Música Hodie | ISSN: 2317-6776 DOI: 10.5216/mh.v24.80288

The Change of Time Expression in 20th Century Music Creation and the System of Music Education

A Expressão da Mudança do Tempo na Criação Musical do Século XX e no Sistema de Educação Musical

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Abstract: The purpose of this publication is to study the processes of comprehension in the world's society of the 20th-century academic tradition's works, where rhythm is the leading factor in the formation, fixation, and development of images, concepts, and plots. The study used practical (Internet monitoring) and theoretical (analysis, comparison, and synthesis) methods. As a result of studying the problem of rhythm in the music of the 20th-century composers, it was revealed that students were interested in this type of composition, where rhythm, being of key importance, appears in inextricable synthesis with intonation based on a centuries-old modal system and a variety of timbre coloring ("Bolero" by M. Ravel). A significant number of students recognize the crucial role of rhythm skills in musical composition. The most important aspects among them are concentration on a specific rhythmic sequence over an extended period (87%); mastery in manipulating the tempos of the composition (96%); constructing a cohesive concept based on prominent themes that symbolize various facets of imagery (83%); and flexibility in working with sound material (98%). The practical significance of the study

is that it reveals the specifics of the modern listener's perception of academic music of the 20th century, where rhythm plays a key role and allows composers to find ways to communicate with the audience. The prospects for research on this problem in the future are determined by the process of the emergence of new works, where the authors will interpret the rhythm uniquely and multimedia will serve as a platform for their dissemination.

Keywords: listeners' perception. music order. rhythm. time concept. virtual audience.

Resumo: O objetivo desta publicação é estudar os processos de compreensão na sociedade mundial das obras da tradição académica do século XX, em que o ritmo é o principal fator na formação, fixação e desenvolvimento de imagens, conceitos e enredos.. O estudo utilizou métodos práticos (monitoramento da Internet) e teóricos (análise, comparação e síntese). Como resultado do estudo do problema do ritmo na música dos compositores do século XX, foi revelado que os alunos estavam interessados nesse tipo de composição, em que o ritmo, sendo de importância fundamental, aparece em síntese inextricável com a entonação baseada em um sistema modal secular e uma variedade de coloração de timbre ("Bolero" de M. Ravel). Um número significativo de alunos reconhece o papel crucial das habilidades rítmicas na composição musical. Os aspectos mais importantes entre eles são a concentração em uma sequência rítmica específica durante um período prolongado (87%); a maestria na manipulação dos tempos da composição (96%); a construção de um conceito coeso com base em temas proeminentes que simbolizam várias facetas do imaginário (83%); e a flexibilidade no trabalho com material sonoro (98%). A importância prática do estudo é que ele revela as especificidades da percepção do ouvinte moderno sobre a música acadêmica do século XX, em que o ritmo desempenha um papel fundamental e permite que os compositores encontrem maneiras

de se comunicar com o público. As perspectivas de pesquisa sobre esse problema no futuro são determinadas pelo processo de surgimento de novas obras, em que os autores interpretarão o ritmo de forma exclusiva e a multimídia servirá como plataforma para sua divulgação.

Palavras-chave: percepção dos ouvintes. ordem musical. ritmo. conceito de tempo. audiência virtual.

Submetido em: 26 de Agosto de 2024
Aceito em: 1 de outubro de 2024
Publicado em: novembro de 2024

1. Introduction

The complexity of time determines that humans are still exploring it infinitely to this day. Whether from a scientific perspective that time is a fundamental form and physical quantity of all material existence or from a philosophical perspective that extends time to the subjective consciousness and spiritual power of humans, time has become a ubiquitous phenomenon in our daily lives. Time, as a way of existence in music art, is not only reflected in physical sounds and musical forms but also produces various functions and meanings in human consciousness and the inner world. Whether it is the explanation of time in reference books such as "The New Grove Dictionary of Music and Musicians", or important discussions on time philosophy by philosophers from early Plato and Augustine to modern Bergson, Schutz, Ingarten, Susan Lange, or Jonathan Kramer. The significant new concept of time proposed by music theorists such as Roy Francoli and their elucidation of "musical temporality". We can conclude that the concept of time in music involves two meanings: firstly, in terms of objective time or physical time, it refers to musical elements with temporal characteristics such as rhythm (beat, speed); Secondly, examining the musical function of time from a subjective or psychological time perspective focuses on providing the viewer with a sense of order and a special experience, feeling, and imagination of time. However, the author believes that in the study of 20th-century music, the concept of time, expression methods, and expressive meanings in music creation is also worthy of attention. This is because the re-understanding of time in music and the updating of expression methods have almost always been present in modern and contemporary music creation since the 20th century. Therefore, based on the research perspective of some representative composers and their music creations, the author will observe and summarize the transformation of time expression in 20th-century music creation from three dimensions: rhythm innovation, time concept, and music order, focusing on the subjective and objective elements of music time.

For a long time, the music concepts and creative thinking of composers during the "common practice"[1] have always adhered to a mode centered around a certain tonality. In the 18th century, the modern harmony system was established and dominated by the organized music of the T-D-S system. The "main tone music" and the "major and minor tone system" have become the basic framework of the music movement, and the tendency of each tone to the main tone creates an expectation in the process of time. From the beginning to the end, a piece of music seems to be a process of moving towards the main melody, and finally, it is solved by termination (belonging-main). It has a high degree of orderliness, orderliness, and directionality. For example, after a long and complex development of sonata (sonata form movement), whether it is the return of the main chord that leads to the emergence of the main key, or the reproduction of the main and auxiliary themes in the main key. Even if it is not achieved overnight, it fully demonstrates that music leads to a stable ending step by step through different time points, showcasing the unfolding process of time in music movement, and also proving the universal existence of linear time in music during the period of common writing. This directionality is also controlled in the layout of the overall structure, as "sonata itself is a form based on partial compensation for the time movement in a single direction - because the mode of the presentation part is not completely repeated at the end, but is rewritten to show that the music is ending" (Rosen, 2014). Then, it is not difficult for us to understand why composers in the period of universal writing should use distant tone sandhi in the development department and conceive dynamic materials in the reproduction department. For this reason, the tense kinetic energy of the reproduction part makes it very similar to that of the presentation part, thus realizing the tonality tendency and stability of this surging music flow at the end of the movement. At the beginning of the formation of sonata form in the classical period, the repetition and regression of the reproduction part made its three parts have certain balance and

1 Also known as "tonal writing period", it mainly refers to the period of music creation between the basic formation of modern harmony system in Europe in the 17th century and the gradual disintegration of tonality in the late 19th century and early 20th century.

symmetry. With the maturity of style, this balance also tries to make it more complicated and break the mechanical and straightforward balance in creation. Composers don't use completely rigid repetition, even to achieve perfect symmetry, they will still consider using symmetry techniques inside the phrase and reflect a "sense of time orientation" (Rosen, 2014).

During the period of Classicism, music creation reached a certain degree of consensus under the guidance of such a linear time order with orderly development. However, in the late period of romanticism, with the massive infiltration of semitones, this musical time order was gradually broken. Composers, such as Wagner, make extensive use of semitone harmony techniques, and the further use of semitone modularity and subordinate chords finally pushed tonality expansion into a new era. The concept of chromatic creation gradually increases the unstable factors, which leads him to lose his sense of order in the process of trying to present the subjective time of music, and contains many irregular contents. The extensive continuous use of chromatic and dissonant chords leads to ambiguity between paragraphs, unprepared and unresolved chord connections, and complex tonal overlays that tend to disrupt the functional harmony system while dissipating the momentum of music's progression, stimulating the continuous movement of music and the expression of an "eternal" temporal mood. Nevertheless, the dominant tonal thinking before the 20th century always injected a strong sense of orientation and linear process into the composer's concept of time, creating a subjective feeling that time flows forward, while the rhythmic elements with objective time attributes only depend on it at this time. On the contrary, composers in the 20th century not only extended the expression of time to rhythmic practice but also broke the long-standing linear order of time in music.[2]

In the period of universal writing, the expression of music time mainly depends on the tonality that causes linear time perception.

2 Regarding to the breakthrough and transformation of time order by composers in the 20th century, this paper will elaborate on the concept of time in the third part.

At this time, the rhythm (beat, speed) as the objective time of music only makes periodic balanced movements in a relatively square and regular form.[3] However, in the 20th century, the field of rhythm has been greatly developed, which is reflected in two aspects: First, the style and structure of rhythm are more abundant and diversified. Secondly, the band's works, not only improve the status of percussion instruments and give them a more important role, but also the rhythm function of other musical instruments is equally important. It can be said that "rhythm has received unprecedented attention for a long time, and the result of its emphasis is that rhythm not only often acts as an explicit factor in expressing music content and style parallel to or even replacing pitch, but also has a deeper impact on the structure and motivation of music in the hidden layer. The degree of its influence is rarely seen in previous music" (Andy, 2009). The change in the concept of rhythm leads to the deviation of the objective time of music from the tradition. Stravinsky got rid of the shackles of bar lines on the beat, especially in the work the "Rite of Spring" creatively used "changing the beat" (LI, 2012b). For example, in the third paragraph of the first part of the Ritual Appreciation (Figure 1), the beat is based on the eight diaeresis rhythm, but each bar appears in different beat patterns, namely 3/4, 6/8, 2/4, 9/8, etc. The eleventh paragraph of the second part, "The Naming and honoring of the chosen one," describes the dance scene of a girl and a young man. On average, the entire song undergoes a beat change every 1 to 2 bars, with all beat styles being 5/8, 9/8, 7/8, 3/8, 4/8, 3/4, 7/4, 6/8, 5/4, 2/4, 6/4, and a total of 49 changes. These beats involve single, compound, symmetric, and asymmetric beats, creating complex rhythmic effects. In addition, Stravinsky prefers to use "metric displacement" technology, that is, the rhythm stress pattern formed by notes does not correspond to the time signature (LI, 2012b). In the music scene one of the dance drama "Soldier's Story" ("Soldier and Violin") (Figure 2), while frequently using a beat-changing pattern, he matches the violin's

3 This view does not deny that there is no irregular rhythm phenomenon in the rhythm field of common writing period. In fact, there have been many irregular rhythms and beats in the music of Mozart, Beethoven, Schumann and Brahms, and there have been rich rhythmic effects caused by the dislocation between the strength of the beat and syntax. But the author's point here is that the common phenomenon of time perception in music during the period of universal writing is undoubtedly dominated by tonal movement.

voice with the actual time sign - the beat-changing pattern. The double bass, on the other hand, keeps repeating the four eight-diaeresis groups, completely deviating from the time mark of the score, thus forming a continuous metric display feature.

Figure 1. Stravinsky's "The Rite of Spring", Part 1, Paragraph 3, "Literary induction", Sections 31-35, Woodwind sound part

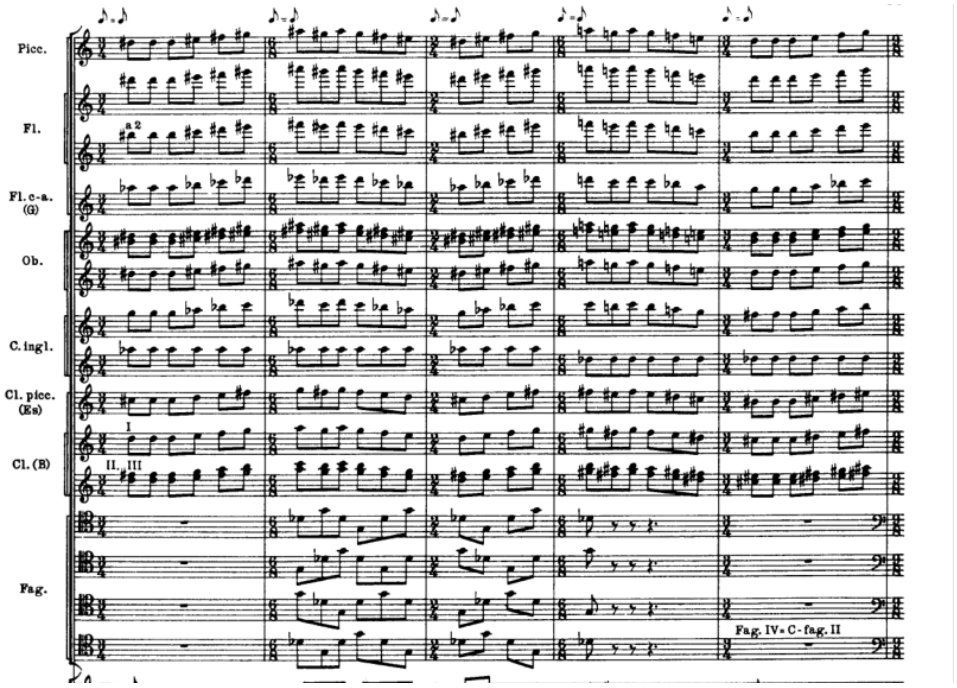
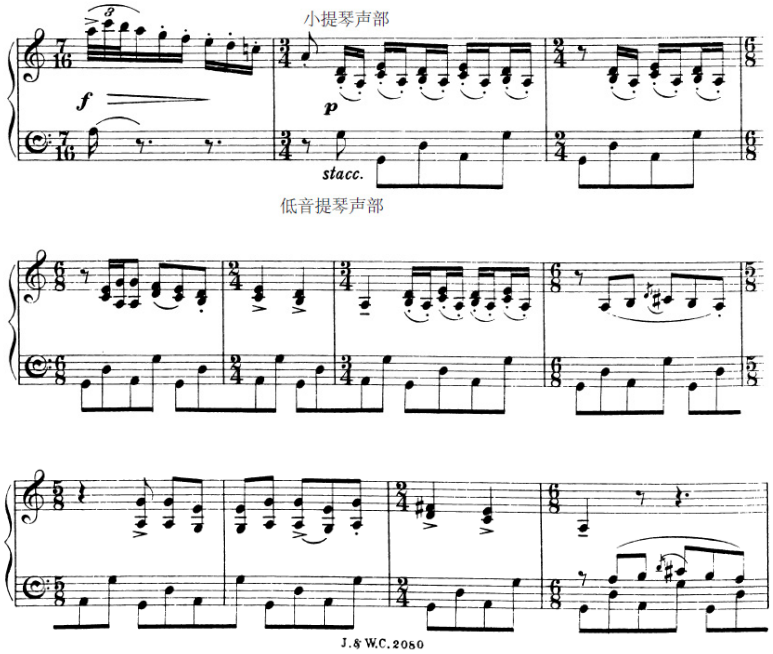


Figure 2. Stravinsky's "Soldier's Story" Music Scene 1 ("Soldier and Violin"), verses 75-85



The innovation of Stravinsky's rhythm technology is closely related to his understanding of the time in music. In his famous aesthetic theory work "Six Lectures on Musical Poetics", Stravinsky drew inspiration from the viewpoint of his philosopher friend Suvkinsky[4] and argued that there is a type of music that proceeds in a parallel process to the logical time, where music is carried by musical elements with temporal characteristics such as rhythm, beat, and speed. The composer makes it smooth and pleasant, creating a sense of beauty for the audience, which is called "dynamic call". On the other hand, the opposite is true for another type of music, which goes beyond the process of logical time. From the perspective of the ontological characteristics of music, this type of music is highly unstable and contrastive, especially suitable for expressing emotional impulses, and is a more flexible psychological time than ontological time. Essentially, the process of music creation is the realization of sound and temporal forms, which inevitably depends on human subjective initiative and creative consciousness. Stravinsky believed that music creation is about organizing time and sound in a specific way and placing them in a specific musical order. Therefore, he used the two important concepts of "order" and "organization" to give time and sound form. This is in line with Stravinsky's highly organized and ordered philosophy of music, which he believes is that music is a "controlled sound and time" organized into a specific order (Yu, 2000). Therefore, although he acknowledged that objective time needs to be combined with subjective time to reflect the speed of music when discussing Suvkinski's chronos of music viewpoint, he denied considering music as a means of expressing emotions. On the contrary, under the control of form self-discipline[5], he advocates that the value and creative purpose of music is to establish a persuasive formal structure, rather than expressing emotions. Composers should not implant feelings into music without restriction, let alone be too free, but should follow the objective law-the music structure that can reflect the power of

4 Pierre Souvtchinsky, 1892-1985, Russian philosopher.

5 In Introduction to Modern Western Music Philosophy, Mr. Yu Runyang regards "form-self-discipline theory" as a musical philosophy system to summarize the musical ideological trend with form as the core. It is characterized by paying more attention to the problem of music form, which is closely related to Autonomie in music aesthetics.

"order". In his view, the process of music creation, it is the composer's control and organization of music materials, rather than breaking this orderly law with subjective feelings. Therefore, Stravinsky used a new rhythm form to express his favour for an objective time in music. Under the influence of this musical concept with form as the core, some composers in the 20th century made innovations in rhythm with a pioneering attitude.

Bartok used "irregular rhythmic grouping" in the first movement of Piano Concerto No.1, which made the actual rhythm stress pattern and beat stress contradict each other. The so-called time signature is just a notation tool or a simple expression of these complex rhythms, thus reflecting the irregularity of music in time order. His works such as Bulgarian Rhythm Ⅰ (the whole song uses 7/8th beat, and it can be seen from the introduction that it is divided into irregular rhythm patterns of 2+2+3) and the Fifth String Quartet (the middle of the three tones is dominated by 10/8th beat, and the structure contains unequal 3+2+2+3 patterns) show "asymmetrical or additive" beats. The so-called asymmetric beat refers to the combination of two or more asymmetric beat units. Take 5/8 beat as an example; it can be divided into 3+2 or 2+3 combinations. The two beat units in these two combinations (one is odd and the other is even) are asymmetrical. At the same time, because of their asymmetry, no matter in which order, 5/8 beats contain a quarter note and a dotted quarter note, thus forming an additional beat in such unequal beats. Composers in the 20th century not only like to use these changing, irregular and asymmetric beat patterns in the horizontal direction, but also make breakthroughs in the vertical direction. In the second movement of Bartok's String Quartet No.2, the violin and viola parts are all played in 6/4 beat, while the double bass and the upper three parts form a "polymeter" in 4/4 beat[6]. The effect is that six quarter notes and four quarter notes are carried out at the same time, resulting in a 6:4 ratio pattern, which can also be simplified to a 3:2 comparisons (three beats and two beats are juxtaposed

6 Polymeter refers to the simultaneous presentation of two or more beats in the longitudinal direction.

vertically), which is called "hemiola". His "Fourth String Quartet" uses the Carnon style counterpoint of four asymmetric rhythmic combinations of four parts in 2/4 beats, allowing people to hear the effect of different rhythmic combinations interweaving vertically. It uses the "polyrhythm" technique[7] to reflect the different steps of microscopic note time combinations in the vertical direction.

Olivier Messiaen began to get rid of the restriction of rhythm. He gradually separated from classical order of rhythm. Inspired by Indian folk music such as "Tala", he carried out rhythm combination in three aspects with asymmetric or non-rhythmic time value combination: first, he used "rhythm with added value", that is, to add a short-term value note, rest or attachment to the original regular rhythm to make it irregular. In the "Mad Dance of the Seven Horn" of the "Doomsday Quartet", he used the technique of adding time value to gradually make the originally uniform beat unstable. Secondly, the same method of adding or reducing time value, i.e. increasing or decreasing value, is used to further deform the rhythm, commonly referred to as "rhythmic augmentation or differentiation". The basis for its appreciation or impairment can be proportional or based on fixed time values, or it can be imprecise. Thirdly, a "non-retrogradable rhythm" was created using symmetrical and palindromic structural thinking. The characteristic of this rhythm is that it is centered around the time value in the middle position, and its rhythm pattern is the same whether viewed clockwise or backwards. In addition, Olivier Messiaen's breakthrough in rhythm can also be seen in such techniques as "rhythmic foot" or "ostinato"[8], "polyrhythm"[9] and "rhythmic canon"[10].

Whether it is the frequent changes in rhythm by composers such as Stravinsky, Hindemith, Bartok, etc. that lead to stress shifting and subverting traditional rhythm relationships or the complexity

7 Francoli argued in his work that the actual performance of polymeter and polyrhythm is very similar, and it is not easy to make an absolute distinction between them. Generally speaking, mixed beats are only seen as the vertical synchronous presentation of different beat combinations, while polyrhythms observe different beat combinations or elements from a broader perspective while also delving into the subdivision or beat points of beats.

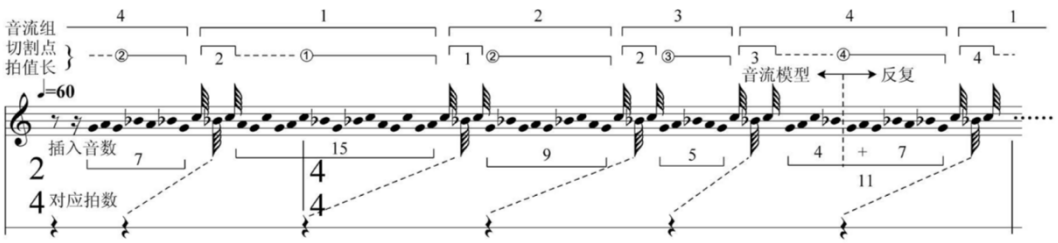
8 This rhythmic technique refers to a rhythmic pattern in which a rhythm or rhythmic sound pattern is constantly repeated, forming a cycle.

9 The polysythm referred to here refers to the vertical stacking of unequal length rhythms or different rhythm patterns.

10 This is a special form of polyrhythm, such as answering questions in a form that adds value to the topic.

of rhythm added by Olivier Messiaen and Debussy's polymeter, these are pure explorations of the objective time of music. Another type of composer, while innovating rhythm techniques, also incorporates psychological time factors, expressing a special temporal effect through rhythm forms. For example, in "Chamber Concerto for 13 instrumentalists" (1969-70), Ligeti used a non-quantitative and high-density rhythm group form, and the rhythm marked by the score could no longer be recognized during actual listening. Only a few perceivable sounds (C, Bb, C) could be inserted to determine the progression of rhythm (Figure 3) (Yang, 2010).

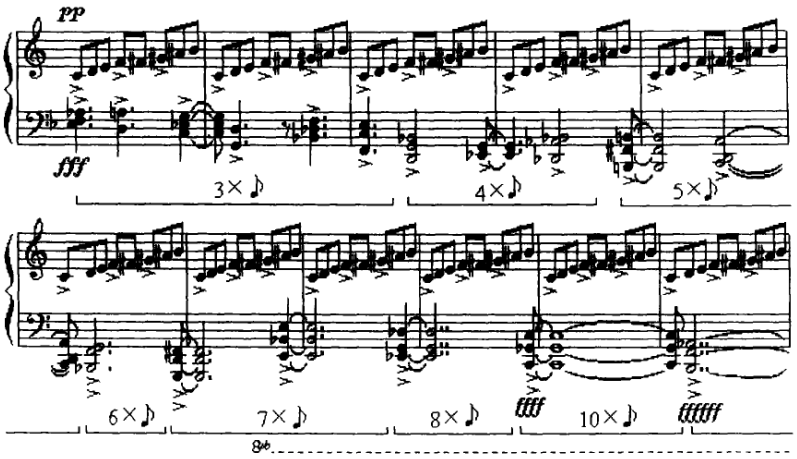
Figure 3. Leggetti's "Chamber Concerto for 13 instrumentalists", sections 23-24 (Yang, 2010)



After the technique of micro polyphonic texture gradually faded out of Lighetti's music creation, rhythm became an important element of his attention. He mainly develops the writing of rhythm from two extremes: one is towards simplicity, which is "mechanical rhythmic movement", and the other is towards complexity, which is "interlaced rhythmic movement" (CHEN, 2007). The former is a kind of rhythmic type with rapid "granular feeling" that is repeated continuously in the horizontal direction and creates a mechanical effect with simple and constant rhythmic materials (such as clavichord work "Continuous Unity"). The latter involves shifting the upper and lower voice parts with the same rhythm pattern back and forth to create a sense of overall interlacing, such as the first piano practice piece "Desordre" (with a brief score example), which does not use a clear time sign, although the two voice parts have the same rhythm. But from the fourth bar, the composer made the bars of the upper and lower parts interlace by reducing an eight diaeresis, thus forming "the same rhythm longitudinal moving staggered rhythmic movement" as a whole achieving the disorder

effect implied by the title (CHEN, 2007). The fourth piece, Fanfares, is near the end (see music Figure 4). Ligeti gradually broadens the lines of the lower voice part through the change of pulse, that is, the increase of the number of eight diaeresis, and forms the illusion of speed contrast with the fixed pattern of the upper voice part, that is, 3+2+3 rhythm type (there is no speed change actually). When listening to this piece of music, we experience an illusion of time, with the time axis centred around the smooth movement of the upper voice as a reference, and the time of the lower voice gradually slows down to reach a "stationary" state.

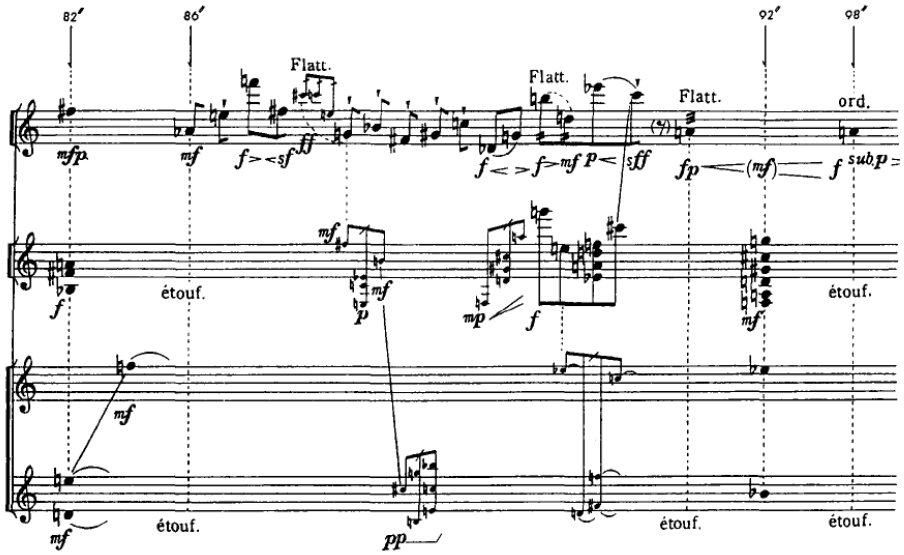
Figure 4. The Fourth Piano Etude of Liggetti, "Fanfares," Sections 187-197 (CHEN, 2007)



The same goes for Eastern composer Takemitsu. In notation, he completely broke free from the constraints of time signs and bars, using a notation method without beats or even bars, and the parameters controlling music performance are often relatively quantitative note durations and clock seconds (sometimes there is no indication of seconds, only a general indication of speed). The rhythm rules in the first movement of Takemitsu's "Sacrifice" (1962) are difficult to distinguish. Composers only use dashed and solid lines to assist in determining the length of a note, where a vertical dashed line represents the synchronicity relationship between the upper and lower notes, and arrows are used to indicate the number of seconds played between vertical pronunciation points

or segments, while an oblique solid line represents the relationship between the notes in sequence (Figure 5). Of course, these indicators can only generate relative rhythmic constraints, and the composer's original intention is to make the rhythm organization more free and broad. Takemitsu often uses not only non-even ratios but also non-integer ratios and even irrational ratio relationships when arranging mathematical proportions for rhythm subdivisions. Therefore, compared to the traditional "forward" music writing method, Takemitsu's techniques are flexible and rich. He "gives music a very broad sense of time stretching between the moving and stationary poles" (Xu, 2007). The purpose of doing this is to "reflect the subtle, ambiguous and gentle characteristics of the time flow that is either sick or slow" (Xu, 2007).

Figure 5. Takemitsu's "Sacrifice" First Movement Fragment



1.1 The renewal of expression, meaning and order under the new time concept of music in the 20th century

With the emergence of some new concepts of time by composers in the 20th century, the expression and significance of time in music have gained more widespread attention. In contrast to the linear expansion process rooted in tonality prevalent in prior eras of composition, the 20th century witnessed a departure from these conventions. Fueled by the breakdown of tonal structures,

composers embarked on a transformative journey, expanding their repertoire of techniques encompassing musical structure, materials, and rhythm. This innovative endeavor aimed to convey the non-linear temporal dimensions and significance inherent in music, ultimately leading to a profound reevaluation and modernization of temporal expression in the realm of musical composition.

As an important issue in music creation and theory, the temporality of music was once questioned and stagnated in the 20th century, until an article entitled "How Time Passes" published by German composer Karlheinz Stockhausen in 1957 made outstanding contributions to solving the mystery of chronos of music (Stockhausen, 1959). More importantly, in his article, he first proposed the viewpoint of discontinuous music structure, believing that music is no longer seen as a logical and sequential event, but rather as a unified entity composed of events with instantaneity and independence. Specifically, he attempted to reduce all pitch and duration dimensions of music to a unified time range. In this range, the vibrations of pitch constitute "micro time" or rhythmic vibrations - this is relative to the slower rhythmic pulse known as "macro time". The entire music structure can be considered as a hierarchical structure, where rhythm is a manifestation of a higher-level duration "formant", meaning that rhythm comes from a specific and complex division, just like the complex subdivision of timbre derived from a higher-level pitch. And these higher-level durations combine to form higher-level durations or phases, and form phase groups based on the group spectra of each group. Therefore, in Karlheinz Stockhausen's view, a work is a single basic time spectrum. Even though the issue of a single instrument called a 'timbre' has always existed, his view is that the entire structure of the work can be conceived as a 'timbre'. Karlheinz Stockhausen called his theory "the unity of musical time" (Morgan, 1991).

For the independent, segmented, and microscopic music events within the time entity, please refer to his paper "Moment Form" for details. The so-called Moment Form refers to music consisting of a series of "instantaneous" events that can be interconnected through

motivation, rhythm, and other means, but not in a transitional mode like traditional music creation thinking. Consistent with the above viewpoint, this Moment Form - more abstractly, a representation of instantaneous time - is discontinuous or non-linear. One moment cannot imply the next moment, as they are self-contained, independent, and static, and cannot be represented by the linear implementation of suggestion, which constitutes a tendency movement to the next moment like traditional tonal music. This Moment Form, represented by discontinuities, often conveys an eternal sense of time. Because the audience does not have to be hindered by the logical connections before and after the music event, the non-total flow of time makes it easier for our perception to be infinitely static in a certain independent moment. As he said, "Pay attention to the present moment, each current moment can be vertically cut, and to some extent, the perception across horizontal time extends to what I call eternal timelessness. This is not an eternity at the beginning of the time node, but an eternity presented in every moment" (Jiang, 2013). Karlheinz Stockhausen's "Moment Form" can be found in his Kontakte, Momente, Stimmung and other works. The Bb sound of 'Timbre' always brings a sense of stillness due to its unchanging nature, while the sense of motion is created by various musical events such as timbres and rhythms caused by different performance modes. Therefore, it is difficult for us to predict the next event after hearing it, and there is no correlation between them. Karlheinz Stockhausen tried to erase the expectation of development, climax and solution established in the traditional structure and was concerned about the "present" and "non-linear" principle of "disordered time" of music.

However, the question of the modern student's perception of rhythm as one of the leading aspects of the formation of the compositional structure as a whole remains open. This fact led the authors of the proposed publication to cover it.

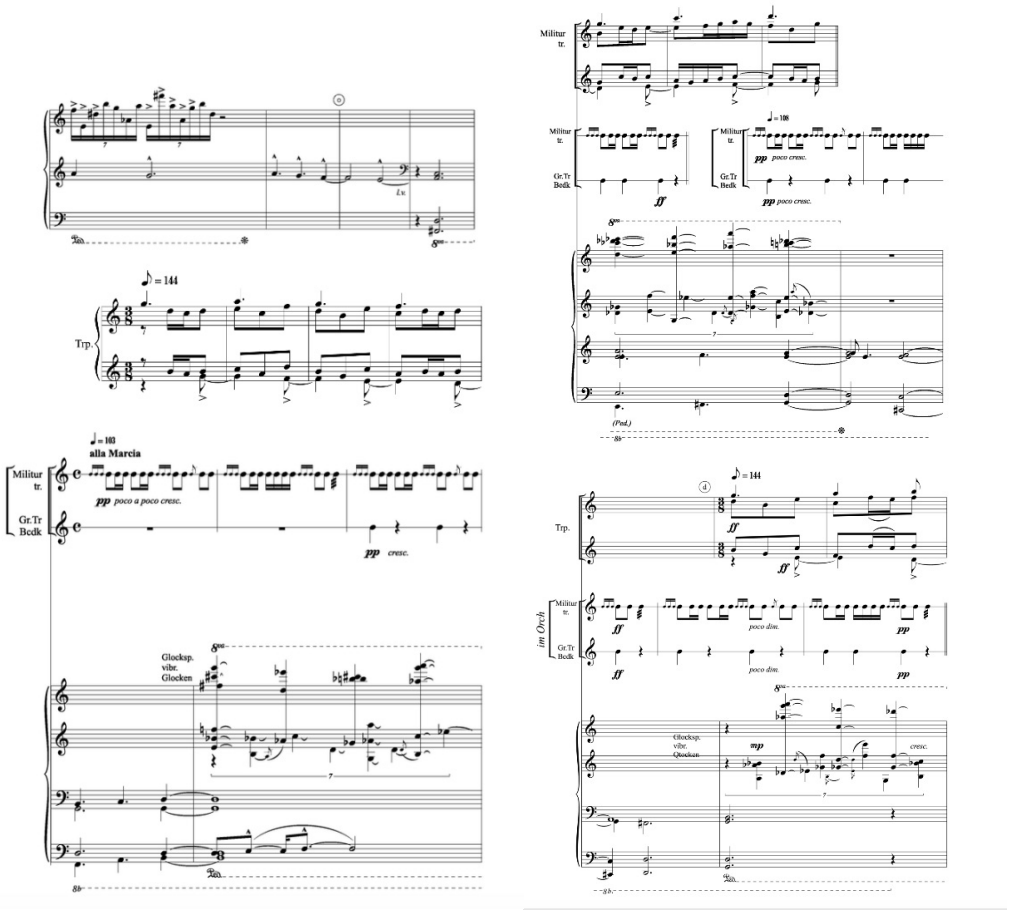
1.2 Literature review

The collage creation technique also extends the movement in music in another way in terms of order. It combines independent

music fragments by "quoting" classic works from the past, allowing modern and past music languages to appear simultaneously in a work, creating a sense of interweaving between different genres, styles, and eras. Collage thinking was favoured by some composers after the 1950s and expressed a new sense of time and space. Just as it draws inspiration from the art of painting by pasting different materials together to achieve the effect of spatial displacement, collage music also changes the traditional sequential and linear temporal order, overlapping different temporal dimensions. The German composer B.A. Zimmermann truly established and widely applied college technology. Based on his theory of "rotated time" (Kugelgestalt der Zeit), Zimmerman views time as three stages: "past", "present", and "future". Unlike the linear and irreversible development of time, he believed that time operates like a sphere in a circular manner, organically unifying the three stages, which can occur simultaneously or disrupt order, overlapping with each other. He often collages pieces of music from different historical periods and styles, such as Gregory chants, Bach chorale, jazz, etc., in his works. The audience will shuttle at different times and spaces due to sudden display. His opera "Die Soldaten" (1957-65) is the best example of this time theory. The second act of the "Interlude" combines the chanting fragments from Bach's "The Passion of Matthew" (Figure 6, a line sheet with a beat of 3/8) with Zimmerman's music material, which is the storyline of different characters in the play, to achieve what he calls a "rotating time" effect. Zimmerman's philosophy of time was influenced by Augustine's viewpoint[11], placing the issue of time within human subjectivity, that is, "the extension of thought" is the essence of time. Therefore, "the past", "the present", and "the future" are connected and unified in the internal and infinite flow of consciousness. In this opera, the creative practice guided by the theory of "rotated time" not only refers to the past and various musical cultures - some even have distant relationships - but also reflects the diversified time experience of "no time present" (Li, 2012a).

11 From Augustine's thoughts, we can understand that his measurement of the past, present, and future is not based on a metric system, but rather an internal measure. He believes that only the present is real, the past is just a memory of the present, and the future is the expectation of the present. The past, present, and future are actually the same thing, all based on the current 'me' as a reference.

Figure 6. Fragment from Zimmerman's "Die Soldaten"



American composer Elliot Carter not only devoted himself to the innovation of objective time rhythm technology but also placed it in the category of psychological time to seek the dual expression of music movement. He expressed his concept of music movement in a speech, believing that time can map the process of music like a canvas, so he named it "time screen". Just like clock time can measure objective time in real life, a time screen reflects the time impression in music, mapping out music and all its time attributes. Movement in music is a virtual time in which all the pathways of statement, memory, and shift of attention focus are projected onto the listener's so-called "psychological time" time screen by a certain impression established by music. Therefore, the true time screen is the listener's psychological time. Therefore, music acts on people's psychological time through relevant temporal attributes, enabling them to gain a brand-new time experience (Carter, 1997). The technical technique that reflects this concept is to pre-design a

systematic rhythm strategy in each piece (as shown in Figure 7 for the time screen of "The Second String Quartet"). He regards rhythm as a pitch melody that constantly develops and moves forward, with each rhythm pattern closely related before and after, forming a continuous "music flow".

Figure 7. Time screen of Carter's "Second String Quartet" (Yu, 2007)

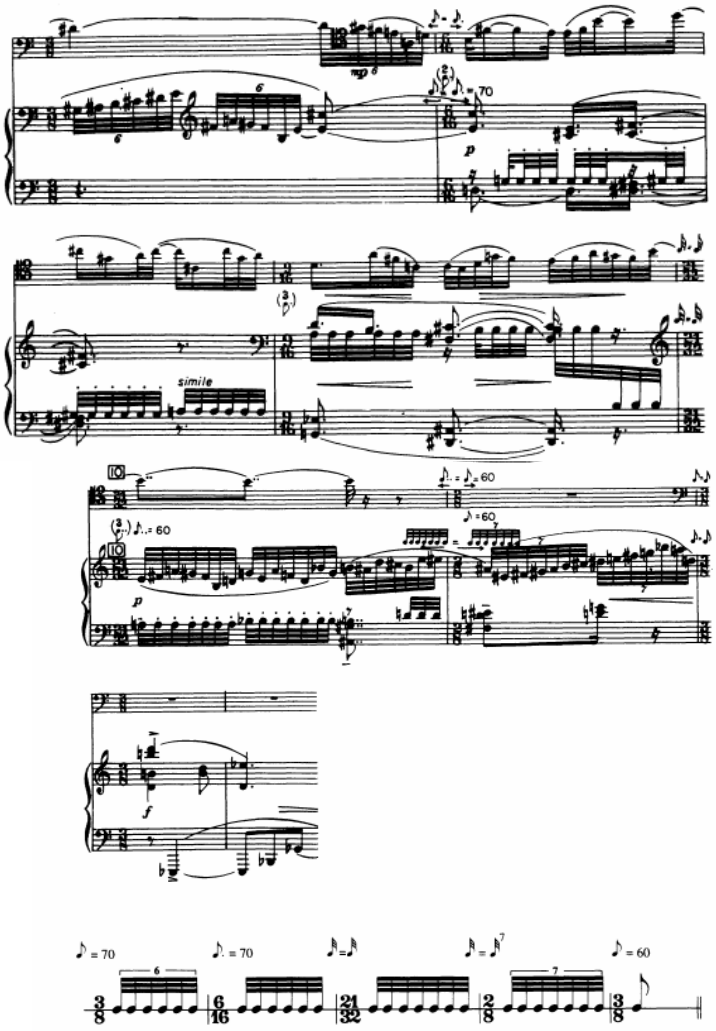
第二小提琴脉动	速度	比率（脉动与速度）
♩.=70	♩=105	2:3
𝅗𝅥=70	♩=140	1:2
=70	♩=112	5:8
𝅗𝅥=70	=112 ♪.=186	5:8 3:8
♩. .=70	♪.=163.3	3:7
=70	♩=93.3	3:4
=70	♩=175	2:5
=70	♩=84	5:6
=70	♩.=60	7:6

The realization of the time screen depends on Carter's frequent conversion of speed to obtain a new rhythmic structure with mathematical logic. People often call his method of dealing with rhythm - more precisely, speed "metric modulation" or "beat conversion". Carter gradually changes the rate of music's rhythm to control the changes in its speed, which is a method of transitioning from one absolute speed to another through a series of intermediate steps. The intermediate step (or "intermediate pitch") is not only a certain pitch in the old speed and beat, but also a certain pitch in the new speed and beat. It is similar to the

intermediate chord in tonal music, which plays a certain connecting role in two different speed modes.

For example, the third movement of his Cello sonata (Figure 8) has changed from 3/8 beats of the sixth bar to 6/16 beats, but they all take thirty-two diaeresis as the subdivision of time, and the eight diaeresis of the former are equal to the eight diaeresis of the latter. The beat reduction spectrum reflects the entire process of velocity conversion in these 8 sections, namely the time process of velocity from MM=70 to MM=60. From this, it can be calculated that the ratio between new and old speeds is 6:7, which slows down the speed by about 1.16 times. The rhythmic pattern from the sixth to the ninth bars is composed of six thirty-two diaeresis until the tenth bar is transformed into seven thirty-two diaeresis. As a result, the ratio of the number of intermediate notes in the old beat unit (6) to the number of intermediate notes in the new beat unit (7) is also 6:7, completing an equal conversion in rate. Through this equivalent transformation, two completely different rhythm (beat) modes are naturally sequentially processed. For performers, this regular and highly ordered logical rule enables them to accurately navigate such frequent and complex speed transitions, but the performance effect is disorderly. For the listener, the limited objective mathematical logic will be transformed into an endless stream of subjective psychological experience and association through time screen extension. Its significance lies in that movement in music is a unique time illusion, which makes people from various impressions such as drifting, staying or extending, flashing, reviewing, and overlapping (JI, 2013). Therefore, Carter always seeks the combination of tradition and pioneer and seeks a unique time order between order and disorder, objectivity and subjectivity.

Figure 8. Score and Beat Reduction in Sections 6-13 of the Third Movement of Carter's *Cello Sonata* (BERNARD, 1988)



Anthony Seeger examines the music of the 20th century, including genres where rhythm plays a fundamental role (rap), from the point of view of its social and political concepts. The scientist highlights individual examples of musical creativity, in particular songs, as a means of uniting the masses in the struggle for justice and general well-being (Seeger, 2018). Snježana Dobrota and Marija Sarajčev in their study, concluded that the current generation of children studying music is interested in works of various eras and styles, including the art of the 20th century. This fact indicates a positive trend in the formation of tastes, erudition and knowledge systems in future professional musicians (Dobrota, Sarajcev, 2021).

Alvim (2023) raises the issue of the synthesis of different spheres of art: cinema and music. In this case, preference is given to highlighting examples of how directors turn to works of avant-garde direction. It also focuses on rhythm as the foundation of composition (Alvim, 2023). Mornell *et al.* (2023) study how rhythm influences physiology, behavioral responses, human perception of the world around us, and the art (in particular, music) that is formed in this context. Using the principles of interdisciplinary synthesis, scientists were able to identify the specifics of acceptance, reflection and synchronization of rhythm in the context of various types of creativity (Mornell *et al.*, 2023). Sebastiani *et al.* (2022) highlight the relationship and conditionality of rhythm associated with the work of the performer's (pianist's) heart in the process of interpretation and the nature of musical works. Music that requires a high level of skill in playing the piano (virtuoso technique and maintaining rapid tempos when expressing thoughts) causes, according to their findings, energetic, rapid rhythms of contraction of the heart muscle. Compositions of meditative, unhurried plans, on the contrary, contribute to saving and maintaining a smooth, average-speed rhythm in the work of the heart (Sebastiani *et al.*, 2022). These results also help to identify the specifics of the audience's perception of various works and the characteristics of the listener's heart rhythms responding to their content. The authors of this study note the profound scientific and practical value of the concepts shared by the researchers in the works listed above. At the same time, there is a need to study the problem of rhythm perception by the modern listener, as one of the leading formative factors of musical composition.

1.3 Problem statement

The relevance of this study is due to the need to highlight the problem of perception by a modern listener of academic musical works of the 20th century, where rhythm performs a leading function in terms of form formation and developing ideas and plot. Composers of the last century have demonstrated the great potential of rhythm as a means of musical expression and

its importance as a structural foundation. In their work, it became a symbol of the modernized organization of instrumental texture and time.

Due to such a transformation of the qualities of rhythm and its functional purpose in academic music of the 20th century, there is a need to study the processes of its perception by students. The purpose of this work is to highlight the problem of their comprehension of a composition where rhythm (and its various modifications) plays a key role.

By the intended goal, the authors of the study set themselves the following tasks:

- Identify the works of composers of the 20th century when rhythm plays a leading role as a means of expression; structural core; and means of illustrating phenomena and plots;

- monitor the comprehension of such works by the future professional piano players and conductors during 2023 - 2024;

- Carry out an analysis of the compositions' rhythm aspects and their significance;

- Draw conclusions about the students' attitude in questions connected with rhythm.

2. Methods and materials

2.1 Research design

In the process of research, various sources were used on the problem of rhythm as a factor in the modernized organization of time and the formation of the structure of works in the academic tradition in the 20th century. Such sources include existing scientific concepts as well as materials provided by the artistic practice of the present period (performance of compositions of the noted type). Practical (Internet monitoring and online survey) and theoretical (analysis, comparison, and synthesis) methods were chosen as research ones. A survey was conducted among students

studying the fundamentals of piano performance and orchestral conducting regarding their perception of rhythm as a category of musical language.

2.2 Sample

The foundation of the present study was constituted by a group of students from various countries enrolled in higher music education institutions. Through online surveys, they provided information on the role and significance of rhythm in music, as well as the nature of its perception by contemporary students. The total number of participants in the project was 100 individuals.

2.3 Survey

The significance of rhythm was assessed through an online survey of students. They were presented with a list of questions concerning the expressive, form-structuring, semantic, and illustrative roles of rhythm in academic compositions. Responses were evaluated using a 10-point scale. According to this scale, rating the role of rhythm as a secondary component of professional music was equivalent to 1-2 points. Perceiving its significance as not fundamentally essential corresponded to 3-4 points. A neutral attitude towards rhythm as a factor influencing the success of composition and performance activities yielded scores of 5-6 points. Viewing rhythm as one of the key categories in the creation and interpretation of musical works aligned with scores of 7-8 points. Finally, recognizing rhythm as one of the leading components of composition resulted in scores of 9-10 points.

2.4 Statistical processing

Statistical analysis of the data was performed using the proportion method to determine the percentage indicators of the significance of rhythm in academic music. Excel spreadsheet resources were utilized for this purpose. The calculations were

based on student responses in which rhythm was perceived as one of the key components of a musical composition (scores of 9-10).

2.5 Research limitations

The limitations of the study are due to the fact that the survey involved only 100 participants from two countries and the temporal constraints of the project preparation period, which was defined as 2023-2024.

2.6 Ethical issues

The ethical aspect of the study is that the students participated under conditions of anonymity. Additionally, no conflicts of interest were observed.

3. Results

During the research on the perception of principles of musical form formation by contemporary listeners, where rhythm plays one of the leading roles, it was established that rhythm organizes the development of artistic ideas and compositional structures over time and accumulates sources of energy for interaction with the audience. Its nature is capable of capturing a person's attention and reflecting specific characters, moods, narratives, and the sequence of their unfolding. Rhythm, as a component of musical composition, has always played a crucial role in shaping and developing musical themes. However, the styles and characteristics typical of the musical language of various epochs and national cultures have influenced its distinct features and variations. The Viennese Classical School introduced a type of rhythm characterized by orderliness, stability, clear periodicity, and progression from the perspective of dynamics (such as tempo and note duration). The legacy of Romantic composers revealed the effect of flexibility and improvisational qualities in rhythm. Representatives of Impressionism, Expressionism, and other

stylistic movements of the 20th century considered rhythm as an element of thematic expression and imagery.

Table 1 illustrates the interests of composers who became classics of the 20th century. They sought to depict phenomena typical of their contemporary environment, including the emergence of railway communication between cities (A. Honegger's "Pacific 231"; V. Ellis's "Coronation Scot"), as well as the transformation in the perception of ancient dances by modern consciousness (G. Ligeti's "Hungarian rock," "Passacaglia Ungherese"). This table also demonstrates the significance of rhythm as an element that creates imagery, mood, dynamics, and structure in compositions, from the perspective of future instrumental performers and orchestral conductors.

Table 1. Rhythm as a Formative Factor and Its Significance in the Context of Composition

Title of the Musical Composition	Areas of Special Role and Significance of Rhythm in the Context of Musical Composition	Indicator of Students' Perception of the Importance of Rhythm
Honegger - Pacific 231 (created in 1923)	Distinct Timbre Layer of Orchestral Texture, Dynamics, Form Formation	82%
V. Ellis Coronation Scot (created in 1938)	Sound Imagery Based on Specific Technical Playing Techniques (Brass Instruments), Enrichment of Orchestral Texture with Elements Imitating Train Signals and Motion	86%
S. Reich «Clapping Music» (1972)	Enrichment of the Stylistic and Timbre Palette of Sound through the Use of Elements from Specific Music and Non-Musical Sounds	90%
György Ligeti - Hungarian Rock (created in 1978)	Encoding the Code of Hungarian National Musical Culture	70%
György Ligeti - Passacaglia Ungherese (created in 1978)	Transformation of the Traditions of Ancient Dance Genres	81%

Thus, rhythm, within the context of musical composition, serves as a crucial component for capturing its various aspects. These aspects include style, genre, structure of the work, as well as orchestral texture and dynamics. The indicators of students' attitudes towards the significance of rhythm in their interpretation and development suggest that future professional musicians perceive these musical examples in a comprehensive and multifaceted manner, and will be able to showcase the uniqueness of their content during interpretation. Specifically, they consider important aspects of transmitting musical works such as preserving the genre basis (81%), national tradition (70%), highlighting the uniqueness of music through timbre, including non-musical but clearly organized sequences of durations (90%), conveying timbral originality through sound-imagery techniques (86%), and forming compositional structure (82%).

Table 2 presents examples of various interpretations of one of the most prominent compositions of early 20th-century academic music, where rhythm served as the architectural blueprint for the entire work. This is "Boléro" by M. Ravel, composed in 1928. Students focus their attention on different aspects of its interpretation in the 21st century.

Table 2. Ravel's "Boléro" and Its Interpretations across Different Periods

Title of the Musical Composition, Source Link	Performance Techniques and Style of Presenting the Musical Text	Degree of Popularity of "Boléro" Performance Methods Among 21st-Century Students
Ravel - Bolero. Sergiu Celibidache 1971; https://youtu.be/gy5Ve3338-E?si=DKkkAkjc2Dz_N4dz	Strictness, Discipline, and Vivid Expression of Emotions in the Climax	71%
André Rieu - Boléro (Ravel); https://youtu.be/LwLABSm0yYc?si=u0UYb29CwRxMFLlt	Preservation of Academic Performance Traditions and Elements of Showmanship	91%

BOLÉRO, Ravel - FLASHMOB (São Paulo, Brazil); https://youtu.be/fTd3ZsvqDiQ?si=7ef-Shiw-FnvA5Qw	Mastery in Maintaining the Rhythmic Ostinato Line During Improvised Formation of the Instrumental Ensemble	83%
Wiener Philharmoniker - Maurice Ravel - Bolero - Regente Gustavo Dudamel (HD); https://youtu.be/E9PiL5icwic?si=Hiavl0XdLqbszWIp	Traditions of Classical Performance Culture and Their Preservation	89%

As indicated by the data in Table 2, 21st-century students are focused on exploring various interpretations of a work that has become a classic of the 20th century, achieving significant popularity and dissemination, partly due to multimedia. All these interpretations emphasize the precise, clear, and thorough reproduction of rhythm as the foundation of Ravel's "Boléro."

Table 3 presents indicators of the importance of students' development of a thorough sense of rhythm, which facilitates a comprehensive understanding of musical form and the transmission of the composer's intentions in the most complete manner.

Table 3. Factors Contributing to the Understanding of Rhythm as a Key Component of Musical Composition

Factor Name Supported by the Development of the Necessary Skill	Significance of the Factor for Developing Performance Skills for Students
Concentration on a Specific Rhythmic Sequence Over an Extended Period (M. Ravel "Boléro", V. Ellis "Coronation Scot")	87%
Mastery in Manipulating Tempos of the Composition (A. Honegger "Pacific 231")	96%
Constructing a Cohesive Concept Based on Prominent Themes Symbolizing Various Facets of Imagery (G. Ligeti "Hungarian Rock")	83%
Flexibility in Working with Sound Material (S. Reich "Music for 18 Musicians")	98%

As indicated by the data presented in Table 3, the majority of students recognize the crucial role of rhythm skills in musical composition. Understanding, feeling, and thorough mastery of rhythm contribute to the creation of high-level professional interpretations.

Thus, contemporary students' interest in music compositions where rhythm plays a leading role becomes evident. This trend has also found its continuation and vivid reflection in jazz, popular culture, and genres like "rock." However, the uniqueness and value of 20th-century classical music lie in the fact that it, on one hand, provided rhythm as a means of expression with significance as a formative aspect and, on the other hand, transformed its diversity within the context of classical instrumentation and grand conceptualizations.

4. Discussion

Dominici *et al.* (2022) examine rhythms inherent in human activities and natural phenomena as a complex phenomenon characterized by periodicity, regularities, and repetitions in time and space. According to the specialist, they constitute a combination of structural elements in harmonious and balanced interaction with each other. Thus, the rhythms conveyed by composers in their musical compositions serve as a projection of a multifaceted and complex reality. As a temporal art form, music contributes to capturing their specificity and functioning principles in the context of individual life and society as a whole (Dominici *et al.*, 2022). This idea is substantiated by the composition "Music for 18 Musicians" by S. Reich.

Valente (2020) explores the process of transforming classical music masterpieces (using Maurice Ravel's "Bolero" as an example) within the realm of an attractive sound landscape for tourists. The specialist analyzes the strategies of contemporary cultural management that cater to societal demands, including aspects

of music such as its temporal organization and the rhythmic architecture of the acoustic space (Valente, 2020). Bhogal (2020) raises the question of achieving expressiveness and vivid embodiment of concepts in music where rhythm plays a leading role (as in Maurice Ravel's "Bolero"). This is accomplished through the manipulation of a broad spectrum of timbres, resulting in variations of instrumental colours that impart uniqueness to the composition (Bhogal, 2020). As the results of this study indicate, Ravel's noted work continues to receive new interpretations and enjoys widespread popularity among listeners, owing to the composer's unique approach to the significance of rhythm and its function within the context of the symphonic score.

Vézina (2022) focuses on the formation of the stylistic and genre sphere within the global music culture, particularly in the context of jazz. It is within the realm of jazz that 20th-century academic music discovered an inexhaustible source of rhythmic diversity and its constructive role in organizing compositional structures, ranging from miniatures to large-scale cycles. Specifically, the specialist highlights the significance of creoles (descendants of French settlers in African countries) in the history of the emergence and popularization of jazz during the period from 1890 to 1917 (Vézina, 2022). Tsap (2022) observes the birth of popular music as a major direction in 20th-century global culture, rooted in jazz and its rhythmic variations. The author notes that outstanding figures in jazz were educated in the traditions of academic musical education. However, the uniqueness of jazz as an artistic phenomenon, including aspects such as improvisation, not only contributed to its expansion beyond established classical forms but also laid the foundation for an entire industry that gained popularity among the masses (Tsap, 2022). Zhurba, Y., Zhurba, V. (2022) dedicate their research to the unique structure of the 12-bar blues. This structure remains open to creative experimentation, innovation, and the realization of individual performance projects. Rhythm, playing a pivotal role in this context, binds the form together, contributing to its integrity while simultaneously fostering internal development

and a sense of dynamics (Zhurba, Zhurba, 2022). The flexibility of musical presentation and the ability to perceive the cohesive panoramic view of the composition's rhythms, characteristics that distinguish jazz performers, are qualities of interpretation that, according to students of the 21st century, constitute the highest level of mastery.

Oliferko-Storck(2023) raises the question of the significance of rhythms in academic compositional creativity, particularly concerning the reflection of ethnic identity through national dances. By analyzing the compositions of authors such as Julian Fontana, Ferenc Liszt, and Louis Moreau Gottschalk, the specialist concludes on the importance of intercultural interactions, understanding, and the exchange of indigenous artistic traditions from various countries, embedded within the system of melodic patterns and textures of the works as a whole (Oliferko-Storck, 2023). This concept resonates with the observations made by the authors of the study on György Ligeti's work Hungarian Rock. In this piece, rhythm, as an element of the Hungarian cultural code, imparts a unique quality to the composition and serves as a bridge between folk traditions and the complex resources of 20th-century professional music.

Mcewing (2008) conducts an in-depth study of the interaction between the rhythms of ancient dances, particularly chaconnes, and academic compositional music over several centuries (17th-20th century). The specialist observes that during the 17th and 18th centuries, music and dance held equal significance in the arts. This understanding helps shed light on how composers from a later period (20th century) interpreted rhythms as a leading component in the development of the ideas and structures of their works (Mcewing, 2008). An example supporting this idea is György Ligeti's Passacaglia Ungherese. This work facilitates the listener's understanding of the profound connections between styles, epochs, and different generations of people.

LEE (2023) shares observations that melodies and rhythms in academic compositional music inspire choreographers to create

the dance framework for modern productions. Consequently, music becomes the foundation for movements that receive artistic expression. This represents a mirrored version of the concepts in which rhythm precisely shaped musical composition (LEE, 2023). Maurice Ravel's Boléro exemplifies the aforementioned idea. Its music served as the basis for the staging of a ballet of the same name.

Yin *et al.* (2023) introduce the public to one of the latest engineering models – JustLMD. It represents a modernized dataset (in a three-dimensional format) of dance movements synchronized with music and lyrics. This entails the combination of music, dance, and lyrics of a specific song. Such an invention reflects the 20th-century composers' ideas regarding the significance of rhythms in the realization of musical composition. Additionally, it encompasses a significant genre of songwriting (Yin *et al.*, 2023). All the aforementioned works have contributed to the exploration of the issue of rhythm, concepts, and order in the context of 20th-century academic musical composition. However, each of them is dedicated to revealing a specific aspect of the examined phenomenon. In this article, the authors attempt to present it as a unified system using examples from 20th-century classical music compositions that have gained worldwide popularity.

5. Conclusions

During the period of commonality writing, composers mainly expressed subjective (psychological) time in music through "tonal resolution", which contained an orderly, directional, and continuously advancing linear time. In contrast, the exploration of time in music (by 20th-century composers) was diverse, manifested in innovative rhythms, updated ways of expression and meaning under new time concepts, and breaking the single linear order. Firstly, composers began to pay attention to and develop the objective (physical) time in music, attempting to break through and expand the temporal elements of rhythm in music form, elevating rhythm to an equally important position as pitch organization and

other elements. Rhythm has not only become the core of music structure, but more importantly, it transcends the more stable and periodic rules of traditional rhythm. Unstable factors, frequent changes, mathematical logic, and other thoughts have brought rhythm writing technology into a new era. Secondly, 20th-century composers developed some unique concepts of time and used creative techniques such as Moment Form, collage techniques, and metric modulation to express a specific sense of time and artistic conception. Thirdly, the update of the concept and expression of chronos of music has led to the disruption of the traditional linear time order. Composers explore the non-single linear time order in order and disorder through the discontinuity of musical form structure, the uncertainty of music progress, the quotation and collage of materials, the fusion of pluralism, the rhythm speed conversion of mathematical logic, and other ways, as well as Desordre, overlapping, eternity, no time and other effects. At the same time, it should be noted that whether it is the innovation of rhythm technology by Stravinsky and other groups, or the expansion of Karlheinz Stockhausen and Zimmerman in music structure and materials with special time concepts, or Carter's dual foray into the new time concept and rhythm innovation. The concept, way, meaning, and order of "time" in music creation in the 20th century gradually show a new attitude of diversification and personalization.

At the same time, studies of the nature of music perception by a modern student indicate that the most attractive are those examples of academic composition in which rhythm, being of paramount importance, is combined with a felt modal concept (M. Ravel's "Bolero") and timbre color (D. Ligeti "Hungarian Rock"), and also serves as an illustration of a certain phenomenon (A. Honegger "Pacific 231"). The majority of students recognize the significant role of rhythm in the study of musical composition. Among these, the most crucial aspects include concentration on a specific rhythmic sequence over an extended period (87%); mastery of tempo variation in the performance of the composition (96%); development of a coherent concept based on prominent themes

that symbolize distinct facets of the imagery (83%); and flexibility in the approach to working with sonic material (98%).

The practical significance of the study lies in highlighting the fact that society is in demand for works created by composers of the 20th century, where the leading role belongs to rhythm, acting in unity with the intonation material and the system of instrumental colors (timbres). The prospects for studying this problem in the future are determined by the unlimited possibilities of information and communication technologies, which serve as the basis for the dissemination of archival and modern versions of music performance, the foundation of which is rhythm in its various manifestations, as well as the process of creating new works where the rhythm acquires a unique author's interpretation.

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Yelin Zhang – Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources; *Ning Sun* – Data Curation, Writing – Original Draft Preparation, Writing – Review & Editing, Visualization, Supervision, Project Administration, Funding Acquisition. All authors read and approved the final manuscript.

Publisher

Federal University of Goiás. School of Music and Performing Arts. Graduate Program in Music. Publication in the Portal of Periodicals UFG.

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