AESTHETIC PROBLEMS OF SOUND CULTURE ON SPIRE BREATH INSTRUMENTS

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Abstract: This article examines the aesthetic issues of forming sound culture in the performance of brass wind instruments. The main factors influencing the quality of sound production, artistic expressiveness of performance, performance mastery, and interpretation of the musical work are analyzed. Particular attention is paid to the relationship between the performer's technical training, breathing characteristics, articulation, timbral coloring, and the instrument's dynamic capabilities with the aesthetic requirements of modern performing arts. It is emphasized that sound culture is one of the most important indicators of a musician's professional level and contributes to the formation of artistic taste, performance culture, and creative individuality. The research results can be used in the educational process of music educational institutions to train performers in brass wind instruments.

Keywords: sound culture, brass wind instruments, performance aesthetics, sound production, performance mastery, artistic expressiveness, timbre, breathing technique, articulation, musical interpretation, professional training, musical pedagogy

Introduction

Among the problems that musical practice poses to modern brass players, one of the most pressing is the problem of improving sound quality. It should be noted that this very important factor in performance art was prioritized by renowned domestic musicians. For example, the famous violinist L. Auer wrote: ... "The problem of producing a truly beautiful sound, or in other words, a sound so melodious that it forces the listener to forget the physical process of its emergence, belongs to those problems whose solution must always remain the most important task for everyone who dedicates themselves to the violin." Interpretation of works of violin classics." p. 51. M.1965

This statement by the outstanding master fully applies to performers on wind instruments as well, for the comprehensive mastery of a beautiful, clear, deep, voluminous, singing sound that is timorously homogeneous in all registers appears to be a necessary condition for high-artistic performance.

The full-fledged, expressive sound of the instrument's melodic line in the smallest details allows the musician to achieve maximum variety in dynamic nuances, color effects, shade richness, and emotional expressiveness. At the same time, it is easy to imagine how mundane the sound musical image in the performance of a wind instrument is, the sound of which is deprived of sufficient flexibility, power, timbral clarity, purity of intonation, and other aesthetic qualities of sound.

In recent years, interest in researching various aspects of wind instrument performance has significantly increased, particularly in revealing the objective patterns of sound formation and sound production, the principles of functioning for individual components of the performance apparatus, and their interconnection with one another. There are achievements in the understanding, objective assessment, modeling, and management of the complex, unified acoustic system "performer - instrument."

These problems have been addressed by authors such as G.Orvid, V.Apatskiy, R.Teryokhin, I.Pushchnikov, I.Mozgovenko, Yu.G.Ritsenko, and others.

Let us consider some objective and subjective factors that have a significant impact on the sound quality of brass wind instruments.

First of all, let us address the problems of sound emergence as a physical phenomenon and analyze the acoustic prerequisites for sound formation. In a broad sense, sound is the oscillatory movements of particles in an elastic medium that propagate as sound waves. In a narrow sense, these are sensations subjectively perceived by the auditory organ, caused by the influence of various oscillatory movements.

Sounds reproduced on musical instruments possess quite specific properties: pitch, loudness, timbre, and duration.

An important characteristic of sound is the spectrum, the main frequency of which determines the perceived pitch of sound, and the set of harmonic components determines the timbre of sound.

The timbre of a sound depends mainly on the number of overtones, their numbers, and relative loudness. It also changes with distance from the sound source, as high overtones are more strongly absorbed by the air than the main sound and low overtones.

As is known, timbre is usually placed in the same rank as the properties of musical sounds such as pitch and loudness. But if pitch and volume are distinguished by comparative simplicity (pitch is determined by oscillation frequency, while volume is mainly determined by intensity), then timbre, which is an elementary quality for perception, is most difficult to connect with a single physical characteristic.

The perception of timbre is also influenced by factors such as attack (the initial moment of sound), attenuation (the end of sound), vibrato, and formants (groups of enhanced harmonic and non-harmonic partial tones). Sound pitch, loudness, purity of intonation, the environment of a specific sound in a musical texture, etc., also exert an influence. Although all these factors are secondary compared to overtones, their significance for perception is great. It is enough, for example, to exclude the vibrato technique, and the sound will lose its beauty; and conversely, the inclusion of vibrato animates the sound, making it warm, full, and saturated.

This complex ratio of objective and subjective elements complicates both the investigation of the expressive properties of sound and the conscious change of its various characteristics. The difficulty is further exacerbated by the fact that in live sound, all physical elements that determine timbre are in constant motion, i.e., subject to dialectical laws.

Let us attempt to establish the level of influence of some objective and subjective components on the perception of the expressive properties of sound. One such element is the harmonic composition of the sound spectrum, which is of great importance for perception.

Acoustics conducted research on the spectra of various instruments. The obtained data allow for the conclusion that the role of individual harmonics in the spectrum is not identical and is determined by two main factors: relative intensity and relative height.

It has been experimentally proven that increasing the intensity of the primary tone changes the timbre from darkened, muffled, and dull to light, full, wide, and powerful. On the contrary, with a slight intensity of the main tone, the timbre is perceived in most cases as more harsh, sharp, and sharp. Strengthening the second harmonic creates the impression of a slight softening of the timbre; further increasing the intensity of the 4, 5, 6, and 8 harmonics increases qualities such as shouting, sharpness, and piercingness.

The sound of the trumpet is bright and brilliant, characterized by a large number of overtones (over 25), the amplitude of which reaches its maximum in the 3-8 harmonic region, slowly decreasing in both directions.

The timbre of the trombone is characterized by a very significant number of harmonics (up to 40). According to E. Meyer's research, in the main (pedal) sound of the counter-octave Si-bemol, the amplitudes of 1-20 harmonics are approximately the same, with small gaps of 3.6 and 12, and higher, they rapidly decrease. In the trombone timbre at a frequency of 465-500 oscillations per second, there is a fairly strong formant. A small secondary maximum is located at a frequency of approximately 2000 Hz. At high frequencies exceeding 5000 Hz, high-intensity sound nuances are noticeable. They give the sound a certain sharpness and metallic notes.

The timbre of the valtorne is characterized by a small number of harmonics.

The timbre of the tuba includes only 13-14 overtones. The third harmonic has the maximum amplitude, while the amplitude of the main tone is somewhat reduced. The 2-8 harmonics also predominate, with a slight decrease in the strength of the even harmonics; the amplitude of the 9th and higher harmonics decreases sharply to zero. In this regard, the sound spectrum of the tuba is close to the sound spectrum of the valtorne, differing from the latter by a large layer of 7-10 harmonics.

The timbre of alto, tenor, and baritone sounds is characterized by sufficient softness and completeness, which increases in proportion to the increase in the instruments' scale. A comparison of the timbres of three soprano instruments—the trumpet, cornet, and flugelhorn - shows that as the middle scale of these instruments gradually expands, the brilliance and sharpness of the sound decrease, while the softness and depth increase.

Analysis of instrument sound spectra shows that harmonic components exert a strong influence on sound timbre, and as the sound rises, the number of overtones in their spectra gradually decreases, starting from the highest harmonic numbers.

The most complex spectrum is identified for the lower sounds of the instrument, resulting in a more colorful sound; the sounds of the upper register are poor in their spectral composition.

Soprano instruments have simpler sound spectra compared to similar instruments of lower tessitura.

Of course, it is difficult to apply this information in performance practice; intermediate research is necessary to establish a connection between the objective characteristics of timbre and various sound production techniques, particularly the distribution of sound energy between individual harmonics and the sound spectrum. However, knowing these patterns will help to understand more clearly the essence of sound quality and will allow for a conscious approach to the use of expressive means, which is one of the necessary conditions for the successful creative activity of a wind musician.

It is known that a whole series of conditions is necessary for the emergence of a musical sound. The creation of sound on instruments with funnel-shaped mouthpieces is particularly complex, where the main sounding body is the volume of air filling the body channel, and the vibrator is the musician's lips. Both of these elements are functionally linked and inseparable from one another.

The resonator serves as the instrument's body and mouthpiece, which respond to sound oscillations of specific frequencies and propagate sound to the surrounding atmosphere. The air contained within the instrument also possesses resonant properties, maintaining a specific frequency of oscillations in the "performer-instrument" system.

The regulation of air flow movement is facilitated by the mechanism of the human respiratory apparatus. Furthermore, the cavity of the lungs, respiratory tract, bronchi and their branches, larynx, and nasopharynx serves as a reservoir in which the air necessary for sound formation is concentrated; the strength of the muscles of the diaphragm, chest, face, neck, shoulder girdle, and back ensures that during exhalation, the pressure of this air exceeds atmospheric pressure and its flow rate increases or decreases.

The regulator of oscillation frequency and the direction of air strings is the musician's lips, as well as their tongue, the tip of which plays the role of an auxiliary valve and allows for the opening and closing of the gap between the lips. The air jet, passing through this slit into the mouthpiece cup, periodically changes the pressure there, leading to the resonance of the air column inside the instrument. Thus, a sound arises, the pitch of which depends on the degree of labial tension, the narrowing and widening of the labial cleft, and the pressure level of the air flow.

The air entering the instrument is modulated by the impedance (the ratio of pressure amplitude to flow velocity) of the labial slit. As a result, a volumetric air flow is formed in the mouthpiece, the pressure of which determines the waveform at the exit of the instrument, and consequently, the quality of the sound. In addition, it is necessary to consider the influence of the instrument's various parameters on the timbre of the sound.

The musician is called upon to exert a significant influence on the character of the sound. In this way, it adapts the lip impedance to the input impedance of the instrument so that maintaining the oscillatory process in the acoustic system is ensured with minimal energy loss. Energy losses will be less the more the vibrations of the lips are adapted to the vibrations of the sounding body.

Objective patterns include an increase in the number of harmonics as the amplitude of lip movement increases, which corresponds to a greater opening of the slit and greater sound pressure. This allows us to speak of the fact that the musician's lips are the basis for the formation of harmonics, and that the content of upper tones depends on the amplitude of lip vibration.

At the same time, it should be taken into account that human lips may undergo various deformations during oscillation, resulting in a change in impedance. Musical practice has many examples where two musicians playing the same instrument extract tones of different spectral composition. This indicates that the formation of harmonics is influenced by the anatomical structure of the lips, the musician's physical capabilities, and performance experience.

Such images, even a schematic consideration of the sound formation process on brass wind instruments, allows for the identification of several components. Among them are objective, independent of the musician, and subjective, which are determined by his creative intentions and the degree of professional training. The first includes musical instruments, room acoustics, and theoretical concepts common to musicians of a given historical period. Secondly, the musician's personal abilities - primarily musical hearing - allow the performer to recognize various sounds and their combinations, foresee them, and control the quality of performance. One of the most important subjective factors is the musician's performance apparatus.

The quality of the musical instrument and the construction of the mouthpiece are of great importance. It has been proven that to create a high-quality sound across the entire frequency range, it is necessary for each instrument to have a corresponding mouthpiece with a precise frequency ratio (cup volume, mouth diameter and length, internal body shape).

Changing one parameter without considering others leads to the disruption of the instrument's sound balance as a whole. For example, if the mouth diameter is large, it is difficult to play the piano, especially in the high register; changing the mouth length increases the acoustic mass and leads to a change in reaction; the internal cone affects both sound quality and intonation. If the cone is small, the high register sounds quiet and usually low. If the cone is large, the reaction will not have sufficient resistance and the instrument will emit low-quality sounds.

Affects sound quality and cup volume.

Large volume leads to the formation of a muffled, rounded, and full sound; the reaction of high tones is smaller. A gradual transition from the bottom of the cup to the mouth is a softer tone, while a sharp one is a shiny one. The quality is also influenced by the shape of the instrument's sound guide, as it consists of cylindrical and conical tubes, as well as the change in cross-section when the tuning regulators are moved forward. At the same time, vortices arise on the ends of the tubes between the layers of flowing and oscillating air.

This leads to energy loss in the oscillating air column and the weakening of some harmonic components.

A similar pattern is observed in the case of inaccurate adjustment of individual parts of the vocal machine. In practice, this leads to a general muffled sound and difficulty in sound excitation.

The quality of sound is affected by the irregularities of the instrument's internal channel, which are the cause of energy loss. The instrument's mouthpiece also plays a major role. The head of the acoustic laboratory of the Czechoslovak Association of Musical Instruments, Dekan, writes, for example, that if the resonator expands smoothly, the emergence of natural partial tones is suppressed, and if it expands sharply, it helps the emergence of natural partial tones. The quality of sound largely depends on the resonant frequencies of both the instrument as a whole and its parts.

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