design for acoustics. Generally speaking, Han Dynasty craftsmen would carefully design the body parts of the drum, requiring its size, thickness, material, etc., so as to ensure that the Han Dynasty bamboo drum could produce a rich and powerful sound effect. In addition, during the processing process, the artisan will adjust the timbre according to the specific performance requirements so that each drum type can have its unique sound effect.

THE MUSICAL HISTORICAL VALUE OF PERCUSSION INSTRUMENTS IN THE HAN DYNASTY

Reveal the Development of Aesthetic Changes in Percussion Instruments in the Han Dynasty

The different shapes of percussion instruments in the Han Dynasty enriched the music culture of the time, and at the same time, their shapes and designs can also reflect the Han Dynasty's aesthetic concept of music, mainly manifested in the following points. At the beginning of the Han Dynasty (25~90 AD), percussion focused on the inheritance of tradition, and chimes and chimes were widely used in major events. The social and economic development and the integration of foreign cultures have reached a relatively high peak level, so the percussion instruments of the Han Dynasty have a variety of shapes, pay more attention to practicality and aesthetics, improve the shape of the chimes, and combine a variety of materials to design the instrument. During the Qin Dynasty, the use of chimes and other musical instruments in court music and ceremonial activities in the Han Dynasty represented the majesty of the emperor, and in the early Han Dynasty (25~90 AD), chimes were also continuously used, reflecting the great importance that the society attached to ceremonial and banquet occasions at that time. In the late Han Dynasty (150~220 AD), the shape of the chimes was changed to be oval, but the overall shape was the same, which can also reflect the importance of court music and ceremonial activities in the Han Dynasty at that time, which shows that the middle of the Han Dynasty (90~150 AD). Society regarded noteworthy court music performances and ceremonial activities as one of the ways to show the majesty of the state and also regarded them as activities to demonstrate the authority and etiquette of the ruler, so the relationship between chimes and ceremonial activities is inseparable. In addition to solemn ceremonial activities, chimes were also used in banquets and other occasions in the late Han Dynasty (150~220 AD).

In the middle of the Han Dynasty, chimes, bells, and drums were also effectively applied, as a fine percussion instrument with high aesthetic value, and showed a pleasant timbre, adding a strong cultural atmosphere to the court banquet. As we all know, during the Eastern Han Dynasty (25~220 AD), sacrificial activities were always regarded as extremely important activities, and the rulers of the Han Dynasty established a close relationship with

the gods. For this reason, the emperors of the Han Dynasty generally attached great importance to sacrificial activities and strengthened the connection between ritual and music. Based on this, the chimes became an important musical instrument in the sacrificial activities of the Eastern Han Dynasty (25~220 AD) and showed effective communication between music and the gods. In a sense, the Han Dynasty believed that the crisp sound of chimes helped people convey their reverence for the gods and strengthen their connection with them (Yang et al., 2023). It can be seen that the Han Dynasty chime, one of the most widely used percussion instruments at that time, could enhance the grand atmosphere of the celebration and highlight the sacrificial culture at that time. In addition, the effective application of drums and celadon reels in sacrificial activities can also prove the worship and respect of the gods in the Han Dynasty society, and prove that in the Eastern Han Dynasty (25~220 AD), music has always been regarded as a more divine art form. Based on this, this paper argues that the use of chimes shows that the people of the Han Dynasty had a high degree of recognition of music art.

In the late Han Dynasty (150~220 AD), the flexibility of chime design, and the shape often had symmetry and attached importance to the characteristics of simplicity, generosity and stability. It can be seen that the aesthetic concept of the Eastern Han Dynasty (25~220 AD) attaches more importance to the integration of balance, simplicity and stability. From the research of later generations, people can also find that the decoration of percussion instruments in the Eastern Han Dynasty (25~220 AD) is relatively diverse, and the more traditional patterns such as the cloud pattern and dragon pattern are basically the cloud pattern, which can show that the Han Dynasty people admired nature and yearned for myths and legends. The decorative patterns on the surface can show the aesthetic concept and level of percussion instruments in the Eastern Han Dynasty, and the skill level of percussion instruments in the Eastern Han Dynasty can also give people a glimpse of the super high requirements and aesthetics of people at that time. For example, the extraordinary skill of Han artisans is reflected in the high level of skill they used in producing Han percussion instruments. In the early days of the Western Han Dynasty, Han Dynasty artisans would also use bronze, animal leather, bamboo and other materials to complete exquisite processing skills and use carving and casting techniques to make Han Dynasty percussion instruments so as to improve the artistic value of percussion instruments at that time. In the late Western Han Dynasty, the outstanding skills of the craftsmen of the Han Dynasty and their extremely high creative and aesthetic abilities. During the Eastern Han Dynasty, Han Dynasty craftsmen were also able to complete timbre adjustment and control through their own exquisite skill level, so that Han Dynasty percussion instruments such as chimes and chimes could maintain a crisp, pleasant, and moving timbre, and maintain a beautiful appearance. For example, in the middle of the Eastern Han Dynasty (90~150 AD), artisans also made fine processing of bamboo percussion instruments and good tuning control over them to ensure that each bamboo pipe could show accurate pitch after arrangement. It can be seen that the percussion instruments of the Han Dynasty are full of the social aesthetic concepts of the time in all aspects, and in the aesthetic concepts contained in the percussion instruments of the Han Dynasty, future generations can also find the requirements of the society at that time for the level of music culture, art and aesthetics.

The Musical Value of Percussion in the Han Dynasty

The percussion instruments of the Han Dynasty have a certain musical historical value, which can be glimpsed from many aspects. At the beginning of the Han Dynasty (25~90 AD), percussion paid great attention to the inheritance of Han Dynasty culture. The percussion instruments of the Han Dynasty reflect the importance of the Han Dynasty society to music culture, and they give a glimpse of the aesthetic tastes of the people at that time, showing the style and characteristics of the music of the Han Dynasty. It can be said that the percussion instruments of the Han Dynasty carried the musical traditions and historical culture of that era, and influenced the development of music in later generations. For example, chimes, bells, Hetian jade chimes, and celadon chimes can reflect the time's social music culture and aesthetic tastes. There is a close connection between the musical culture of the Han Dynasty and the majesty, power and social outlook of the ruling class. Among them, the bells and drums of percussion instruments in the Han Dynasty were widely used in court ceremonial activities and sacrifices and occupied a very high position in folk music activities. First, the use of percussion instruments in the Han Dynasty, as well as their timbre characteristics and performance techniques, can reflect the pursuit of music in the society at that time, and show the aesthetic taste of the Han Dynasty people and the cultural characteristics of the time. The study of percussion instruments in the Han Dynasty will help future generations to understand the evolution of Han Dynasty music and the development of Chinese classical music and promote the music performance techniques of the Han Dynasty, and then reveal the development and changes of Han Dynasty music in various historical periods. In this way, studying various aspects of percussion instruments in the Han Dynasty will help people understand ancient Chinese music culture and provide valuable reference content for future cultural inheritance and research on Chinese music history. This also shows that the percussion instruments of the Han Dynasty carried the traditional culture and historical memory of Chinese classical music, which is of great significance for the further innovation of music and the protection and inheritance of traditional

music culture in later generations. In the middle of the Han Dynasty (90~150 AD), great attention was paid to creating musical melodies and rhythms. Han Dynasty percussion instruments can not only show the melody and rhythm of musical works but also add diversity to the cultural and artistic performances of the Han Dynasty. Based on the study of various aspects of percussion instruments in the Han Dynasty, people can understand the music culture of that time and the musical aesthetic level, performance methods, performance skills, and aesthetic characteristics of the Han Dynasty people. First, the percussion instruments of the Han Dynasty provided many unique rhythms to the musical works of the time. In the music performance activities of the Han Dynasty, chimes and bamboo drums all have great weight, and their performance methods are unique, and the timbre characteristics are different, which can inject new rhythmic elements and melodic beauty into the music works of that time. Based on this, the musical works of the Han Dynasty became more diverse, and their artistic charm became very unique, which had a great influence on the aesthetic concept of the Han Dynasty people. On important occasions, Han Dynasty percussion instruments were generally used as accompaniment instruments or solo instruments to show a unique timbre, with rich and colorful sound effects and extremely varied playing techniques, which can add a unique artistic atmosphere to musical performances. Moreover, percussion instruments appeared in the court and folk occasions of the Han Dynasty, and in the music performance activities in the temples, which played a strong role and became one of the characteristics of music and art in the Han Dynasty. In the late Han Dynasty (150~220 AD), great importance was attached to developing comprehensiveness, and the forms of expression were more diverse. The percussion instruments of the Han Dynasty can reflect the unique aesthetic pursuit of sound, rhythm and rhythm of the Han Dynasty. Through the study of the phonological characteristics of percussion instruments, people can know and understand the emotional experience of music and art in the Han Dynasty. The percussion instruments of the Han Dynasty were able to show the people's pursuit of sound and rhythm and the beauty of rhythm and rhythm at that time. At that time, music was not only one of people's entertainment lifestyle but also a way to express their aesthetic ideas and emotional communication. The unique timbre and strong sense of rhythm of percussion instruments in the Han Dynasty made them one of the mediums for the Han Dynasty people to express their emotions and aesthetic pursuits. The percussion instruments of the Han Dynasty, made of bronze materials, bamboo, animal leather, etc., had many different functions, and people could create a variety of sound effects, thus driving the musical aesthetics of the Han Dynasty people and having a high appreciation value. Through the study of the phonological characteristics of percussion instruments in the Han Dynasty, people can also connect them with the folk culture of the Han Dynasty and deepen their knowledge and understanding of the social life of the Han Dynasty and the emotional experience of music and art of the people at that time. Moreover, in this context, people can also interpret the percussion instruments and their performance movements in the Han Dynasty from a historical perspective so as to better understand the music of the Han Dynasty and ancient Chinese music culture and use this to study the social features of the Han Dynasty as shown in the history of ancient Chinese music culture. At the same time, it is also conducive to future generations to further understand the musical concepts, aesthetic concepts, and spiritual outlook of the Han Dynasty. The drums, chimes and chimes of percussion in the Han Dynasty have a low frequency of about 752~2785Hz, mainly made of bronze, pigskin, bamboo, stone and other materials, and the sound form is single, but the deep sound can create a solemn atmosphere, which is suitable for large-scale sacrifices and performance activities, so the percussion instruments of the Han Dynasty are widely used in court music ceremonies and religious activities. Chimes, chimes and drums are played in a variety of forms, and through the concerto of different instruments, the atmosphere of the performance can be enhanced, forming a magnificent momentum, highlighting the dignity of the emperor and the importance of the ceremony. Therefore, the combination of percussion instruments in the Han Dynasty, as well as the combination of melody and timbre, can provide a reference for modern large-scale performances and multi-performance, a deeper understanding of the music culture of the Han Dynasty, and help the study of court music culture in the Han Dynasty.

CONCLUSION

Through the study of this topic, future generations will better understand the sound characteristics, form and development of percussion music in ancient China. At the same time, it will also enable people to better understand the music's historical value, Chinese cultural connotation, and profound historical background of the percussion instruments of the Han Dynasty. The results of this study show that the main components of percussion instruments in the Han Dynasty were bronze, iron, aluminium, etc., as well as calcium, magnesium silicate, sodium aluminium silicate, sodium aluminium silicate, wood fibre, lignin, animal fibres, organic salts, and a change in timbre. Among them, the chimes and chimes are mainly changed in material, mainly Hetian jade, clay and bronze, and the musical instruments such as drums, celadon reeds, chimes, and chimes show diversified changes, but the materials have not changed. In terms of timbre, the timbre of the chimes and chimes is low, so the shape is trumpet-shaped, and the percussion materials, such as drum and porcelain, cheque are diverse, such

as clay, porcelain and bamboo, etc., so the shape is closed, and more attention is paid to the aesthetics of the modelling. The results of this paper excavate the characteristics of percussion instruments in the Han Dynasty in terms of material, melody, timbre, etc., and find that although the percussion instruments of the Han Dynasty have a single material, they can display a variety of musical forms through the form of combination. Moreover, the cultural exchanges between the Han Dynasty and the West enriched the form of percussion performance, changed the ratio of tin and iron in bronze percussion, and increased the frequency of chimes, which provided an empirical basis for the melody classification of modern musicology and the excavation of music culture in the Han Dynasty. In addition, the change in the combination of musical instruments such as chimes, stone chimes, and drums also provides case support for the optimization of modern large-scale music performances and integrates the percussion culture of the Han Dynasty with modern music theory to complete the inheritance of Han Dynasty music. Therefore, percussion music in the Han Dynasty had a high value in terms of material, timbre, and shape, and it was of great significance for enriching the history of music. In this study, there are problems such as few reference materials and insufficient test samples, and we will focus on making up for the above shortcomings and deepening the research in the future.

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