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GEOMETRIC ELEMENTS IN THE MUSICOGRAM FOR LISTENING TO *RADETSKY MARCH*

Abstract: This paper highlights the possibilities of applying geometric elements in a musicogram as an effective technique for music listening activities with primary school students. The aim of the study is to identify and explain the relationship between the geometric shapes used in a musicogram and the corresponding musical elements or musical phrases in *Radetzky March*. The study addresses two interrelated research questions: (1) Which musical characteristics can be represented by geometric elements? and (2) Which geometric elements are most suitable for the graphical representation of music? The paper presents a musicogram designed for listening to *Radetzky March*, a composition included in the current Music Education Curriculum for the fourth grade of primary education. Based on the analysis of the musical composition and the designed graphical representation, i.e., musicogram, it can be concluded that the successful application of appropriate geometric shapes in a musicogram primarily depends on the careful selection of the musical composition, the identification of individual musical phrases, and the recognition of their key characteristics. The pedagogical implications of this paper relate to the use of musicograms in classroom practice to promote active music listening and to foster the development of perceptual abilities among primary school students.

Keywords: musicogram, elements of geometry, music listening, Music education.

INTRODUCTION

The development of music listening skills represents an essential component of students' musical growth within the music education. In primary education, performing, listening to, and creating music are co-integrated with listening; with listening being the foundation that connects all musical activities (Anderson 2012; Kerchner 2009; Mark, Gary 2007; Reimer 2003). Loane (1984/2008) argues that the traditional division of music instruction into separate domains is not entirely appropriate, suggesting that both music performance and music creation constitute specific forms of listening. Similarly, Reimer (2003: 257) emphasizes that listening should be regarded as a creative activity and the central component of music

education, considering that “people interact with music most frequently as listeners rather than as performers.”

Listening, as a specific cognitive and emotional experience (Hargreaves et al. 2003), is closely associated with broader aspects of children’s development. Previous research has shown that listening to music promotes the development of attention (Zaatar et al. 2023), auditory perception (Wesseldijk et al. 2020), and verbal memory (Al-Yasin, Hamdan 2023; Dunning et al. 2015; Proverbio et al. 2015). Furthermore, listening to music contributes positively to academic achievement in areas such as early literacy, writing, mathematics, and foreign language learning (Gelabert Gual et al. 2023).

The previous studies have also shown that listening to music at school and at home differ significantly, meaning that students intuitively employ different listening strategies depending on the context (Boal-Palheiros, Hargreaves 2001, 2004). In everyday life, listening to music is generally passive and primarily driven by emotional engagement, whereas in educational settings it involves a structured musical experience with clearly defined objectives, learning tasks, and expected outcomes (Boal-Palheiros, Hargreaves 2001). Within the context of primary music education, this approach is commonly referred to as active music listening. It involves the conscious and purposeful monitoring of musical events while students engage in specific emotional and cognitive or analytical tasks. To encourage active participation, listening activities are typically preceded by inquiry-based tasks that direct students’ attention towards particular musical elements, such as melody, rhythm, dynamics, tempo, texture, or musical form.

Although music listening is inherently an individual and internal experience, following the musical flow presents a considerable challenge for young learners because music is a temporal art. Children organize sounds and musical events as they occur in the present moment (Bamberger 2006). As Vujošević (2016: 114) points out, the understanding of musical content depends not only on the passage of musical time but also on the listener’s memory capacity. Moreover, children may focus on different musical parameters at different moments during listening, indicating that their attention fluctuates throughout the listening process (Anderson 2012). As Aiello (1994) observes, “attentive music listening is a complex process,” requiring listeners to make continuous decisions about which musical features deserve their attention.

For these reasons, music educators employ a variety of instructional techniques that help students follow the musical flow and maintain focused attention throughout the listening activity. One particularly effective technique is the musicogram. The pedagogical application of the musicogram was developed by the Belgian composer and music educator Jos Wuytack (Wuytack 1971, as cited in Wuytack, Boal-Palheiros 2009), with the aim of making the structure of a musical composition more transparent and easier for students to follow. Like other forms of visual representation used in teaching, the musicogram plays an important mo-

tivational role by encouraging students' engagement in music listening. This motivation is closely related to all stages of perceiving, understanding, and interpreting a musical work and is particularly significant during the early years of schooling.

Since the musicogram is not included among the instructional strategies currently recommended for music listening activities in the Serbian primary school curriculum (Curriculum for the Fourth Grade of Primary Education, 2019), the theoretical framework of this study draws on previous research investigating the possibilities and educational effects of using musicograms in music instruction. These studies are primarily grounded in Wuytack's approach to music listening and in the musicogram as a technique for promoting active music listening.

THEORETICAL FRAMEWORK: MUSICOGRAM AS A TECHNIQUE FOR ACTIVE MUSIC LISTENING

Wuytack's approach to music education is founded on the premise that music listening in school should not be a passive activity. Rather, every child, regardless of age or level of musical development, is capable of following the musical flow attentively, recognising essential musical characteristics, and appreciating art music (Boal-Palheiros, Wuytack 2006). Children naturally and intuitively experiment with musical material through performing, listening to, and creating music. According to Wuytack (2006), these early musical experiences play a crucial role in subsequent musical development; therefore, music education should be accessible to every child.

Central to Wuytack's pedagogical approach is the *musicogram*, a simplified visual representation of a musical work that enables children to follow and understand the structure of the music while listening (Rubio et al. 2017). The simultaneous processing of visual and auditory information enhances musical perception (Eysenck, Keane 2020), making the musicogram a particularly effective instructional tool for active music listening in primary education (Boal-Palheiros, Wuytack 2006). As Rubio et al. (2017: 8) explain, "the purpose of the musicogram is to attract the listener's attention through a graphic representation of the temporal development of a musical work, enabling students to understand different musical elements by establishing relationships through symbols or images." Its primary function is to highlight fundamental musical relationships, including change, contrast, repetition, and thematic organization.

A musicogram deliberately avoids excessive detail, as detailed musical analysis belongs to later stages of music education. Young learners first perceive the overall musical flow and broader contrasts before gradually becoming capable of identifying individual musical elements (Bamberger 1991, as cited in Johnson 2004). In this way, students progressively develop the ability to follow and rec-

ognize the temporal progression of music, which constitutes one of the principal learning outcomes of active music listening. Vujošević (2016) argues that the auditory perception of musical form is among the most demanding aspects of music learning because musical form represents one of the most abstract musical concepts. Consequently, listening activities should encourage students to direct their attention to both the structural organization and the constituent musical elements of a composition (Swanwick 1991, as cited in Rubio et al. 2017). As a visual map constructed from drawings or interconnected symbols, the musicogram “helps listeners understand the structure of a musical work through an audiovisual process of observation and active listening” (Olarte Martínez 2009, as cited in Rubio et al. 2017: 10).

Within a musicogram, musical form and the most salient musical elements—particularly rhythm and instrumentation—are represented by abstract symbols and geometric shapes. Wuytack proposed specific graphic symbols for individual instruments and instrumental families, whereas colours are used more freely to emphasize contrasts between sections and themes. At the same time, he stressed that the musicogram should not be regarded as a rigid or universal model (Wuytack, Boal-Palheiros 2009). Instead, teachers are encouraged to adapt the technique to the cultural background, traditions, educational context, and developmental characteristics of their students.

The use of a musicogram typically comprises two complementary phases: preparation before listening and guided activities during listening. Wuytack’s methodological guidelines recommend listening to the selected composition at least three times (Wuytack 1971, as cited in Boal-Palheiros, Wuytack 2006), with each listening stage involving different musical and pedagogical objectives.

During the first encounter with the composition, students become familiar with its principal themes and musical phrases through active musical participation. They sing selected melodic fragments, perform rhythmic movements, or play short passages on classroom instruments, thereby acquiring direct experience with the thematic material before listening analytically.

During the second listening, students collectively follow the large-format musicogram while listening to the complete composition. The teacher guides the activity by explaining changes in the musical flow and drawing attention to the symbols and geometric shapes representing different musical events. This stage reflects an analytical approach to music listening that is consistent with contemporary models of music education (Ivanović 2007; Vidulin et al. 2020; Vujošević 2016).

During the third listening, students receive individual copies of the musicogram. While listening, they actively follow the music by touching symbols or tracing the indicated lines with their fingers according to the prescribed direction of movement. Even subtle hand movements encourage active engagement and facilitate the concretization of musical characteristics as well as the perception of

musical form. Consequently, coordinated movement constitutes an essential component of Wuytack's pedagogical approach.

Previous research demonstrates that listening to music with the support of a musicogram requires substantially greater cognitive and physical engagement than traditional listening activities, in which students frequently remain passive listeners. Active participation facilitated by the musicogram improves concentration, extends attention span, enhances comprehension of musical works, and increases students' enjoyment during classroom listening activities (Boal-Palheiros, Wuytack 2006). Similarly, Türkoğlu and Yaşar (2023: 171) describe the musicogram as "a method that supports children's active participation in music through music listening," while other researchers likewise emphasize its role in fostering active listening and increasing students' motivation (Türkoğlu et al. 2023).

Considering the developmental characteristics of young learners, the musicogram appears particularly appropriate for students in the third and fourth grades of primary school. Within the Serbian educational context, its implementation corresponds closely to the intended learning outcomes of the Music Education, especially those related to analytical and cognitively oriented music listening. According to the current curriculum for the fourth grade, students are expected to distinguish instruments according to their timbre and expressive possibilities, relate musical character to instrumental choice and musical elements, and recognize contrast and repetition within musical works. Consistent use of graphic symbols for recurring rhythmic or melodic motives facilitates the recognition of repetition, whereas different symbols emphasize musical contrasts. Furthermore, the musical elements included in the fourth-grade curriculum—such as melodic contour, tempo, rhythm, and dynamics—are all well suited to symbolic graphical representation.

According to Boal-Palheiros & Wuytack (2006), careful selection of musical repertoire represents one of the most important prerequisites for successful use of the musicogram. Short instrumental works with relatively simple texture, regular metre, and clearly articulated formal structure are particularly appropriate. Another essential stage in designing a musicogram is the identification of characteristic motives, phrases, and formal units within the composition. Consequently, teachers need sufficient musical knowledge and pedagogical competence to use musicograms effectively (Türkoğlu, Yaşar 2023). Each musical motive should be represented by an appropriate symbol, as symbolic representation is more accessible to children and facilitates their perception of musical structure (Boal-Palheiros, Wuytack 2006).

Musical perception constitutes the first stage of aesthetic musical experience, upon which emotional engagement and aesthetic understanding are subsequently built (Li 2022). Therefore, one of the fundamental principles in designing a musicogram is that its visual representation should not evoke extra-musical imagery but should instead represent the formal structure and musical elements of the

composition itself (Boal-Palheiros, Wuytack 2006). In this way, the musicogram enables listeners to connect the musical whole with its symbolic visual representation (Türkoğlu et al. 2023). Symbols should therefore be selected according to the defining characteristics of individual musical phrases and the musical element that predominates within each phrase, such as rhythm, articulation, or melodic contour.

The selection of graphic symbols should also correspond to young learners' prior knowledge acquired in other curricular areas. Elements of geometry are particularly appropriate for several reasons. Geometric concepts occupy a substantial place in the primary mathematics curriculum (Milikić 2025) and are therefore already familiar to students. As Milikić (2025) notes, successful learning of geometry depends largely on appropriate visual representations that begin with perceptual recognition of shapes in children's immediate environment.

According to the Serbian mathematics curriculum, first-grade students acquire basic spatial relationships, compare objects according to size and position, identify geometric shapes and solids, and distinguish between straight, curved, broken, open, and closed lines. During the second grade, these concepts become more complex, requiring students to determine the length of broken lines, calculate the perimeter of geometric figures, and construct simple geometric forms. Building upon this prior knowledge, third-grade students learn about angles, different types of triangles, circles and circumferences, rectangles, and squares, while increasingly applying this knowledge through practical geometric constructions and measurements. Although the fourth-grade curriculum further develops measurement of geometric quantities, the geometric concepts acquired during the first three grades are particularly relevant for designing and interpreting musicograms.

Accordingly, the first research task of the present study involves analysing the expressive characteristics of the selected musical composition with regard to their suitability for visual representation through graphic symbols. Among the various graphic elements available, lines, dots, circles, and triangles appear particularly appropriate for representing musical events. These geometric elements are therefore examined in the second research task, which analyses the symbols incorporated into the musicogram designed for Johann Strauss I's *Radetzky March*. The musicogram developed for this study represents the opening section (A) of the composition, whereas the graphic representations of the introduction and the middle section, with minor modifications, were adapted from the model proposed by Emanuele Ruggiero (2020).

METHODOLOGY

The methodology adopted in this study is based on a qualitative content analysis of data related to the use of musicograms. The data were collected through a review of studies addressing the application of musicograms in music education

from the perspectives of theoretical frameworks, previous empirical research, and pedagogical implications for identifying effective instructional techniques in music listening. In addition, existing musicograms developed by various authors were examined and analysed.

The study explores the suitability of using elements of geometry as visual symbols in the design of musicograms. A musicogram was developed for Johann Strauss I's *Radetzky March*, and the primary aim of the research was to identify and explain the relationship between the geometric shapes employed in the musicogram and the corresponding musical elements or musical phrases in the composition.

The findings are presented and discussed in accordance with the research objectives. The first subsection analyses the musical characteristics of *Radetzky March* that are particularly suitable for graphical representation through geometric elements. The second subsection examines the rationale for selecting specific geometric elements according to the musical components that are most prominent within particular segments of the composition.

The research findings were interpreted using qualitative content analysis.

RESULTS AND DISCUSSION

MUSICAL CHARACTERISTICS OF RADETZKY MARCH

Johann Strauss I's *Radetzky March*, included in the current Serbian Music Education Curriculum for the fourth grade of primary education, was selected for the presentation and analysis of the musicogram. The musicogram was designed for the first section of the composition, which is particularly memorable and easily recognizable to young learners. The popularity of the opening theme may be attributed to its intertextual character, as Burns (2020) notes that a similar thematic idea appears in Strauss's *Jubel-Quadrille*, Op. 130, while also recalling the thematic material of Haydn's *Symphony No. 100*. In addition to being developmentally appropriate for primary school students, the composition satisfies the criteria proposed by Boal-Palheiros and Wuytack (2006) as essential prerequisites for the successful design and implementation of a musicogram in music listening activities.

The composition exhibits a clear ABA formal structure, consisting of three principal sections preceded by a brief introduction. The formal units are articulated through authentic cadences and are characterized by frequent repetition, a pronounced rhythmic profile, a steady tempo, and consistently strong dynamics without abrupt dynamic contrasts. Strauss composed the march in D major, a sharp key traditionally associated with brightness and brilliance (Despić 1989). This characteristic contributes to the vivid and energetic musical atmosphere and partly explains the frequent use of D major in well-known orchestral repertoire.

Although composers generally choose tonalities according to artistic preference, certain perceptual associations have been identified in the literature. For example, Rimsky-Korsakov and Scriabin both associated D major with the colour yellow, describing it as a bright and radiant key (Despić 1989).

In accordance with the conventional structure of the march and ternary song form, the contrasting middle section (B) is presented in the dominant key, thereby enhancing the sense of development and forward motion that is characteristic of this musical form (Despić 1989). The correspondence between the thematic and tonal recapitulation, a defining feature of compound ternary form, also produces a sense of structural balance and psychological closure for the listener (Despić 1989). In the present context, this contributes to a coherent and convincing musical experience for primary school students.

The harmonic foundation of the opening thematic section is built upon three principal chords. Through his distinctive treatment of melodic progression and the tension established between melody and harmony, Strauss achieves a level of melodic complexity that is uncommon within a simple song form. As is typical of the march genre, the composition also employs varied musical textures. The orchestration includes strings, three flutes, piccolo, two oboes, two clarinets, two bassoons, four horns, two trumpets, three trombones, tuba, and percussion (snare drum, bass drum, cymbals, and timpani). This rich orchestral palette creates striking timbral contrasts that intensify the musical experience and enhance students' motivation to engage in attentive listening.

Rather than conveying an overtly military or martial character, the composition projects a ceremonial and celebratory atmosphere. This expressive quality is achieved primarily through orchestration and through the distribution of the principal melody among different instrumental groups throughout the work (Burns 2020). At the beginning of the composition, the main march theme is introduced by the strings and woodwind instruments. Following the initial statement of the theme, the piccolo emerges above the orchestral texture with its distinctive high register. Before the return of the principal theme (Section A), a seamless transition is created through a trio passage performed by the brass instruments, while the march concludes with a powerful and energetic tutti performed by the full orchestra (Burns 2020).

Considering both the relative importance of individual musical elements in shaping the expressive character of the composition and the sequence in which these elements are typically perceived by young listeners, the symbols incorporated into the musicogram for Section A (Figure 1) primarily represent rhythm and musical form, while the central subsection additionally illustrates the melodic contour.

Figure 5. Musicogram for the first section of *Radetzky March* (adapted and modified from Ruggiero 2020).



Rhythm, owing to its precision and regularity, is one of the musical elements most frequently represented through visual means. Its prominent role in a duple (*alla breve*) metre, a defining characteristic of the march, further reinforces its importance in the perceptual process, particularly for young learners.

At the beginning of the composition, the rhythmic texture is dominated by short note values performed staccato, enriched with ornamental figures, eighth-note rests, and occasional accents. These rhythmic features contribute to the festive, lively character of the march. Correspondingly, the melodic contour is discontinuous and assumes a wave-like shape in the second, contrasting subsection of Section A. Rather than following a clearly directed ascending or descending trajectory, the melody consists of alternating upward and downward movements within a relatively narrow range, interspersed with turning figures.

The ternary form of the composition, in which contrast constitutes “the essential characteristic of three-part form” (Crnjanski 2024: 311), enables students to recognize the principal sections of the work more easily, distinguish their contrasting features, and identify recurring musical phrases. At the microstructural level, the composition also exhibits a regular periodic organization, another

characteristic feature of the march. The clear formal closure of smaller musical units helps students recognize the completion of individual musical ideas, identify phrase boundaries, and develop an initial understanding of the principles underlying larger formal structures. Articulation, characterized predominantly by staccato and accented notes, further emphasizes the rhythmic profile and expressive character of the march. It should be noted that the analysis of individual musical elements presented in this study serves the specific objectives of the research. Nevertheless, the expressive character of the march is determined primarily by the interaction and organization of these musical elements within the composition as a whole.

When describing the musical elements, terminology commonly used in geometry instruction—such as broken line, wavy line, and direction of movement—was deliberately adopted to highlight the close analogies between musical features and geometric concepts. Although the numerous correspondences between music and mathematics have frequently led scholars to classify music within the domain of scientific inquiry (Wright 2009), the present study does not seek to translate musical concepts directly into mathematical language. Instead, it proposes a pedagogical approach to the design of music listening activities based on the structural analogies and conceptual correspondences between these two domains.

Given the prominent role of rhythm, form, and articulation in shaping the expressive character of the march, these musical components were selected as the primary elements for graphical representation in the musicogram. In addition to different types of lines, the graphical representation incorporates several basic geometric elements, including dots, triangles, and circles. The findings reported by Türkoğlu et al. (2023), based on a formal analysis of musicograms published in Turkish and other languages, demonstrate that a wide variety of graphic symbols have been employed in musicograms. The most common include horizontal and vertical lines, wavy, broken, and parallel lines, circles, triangles, horizontal and vertical groups of triangles, dots, groups of dots, stars, capital letters (C, B, U, and M), the infinity symbol, and the numbers 0, 1, and 7, whereas squares and rectangles appear considerably less frequently (Türkoğlu et al. 2023: 2294).

Although that study pursued different research objectives, its findings indicate that the selection of symbols to represent specific musical components is systematic rather than arbitrary. Considering the shared structural characteristics of music and geometry, together with young learners' visual perceptual abilities, geometric elements appear to provide the most appropriate means of representing musical structures graphically.

ELEMENTS OF GEOMETRY IN THE GRAPHICAL REPRESENTATION
OF *RADETZKY MARCH*

Among the geometric elements employed in the visual representation of music, the line is by far the most prominent because of its ability to represent a variety of musical features, including rhythm, melody, articulation, formal units, and structural closure. The strongest analogy exists between the line and melody, as reflected both in the commonly used term *melodic line* and in the understanding of melody as the horizontal dimension of musical flow (Ivković, Melody, as cited in Crnjanski 2024).

In Rodo's (2024) study investigating the use of music and musicograms for foreign language learning and the development of listening skills in early childhood, lines connecting circles were used to reinforce visually the tendency of melodic movement, with ascending and descending lines corresponding to higher and lower pitches, respectively. Similarly, in the musicogram developed for the present study, lines represent the melodic contour by illustrating both the type and, at specific points, the direction of melodic movement. The use of lines is also pedagogically appropriate in relation to students' prior knowledge of geometry. From the first grade onwards, Serbian primary school students learn that different types of lines can be used to represent objects and phenomena in the surrounding world (Tahirović, Ivančević 2016). This prior knowledge facilitates their understanding of the line as a graphic representation of melodic and rhythmic movement.

The musicogram (Figure 1) incorporates all basic types of lines: straight, curved, and broken. Open lines are used most frequently. Curved open lines indicate wave-like melodic movement, lyricism, and a sense of calmness, whereas broken open lines represent melodic leaps and fragmented or detached rhythmic patterns. Musical motives that are more appropriately represented by closed shapes are depicted using geometric figures, specifically the triangle and the circle.

The circle symbolizes the completion of a musical idea. Tracing the circumference of the circle with the finger represents the cadential process and the conclusion of a musical phrase or section. Empirical studies by Goodnow (1971, as cited in Vujošević 2016) and Bamberger (1991, as cited in Rubio et al. 2017) have shown that children frequently use circles to represent rhythmic patterns perceived through listening, employing circles of different sizes to indicate different note durations within a rhythmic stimulus. A similar function is also attributed to the dot.

The dot is particularly suitable for representing short note values and staccato articulation. In the musicogram designed for *Radetzky March*, dots represent short motives containing ornaments, turning figures, or repeated notes. Representing every individual pitch with a separate dot and asking students to point to each symbol while listening would reduce the activity to a purely technical exercise, directing attention to isolated notes rather than encouraging students to perceive

complete musical phrases, recognize phrase boundaries, and understand their structural role within the composition.

The triangle appears in the musicogram whenever a rhythmic motive consists of three notes, regardless of the specific rhythmic pattern (e.g., three eighth notes alternating with eighth-note rests or two eighth notes followed by a half note). Its use is based on the analogy with the defining geometric properties of a triangle, namely its three sides, three vertices, and three angles. Two types of triangles are employed: the equilateral triangle and the right triangle. The equilateral triangle was selected because of its symmetry and regularity, reflecting the balanced and recurring organization of motives within the composition. The right triangle represents motives containing a larger upward melodic leap, with the right angle emphasizing the sudden melodic ascent and the prolonged duration of the final note.

In addition to selecting appropriate geometric symbols, the effective use of a musicogram depends on performing hand movements in a carefully coordinated direction so that the movements follow one another naturally and remain synchronized with the tempo of the music. For this reason, directional arrows may be added to lines, as shown in the present musicogram, and teachers are encouraged to demonstrate the required movements before the listening activity.

For example, in the first measure following the introduction, a vertical line ending with a downward-pointing arrow guides students' hand movement. This downward motion does not literally correspond to the melodic direction, since the musical motives contain brief turning figures. Instead, the direction of the movement is coordinated with the subsequent downward motion used to trace the sides of the triangle (second row of the musicogram, Figure 1), thereby enabling students to follow the symbols accurately and continuously in synchrony with the musical tempo.

As Petrović (2015: 122) emphasizes, "movement should be synchronized with the musical form and dynamics," while its intensity should correspond to all structural elements of the composition, including accents, tempo, microformal patterns, and compositional devices such as repetition and contrast. Although particular musical parameters are represented visually through graphic symbols, movement further reinforces musical visualization. Petrović (2015) argues that movement, as a catalyst for students' cognitive, psychomotor, and affective development, facilitates the understanding of individual musical elements, their interrelationships, and their integration into a coherent musical whole.

Given that successful use of a musicogram requires the coordination of auditory and visual information with purposeful hand movements, its effectiveness may depend not only on students' visual-perceptual abilities but also on their visual-motor skills. Investigating the relationship between the educational outcomes of musicogram-based instruction and these learner characteristics represents a promising direction for future research.

CONCLUSION

The conceptual framework of this study is grounded in several key aspects of analytical music listening within primary music education. The integration of musical and visual content contributes to a more dynamic teaching process and facilitates young learners' perception and understanding of musical elements and their interrelationships. In other words, instructional approaches to music listening should promote the integration of auditory and visual perception. One of the most accessible techniques based on this principle is the musicogram. Wuytack developed the musicogram as a visual strategy to foster active music listening, encouraging learners to become aware of the musical flow and to perceive music as a dynamic, evolving process. Although Wuytack's pedagogical ideas and instructional concepts have been widely discussed and cited in the literature (Şen 2022), the available evidence indicates a lack of empirical research examining the frequency and effectiveness of musicogram use, particularly within the Serbian educational context. This suggests that the musicogram is either rarely implemented or not implemented at all in classroom practice. This observation provided the impetus for the present theoretical study, which seeks to contribute to a better understanding of the characteristics, pedagogical value, and practical applications of the musicogram.

The primary aim of the study was to examine the relationship between the musical characteristics of a selected composition and the geometric elements used as visual symbols to represent the musical flow. In accordance with the fourth-grade Music Education Curriculum, Johann Strauss I's *Radetzky March* was selected as the focus of the analysis.

The analysis of the musical characteristics of the composition and the identification of analogies between individual musical components and specific geometric elements led to two principal conclusions. First, the line, dot, circle, and triangle appear to be the most appropriate geometric symbols for the visual representation of musical structure. Second, among the musical elements, melody and rhythm are particularly suitable for graphical representation using geometric forms. Importantly, both the selected musical concepts and the corresponding geometric concepts are already familiar to fourth-grade students through the curricula of Music Education and Mathematics. This curricular alignment further supports the feasibility of designing and implementing musicograms in primary education.

Taken together, the identified analogies between musical and geometric elements, combined with the coordinated hand movements required to follow the visual symbols while listening, support previous findings regarding the educational value of the musicogram as a teaching aid. Specifically, the musicogram facilitates students' understanding of musical flow, the temporal organization of a musical work, and the nature of music as a temporal art form.

Despite these pedagogical advantages, several limitations of the musicogram should also be acknowledged. Excessive reliance on visual representations may adversely affect students' understanding of music as an autonomous art form by encouraging the interpretation of musical meaning through extra-musical associations (see Miletić, Vukićević 2011). If the perception of musical elements becomes overly dependent on visual stimuli, young learners may develop the misconception that music must always be translated into another representational system in order to be understood. In more extreme cases, students may later experience difficulty following the musical flow independently, without visual support. Furthermore, concentrating simultaneously on movement and visual tracking may reduce students' aesthetic engagement with the music itself. As Novotná and Ašenbrennerová (2021: 28) emphasize, visualization, regardless of its form, should never divert children's attention from the essence of the musical work or from the experience of music itself.

These limitations also indicate the principal limitations of the present study and point to several directions for future research. In particular, further empirical studies should examine the educational effects of musicograms incorporating geometric elements designed according to the criteria proposed in this study. Future research could investigate their impact on students' achievement in music listening and compare the findings with those of previous studies (Boal-Palheiros, Wuytack 2006; Wuytack, Boal-Palheiros 2009; Júnior, Raymundo 2020, as cited in Şen 2022), which consistently suggest that students perceive, understand, and retain musical content more effectively when musicograms are used as a visual strategy to support active music listening.

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ЕЛЕМЕНТИ ГЕОМЕТРИЈЕ У МУЗИКОГРАМУ ЗА СЛУШАЊЕ КОМПОЗИЦИЈЕ *РАДЕЦКИ МАРШ*

Резиме: У раду се указује на могућности примене елемената геометрије у музикограму, као погодној техници слушања музике за ученике млађег школског узраста. Циљ рада је утврдити и објаснити везу између геометријских облика примењених у музикограму и музичког елемента или музичке фразе у композицији *Радецки марш*. Покушали смо да одговоримо на два, међусобно условљена, истраживачка питања: 1) које музичке карактеристике се могу представити елементима геометрије; и 2) који елементи геометрије су погодни за графичко представљање музике. Представљен је пример музикограма за слушање композиције *Радецки марш*, која се налази у актуелном Програму наставе и учења за предмет Музичка култура у четвртм разреду. На основу анализе музичке композиције и осмишљеног графичког приказа у виду музикограма, може се закључити да су за примену одговарајућих геометријских облика у музикограму најважнији одабир композиције за слушање, издвајање појединачних фраза и препознавање њихових кључних карактеристика. Педагошке импликације овог рада односе се на примену музикограма у наставној пракси, са циљем подстицања активног слушања музике и развијање перцептивних способности ученика млађег школског узраста.

Кључне речи: музикограм, елементи геометрије, слушање музике, настава музичке културе.