Explore the solution to the contradiction between violin temperament pitch and central C theory

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Abstract: Among the factors restricting the pitch of violin performance, the temperament system is the most fundamental factor. Its existence is not single, and there will even be a situation in which multiple systems coexist in a work. Under the influence of the longitudinal direction of the temperament system, other factors such as mode, tonality, harmony and playing method have different horizontal influences on it. When playing the violin, the pitch factors that need to be grasped should be comprehensively considered and summarized. This article selects the common performance of the central C score as the research object, and explores the solution to the contradiction between the violin temperament pitch and the central C theory.

1. Introduction

As a "Queen of Musical Instruments", the violin has the characteristics of beautiful timbre, wide range, difficult playing and rich expressiveness. The sound of the violin is "live", and the pitch is completely controlled by the player [1]. Due to the different degree of grasp of the works by the players, different artistic effects appear when different people perform the same work. This phenomenon is not very obvious in solo works, but in symphony orchestras, the performance of the players varies, and some people only pay attention to the basic factors of musical performance such as pitch and rhythm. However, there is not much in-depth study of musical score performance in the knowledge of temperament, so there are individual differences in the standard judgment of pitch, which makes the pitch and timbre inconsistent when playing the part in concert, making the expressiveness of the music is greatly reduced. This article selects the common performance of the central C score as the research object, and explores the solution to the contradiction between the violin temperament pitch and the central C theory.

2. Principle of sounding of violin

As a stringed instrument, the violin is mainly composed of two parts: the body and the bow. During the bow movement, the bow hairs are repeatedly rubbed after contacting the strings to vibrate the strings. The vibration of the strings is transmitted to the panel through the bridge, and then the panel passes through the sound column transmits the vibration to the back panel, so that the entire violin vibrates immediately and makes a sound [2].

The pitches of the four strings are g, d_1, a_1, and e_2 from low to high, and there is a pure five-degree relationship between each adjacent two strings. The right hand holds the bow and pulls the string. The left hand is responsible for pressing the string. The pitch is changed by changing the effective vibrating string length. Because there is no fret on the string, the sound played does not have a fixed pitch. The pitch is live. The standard of the pitch depends on the player to grasp. The difficulty for the violin intonation is that it lacks a strict requirement and regulation. Not only should we consider the type of work, mode and tone, harmony function, melody trend and other factors, but also the performance form and style charm of the work, etc. Factors to make appropriate artistic adjustments.

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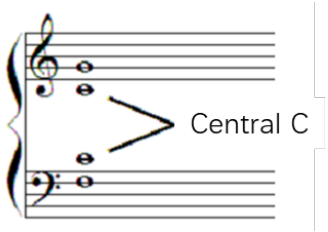
The violin's legal system is very complicated, most of which are based on the twelve-tone equal temperament, and the principle of just intonation is used. In the face of complex legal issues, Mr. Lin Yaoji also put forward the idea of using the “comprehensive equalization temperament” based on the temperament of five-degree mutualism. Therefore, in practice, the specific legal system to be used must comprehensively consider the type of work and performance form, so that specific problems should be analysed.

3. The contradiction of violin tempo and central C theory

3.1. Central C

A line of C sound (c^1) is added under the G clef, and it is also a line of C sound (c^1) added to the F clef. This sound has an equal distance (pure five degrees) from g_1 and down from f, so it is called central C, spectrum example 1. The line where the centre C is located is a real plus line, that is, the treble clef and the bass clef share a C, which is in the centre of the five C_s in the example of the spectrum, C on both sides forms a symmetric figure with it, so it is called central C [3].



3.2. Theoretical contradictions and solutions

According to the knowledge of central C related temperament, in the Pythagorean tuning and just intonation, $^{\#}$C and ^{b}D are not completely equal, $^{\#}$D and ^{b}E are also different, and $^{\#}$F can not be equal to ^{b}G. The pitch values of these notes are not the same. But in violin playing, players often use the principle of just intonation to match these notes with empty strings. As shown in Fig. 1: When the sounds on the left and right sides are used as just intonation, they should not be equal in theory, but they are often equal on the violin. The player uses the empty strings of C, G, D, A, and E to force them to be equal.

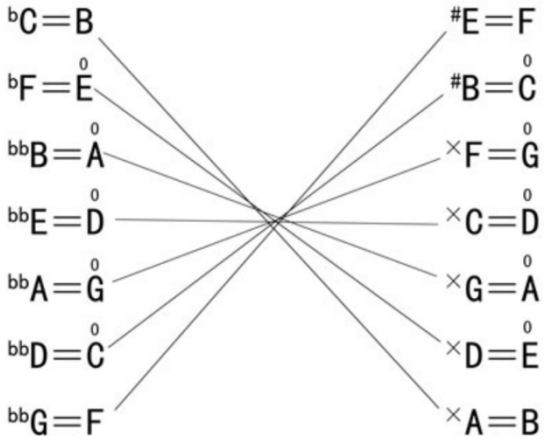


Figure 1 Equal sound in violin performance

As shown in Fig. 2, the first line and the second line have an equal sound relationship up and down. For example, ^{b}F is equal to E, ^{b}C is equal to B, ^{b}G is equal to $^{\#}$F, and so on to the right, until B is equal to × A. The second line is the Pythagorean tuning extending from D to the right and the just intonation minor third chord produced by the third line. According to the principle of the Pythagorean tuning $^{\#}$E is not F, it is 24 cents higher than F. But we also know that the F of the just intonation is 22 cents higher than the F of the fifth-degree symbiotic temperament.

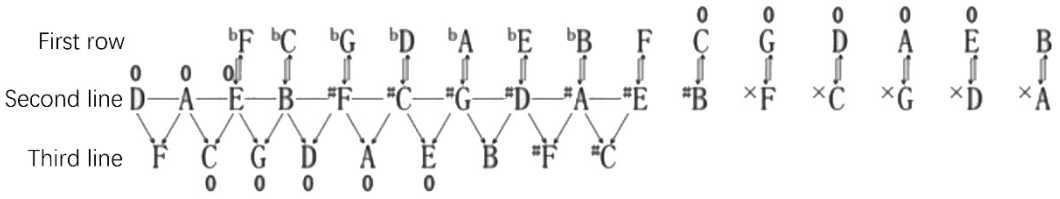


Figure 2 Equal sound relationship

The difference between F as $^{\#}$E and F as pure temperament is 2 cents apart, but they are often used as one tone in violin performance. The player achieves this by using F ($^{\#}$E) and the empty string A to form a pure major third double note. In addition, #B is not C, it is 24 cents higher than C, but we also know that the just intonation C is 22 cents higher than the fifth-degree symbiotic C. As C of $^{\#}$B and C of pure temperament are only 2 cents apart, they are often used as a single one tone in violin performance. Players use C ($^{\#}$B) and empty string E to form a pure major third two-tone. The other sounds extended to the right, and the sounds of four consecutive double-ups were influenced by the empty strings of G, D, A, and E. They were enharmonic notes, and return to the starting pitch of the five-degree symbiotic temperament.

As shown in Fig. 3, the first line and the second line have an equal sound relationship up and down. For example, F equals ^{bb}G, C equals ^{bb}D, D equals bbE, etc. Deriving to the right in the same way, we can get $^{\#}$B equal to C .The second line is the Pythagorean tuning that extends from D to the left and the pure third major chord produced by the third line.

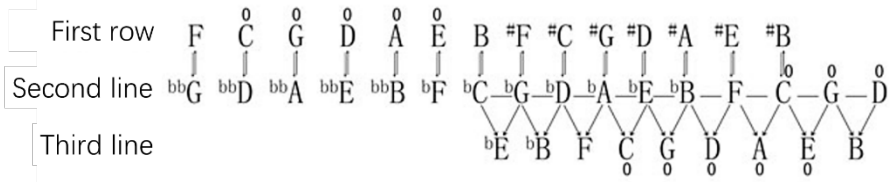
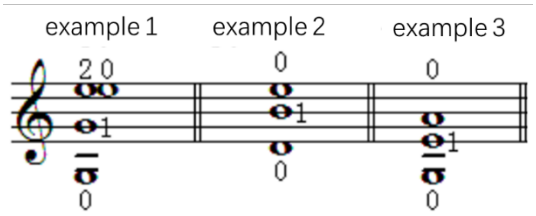


Figure 3 Equal sound relationship

Similarly, according to the principle of Pythagorean tuning, ^{b}C is not B, which is 24 cents lower than B. But we also know that positive B is 22 cents lower than Pythagorean Law B. B (bC) is only 2 cents apart from B. B is usually used as a violin player. It is achieved by using B (^{b}C) and the empty string D to form a just intonation of six degrees. In addition, ^{b}F is not E, it is 24 cents lower than E. But we also know that the just intonation E is 22 cents lower than the E of the fifth-degree symbiotic temperament. As ^{b}F, E and pure temperament E are only 2 cents apart, and are often used as one in violin performance. We used E (^{b}F) and empty string G to form a just intonation of six degrees. For the other notes, the sounds of three consecutive double-declining signs that extend to the left are also affected by the empty strings of G, D, A.

3.3. Contradictions and solutions in the Pythagorean tuning

When playing chords, the two empty strings of violin G and E should not be used at the same time. The empty string E prevails and G has a high point; the empty string G prevails and E has a low point (see Example 1). D and E, G and A should not be used at the same time when playing chords. B is the low point based on D, and B is the high point based on E (see Example 2). With G as the criterion, E would have a low point, and with A as the criterion, E would have a high point (see Example 3). The Pythagorean tuning, for example, C_1 of a large group of characters is the initial sound, and all are generated 11 times upward according to the pure fifth-degree relationship, and then the 12 semitones of the Pythagorean tuning can be obtained, such as: C_1 —G_1 —D —A —E—b—f—c—g—d—a—e—b. Move all the above sounds to within an octave to form the chromatic scale of the fifth-degree mutualism. In the Pythagorean tuning, every fifth-degree co-occurrence is two cents higher than the twelve-tone equal temperament [4]. Twelve times after the fifth degree, they will be 2 × 12 = 24 cents higher.



Therefore, in violin performance, you should not start with C as the starting sound, you should start with the A or D sound. As shown in Figure 4A, B: D is the centre, with A as the standard sound, aligned up and down. In the form of positive and negative numbers, the pure five degrees are spread in the left and right directions, so that the difference between the Pythagorean tuning and the twelve-tone equal temperament can be correctly revealed. (Many violinists are willing to set A slightly higher when working with the piano, in fact they are using D as the standard sound). D is the centre is not artificially specified, but occurs naturally, so D is the boundary of the (just intonation) horn (see Figure 4B). Taking A or D as the standard sound (to the right), five consecutive degrees of each other are two cents higher than the twelve-tone equal temperament each time. Still using A or D as the standard sound (to the left) five consecutive degrees of each other are two cents lower than the twelve-tone equal temperament each time. Fig. 4A shows that the upper line represents the Pythagorean tuning, and the lower line represents the twelve-tone equal temperament. The interval of the Pythagorean tuning is slightly larger for 702 cents; the interval for the twelve-tone equal temperament is slightly smaller for 700 cents. Taking A or D as the standard (to the right), the higher the higher, the (left) the lower the lower. Note: A closer look at A or D is aligned up and down. The grids on the two lines (to the right) are more frustrated and higher, and (to the left) are more frustrated and lower.

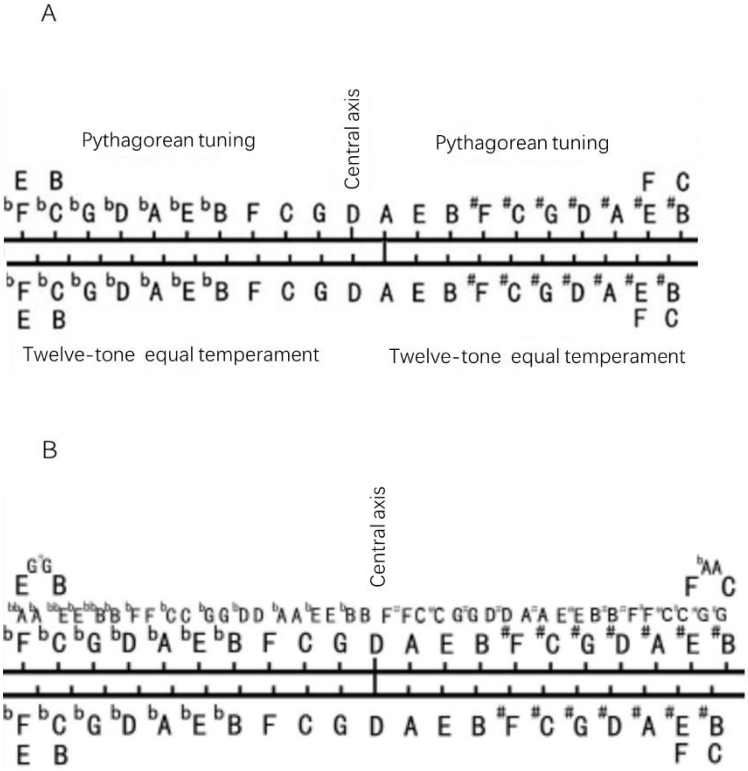


Figure 4 Pythagorean tuning interval

3.4. Contradictions in the arrangement of phonetic names and solutions

Use the pure fifth between the second and third partials in the harmonic series, and then add the major third between the fourth and fifth partials as the element of the rhythm, thus forming a temperament of each temperament system, called just intonation (Figure 5 A) [5]. For the violin, the just intonation uses a major chord and a minor chord as the elements of the birth temperament (Figure 5B).

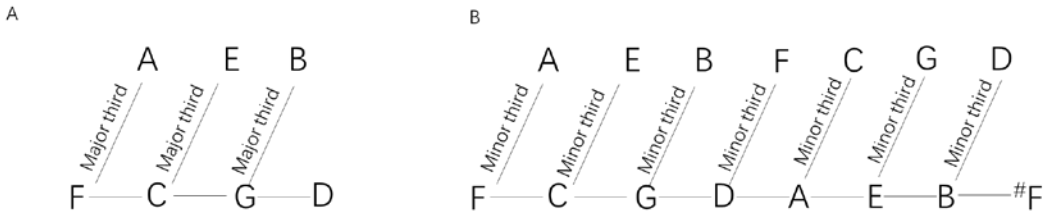


Figure 5 Interval of just intonation

Comparing the pure-temper major scale with the fifth-degree co-occurring major scale, the two major-scale major scales C, D, F, and G are all constructed in the same way, and their cent values are also the same, but the arrangement is the difference. It should be F, C, G, D, then a, e, b, indicating the lack of F, C, G, D, A, E, B or vice versa B, E, A, D, G, C, F. The basic concept of Pythagorean tuning is the order in which the escalating signs appear. C can't occupy a special position in each tone. Among these seven notes, A has the important position of standard tone and the first tone in minor. D is the centre position of all sounds, and is the dividing line of the pure rhythm horn. Then there is c, the central C has a linking effect on the treble clef and bass clef in the notation, and is the first note of the major key. F ranks first in the ascending sign, and B ranks first in the descending sign. G is the lowest note on the violin, and E is the highest note on the empty string of the violin. According to the Central C theory, the comparison between the Pythagorean tuning and the just intonation should be defined as “walking down the right”, but the violin player will use this principle to reverse thinking. The small letter A on the right is tall because it is the large letter 4F and the large letter built on the right. On C, the Pythagorean tuning is on the high side. It is necessary to lower the two from the pitch of the fifth-degree symbiotic temperament, and purely combine with the large letter A of the fifth-degree symbiotic temperament. At this time, the small letter A on the right will not be high. Besides the small letter A on the left, it is supposed to be low, and the large letter F and the large letter C, which are Pythagorean tunings, are also low. It is necessary to raise them from the pitch of the Pythagorean tuning to purely combine with the large letter A. At this time, the small letter A on the left will not be high.

4. Conclusion

In the violin playing process, pitch is an important part. Without good pitch, it is difficult for the player to accurately express the connotation of the musical composition. The problem of the pitch of the violin involves many aspects, of which the performance of the score is the most critical. Therefore, this article starts with the Central C Theory and discusses ways to improve the pitch of the violin performance, providing a reference for improving the violin performance.

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