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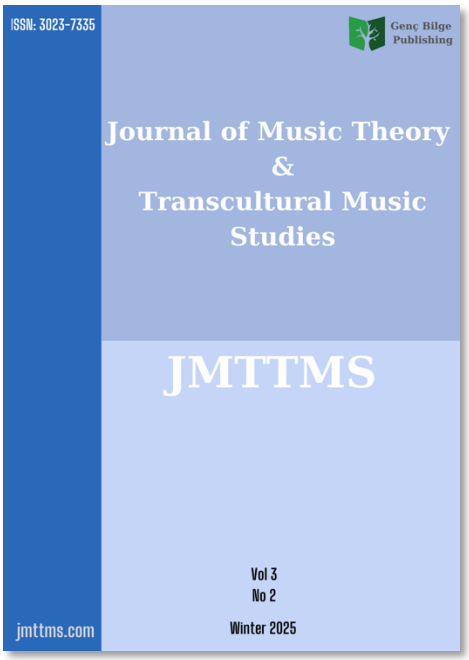


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**Contents**


| No | Title | Pages |
|---|---|---|
| 1 | **A music theoretical history of two continents. German and European roots and (re)reception of pitch-class set theory**<br>*Stephan Lewandowski* | 67-77 |
| 2 | **A historical and statistical view on Old-Roman, Gallican, and Gregorian Chant**<br>*Dirk van Kampen* | 79-90 |
| 3 | **Analysis of sentence structures in Uzzâl oud taksim of Cinuçen Tanrikorur**<br>*Kibele Kıvılcım Çiftçi* | 91-109 |
| 4 | **Reclaiming somatic intelligence: A Sumerian Minahasan embodied framework for music education in the AI era**<br>*Soegiarto Hartono* | 111-119 |
| 5 | **Music theory in the digital age: Transformation of traditional theory in popular music production, analytical approaches, and a systematic literature review on DAW-based practices**<br>*Serkan Çolak* | 121-136 |


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Research Article

# A music theoretical history of two continents. German and European roots and (re)reception of pitch-class set theory[1]

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**Abstract**

Pitch-class set theory was developed on the American continent in the 1940s by composers and music theorists such as Milton Babbitt (1916–2011), Allen Forte (1926–2014), and others. Since the 1970s, this discipline, which is located between music and mathematics, can be regarded as more and more established and institutionalised throughout the Anglo-American world. In contrast, it is often strongly rejected in large parts of the European and especially the German discourse, which can be seen as one of the many devastating aspects of the division of the international research community following the Second World War. This study attempts to trace the historical causes of the ambivalent reception of pitch-class set theory world-wide, partly on the basis of exclusive sources, such as an e-mail correspondence with Allen Forte. It discusses the paradoxical situation that it is precisely in German and French music theory of the 19th century (and in some cases even further back) that predecessor models of this music theoretical system can be found in the history of ideas. Only recently, depoliticised and in the context of the ever stronger and more natural international networking of specialist discourse in the German-speaking world and other parts of Europe, has it become possible to consider pitch-class set theory as a meaningful analysis tool for post-tonal Western music and to apply it accordingly, on the one hand, as well as to individualise and further develop it, on the other. In times of internationalisation, globalisation, and digitalisation, this form of re-reception holds the potential to expand pitch-class set theory into a transcultural music-analytical tool that can also gain strength beyond its previous musical boundaries and areas of application.

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## Introduction

Hardly any other sub-discipline of music theory is as polarising as pitch-class set theory. On the one hand, in the Anglo-American world it has become an established standard in both specialist discourse and the university curriculum. A veritable cult apparently associated with it in US music theory in the 1980s can be inferred from words by Allen Forte (1926–2014) taken from his opening speech of the 10th Annual Conference of the American Society for Music Theory in 1987: "I did not invent the unordered pitch-class set. That was the creation of a far higher power."[3] On the other hand, pitch-class set theory met with enormous resistance in the anti-systematic discourse of the post-war period in Europe, and especially in Germany, which was at least at first glance difficult to understand both in terms of content

[1] This study was partially presented at the 4th International Rast Music Congress (IRMC), held online in Antalya, Türkiye, on November 30–December 1, 2024.
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[3] FORTE 1989, p. 95, see also LEWANDOWSKI 2010, p. 190.

and nature. Michiel Schuijer describes this dilemma in his book *Analyzing Atonal Music*, published in 2008.[4] The first section of the introductory chapter of this publication bears the telling title "A Tale of Two Continents".[5]

Within that chapter, Schuijer uses an anecdote that took place at the Fourth European Analysis Conference at the Conservatory in Rotterdam/Netherlands to describe the existing dilemma surrounding pitch-class set theory. Firstly, the late arrival of an (anonymous) US-American conference participant during a panel discussion on the analysis of contemporary post-tonal music is described. After listening for only a short time, it continues, he raised his hand and asked the question: "You guys are discussing methods of analyzing twentieth-century music. Why don't you talk about pitch-class sets?"[6] Schuijer continues: "The chairman, a professor from the Sorbonne, was quick to respond: 'We don't *talk* about pitch-class sets, because we don't *hear* them.'"[7] The ineffectiveness of this answer needs no further elaboration, for the fact that we are still talking about pitch class sets after almost a quarter of a century is proof enough of the value of pitch class theory as an analytical tool.

In the following, I would like to try to get to the bottom of the causes of this polarisation. In doing so, I would like to trace a history of the reception and re-reception of ideas developed step by step over several centuries on two continents. Starting with the development of pitch-class set theory in the USA in the 1940s, I will first follow a timeline backwards to the 19th century and even further. At the end, I would like to briefly outline the status quo of pitch-class set theory in Germany, as well as the potential of this analytical discipline fort he present and the future in international discourse.

Pitch-class set theory was developed in the United States in the 1940s. Pioneers of this discipline included Milton Babbitt (1916–2011), George Perle (1915–2009) and Allen Forte. Two factors played a decisive role in the development of a discipline located between music and mathematics:

- The emerging computer age. At least in the early days of pitch-class set theory, there was a vision of being able to analyse musical scores in the future with the help of computers, which at that time were still space-consuming machines with a very low memory capacity that is unimaginable today and had to be fed with punched cards. Allen Forte even developed his own programming language called SNOBOL3, the functionality of which he published in an article.[8] The fact that this vision – fortunately! – was not to be fulfilled, need not be explained in detail from today's perspective. However, pitch-class set theory was to prove its usefulness and informative value for post-tonal music, especially the pre-dodecaphonic music of the Second Viennese School. It continues to have a great influence on the discourse surrounding this œuvre to this day.

- The presence of Arnold Schoenberg (1874–1951). Schoenberg, who lost his position as Professor of Composition at the Stern'sches Konservatorium in Berlin immediately after Hitler came to power as Reich Chancellor, emigrated to the USA. In fact, the development of set theory or pitch-class set theory is linked to twelve-tone theory and Schoenberg's ideas on this topic, in particular. The composer was now able to teach and disseminate his theories personally through lectures and classes at US universities. This already reveals the first direct European roots of pitch-class set theory in the history of ideas.

The latter can be vividly illustrated by Schoenberg's music-theoretical and composition-theoretical English-language terminology, which has been constantly developing since his move to the USA, but also by the conceptual ideas of twelve-tone and row-based composition, as well as post-tonal composition in the run-up to dodecaphony. For example, the term "row" goes through several stages of development: While Schoenberg initially chooses the term "row" as a literal translation of the German word "Reihe", he later opts for the word "series", which already comes much closer to his concept in the context of composing with twelve equal tones, but is still not completely satisfactory for him.[9] Finally –

[4] SCHUIJER 2008.
[5] Ibid, pp. 1–4.
[6] Ibid., p. 2.
[7] Ibid.
[8] FORTE 1967.
[9] PERLE 41977, p. 2, see also BEICHE 1984 and LEWANDOWSKI 2017, p. 7.

allegedly at the suggestion of George Perle – he uses the word "set", since Schoenberg's twelve-tone rows are basically unordered groups of tones and thus by definition pitch-class sets.[10]

In the beginning of Schoeberg's dodecaphonic creative period the chromatic total is achieved by a special arrangement of three tetrachords (see ill. 01). A little later, from Op. 31 onwards, Schoenberg uses two hexachords, each of which complements the other to form a chromatic total (see ill. 01b). The hexachordal row technique was extensively studied by several music theorists, including Milton Babbitt, and labelled "combinatoriality".[11] Its preliminary form with the three tetrachords can also be described with this term. It is used in the *Suite for Piano* Op. 25, a work that represents Schoenberg's earliest composition organised entirely in twelve tones – although the *Waltz* from the *Piano Pieces* Op. 23 was written even earlier according to the history of its composition.[12] Schönberg used the *Suite* in a text, originally written in German, to illustrate his "method with twelve tones related only to each other" (originally in German: "Methode der Komposition mit zwölf nur aufeinander bezogenen Tönen").[13] It emphasises that every note within a row (within a set) is treated equally respective has equal musical rights.

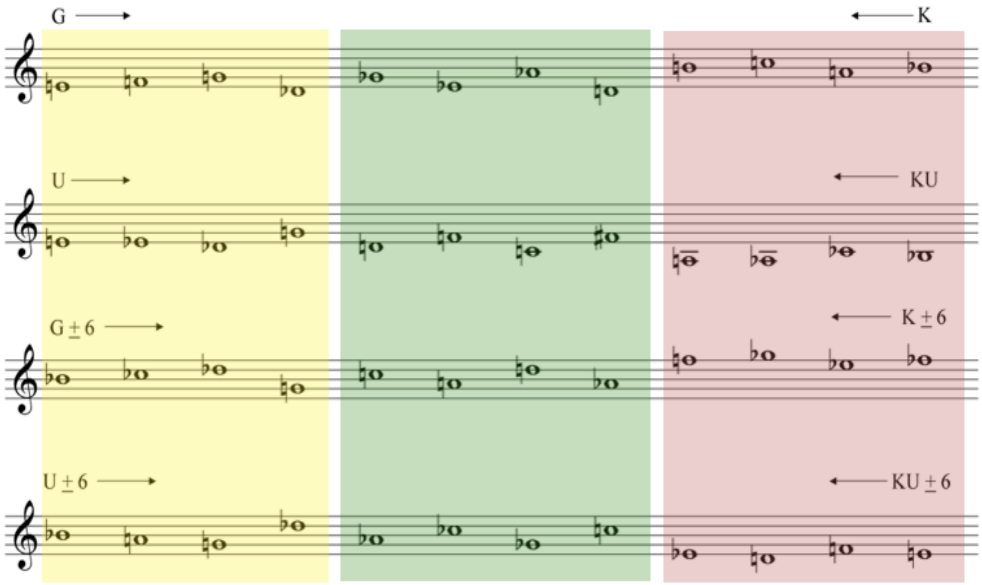


**Figure 1.** Twelve tone row used in A. Schoenberg: *Suite for Piano* Op. 25.

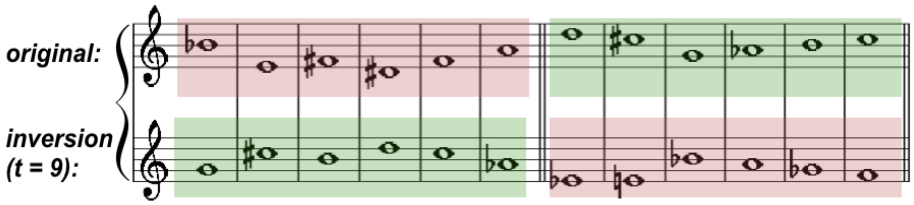


**Figure 2.** Twelve tone row with combinatoriality used in A. Schoenberg: *Variations for Orchestra* Op. 31.

The misunderstanding of the concept of a row as a linear phenomenon is rooted in several European twelve-tone textbooks of the post-war period. In particular, the publications of Herbert Eimert (1897–1972)[14], Hanns Jelinek (1901–1969)[15], and Ernst Krenek (1900–1991)[16], who was even a student of Schoenberg, should be mentioned in this context. The concept of a row as a primarily or even exclusively linear-contrapuntal phenomenon never actually existed, at least in relation to Schoenberg's twelve-tone technique.

Rather, the arrangement of the twelve tones using three four-tone pitch-class sets shows the possibility of a harmonic and contrapuntal encounter of all possible row tones. Motivic ideas and ideas for the reorganisation of traditional forms,

[10] Perle [4]1977, p. 2.
[11] Babbitt 1950, p. 160, Perle [4]1977, p. 129–131.
[12] Sichardt 1991, pp. 206–211.
[13] Schoenberg 1976.
[14] Eimert 1950.
[15] Jelinek 1952.
[16] Krenek 1952.

such as the suite or the sonata form, are particularly prominent at the beginning of Schoenberg's twelve-tone phase. This goes so far that even within a tetrachord the order of the notes can be interchanged in favour of a consistent sequencing, as the opening bars from the Musette of the Suite for Piano Op. 25 show (ill. 02).

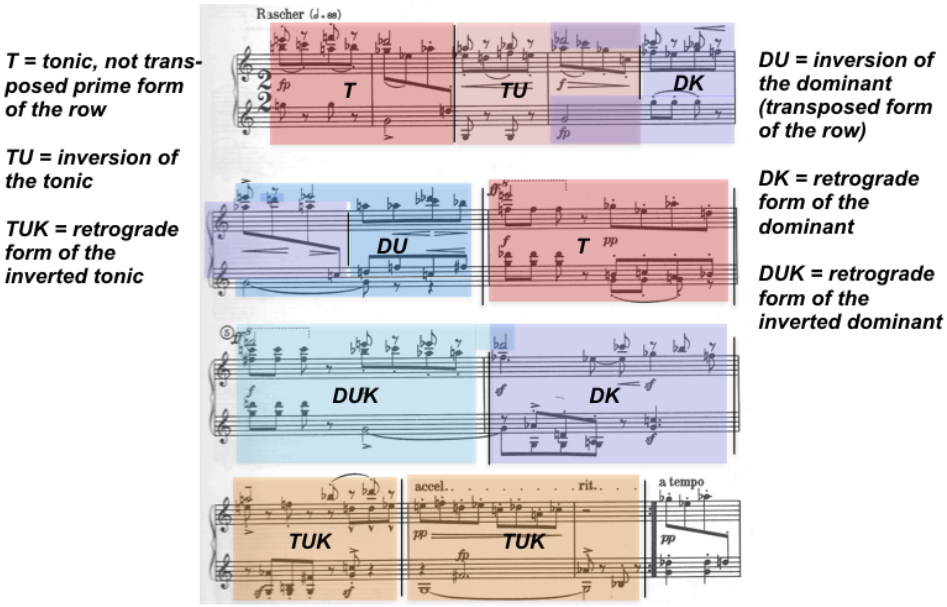


**Figure 3.** Arrangement of notes within tetrachords as parts of the underlying twelve tone row, as being present in the opening bars of the *Musette* from A. Schoenberg: *Suite for Piano* Op. 25.

Unordered groups of notes, or pitch-class sets, also play an essential role in pre-dodecaphonic concepts of material arrangement. Arnold Schoenberg's *Piano Piece* Op. 23, no. 2, for example, consists entirely of subsets, taken from a super set, or the musical "Keimzelle", which is exposed at the beginning of the piece. The composition is de facto a compositional realisation of the relationships between supersets and subsets described in later theories by Allen Forte[17], whereby freely atonal and sequentially bound sections alternate in this work.[18]

Josef Matthias Hauer's (1883–1959) tropes also represent unordered groups of six tones that complement each other to form a chromatic total. In this respect, Schoenberg's and Hauer's approaches to twelve-tone technique are even similar. In the context of the bitterly fought so-called priority dispute over the question of which of the two Viennese composers had discovered his respective method of twelve-tone composing earlier, there would certainly have been agreement from a set-theoretical perspective. Hauer described his theories in two self-published works.[19] His pathetic, sometimes cryptic, writing style makes the small books difficult to understand and may have prevented a wider reception.

However, the roots of pitch-class set theory go back even further in history. In the second half of the 19th century, a generation of music theorists emerged whose spirit can be described as more or less rigorous. Among them were Carl Friedrich Weitzmann (1808–1880), a friend of Franz Liszt (1811–1886), Friedrich Zamminer (1817–1858), Friedrich Wilhelm Opelt (1794–1863), Josef Anton Singer (1810–1882), and Heinrich Josef Vincent (alias Winzenhörlein) (1819–1901), to name just a few.

In the following, I would like to concentrate on Vincent, as his ideas seem to be most far-reaching, partially even appearing as a look into the future. Also they seem very refreshing, as they are not much influenced by any chains of historicity. It is not my intention to judge Vincent's ideas, either positively or negatively, but to point out some interesting (conscious or not conscious) relationships between him and other theorists of other eras, relationships which seem to show that music theory keeps coming back to the same problems at different levels. I believe that the more recent history of music theory, especially the development of pitch-class set theory, has shed some new light on Vincent's ideas, which were developed in the second half of the 19th century.

[17] FORTE 1972 and FORTE 1973.
[18] For detailed analyses of Schoenberg's Op. 23, no. 2 see HOLTMEIER 1999 and LEWANDOWSKI 2019.
[19] HAUER 1925 and HAUER 1926.

Heinrich Josef Vincent was born in 1819 in Theilheim, a small town in central Germany. After having studied theology and law, he dedicated his life to music, which was his passion since he was a young boy. He sang (and later conducted) several choirs even during his time as a student. It is documented that he was a good singer and founded the "Liedertafel" in Würzburg, where he studied. After giving up his studies in law, he was engaged as an opera singer on several stages (Würzburg, Halle an der Saale, Schwerin, and Vienna). Besides that, he was a (not very successful) composer of a few operas and musical comedies, and also wrote a biography of Franz von Suppé.[20] His radical views on the field of music theory were unique, but probably contributed to him becoming somewhat of an outsider. Beside a few magazine articles, Vincent published between 1860 and 1894 five music theoretical writings:

- 1860: *Kein Generalbass mehr! Dafür: der Geist der Einheit (I) in der musikalischen Progression. Ein Beitrag zur Musikwissenschaft*, Vienna: Wallishausser'sche Buchhandlung (Josef Klemm)[21],
- 1862: *Neues musikalisches System: Die Einheit in der Tonwelt. Ein kurzgefasstes Lehrbuch für Musiker und Dilettanten zum Selbststudium*, Leipzig: Heinrich Matthes[22],
- 1875: *Die Neuklaviatur. Ihre Vorteile gegenüber den Nachtheilen der alten. Ein Aufruf zur Beherzigung an alle Musiker und Dilettanten, Klavier-Lehrer und Fabrikanten*, Malchin: Adolph Hothan[23],
- 1890: *Die Zwölfzahl in der Tonwelt. Ein Blick in die Zukunft. Beitrag zur Vereinfachung u. Erleichterung des Musikbetriebes*, Vienna: Rörich[24],
- 1894: *Ist unsere Harmonielehre wirklich eine Theorie? Eine musikalische Lebensfrage, beantwortet von H. J. Vincent*, Vienna: Rörich[25].

The title of the first one contains the straight motto: "No figured bass anymore!"[26] It is published anonymously. In the first chapter of this little brochure, Vincent compares music with the arts of poetry.[27] He considers it as unnatural, if anybody would have the idea to ask a painter or poet to express his colours, words or even single letters with numbers. But, nevertheless, exactly that would be the content of figured bass.[28]

Vincents thoughts about figured bass being old-fashioned and unnecessary are rooted in his very own understanding of Ramistic music theory. This shows his depiction of the G major seventh chord, at first in the "wrong" old system, and then in the "more correct" new one (ill. 03).[29]

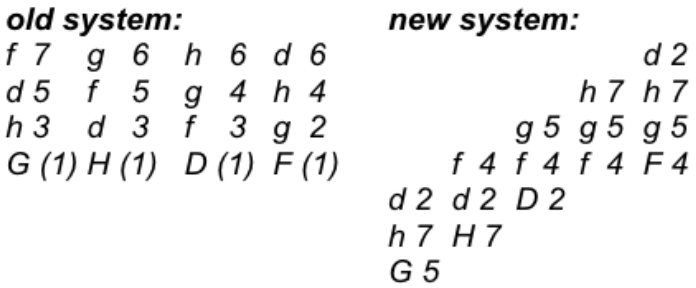


**Figure 4.** Depiction of the G major seventh chord after ANONYMOUS [VINCENT] 1860, p. 24.

Ludwig Holtmeier writes: "Vincent's critique is based actually on a misunderstanding: 'Figured bass' is for him the Ramistic theory – in this point mainly referring to the writings of S. [Simon] Sechter [(1788–1867)] –, the theory that has pushed away the 'figured bass teaching' of the 18th and early 19th centuries."[30] I agree to this fact, though in Vincent's early writings of the 1860s, Sechter is only mentioned very rarely. Regarding figured bass, Vincent refers in

[20] HOLTMEIER 2008.
[21] ANONYMOUS [VINCENT] 1860.
[22] VINCENT 1862.
[23] VINCENT 1875.
[24] VINCENT 1890.
[25] VINCENT 1894.
[26] ANONYMOUS [VINCENT] 1860, title page, orig: "Kein Generalbass mehr!", own translation.
[27] Ibid., p. IV.
[28] Ibid.
[29] Ibid., p. 24.
[30] HOLTMEIER 2008, col. 1036, orig.: "Vincents Kritik fußt dabei eigentlich auf einem Mißverständnis: Unter 'Generalbass' versteht er bezeichnenderweise gerade jene ramistische Musiktheorie (Hauptbezugspunkt sind die Schriften S. Sechters), die wesentlich dazu beigetragen hat, die 'Generalbaßlehre' des 18. und frühen 19. Jh. zu verdrängen.", own translation.

*Kein Generalbass mehr!* to an Italian music theorist as its inventor: "If Lodovico Viadana [(1560–1627)] could have suspected, what misuse would evolve out of his 'stenographic' invention with time, he would have – suppressed it."[31] After the introduction, the author starts explaining somewhat cryptic laws of numbers, mathematical axioms and progressions.[32] He tries to transfer mathematical "progressions of unity"[33] to musical correspondences. Subsequently, Vincent explains the circle of fifths[34], then comes soon to the overtone series[35] and, among other topics, to problems of enharmonic change.[36] His remarks lead Vincent to the conclusion: "It would be good, if we had only twelve names for the twelve notes due to the established temperature; the whole trouble of the orthographic gadget, that is only existing for reasons of orthography, at the end, would be spared to us."[37] He suggests to name the black keys on the piano after the letters "i", "k", "l", "m", "n" or – without giving a real reason – only to use the tone names *d flat*, *e flat, g flat*, *a flat* and *b flat*.[38] Such an emancipation of tone names falls under the term "solidarity"[39] used by Vincent. No note should have any advantages by having more names than others. By reducing the system of notes to twelve and by treating them as equal, Vincent anticipates some fundamental ideas of later evolving twelve-tone theories.

At this point, I would like to make a short digression. It is worth mentioning that Vincent presents the picture of a new keyboard in the earliest of his five main writings (see ill. 04a).[40] This keyboard consists of a permanent change of black and white keys, the places where only two white keys appear in the normal keyboard (*e* and *f* as well as *b* and *c*) are missing. It is described as very practical for playing scales. The chromatic scale would be, of course, without any difficulties anymore. Furthermore, the major scales are reduced to two schemes, either three white and four black keys or four white and three black keys. Vincent is sure that the near future will accept this new keyboard, although his radical changing of the tone-names will cause more difficulties.

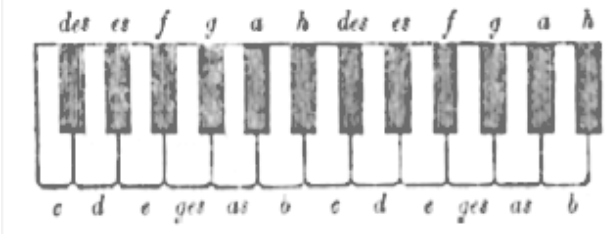


**Figure 5.** Depiction of Vincent's new keyboard, ANONYMOUS [VINCENT] 1860, p. 27.

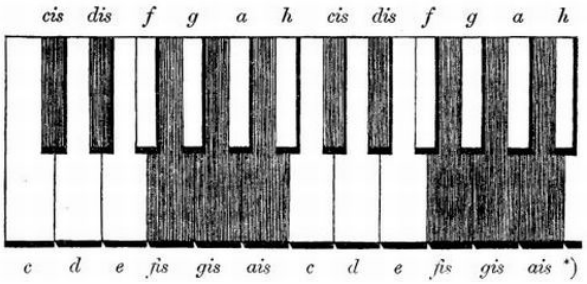


**Figure 6.** New keyboard by Karl Bernhard Schumann, SCHUMANN 1859, p. 11.

Vincent's writing entitled *New Musical System* [Neues musikalisches System] from 1862[41] refers directly to this previous publication. Its intention is to render a more detailed version of the thoughts he had previously introduced. However, the idea of the new keyboard is missing in it. It should take 13 more years, until Vincent finally dedicated a

[31] ANONYMOUS [VINCENT], orig.: "Hätte Ludovico Viadana [(1560–1627)] ahnen können, welcher Missbrauch mit der Zeit erwüchse aus seiner 'stenografischen' Erfindung, er würde sie – unterdrückt haben.", own translation.
[32] Ibid., pp. 3–9.
[33] Ibid., p. 5, orig.: "Progressionen der Einheit", own translation.
[34] Ibid., p. 7f.
[35] Ibid., p. 9.
[36] Ibid., p. 11f.
[37] Ibid., p. 12, orig.: "Es wäre gut, wenn wir für die zwölf Töne Angesichts [sic!] der eingeführten Temperatur auch nur zwölf Namen hätten; es würde der ganze orthografische Apparat, der doch nur am Ende um der Orthografie willen existirt, erspart sein.", own translation.
[38] Ibid.
[39] Ibid., orig.: "Solidarität", own translation.
[40] ANONYMOUS [VINCENT] 1860, p. 27.
[41] VINCENT 1862.

complete work to this topic: *Die Neuklaviatur. Ihre Vorteile gegenüber den Nachteilen der alten* [The new keyboard. Its advantages in comparison to the disadvantages of the old one].[42]

It might be the case that Vincent has been inspired by ideas of other theorists of his time when developing his new keyboard, especially by Karl Bernhard Schumanns *Vorschläge zu einer gründlichen Reform in der Musik* [Suggestions for a fundamental reform in music], published in 1859, one year before Vincent's first writing appeared.[43] Schumanns depiction on page 11 shows some similarities to Vincent's presentation (ill. 04b). Vincent writes that both, he and the physician Karl Bernhard Schumann, living in the small town Rhinow/Mark Brandenburg near Berlin, had invented the new keyboard at the same time, later on admitting that Schumanns writing had been published earlier than his own.[44] In 1843 William A. B. Lunn had already written a paper dealing with a "sequential keyboard", which was nearly identical to Schumann's and Vincent's. Lunn used the pseudonyme Arthur Wallbridge for this publication.[45] A fine overview about the history of the development of new keyboards and systems of notation in the 19th century is given in Otto Quantz' work *Zur Geschichte der neuen chromatischen Klaviatur und Notenschrift* [On the history of the new chromatic keyboard and notation].[46]

The digression on this topic should now be concluded and Vincent's writing from 1862 should return to centre stage. This even more emphatic writing, which he published not anonymously anymore, and in which he states that "a musical Galileo is still missing", once again harshly renounces figured bass.[47] It does however contain some interesting concepts of presenting chords, mainly consisting of three or four notes, on circles.

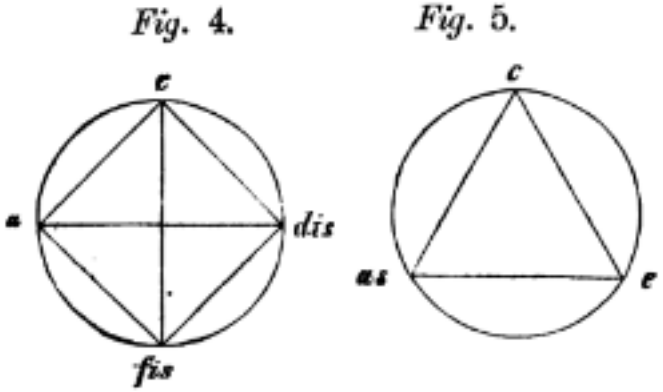


**Figure 7.** Symmetric sounds on circles, VINCENT 1862, p. 25, figures 4 and 5.

Vincent uses the names 'triangle' for the augmented triad and 'square' for the diminished seventh chord – sounds that are symmetric ones in the geometrical sense (see ill. 05). He points out, that the symmetry of the eye does not correspond to the symmetry of the ear.[48] The geometric figures are based on a clock-like system of numbers, representing the twelve tones. As a point of reference, the note *c* is placed at the position of the 'full hours'. A geometric representation of a chord contains, beside its original appearance, all its inversions and – if the circle is revolved – all transpositions, and, of course, all the transpositions of its inversion as well. Furthermore, with such a geometric appearance of a sound, nothing is said about whether the notes it is consisting of are played simultaneously or successively. This way Vincent's figures entail some of the main attributes of an unordered group of notes that later generations of music theorists have called a pitch-class set.

[42] VINCENT 1875.
[43] SCHUMANN 1859.
[44] ANONYMOUS [VINCENT] 1860, p. 26.
[45] WALLBRIDGE 1843.
[46] QUANTZ 1877.
[47] VINCENT 1862, p. IV, orig.: "Der musikalische Galilei fehlt uns noch.", own transl.
[48] Ibid., p. 25.

a)

| c | - | f | - | b | - | es | - | as | - | des | - | ges |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 5 | | 10 | | 15 | | 20 | | 25 | | 30 |
| c | - | g | - | d | - | a | - | e | - | h | - | fis |
| 0 | | 7 | | 14 | | 21 | | 28 | | 35 | | 42 |
| 0 | | 12 | | 24 | | 36 | | 48 | | 60 | | 72 |

b)

| c | - | f | - | b | - | es | - | as | - | des | - | ges |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 5 | | 10 | | 3 | | 8 | | 1 | | 6 |
| c | - | g | - | d | - | a | - | e | - | h | - | fis |
| 12 | | 7 | | 2 | | 9 | | 4 | | 11 | | 6 |
| 12 | | 12 | | 12 | | 12 | | 12 | | 12 | | 12 |

**Figure 8.** Vincent's early description of 'modulo 12 thinking', reproduced after VINCENT 1894, p. 1, figure 1.

Another futuristic aspect of music theory of Vincent's later period shall be mentioned here. In the writing *Ist unsere Harmonielehre wirklich eine Theorie?* [Is our Harmonielehre really a theory?][49] Vincent comes really close to pitch-class set theory by using its system of numbers: 0 for *c*, 2 for *c sharp* or *d flat*, 2 for *d* etc. This way the c major chord, in example, appears not as 1, 3, 5, like in the old system of figured bass, but as 0, 4, 7, representing the set class 3-11. The left part of ill. 06 shows that the addition of the numbers in each column leads to sums that may be divided through twelve, while the right part represents that the number twelve is substracted at each point where number twelve is exceeded, a procedure that is called 'modulo 12' in mathematics and that is, again, one of the basic tools of pitch-class set theory.[50]

The phenomenon of futuristic music theory in the second half of the 19th century was by no means limited to the German-speaking world. The writings of the French custsoms official, music theorist and publicist Anatole Loquin (1834–1903) should also be mentioned here, in particular his *Notions élementaires d'harmonie moderne* [Basic notions of modern harmony][51] and the work entitled *Une révolution dans la science des accords, algèbre de l'harmonie* [A revolution in the science of chords, algebra of harmony].[52] The subtitle of the latter work, *Traité complet d'harmonie modern, sans notes de musique ni signes équivalents, avec des nombres pour représenter les combinaisons harmoniques et des lettres pour exprimer les successions mélodiques* [A complete treatise on modern harmony, without musical notes or equivalent signs, with numbers to represent harmonic combinations and letters to express melodic successions][53] – is revealing with regard to the significance of Loquin's various concepts and intellectual approaches in connection with the emergence of pitch-class set theory.

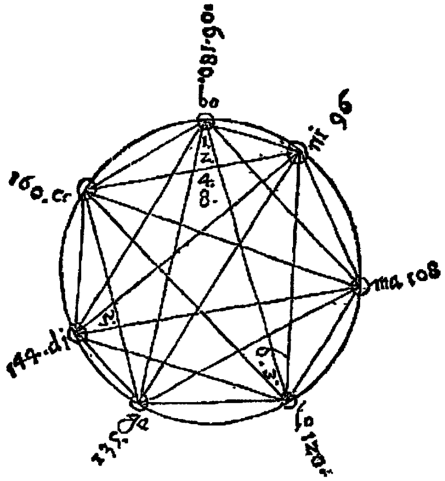

**Figure 9.** Depiction of sounds on a circle-based system after LIPPIUS 1612, f. 3r.

[49] VINCENT 1894.
[50] See also WASON 1988, pp. 62–64.
[51] LOQUIN 1862.
[52] LOQUIN 1884.
[53] Ibid., title page.

Let us return to the circles of Heinrich Josef Vincent, by means of which he systematically graphically depicted sounds and musical material. Such systematisations have existed long before. One of the earliest approaches of this kind was provided by the philosopher, theologian, and music theorist Johannes Lippius (1585–1612) in his *Synopsis musicae novae*[54] (see ill. 07). In terms of its content and methodological approach, Lippius' treatise largely represents a compendium of musical practice that was common at the time it was written. However, the doctrine of double counterpoint, to which many authors devote themselves at the end of similar works, is replaced in Lippius' work by a chapter characterised by revolutionary ideas. His approach is also based on a circular diagram that serves to visualise all possible intervals within the Ionian scale, which in Lippius' work functions as a material background. A line between two tones now results in an interval class in the sense of pitch-class set theory, as it graphically realises both an initial interval and its complementary interval. But Lippius' approach is even more far-reaching: more than a century before Jean-Philippe Rameau's (1683–1764) *Traité d'harmonie*[55], he recognised the sixth chord and the fourth sixth chord as de facto inversions of the triad by describing them as leading to an identical geometric figure.

## Conclusion

The above considerations lead to the conclusion that pitch-class set theory, which originated on the US American continent and subsequently spread worldwide from there, is by no means an original creation, but is inconceivable without historically far-reaching models on the European continent. It is also impossible to imagine its development in the way it took place without reference to global political and technical events. As a result of these events, music theory research is divided into a specifically European and an Anglo-American strand. While the European research community, as a result of the disastrous initial situation in large parts of mainland Europe, tended to be critical of any form of systematics and dogmatics and instead strongly emphasised the individualism of works in music analysis, this reluctance did not exist in North America, which was much less affected by the Second World War. The Schenkerian system for tonal music can become established and institutionalised at US colleges and universities. Schenker's own problematic and highly remarkable relationship to the National Socialist regime can be slowly but steadily depoliticised, as it were, with a sufficient geographical safety distance, and develop in this form. For post-tonal music, the pitch-class set theory, which was available in a teachable form in the 1960s, represented a welcome and very suitable counterpart to layer theory in the university curriculum, especially as Schönberg himself as a source of inspiration (and at least in part probably also to be inspired) was ultimately in the immediate vicinity.

It should be mentioned that Allen Forte, whose 1973 book *The Structure of Atonal Music*[56] is perhaps the best-known internationally recognised standard work of 'classical' pitch-class set theory, was a Schenkerian in his early days. His first book publication dates back to 1955 and is entitled *Contemporary Tone Structures*[57]. One searches in vain for set-theoretical content. Instead, the author deals with the question of how the graphic analysis methods of layer theory can also be applied to post-tonal repertoire. Linear-contrapuntal aspects of the analysed works take centre stage – an aspect to which Forte was to return in his very late publications.[58]

This book publication is spectacular because Forte took an arch-conservative stance in the decades that followed, in the midst of an emerging bitter dispute between the revisionists among the Schenkerians and the traditionalists. The Travis-Forte debate in particular, a verbal dispute between the composer Roy Travis and Forte involving several mutual attacks and counter-attacks, is legendary.[59]

In 2007, I had the honour of exchanging a few emails with Allen Forte, courtesy of Janet Schmalfeldt. In one of these e-mails, Forte casually summarises the gap between the two continents, which remained almost unchanged then as it does today in 2024, when he mentions his former doctoral student Janet Schmalfeldt and her dissertation, which deals with the set-theoretical analysis of Alban Berg's opera Wozzeck: "Janet Schmalfeldt's Wozzeck study was the first (and

[54] LIPPIUS 1612.
[55] RAMEAU 1722.
[56] FORTE 1973.
[57] FORTE 1955.
[58] See for example FORTE 1988 and FORTE 1992.
[59] See for example TRAVIS and FORTE 1974.

still the best) large-scale analysis of a major non-tonal work. I have suggested to Janet that she might do something with Olivier Messiaen's music as well, which I believe remains untouched, since the French seem to be behind the times in analytical matters – although some of the younger scholars have removed the blinders!"[60] This description may sound arrogant at first glance. It was never intended for the public. Nevertheless, it may be true.

However, the French colleagues may not have been exclusively unfamiliar with or interested in pitch-class set theory, or blind to it from Forte's point of view. Rather, the situation in Germany is equally as follows: Publications on pitch-class set theory by German-speaking authors appear comparatively late, their number is extremely small and they are sparsely received.[61] Their supposed lack of musicality and analytical errors are often criticised in specialist circles. Nevertheless, in these times of globalisation and the internationalisation of musicological and music-theoretical discourse, with its growing interest in intercultural and ethnomusicological research, pitch-class set theory has great potential. Depoliticised in its current generation - and hopefully not re-politicised in the context of current global and regional political events - there are many directions in which it can develop further.

This primarily concerns the expansion of their analytical tools: set-theoretical systematics can potentially also be designed beyond the scales of Western music. Algorithms can also be transferred to other musical parameters: To the level of rhythm, timbre, dynamics, articulation, etc. A much larger repertoire of music is waiting to be systematically analysed in a way that is by no means remote from music and ahistorical, and in this way to find its deserved place in the focus of current international discourse.

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Dr. **Stephan Lewandowski** studied music theory and composition at the Hochschule für Musik "Carl Maria von Weber" Dresden. From 2006 to 2012 he worked as a freelance lecturer in music theory at the music universities in Dresden and Weimar. In 2012 he finished his dissertation and received a permanent post at the Hochschule für Musik "Franz Liszt" Weimar. From 2013 to 2015 he also held a substitute professorship in Dresden. Since 2019 he is a senior lecturer for music theory at the Brandenburgische Technische Universität Cottbus- Senftenberg. His current research activities focus on music of Fryderyk Chopin, but also on the analysis of contemporary music.

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[60] FORTE 2007.

[61] See for example LAGALY 1995, SCHEIDELER 2005, SCHMIDT 2009, and LEWANDOWSKI 2017.

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**Research Article**

# A historical and statistical view on Old-Roman, Gallican, and Gregorian Chant

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**Abstract**

In this article, using a sample of 30 cognate Old-Roman and Gregorian proprium chants, support was obtained for the view that the stylistic features that may be assumed to characterize eighth-century Roman chant—such as the presence of tremulous notes and the use of imprecise pitches—are not only recognizable in Old-Roman chant in the form of a greater focus on stepwise melodic motion and a diminished interest in tonality and melodic structure, but also in those Gregorian chants that manifest a high degree of global contour similarity with their Old-Roman counterparts, the latter sometimes assumed to be the descendent of eighth-century Roman chant. It seems clear therefore that the stylistic features of Old-Roman chant do indeed reflect the pulsating, sinuous and tremulous notes in eighth-century Roman chant. For the remaining Gregorian chants with less contour similarity, rather the opposite characteristics were found. So in this case, and still depending on the general hypothesis that Gregorian chant originated from a blend of eighth-century Roman chant and Gallican influences, Gallican melodies appear to be comparatively more important in the shaping of Gregorian chant. Attention was also paid to the work of Hiley and McGee, as these authors offered additional information about the stylistic features of early local Roman chant. In agreement with the above-stated assumption of tremulous notes and imprecise pitches in eighth-century Roman chant, some evidence was finally obtained to corroborate the view that at least the quilisma note in Gregorian chant originated from eighth-century Roman chant.

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## Introduction

Though several conflicting theories do still exist (see, e.g., Cutter, 1967; Levy, 2000), most present-day scholars of monophonic liturgical chant adhere to the hypothesis that what we now call Gregorian chant originated from a blend of eighth-century local Roman chant and Gallican influences (Ober, 2006).[2] There is much to say for this hypothesis, particularly if account is taken of the historical data mentioned below. From a purely musical perspective, however, this hypothesis does not provide much information, because, strictly speaking, nothing is known about the melodies of eighth-century Roman and Gallican chant. However, some scholars have argued that the so-called Old-Roman repertory, which has been preserved in notated manuscripts from the late eleventh to the thirteenth century (Huglo, 1954), must be considered the musical descendant of the eighth-century local Roman chant (Hiley, 1995; Dyer, 1998). Thus, according to Hiley (1995: 562), it is 'highly likely that the Roman chant of the eighth century already had an ornate idiom, in other words, that Old-Roman chant preserves the spirit, if not always the letter, of the eighth-century state'.

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[2] At various places in this publication, we speak of the Gallican liturgy, Gallican chant, and Gallican influences. However, this is a simplification, because it is not possible to speak of an uniform rite. Rather, the Gallican liturgy involves many variations within a general pattern (see Hiley, 1995: 552).

From this perspective, we may even use the known ornamental features of Old Roman chant as a substitute for the unknown ornamentation in eighth-century Roman chant. Others, however, have postulated that the Gregorian melodies, which were notated from the late-ninth century onwards, more closely reflect the eighth-century Roman chant (see, e.g., Lipphardt, 1950; Maloy, 2010). With respect to the Gallican repertory, little can be said with certainty, though it is known that some archaic musical traits in Gregorian chant are still reflective of the musical language of Gallican chant (Nardini, 2018).

In this paper, a statistical study will be presented, based on a sample of 30 cognate Old-Roman and Gregorian proprium chants, to test the hypothesis that those Gregorian melodies that show a high degree of global contour similarity with their Old-Roman counterparts are also stylistically more reminiscent of the Old-Roman repertory. With that aim in mind, several stylistic variables, which mainly refer to *stepwise melodic motion*, will be examined in the present article, as that trait is usually considered to be particularly helpful in discriminating between Gregorian and Old-Roman chant (see, e.g., Snow, 1958). Global contour similarity will be so defined that there is no conceptual overlap with the stylistic features of interest in this study. Sticking to Hiley's (1995) contention that the stylistic features of eighth-century Roman chant were preserved in later Old-Roman chant, support for the just-mentioned hypothesis would also mean support for the view that Gregorian chant originated from eighth-century Roman chant. So, to say something conclusive about the temporal relationship between Gregorian and Old-Roman chant, it is important to find data which corroborates Hiley's position. In those Gregorian chants, which show only little melodic similarity with their Old-Roman counterparts, Old-Roman style characteristics are expected to occur to a lesser degree. Given the view (see above) that Gregorian chant at least partly stems from Gallican chant, we may then infer that Gallican influences are the more important. Finally, support for the notion that Old-Roman chant, because of its stylistic features, is actually 'pre-Gregorian', would also indicate the untenability of Maloy's (2010) conclusion that Gregorian chant equals early Roman chant.

**Historical Data**

The local Roman chant repertory or *cantilena romana* was imported intoFrancia in 754 by Chrodegang, the Bishop of Metz. Chrodegang was delegated to Rome by King Pippin III to accompany Pope Stephen II on his trip to Gaul to ask the king for military assistance against the Lombards, who were threatening Rome. Awaiting Pope Stephen's departure, Chrodegang had every opportunity to observe the Roman celebrations of Mass and Office, which undoubtedly must have made a tremendous impression on him (see Nolthenius, 2009: 104). During his trip to Francia, Chrodegang also became acquainted with the Roman chant and liturgy, for we know that several members of the papal *schola cantorum* formed part of Pope Stephen's travelling party (Ober, 2006: 10). Inspired by these experiences and being aware that the Frankish church before the reign of Peppin was deeply fallen into decay, it comes as no surprise that Chrodegang did everything in his power to introduce the Roman customs in his own country (Claussen, 2004).

***Alignment with the Roman model***

A more or less contemporary description of Chrodegang's efforts to introduce the Roman chant in his own bishopric is presented by Paul the Deacon in his *Liber de Episcopis Mettensibus*, which was written about 784 (Kempf, 2004). Here we are informed that Chrodegang assembled his clergy and made them live on the model of a monastery within the walls of a cloister, where he established for them a rule—how they ought to serve in church. He endowed them sufficiently with victuals and the necessities of life so that, not needing to spend time on transitory matters, they might solely celebrate the Divine Office. When the clergy [probably with the help of the above-mentioned schola cantors] was abundantly imbued in the divinely authorised Roman chant, he prescribed them to observe the custom and ceremonial of the Roman church, which before that time was scarcely done in the Metz Cathedral[3]. It is interesting to note that Chrodegang had no intention to 'monasticise' the clergy, notwithstanding Paul's remark about 'living on the model of a

[3] Hic clerum adunavit, et ad instar coenobii intra claustrorum septa conversari fecit, normamque eis instituit, qualiter in ecclesia militare deberent; quibus annonas vitaeque subsidia sufficienter largitus est, ut perituris vacare negotiis non indigentes, divinis solummodo officiis excubarent. Ipsumque clerum abundanter lege divina Romanaque imbutum cantilena, morem atque ordinem Romanae ecclesiae servare praecepit, quod usque ad id tempus in Mettensi ecclesia factum minime fuit (Monumenta Germaniae Historica, Scriptores (in folio) 2).

monastery'. On the contrary, instead of a group of contemplative monks, he wanted to establish a group of active churchmen around him who were eager to transform the Metz population into a true Christian community. Because Rome was believed to be the source of all authentic Christian traditions, it was only natural to introduce the Roman customs in Metz, including Roman liturgy and chant, in order to create a community of faith and concord in agreement with the perceived unanimity of the apostolic church (see Claussen, 2004: 58, 117, 246).

In other bishoprics of Gaul, similar attempts were made to introduce the Roman chant and liturgy. We know, for instance, from a letter of about 760 written by Pope Paul I and addressed to Pippin III, that Remedius, the bishop of Rouen, was sent the prior of the papal schola cantorum to instruct Remedius' monks how they had to perform the Roman melodies. In the same letter, we are also informed that the Pope had to recall the prior to replace the deceased head of the papal schola, but the Pope assured Pippin III that the same monks, who were now in Rome, would be further trained by the prior (Levy, 2001). Because this schola member was sent to Rouen on Peppin's request, we may safely assume that Peppin himself also was interested in the introduction of the Roman liturgy in his kingdom, perhaps not so much for spiritual reasons, but certainly for political ones.

Under the reign of-Pippin's son Charlemagne, further attempts were made to introduce the cantilena romana in Gaul. For instance, in the *Admonitio generalis* of 789, a collection of 82 directives, Charlemagne urged the clergy 'That they are to learn the Roman chant thoroughly and correctly employ it throughout the night and day offices, as our father of blessed memory, king Peppin, strove to realise when he abolished the Gallican chant for the sake of unity with the Apostolic chair and pacific concord within the holy church of God'[4]. We see here the same care as manifested by Chrodegang in that Charlemagne was convinced about the necessity that the clergy should correct all subjects of the empire toward a Christian ideal, which could be effectuated through alignment with the Roman model (see, e.g., Fried, 2016: 235). To fulfil these aims, royal inspectors—the so-called *missi*—were sent out all over the country to verify whether the clergy adhered to the official directives, including those on liturgy and chant (see, e.g., van Rhijn, 2011).

The abolition of the Gallican liturgy was also explicitly mentioned by Charlemagne in the *Epistola generalis* (786-800) and the *Libri Carolini* of about 790. In the last-mentioned document, for instance, Charlemagne states that the Frankish church, 'While being from the earliest times of faith of the same holy religion as the Roman church, ... [is now] by the care and industry of our most distinguished and most excellent father King Peppin of venerable memory as well as by the arrival in Gaul of the most respectable and holy bishop of the city of Rome, Stephen, also joined to the Roman church in the order of singing, so that the order of singing would not be different from those who share the order of faith and who are united in the sacred reading of the sacred prescriptions'.[5]

***Gallican influences and Roman criticisms***

The documents mentioned thus far do only speak of the willingness of Chrodegang, Pippin and Charlemagne to abandon the Gallican liturgy completely. However, there are several indications that Peppin's and Charlemagne's desire for a liturgical and musical reform, solely based on the Roman rite, was only partly realised. This is already obvious if we realise that between 750 and 800, two important liturgical texts were compiled in Francia, the *Mixed Gelasian sacramentary* and a blended version of the *Ordines Romani*, which both contain Frankish and Roman elements (Ober, 2006). The introduction of these hybrid texts was necessary because for many ceremonies observed in the Gallican church, there was simply no substitute in the Roman liturgical books (Wright, 2008: 61). Moreover, the Gallican practices were probably too deeply rooted to be completely thrown out by superior order.

Two other documents do specifically mention chant. In the first one, entitled *De exordiis* and written by the monk Walahfrid Strabo between 840 and 842, it is still claimed that the musical reform under Pippin 'brought the more perfect knowledge of plain chant, which almost all Francia now loves.' (Harting-Correa, 1996: 168). Nevertheless, Walahfrid

[4] Ut cantum Romanum pleniter discant, et ordinabiliter per nocturnale vel gradale officium peragatur, secundum quod beatae memoriae genitor noster Pippinus rex decertavit ut fieret, quando Gallicanum tulit ob unanimitatem apostolicae sedis et sanctae Dei aecclesiae pacificam concordiam (Monumenta Germaniae Historia, Capitularia regum Francorum I, Leges Capitularia regum Francorum).

[5] Quae dum a primis fidei temporibus cum ea perstaret in sacrae religionis unione ... venerandae memoriae genitoris nostri inlustrissimi atque excellentissimi viri Pippini regis cura et industria sive adventu in Gallias reverentissimi et sanctissimi viri Stephani romanae urbis antestitis est ei etiam in psallendi ordine copulata, ut non esset dispar ordo psallendi, quibus erat conpar ardor credendi, et quae unitae erant unius sanctae legis sacra lectione (Monumenta Germaniae Historia, Concilia, tom. 2, suppl. 1).

also reports that the Gallican church was 'provided with men who were no less skilled [than the Roman cantors], and had a great deal of material for the offices. Some of the Roman offices are said to have been mixed with theirs.' (Harting-Correa, 1996: 166).

The second document, which refers to a mixture of Roman and Gallican chant, is John the Deacon's *Vita Gregorii* of c. 875. In this document, the author informs us that 'The Germans, Gauls and other European peoples might have learned and relearned in a somewhat peculiar way the sweetness of this chant, they were, however, unable to maintain it without distortion. This was due both to carelessness, for they mixed in music of their own with the Gregorian [Roman] chants, and to a native brutishness of their Alpine bodies. With their loud and thunderous voices, they could not correctly capture the musical sweetness of the [Roman] chant. The barbarous coarseness of their thirsty throats, when trying to deal with the inflexions and repercussions of the [Roman] chant, would bring about a roaring sound, just like the confusing racket of a cart upon unequal steps.[6] It is obvious that there is little praise for the Frankish singers in the *Vita Gregorii*. Also of interest, the Roman cantilena is here denoted Gregorian, which is in agreement with the ninth-century legend that Pope Gregory the Great had invented Gregorian chant.

***Roman embellishments***

As mentioned above, about the precise differences and similarities between the eighth-century Roman, Gregorian (or mixed Roman-Gallican) and Gallican melodies, little can be said with certainty. Of some help, however, but unfortunately dating from the same period as the earliest notated Gregorian sources, we have John the Deacon's account in the *Vita Gregorii* of circa 875 (see above) that the Franks had the greatest difficulty with singing properly the *inflexiones* and *repercussiones* of Roman chant. Adémar de Chabannes (see Grier, 2006), in the beginning of the eleventh century, falls back on these remarks, writing that 'All the cantors of the Frankish kingdom have learned the Roman notes which they now call Frankish, except that the French could not perfectly express the tremulous or sinuous notes (*tremulae* or *vinnolae*) and the notes that are to be *elided* or *separated*, being naturally of barbaric voice, and rather cracking their voices in their throats than projecting them'.[7]

What exactly is meant by these designations is not always clear (see, e.g., Hiley, 1995: 562). However, according to a solution presented by McGee (1996, 1998), the inflections and repercussions mentioned by John the Deacon, as well as the sinuous and tremulous notes of Adémar, refer to two currently recognised categories of ornamental neumes—liquescent and repercussive neumes—that were distinguished by Apel (1958: 104) and other scholars. Yet, no direct evidence exists to support these equalisations, and the medieval treatises inspected by McGee (1998: 12) to identify the various ornaments encompass the dates c. 600 to c. 1490. So, at least at first sight, it seems inappropriate to consult all these treatises.

Assuming, however, as McGee (1998: 14) does, that the information contained in later manuscripts is still reflective of the situation in earlier centuries, McGee may be right in claiming that early Roman chant was sung in an Eastern Mediterranean style, characterised by non-diatonic tones, rapid throat articulation, pulsating notes, trills, and indefinite and sliding pitches (see, e.g., McGee, 1998: 127), all of them adding to the inability of the northerners to properly adapt their voices (see also Nolthenius, 2009: 110).

It is difficult to say whether all the embellishments mentioned by McGee really represent the Roman vocal style before say, the ninth century. Moreover, we hardly have any indication which of these Roman ornaments caused serious problems to the Gauls. Fortunately, however, we are rather well-informed about the meaning and musical significance of exactly the *tremula,* and perhaps even of the *vinnola* notes of Adémar, which have led to these problems (see above). As both ornaments were mentioned in the *Musica Disciplina* of Aurelianus Reomensis, a textbook about Gregorian

[6] Huius modulationis dulcedinem inter alias Europae gentes Germani seu Galli discere crebroque rediscere insigniter potuerunt, incorruptam vero tam levitate animi, quia nonnulla de proprio Gregorianis cantibus miscuerunt, quam feritate quoque naturali, servare minime potuerunt. Alpina siquidem corpora, vocum suarum tonitruis altisone perstrepentia, susceptae modulationis dulcedinem proprie non resultant, quia bibuli gutturis barbara feritas, dum inflexionibus et repercussionibus mitem nititur edere cantilenam, natarali quodam fragore, quasi plaustra per gradus confuse sonantia rigidas voces iactat (Patrologiae cursus completus, Series Latinae, 75, col. 90).

[7] Omnes Franciae cantores didicerunt notam Romanam, quam nunc vocant notam Franciscam, excepto quod tremulas vel vinnolas sive collisibiles vel secabiles voces in cantu non poterant perfecte exprimere Franci, naturali voce barbarica frangentes in gutture voces pocius quam exprimentes (Monumenta Germaniae Historica, Scriptores, in folio).

chant written in 849/850 (see Glatthaar, 2011), we may first infer that these Roman embellishments were also used to colour Gregorian chant. Of more importance, it is interesting to note that the tremula was considered in the Musica Disciplina to be a 'tremulous and rising sound', which, given a musical example presented by Aurelianus, certainly referred to what in later manuscripts was indicated by the *quilisma* (Treitler, 1992: 191; Grier, 2006: 70). However, as the French and Germans found the Roman embellishments difficult to sing (see above), it seems likely that the quilisma more recently was executed 'in a more straightforward idiom', no longer emphasizing fine detail (Hiley, 1995: 562). No further explanation was provided by Aurelianus of Adémar's vinnola note. Still in Isidore of Seville's *Sententiae de Musica* (c. 600), the vinnola *vox* was given attention, describing this voice as 'soft', 'light', and 'agile', characteristics which were said by Isidore to reflect the flexible and wavy shape of the 'vinnus' or grapevine. For Müller-Heuser (1963: 69), this resemblance is enough proof for the assertion that these vocal qualities point to the presence of trill-like embellishments in Roman chant. Still, nothing is known about the exact manner of singing of the vinnola note.

***Musical style characteristics and (Old-)Roman chant***

Collectively, the above-mentioned features, as well as other ones, like the absence of a strong focus on melodic lines, are considered to represent the *florid* or *continuous* musical style, which differs greatly from the *discrete* musical style with its emphasis on precise diatonic pitches, larger intervals between individual notes, a primary focus on melodic structure, and neumes that are barely if at all ornamented (see, e.g., Hughes, 2002: 1080; Rankin, 2011). This dichotomy can also be found in Aribo's *De Musica* (11th century), in which we are informed that the cantus in Italy has a greater density ('*spissior*'), whereas the cantus north of the Alps is more open ('*rarior*'), particularly because of the '*saltatrices*, the intervallic leaps, which were avoided in the South or filled in by diatonic steps' (Nolthenius, 1974: 15).

Florid features are also apparent in eleventh- to thirteenth-century Old-Roman chant. Based on descriptions of several authors (e.g., Snow, 1958; Crocker, 1990), McKinnon (2000: 381) summarises the evidence by saying that Old-Roman chant, as opposed to Gregorian chant, can be characterised by 'an overlay of formula and consistently stepwise ornament that is 'monotonous,' 'verbose,' 'redundant' and 'less purposeful' than Gregorian melody, which is more 'compact,' 'definitive,' more 'purposeful' and, to expand upon that last word, more characterised by the 'intense expression of a tonal plan." The last-mentioned trait is considered by McKinnon (2000: 381) to be the main stylistic feature of Gregorian chant.

Though probably not in all respects similar, certain commonalities do exist between the stylistic characteristics of eighth-century Roman and later Old-Roman chant. In particular, the florid and oscillating nature of Old-Roman chant, represented by turning figures and an almost continual stepwise motion, might be understood to reflect the early Roman emphasis on pulsating, sinuous and tremulous notes. Likewise, the Old-Roman preference for melodies that show progression by step may have its early equivalent in the use of indefinite and imprecise or non-diatonic pitches, which also obscure the melodic line. With a chronological gap of at least three centuries, in which further developments of Roman chant may have taken place, stronger relationships can hardly be expected. Nevertheless, we may be pretty sure about these relationships, because theoretical treatises from as late as the thirteenth century still discuss some of the same ornamental figures as mentioned above (see McGee, 1998: 124). So, in our view, it seems likely that eleventh- to thirteenth-century Old-Roman chant grew out of the chant imported in Francia into 754. Hence, we agree with Hiley's (1995) statement (see above) that Old-Roman chant still preserves the spirit, 'if not always the letter' of its eighth-century predecessor. At least, there is no compelling reason to agree with Maloy's (2010: 143) statement that the original Roman melodies were largely forgotten in later times and that the stylistic characteristics of Old-Roman chant are only the product of centuries of oral transmission. If it is true that Gregorian chant originated from a blend of early Roman and Gallican chant, it seems also likely that Gallican chant, perhaps even more than Gregorian chant, is stylistically discrete, and thus may be characterised by a focus on structure and a purposeful tonal plan.

**Statistical Data**

To study the relationship between Old-Roman and Gregorian chant, 30 cognate melodies (only the antiphons) were randomly selected, referring to 10 introits, 10

**Table 1**. Titles of 30 cognate melodies are listed according to proprium type and page number in the Graduale Novum.

| | *GrN* | *cantus* |
|---|---|---|
| IN | 3 | Ad te levavi |
| IN | 11 | Gaudete in Domino |
| IN | 20 | Dominus dixit ad me |
| IN | 43 | Ecce advenit |
| IN | 52 | Misereris omnium |
| IN | 60 | Invocabit me |
| IN | 83 | Laetare Ierusalem |
| IN | 128 | Nos autem gloriari |
| IN | 165 | Resurrexi |
| IN | 216 | Spiritus Domini |
| CO | 6 | Dominus dabit benignitatem |
| CO | 15 | Dicite pusillanimes |
| CO | 23 | In splendoribus |
| CO | 32 | Viderunt omnes fines |
| CO | 46 | Vidimus stellam |
| CO | 59 | Qui meditabitur |
| CO | 69 | Scapulis suis |
| CO | 110 | Pater si non potest |
| CO | 169 | Pascha nostrum |
| CO | 213 | Psallite Domino |
| OF | 5 | Ad te Domine levavi |
| OF | 23 | Laetentur caeli |
| OF | 31 | Tui sunt caeli |
| OF | 45 | Reges Tharsis |
| OF | 58 | Exaltabo te Domine |
| OF | 86 | Laudate Dominum |
| OF | 109 | Improperium exspectavit |
| OF | 168 | Terra tremuit |
| OF | 219 | Confirma hoc Deus |
| OF | 231 | Dextera Domini |

*Note. IN = introitus, CO = communio, OF = offertorium, GrN = Graduale Novum*

communions, and 10 offertories. For the Old-Roman version of these melodies, the *Gradual of Santa Cecilia in Trastevere* (Codex Bodmer 74), dating from 1071, was consulted (see Lútolf, 1987). This Gradual is the oldest one from five extant sources that contain Old-Roman chant, written in Rome between the 11th and the 13th century. For the (melodically corrected) Gregorian melodies, we used the *Graduale Restitutum* compiled by Anton Stingl, which is published on the internet (see http:/www.gregor-und-taube.de). Though not referring to a particular manuscript, this Gradual can be said to reflect the earliest Gregorian melodies, based as it is on the oldest adiastematic manuscripts from the 10th century as well as on the most important diastematic witnesses from the 11th century (see the *Preface* in the melodically corresponding *Graduale Novum* of 2011). So, the 30 cognate melodies as contained in our sample make the earliest melodic rendition possible of both the Old-Roman and the Gregorian proprium chants.

The 30 chants—classified according to proprium type—are listed in Table 1 in order of their page numbers in the *Graduale Novum*. As we will see below, the chants were scored for several variables, some of them characterised by a focus on stepwise melodic motion, supposed to be particularly present in Old-Roman chant, and others representing McKinnon's (2000) claim about the occurrence of some specific tonal clusters in Gregorian chant. Moreover, attention will be paid to the view (see above) that the execution of the *quilisma* note in Gregorian chant actually was derived from early Roman chant.

The investigation presented in this paper is not the first one based on cognate Old-Roman and Gregorian melodies. For instance, in a recent investigation by Maloy (2010), 94 cognate melodies were studied, comprising the whole set of offertory chants in the liturgical year. However, as we are also interested in other types of proprium chant, we opted for a different data set, previously established by Van Kampen (2020), which includes both offertories, introits and communio chants. We also decided to make no use of the five levels and the underlying continuum introduced by Maloy

(2010: 106), with scores ranging from 1 (= strongly related) to 5 (= completely dissimilar), to describe the similarities and differences between Old-Roman and Gregorian chant. Of course, Maloy (2010) is right if she insists that the Old-Roman offertory verses are often based on formulaic patterns or that the Gregorian melodies are more expensive in range and show more individuality in their melodic contours, but her reliance on these characteristics, as well as on other features like the greater presence of formulae in the later parts of the liturgical year, the mode of the melody, and the formula's association with syntactical rules or word accent, makes her continuum more a kind of *latent variable* with different traits loading on it. It remains, therefore, unclear—as Maloy (2010: 106, 110) herself admits—how these different traits are weighted to arrive at a particular score for a certain chant. One additional reason to sustain from Maloy's approach has to do with her principal interest in *structural* criteria (like melodic range and tonal structure), rather than in stylistic features (such as the tendency towards stepwise melodic motion). While it is understandable, therefore, that Maloy prefers to analyse her sample on a *phrase-by-phrase* basis, without paying much attention to individual syllables (see Maloy, 2010: 107), such a procedure appears to be less appropriate for the testing of our hypothesis, stated in the Introduction, that those Gregorian melodies that show a high degree of melodic similarity with their Old-Roman counterparts are also *stylistically* more reminiscent of the Old-Roman repertory. Though, of course, not denying the possibility of a structural analysis on a phrase-by-phrase basis,[8] our criteria are primarily syllable-dependent.

***D as a measure of global contour similarity***

In our approach, we used an index (D) to measure the degree of contour similarity between both versions of a cognate melody. As already indicated above, this measure takes the individual neume or syllable as the basic unit of interest when dividing a particular melody into separate parts. 'Similarity' and 'difference', then, are put into a theoretical framework, as the correlations found by Van Kampen (2017) between text and neume duration in Gregorian chant do clearly 'converge with the emphasis placed by Agustoni and Göschl (1987) and Cattin (1984) on the (sacred) word as the ultimate factor through which the syllables exert their influence.' Indeed, Gregorian chant is characterised by Cardine (1975: 33) as "parole chantée".

Realising that, in the case of exactly the same melody, the pitches of the Old-Roman version correlate $r = 1$ with the pitches of the Gregorian version, a high degree of contour similarity may be expected if the MIDI values related to, say, the highest notes in both series of neumes per chant prove to be strongly proportional to each other.

In estimating the degree of contour similarity for each pair of cognate melodies, we did not only register the MIDI values of the highest note (H) in both series of neumes for a particular chant, but also the values of the lowest note (L), the first note (O), and the last note (E) of these neumes. Moreover, for each of the 30 cognate melodies, the mean (M) of these values was calculated, because M seemed to us a more dependable index compared with H, L, O and E. In our sample of 1207 neumes, the Pearson product-moment correlations among the variables H, L, O, E and M proved to be very substantial, with coefficients ranging between $r = 0.80$ and $r = 0.95$ in the Old-Roman series of neumes, and between $r = 0.83$ and $r = 0.96$ in the Gregorian series. After calculating the product-moment correlations between both series of M values for each individual chant, these correlations were squared and added up to obtain D, the so-called coefficient of determination. The scores on D may vary from 0 (= no similarity in contour) to 100 (= perfect similarity).

[8] Compared with Maloy (2010), there are other, more objective algorithms that may be used to segment a particular melody (see, e.g., Cambouropoulos & Tsougras, 2004; Cenkerová, 2017).

**Table 2**. D values for the 30 cognate melodies, ordered from low to high

| | *GrN* | | *D* |
|---|---|---|---|
| IN | 3 | Ad te levavi | .102 |
| IN | 216 | Spiritus Domini | .250 |
| OF | 45 | Reges Tharsis | .260 |
| OF | 58 | Exaltabo te Domine | .281 |
| OF | 219 | Confirma hoc Deus | .292 |
| OF | 31 | Tui sunt caeli | .325 |
| OF | 168 | Terra tremuit | .348 |
| IN | 60 | Invocabit me | .360 |
| OF | 86 | Laudate Dominum | .372 |
| IN | 20 | Dominus dixit ad me | .423 |
| CO | 46 | Vidimus stellam | .476 |
| CO | 69 | Scapulis suis | .476 |
| OF | 231 | Dextera Domini | .476 |
| CO | 23 | In splendoribus | .504 |
| OF | 5 | Ad te Domine levavi | .518 |
| IN | 83 | Laetare Ierusalem | .533 |
| IN | 165 | Resurrexi | .563 |
| IN | 43 | Ecce advenit | .563 |
| OF | 109 | Improperium exspectavit | .563 |
| IN | 128 | Nos autem gloriari | .656 |
| IN | 52 | Misereris omnium | .672 |
| CO | 169 | Pascha nostrum | .690 |
| IN | 11 | Gaudete in Domino | .740 |
| CO | 32 | Viderunt omnes fines | .757 |
| CO | 110 | Pater si non potest | .774 |
| CO | 15 | Dicite pusillanimes | .792 |
| CO | 6 | Dominus dabit benignitatem | .792 |
| CO | 59 | Qui meditabitur | .792 |
| OF | 23 | Laetentur caeli | .810 |
| CO | 213 | Psallite Domino | .846 |

*Note. IN = introitus, CO = communio, OF = offertorium, GrN = Graduale Novum*

Table 2 presents the D values for the 30 cognate melodies, ordered from low to high. D has a mean value of 0.53 and a standard deviation of 0.20. The median D value is also 0.53. Of the melodies with D scores ≥ 0.50, 6 are introits, 8 communions and 3 offertories. In the group melodies with lower D scores, these figures are 4, 2 and 7, respectively. It is interesting to note that the correlation between Maloy's (dis)similarity scores (see Maloy, 2010: Table 3) and the D values of the 10 cognate melodies that are also studied by Maloy (2010) is -0.48. Though in line with expectations, this correlation is not significant ($p$ = 0.16), due to the limited number of observations. Moreover, the Old-Roman offertories investigated by Maloy differ to some extent from the melodies in the present study, also suppressing the correlation.

***Stylistic differences between Old-Roman and Gregorian chant***

To investigate whether Gregorian chants with D values ≥ 0.50 are stylistically more reminiscent of Old-Roman influences, the above-mentioned notion was followed that the eighth-century Roman emphasis on pulsating, sinuous and tremulous notes finds its Old-Roman analogue in the presence of neumes that are characterised by a focus on stepwise motion.

Only selecting those Gregorian and Old-Roman neumes which contain 2 or more notes, *the percentage of stepwise motion* (Psw) in each neume was calculated by

- first registering the number of diatonic steps between adjacent notes,

● then dividing that number by the total number of notes in the neume minus 1, ● and finally multiplying the outcome of that division by 100.

In the six-note neume *F G a G F G*, for instance, the number of diatonic steps between adjacent notes is 5 (*F-G*, *G-a*, *a-G*, *G-F* and *F-G*), the fraction amounts to 5 / (6 - 1) = 1, and Psw = 100. For the six-note neume *d c d c c G*, the number of diatonic steps is 3 (*d-c*, *c-d*, *d-c*), the fraction is 3 / 5 = 0.6, and Psw = 60. Note that no allowance is made for adjacent notes with the same pitch (c-c in the example).

In the 819 Gregorian neumes with 2 or more notes, the number of notes ranges from 2 to 25, with a median value of 3. The number of notes in the 947 Old-Roman neumes with 2 or more notes ranges from 2 to 27, with a median value of 4. In the group Gregorian neumes with at least 2 notes, Psw has a mean of 66.71 and a standard deviation of 37.65. The mean and standard deviation of Psw in the group of Old-Roman neumes with at least 2 notes are 82.06 and 26.15, respectively. The minimum Psw value in both groups is 0 per cent, the maximum is 100.

After having calculated the Psw values for all Gregorian and Old-Roman neumes with at least 2 notes, t-tests were applied to investigate whether the Old-Roman Psw values are indeed higher than the Gregorian Psw values, thus showing, as expected, more stepwise progression in the Old-Roman neumes. Separate t-tests were run for neumes with different numbers of notes, starting with neumes of 2 notes. However, no analyses were executed for neumes with 8 notes or more, because these neumes ~~do~~ only occur with very low frequencies in Gregorian or Old-Roman chant or both. All analyses were carried out one-sided, using a significance level of 5 percent. Levene's F-test was used to determine whether we had to make allowance with differences in the variance between groups.

**Table 3**. T-tests of Gregorian and Old-Roman style variables in various samples of Gregorian and Old-Roman neumes.

| Variable | Sample | N | Mean | Sd | t | p |
|---|---|---|---|---|---|---|
| Psw-2 | Gr | 272 | 72.79 | 44.58 | -1.96 | 0.024 |
| | OR | 219 | 80.37 | 39.81 | | |
| Psw-3 | Gr | 195 | 64.87 | 39.12 | -4.84 | 0.000 |
| | OR | 208 | 81.01 | 27.14 | | |
| Psw-4 | Gr | 140 | 55.95 | 31.80 | -7.31 | 0.000 |
| | OR | 125 | 80.27 | 20.34 | | |
| Psw-5 | Gr | 85 | 70.88 | 27.24 | -2.46 | 0.010 |
| | OR | 107 | 78.97 | 18.22 | | |
| Psw-6 | Gr | 47 | 62.98 | 30.92 | -5.42 | 0.000 |
| | OR | 84 | 85.24 | 16.17 | | |
| Psw-7 | Gr | 34 | 72.06 | 23.47 | -3.73 | 0.001 |
| | OR | 48 | 88.19 | 15.74 | | |
| RE-FA | Gr | 1207 | 0.15 | 0.48 | -0.73 | 0.234 |
| | OR | 1198 | 0.16 | 0.44 | | |
| LA-UT | Gr | 1207 | 0.10 | 0.36 | 1.75 | 0.040 |
| | OR | 1198 | 0.08 | 0.29 | | |

*Note. Gr = Gregorian neumes, OR = Old-Roman neumes*

Table 3 lists the means and standard deviations of the Psw scores for Gregorian and Old-Roman neumes of 2 - 7 notes. The *t* values and their *p* values for the differences between these means are also shown. Furthermore, Table 3 lists similar data for the variables RE-FA and LA-UT, which refer to the main intervals in two pitch sets or tonal clusters that, according to McKinnon (2000: 382), are frequently encountered in Gregorian chant. These intervals were scored 1 or 0, depending on their presence or absence. Should the interval *D-F* or *a-c* extend over two syllables (for instance, *a* on the first and *c* on the last syllable of the word *Deus*), the value 1 was only applied to the first of both syllables and neumes.

As is clear from Table 3, all variables, except RE-FA, behave as expected. That is, the means of all Psw variables are in line with the expected greater focus on direct stepwise motion in Old-Roman chant compared with Gregorian chant. Though the difference between the means of RE-FA did not attain significance, the LA-UT difference offered some support for McKinnon's (2000) statements about the importance of particular tonal clusters in Gregorian chant.

***Stylistic differences between the two kinds of Gregorian chant***

Having established several style variables that may assist in the discrimination of Old-Roman and Gregorian chant, the same variables were also investigated by means of t-tests in *two subsamples of Gregorian chant*, namely

- a subsample of those Gregorian chants in our study with D values lower than D = 0.50 (GrDL),
- and a subsample of Gregorian chants with D values above or equal to 0.50 (GrDH).

Of course, this was done to investigate the hypothesis that some Gregorian melodies are stylistically more reminiscent of eighth-century Roman influences (believed to be still discernible in eleventh- to thirteenth-century Old-Roman chant), whereas other Gregorian chants are more reminiscent of Gallican influences. However, as both subsamples contain Gregorian chant (and thus are stylistically opposed to Old-Roman chant), the differences between the two groups can only be expected to be slight or even absent. McKinnon (2000: 400) could therefore be right in his claim that 'there are no instances in the entire Gregorian repertory of the characteristic oscillating Roman figuration—neither in the gradual nor in the other items of the Mass Proper.'

**Table 4**. T-tests of Gregorian and Old-Roman style variables in two samples of Gregorian chant with D scores < 0.50 and D scores ≥ 0.50, respectively.

| Variable | Sample | N | Mean | SD | t | p |
|---|---|---|---|---|---|---|
| Psw-2 | GrDL | 109 | 74.31 | 43.89 | 0.46 | 0.324 |
| | GrDH | 163 | 71.78 | 45.15 | | |
| Psw-3 | GrDL | 77 | 53.25 | 41.63 | -3.44 | 0.001 |
| | GrDH | 118 | 72.46 | 35.56 | | |
| Psw-4 | GrDL | 76 | 54.82 | 34.30 | -0.46 | 0.322 |
| | GrDH | 64 | 57.29 | 28.77 | | |
| Psw-5 | GrDL | 39 | 70.51 | 28.60 | -0.11 | 0.455 |
| | GrDH | 46 | 71.20 | 26.34 | | |
| Psw-6 | GrDL | 24 | 50.83 | 26.36 | -2.98 | 0.003 |
| | GrDH | 23 | 75.65 | 30.72 | | |
| Psw-7 | GrDL | 15 | 63.33 | 27.60 | -2.01 | 0.027 |
| | GrDH | 19 | 78.95 | 17.43 | | |
| Psw-all | GrDL | 362 | 62.61 | 38.33 | -2,72 | 0.004 |
| | GrDH | 457 | 69.80 | 36.93 | | |
| RE-FA | GrDL | 514 | 0.18 | 0.56 | 1.78 | 0.038 |
| | GrDH | 693 | 0.13 | 0.41 | | |
| LA-UT | GrDL | 514 | 0.14 | 0.40 | 2.95 | 0.002 |
| | GrDH | 693 | 0.08 | 0.32 | | |

*Note. GrDL = Gregorian neumes in chants with low D scores, GrDH = Gregorian neumes in chants with high D scores*

However, as Table 4 makes clear, McKinnon's (2000) claim is unjustified. It is true, no significant differences exist between the means of Psw2, Psw4 and Psw5 in both groups of Gregorian chant (which is not amazing), but for Psw3, Psw6 and Psw7, as well as for RE-FA and LA-UT, the differences confirm our hypothesis. Moreover, except for Psw2, the differences are in the right direction, with higher means in GrDH. Still, the reason remains unclear why particularly, the means of Psw3, Psw6 and Psw7 led to significant results.[9] It is also of interest that if the Psw values associated with all 25 distinct syllables are combined, resulting in scores on Psw-all (see Table 4), the difference between both samples is also apparent, with a higher mean in the GrDH sample. So, at least generally speaking, the hypothesis that Gregorian chants with high D scores reflect Roman stylistic influences is corroborated. [10]It is further reassuring that the variable RE-FA that did not attain significance in the above-mentioned comparison between Old-Roman ~~an~~ and Gregorian

[9] However, it remains reassuring that the negative correlations between the various Psw variables, on the one hand, and the combination of scores on RE-FA and LA-UT turned out to be significant in 5 out of 6 cases, thus demonstrating their common nature.

[10] In this context, it is also of interest that no support was obtained for the alternative, conflicting hypothesis that Old-Roman chant, if characterised by high D scores, grew out of Gregorian chant. Relying on the same Psw, RE-FA and LA-UT variables as listed in Table 4, but now representing the scores in the two Old-Roman subsamples based on D, no significantly higher means on RE-FA and LA-UT were found in the subsample of Old-Roman chants with D ≥ 0.50, as well as no higher Psw means in the subsample of melodies with D < 0.50.

chant, now led to significant results.

***The tremula or quilisma note***

In the last-mentioned series of t-tests, the D score was used to make a distinction between Gregorian chants that were postulated to be primarily of Gallican origin (subsample GrDL) and Gregorian melodies that primarily have a Roman background (GrDH). So, if it is true that the *quilisma* sign was already executed in early Roman chant, one should observe a greater proportion of this note (here denoted Qu) in subsample GrDH compared with GrDL. However, by only investigating the quilisma, no attention is paid to such ornamental notes as the *oriscus*, the *salicus* and the *pes quassus*, which, given their very shape, may refer to similar trill-like notes in eighth-century Roman chant as the tremula. Indeed, in the notation of Chartres 47 and several other manuscripts, the sign for the oriscus note was found by Jeannin (1925: 207) to indicate the quilisma as well.

Scoring the Gregorian neumes in the samples GrDH and GrDL for the presence (1) or absence (0) of the quilisma (Qu)—or of the quilisma in combination with the oriscus (QuOr)—one-sided t-tests were applied to investigate the hypothesis that the quilisma, or the quilisma plus the oriscus, actually stems from early Roman practice.

**Table 5**. T-tests applied on Qu and QuOrin in two samples of Gregorian chant with D scores < 0.50 and D scores ≥ 0.50, respectively.

| Variable | Sample | N | Mean | Sd | t | p |
|---|---|---|---|---|---|---|
| Qu | GrDL | 593 | 0.04 | 0.20 | -1.55 | 0.061 |
| | GrDH | 614 | 0.06 | 0.24 | | |
| QuOr | GrDL | 593 | 0.10 | 0.30 | -1.79 | 0.037 |
| | GrDH | 614 | 0.13 | 0.34 | | |

*Note. Qu = quilisma, QuOr = quilisma + oriscus, GrDL = Gregorian neumes in chants with low D scores, GrDH = Gregorian neumes in chants with high D scores*

As Table 5 illustrates, the mean scores on Qu are not significantly different, but with a $p$ value as low as $p = 0.061$, the results do at least approach significance. For QuOr, however, the results proved exactly as anticipated. Of equal importance is the finding that the scores on Qu (and to a lesser degree on QuOr) turned out to correlate positively and significantly with the various Psw scores, with $r$ values for Qu between $r = 0.23$ and $r = 0.55$. This agrees well with the trembling nature, often assumed to characterize the quilisma note. Perhaps not in all respects, therefore convincing, these findings may at least offer some support for the view that the quilisma note in Gregorian chant ultimately stems from early Roman chant

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**Research Article**

# Analysis of sentence structures in Uzzâl oud taksim of Cinuçen Tanrikorur

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**Abstract**

The most important building block of the plot in taksim is taksim sentences. The sentence structures that gather the musical expression power of the performer are examined and evaluated within the formal elements of a form. Cinuçen Tanrıkorur's Uzzâl taksim was evaluated as a composition, and sentence structures within the sections were revealed and analyzed. The research was based on the document analysis method. In the determination and analysis of sentence structures in the Uzzâl taksim from a theoretical perspective, Akdoğu's (1996) "Form Detection" method was used. Accordingly, Uzzâl taksim was analyzed within the framework of 5 criteria determined as the motifs, clauses and sentence structures used, frequently used meter, motif and sentence structures, length and shortness of sentence structures, melodic connection and evaluations between sentence structures, and factors that constitute the aesthetic beauty and artistic value in taksim. In the research, it was concluded that Uzzâl taksim is divided into introduction-development-conclusion sections, each section contains unique sentence structures within itself, transitions between sections are clearly shown in taksim, rhythms and motifs that emphasize the musical identity of the performer are frequently used, question-answer motifs and sentence structures are present throughout the taksim and based on all these, Cinuçen Tanrıkorur took into consideration the elements of aesthetic beauty and artistic value in Uzzâl taksim.

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## Introduction

In musical works, sentence, clause, motif, and discourse are structures that belong to formal elements. A sentence constitutes a melodic whole and, when performed, creates a sense of closure. It is explained as *"a phrase made of one or several melodic pieces that is musically meaningful in itself"*(Öztuna, 2000:57). A clause, on the other hand, is a structure that occurs when the melodic progression pauses on an important pitch within the modal flow. Akdoğu (1996) states that a sentence is formed by at least two clauses, and that these structures take shape in a question-and-answer form (p. 55). Within the clause structures, there are motifs, referred to as the "smallest musical idea." A clause may consist of a single motif or several motifs (Akdoğu, 1996:54). Discourse, first introduced by Akdoğu (1996), is used to describe sentence structures that do not contain a clause (p. 58).

Sentence structures are divided into two categories: full cadence and half cadence. While sentences always create a sense of closure, this sense sometimes manifests as a complete ending, and sometimes as a closure that may or may not continue. Based on this effect, sentences are classified as full cadential and half cadential. Akdoğu (1996) defines

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sentences ending on the tonic of the mode as "full cadential," and those that end on the dominant as "half cadential" (pp. 56–57).

In a musical work, sentence structures are the points where the power of expression emerges for the composer or performer. Within the whole of the piece, sentences are the only places where the composer's original expressions appear, and where characteristic features and musical identity converge. Features such as the length or brevity of the sentences, their construction in a question-and-answer form, and their design to avoid monotony for the listener further increase their importance and draw attention to them.

One of the melodic and improvisatory forms of Classical Turkish Music, taksim, offers a particularly rich field in terms of sentence structures. While it has its own set of rules, taksim also provides performers with a space for free creativity. The most important factor in making taksim effective and appealing to listeners lies in musical sentences. Regarding the performer's ability to create original sentences and enrich their improvisation, Yavaşça (1982) noted that monotonous and repetitive melodies were often preferred, thereby highlighting the importance of sentence structures (p. 9). Similar to composed works, the taksim form is divided into introduction–development–conclusion sections, thereby acquiring the characteristics of a composition. The segmentation of taksim itself, along with the analysis of the sentences, clauses, and motifs within each section, reveals the formal features of the taksim form.

Formal elements also include the study of the features that reveal the aesthetic beauty and artistic value of a taksim. Akdoğu (1996) defines these elements as the composer's ability to create melodies, methods of developing motifs and melodies, the appropriate use of modulations and flavors, and prosody in vocal works (p. 51). In addition, adherence to the mode, the progression of the melodic flow, and the performer's technical approach to their instrument may also be mentioned. It is believed that all of these characteristics in taksim should be considered as contributing factors in the formation of sentences.

In this study, the sentence structures identified in Cinuçen Tanrıkorur's *Uzzâl taksim* will be analyzed. Tanrıkorur (1938–2000) was a composer, oud virtuoso, musicologist, and lyricist, and is regarded as one of the prominent figures in Turkish music. Both his composed works and the melodic richness and originality of his improvisations have always attracted attention, influencing not only the performers of his own era but also those of later generations. Beyond being an oud performer, the fact that he performed his own vocal works and presented original performance examples led to his recognition as a contemporary minstrel of the 20th century (Özdemir; Öner, 2011: 326). Tanrıkorur also authored numerous articles and books as a musicologist. Among them, his work *Ottoman Period Turkish Music* provides detailed explanations of Turkish music forms and modal descriptions. In this work, Tanrıkorur defines the taksim form as follows:

> *"It is an improvised composition performed by an instrumental artist in a specific mode. This composition, which is easily recognized as not being a known piece, is subject to the creative artist's authority in terms of melodic structure, rhythm, and duration. Since taksim requires advanced instrumental technique, extensive knowledge of modes, as well as superior compositional and timing ability, it is the most difficult form of instrumental music. It is a noble expression in which the instrumental artist rises from the level of a performer interpreting a known piece to the level of a creator who transforms their inner world into artistry on their instrument."* (Tanrıkorur, 2003: 51)

In this description, Tanrıkorur places special emphasis on the creative process in taksim, which is highly significant for the subject of this study. It is understood that an original expression must be revealed during this creative process. Thus, the emergence of all the elements that make a composition unique is said to pave the way for the instrumentalist's inner world—that is, their musical expressions—to achieve melodic unity.

**Conceptual Framework**

In this study, Cinuçen Tanrıkorur's *Uzzâl* oud taksim was analyzed in terms of sentence structures. The analysis determined that the modal characteristics of *Uzzâl* played a significant role in the formation of sentence structures. It is important to identify and illustrate the modal features that directly influence sentence formation and analysis, such as the initial pitch of the mode, the melodic range, the key pitches in the progression, and the final pitch. Furthermore, it is considered that the limitation placed on the modal characteristics of *Uzzâl* is sufficient for the scope of this research.

The historical definitions of the *Uzzâl* mode provided by theorists are presented in Table 1 within the framework of the aforementioned modal features.

**Table 1.** The Uzzâl Mode in Kantemiroğlu, Seyyid Mehmed Emin, Artin, Hızır Ağa, Abdülbâki Nâsır Dede, Hâşim Bey, Kâzım Uz, Saadeddin Arel, Suphi Ezgi, Ekrem Karadeniz, and Fikret Kutluğ

| Uzzâl Mode | SP | PRUR | PRUL | PWCO | FCP |
|---|---|---|---|---|---|
| Kantemiroğlu (Tura, 2001, s.79,80) | Dügâh | Tiz Hüseyni | Kaba Uzzâl | - | Dügâh |
| Tanbûrî Küçük Artin (Popescu-Judetz, 2002, s. 36) | Hüseyni | Gerdâniyye | - | Hüseyni, Gerdâniyye | Dügâh |
| Abdülbâki Nâsır Dede (Tura, 2006, s. 47) | Hüseyni | Gerdâniyye | - | Uzzâl | Dügâh |
| Hâşim Bey (Tırışkan, 2000, s. 66) | Uzzâl | - | - | - | Dügâh |
| Kâzım Uz (Uz, 1964, s. 61) | Uzzâl | - | - | - | Dügâh |
| H. Saadeddin Arel (Arel, 1993, s. 192) | Dügâh | Muhayyer | - | Hüseyni | Dügâh |
| Suphi Ezgi (Ezgi, 1933, s. 54) | Nevâ, Dügâh | Muhayyer | - | Nevâ | Dügâh |
| Ekrem Karadeniz (Karadeniz, 1965, s. 128) | Hicâz, Nevâ | - | - | Hicâz, Nevâ, Hüseyni | Dügâh |
| Fikret Kutluğ (Kutluğ, 2000, s. 309) | Hüseyni | Tiz Hüseyni | - | Hüseyni, Nim Hicâz, Dik Kürdî | Dügâh |

**SP:** Starting Pitch **PRUR:** Pitch Reached in the Upper Register **PRUL:** Pitch Reached in the Lower Register **PWCO:** Pitches Where Cadences Occur **FCP:** Final (Cadential Pitch)

As seen in Table 1, the Uzzâl mode resolves on the dügâh pitch. It begins on the dügâh or hüseynî pitch and forms its initial melodic movements around the hüseynî pitch and its vicinity. In the course of the mode, cadences are shown on the hüseynî pitch with the use of the evç pitch. In addition, the dügâh pitch, aside from being the finalis, gains importance within the melodic progression, and cadences on this pitch are frequently presented with Hicâz intervals.

A particularly noteworthy aspect is the use of the Uzzâl pitch in the modal progression. Kantemiroğlu describes this pitch as a nim note between nevâ and çargâh (Tura, 2001: 79). In various descriptions, it is referred to as C♯ (do#), Uzzâl, or Nim Hicâz. It is understood that this pitch also plays an important role in cadences within the progression. In some definitions, the nevâ pitch is emphasized; however, the use of hüseynî and uzzâl pitches predominates.

The modal progression of Uzzâl extends up to tiz hüseynî in the upper register, while in the lower register it does not descend below dügâh.

### Significance of the Study

This research is the first study to analyze sentence structures in Cinuçen Tanrıkorur's *Uzzâl taksim*, which makes it significant. Furthermore, in taksim analysis studies, bringing musical sentences—fundamental building blocks in granting the form its compositional quality—to the forefront, understanding the construction, and thus evaluating the taksim as a whole is extremely important. In this study, the identification of the sections of the *Uzzâl taksim*, the determination of sentence structures, and their analysis revealed the general construction, seeking to answer the question of why listeners are deeply affected by taksim. In this respect, the research also serves as an important example for future taksim analysis studies.

### Purpose of the Study

The purpose of this study is to analyze the sentence structures in Cinuçen Tanrıkorur's *Uzzâl taksim* within the framework of five identified criteria. Another aim of the research is to re-evaluate the analyzed sentence structures within the scope of elements that form the aesthetic beauty and artistic value of the taksim, thereby revealing their effects on the overall construction of the performance. The problem at the core of this research is the analysis of sentence structures in Cinuçen Tanrıkorur's *Uzzâl* oud taksim.

## Method

### Research Model

The study was designed within a qualitative research model. In the study, information was obtained through a literature review concerning Cinuçen Tanrıkorur's improvisations and the formal analysis of musical forms, focusing on the segmentation of works and the identification of motifs, clauses, and sentences within sections. Based on the formal characteristics of Cinuçen Tanrıkorur's Uzzâl taksim, the identified sentence structures were analyzed within the framework of five established criteria.

**Data Collection and Analysis**

In the study, Cinuçen Tanrıkorur's Uzzâl oud taksim, which he performed as an introductory taksim, was divided into sections and analyzed in terms of sentence structures. The Uzzâl taksim, by containing introduction, development, and conclusion sections, takes on the quality of a composition, and the length and clarity of its sentence structures allow for the findings of the analysis to be obtained in a reliable manner. The fact that the Uzzâl taksim had not been previously examined in another study with regard to sentence structures and analysis was also a factor in its selection. The taksim, notated in the Bolahenk tuning system, was transcribed using Windows Media Player and written out with the aid of the Muse Score 3.0 notation software.

A review of the literature on the taksim form was carried out, and it was determined that taksim itself is also divided into introduction, development, and conclusion. In order to determine how the taksim is segmented, how sentence structures are constructed within each section, and what characteristics they carry, Akdoğu's (1996) "Form Identification" method was used. In the taksim, the introduction, development, and conclusion sections were marked with capital letters (A-B-C), while the musical sentences identified within the sections were shown with lowercase letters (a-b-c-d). The clauses identified within the sentence structures were marked with numbers next to the letter of the sentence they belonged to (a1-a2-a3). In the taksim, which was divided into introduction, development, and conclusion, each section was analyzed separately, and it was determined in which section or sections the sentence structures were located. Five criteria were established for the analysis of sentence structures. These criteria are presented below in list form:

- Identification of motifs, clauses, and sentence structures in the Uzzâl taksim
- Frequently used rhythms, motifs, and sentence structures in the Uzzâl taksim
- The length or brevity of sentence structures in the Uzzâl taksim
- Melodic connections and evaluations between sentence structures in the Uzzâl taksim
- Factors creating the aesthetic beauty and artistic value in the Uzzâl taksim

For the theoretical framework of the study, descriptions of the Uzzâl mode by theorists were examined, and these descriptions were presented in table form, limited to elements that explain the modal progression. Based on the common points in these descriptions, the general progression of the mode was revealed. The conceptual framework thus constructed formed the basis for the interpretation of the findings.

## Findings

Identification of Motifs and Sentence Structures in Cinuçen Tanrıkorur's Uzzâl Taksim

In the study, the introduction, development, and conclusion sections of the Uzzâl taksim were identified. Each section, organized to ensure structural coherence, contains sentence, clause, motif, and discourse structures, and the identification of these reveals the formal features of the taksim. The formal identification that emerged in the Uzzâl taksim is presented in Figure 1.

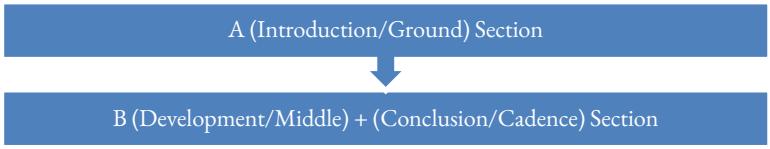



**Figure 1**. Formal Identification in the Uzzâl Taksim

The formal structure of the Uzzâl taksim is presented in Figure 2.

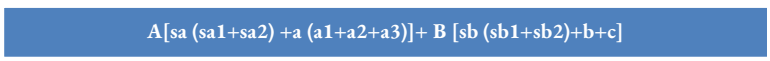



**Figure 2.** Formal Structure of the Uzzâl Taksim

Identification of Sentence Structures in the A [sa (sa1+sa2) + a (a1+a2+a3)] (Introduction/Ground) Section of the Taksim

In the A section, that is, the introduction of the taksim, 2 discourse structures and 1 sentence structure were identified. Within the identified sentence structure, 3 clause structures are present. The first discourse is marked as (s1), and the second discourse is marked as (s2). The identified sentence structure is marked as (a). The clauses within the sentence structure are shown with numbers placed next to the letter representing the sentence, namely (a1), (a2), and (a3).

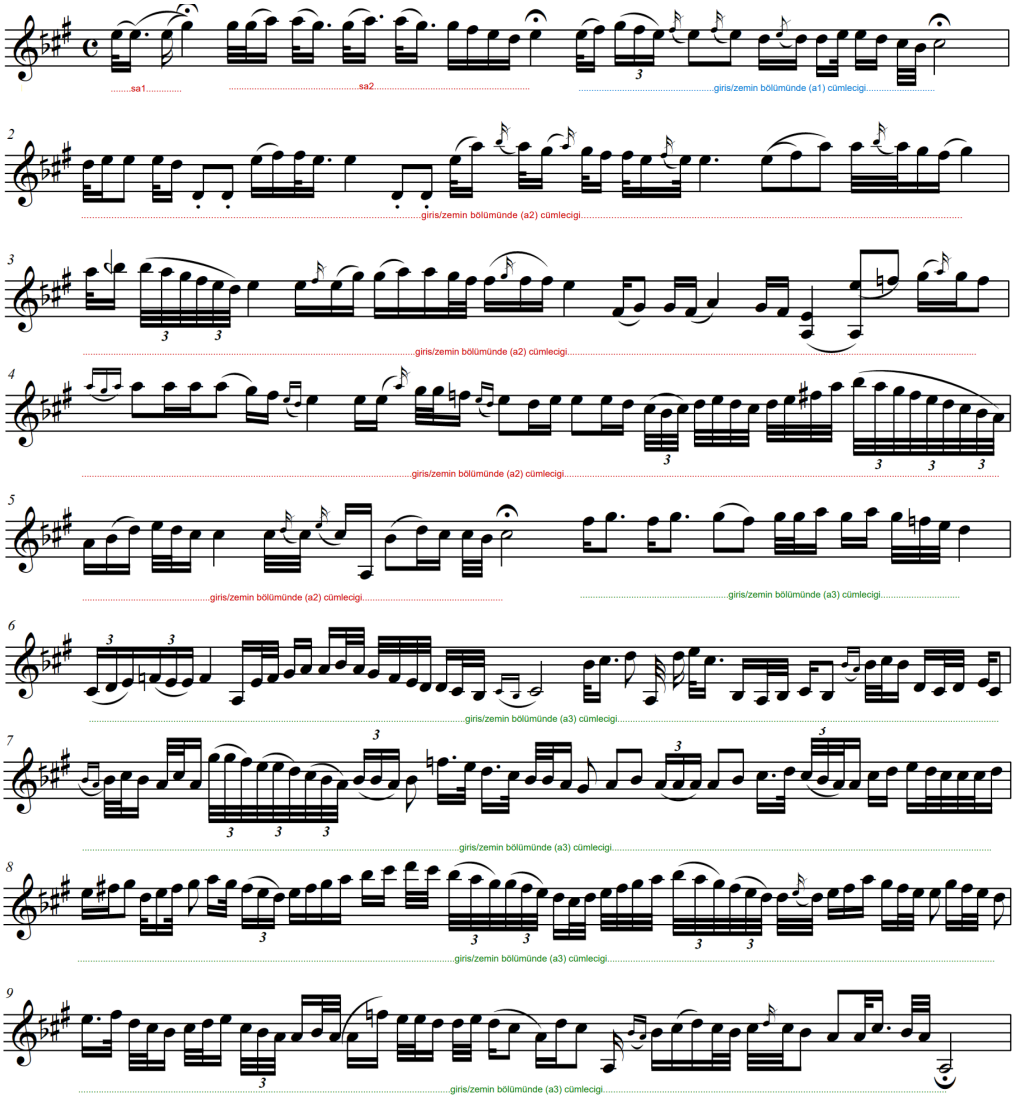



**Figure 3.** Sentence (a) in the A Section of the Uzzâl Taksim

In the introduction (A) section of the taksim, the sentence (a), which begins after the two discourse structures in the first line, starts on the hüseynî pitch and is completed on the dügâh pitch in the 9th line with a full cadence. Within sentence (a), there are 3 clause structures. The first clause occurs on the nim hicâz pitch in the 1st line, the second again on the nim hicâz pitch in the 5th line, and the third at the 9th line, where sentence (a) concludes.

**Identification of Sentence Structures in the B [sb (sb1+sb2) + b + c] (Development/Meyân) + (Conclusion/Cadence) Section of the Taksim**

In the B section, that is, the (Development/Meyân) + (Conclusion/Cadence) part of the taksim, 2 discourse structures and 2 sentence structures were identified. It was observed that in the second sentence structure, there are no clauses, yet the sentences themselves are long. The discourses are labeled as sb1 and sb2. The sentences are labeled as b and c, respectively.

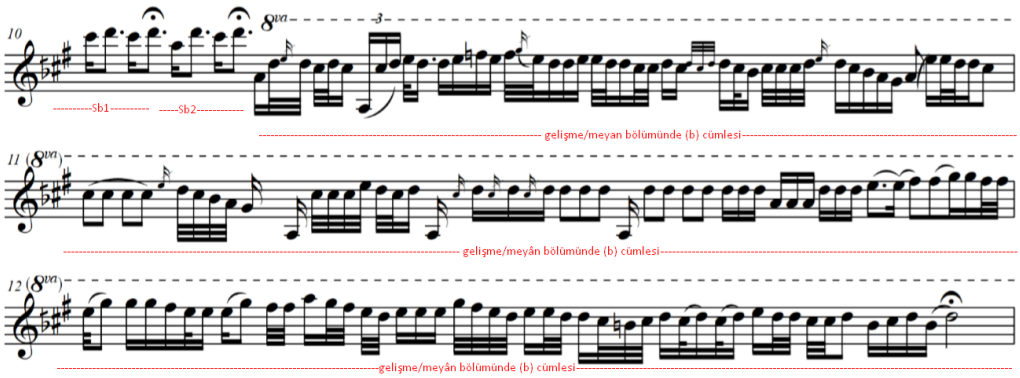



**Figure 4.** Sentence (b) in the B Section of the Uzzâl Taksim

In the development/meyân (B) section of the taksim, sentence (b), which begins in the 10th line after the two discourse structures, starts on the nevâ pitch and concludes on the same pitch in the 12th line. Sentence (b) does not contain any clause structures. The (b) sentence of the development section is also the point where the meyân of the taksim is demonstrated. In his Uzzâl taksim, Cinuçen Tanrıkorur presented the meyân in the upper register. These upper registers are actually the regions located one octave above the modal range of the taksim. In other words, the Uzzâl progression above the muhayyer pitch was repeated, extending up to the octave of the upper nevâ. Within the meyân, only a modulation to the Humâyûn mode was presented. This modulation, shown between two closely related modes, concluded on the nevâ pitch.

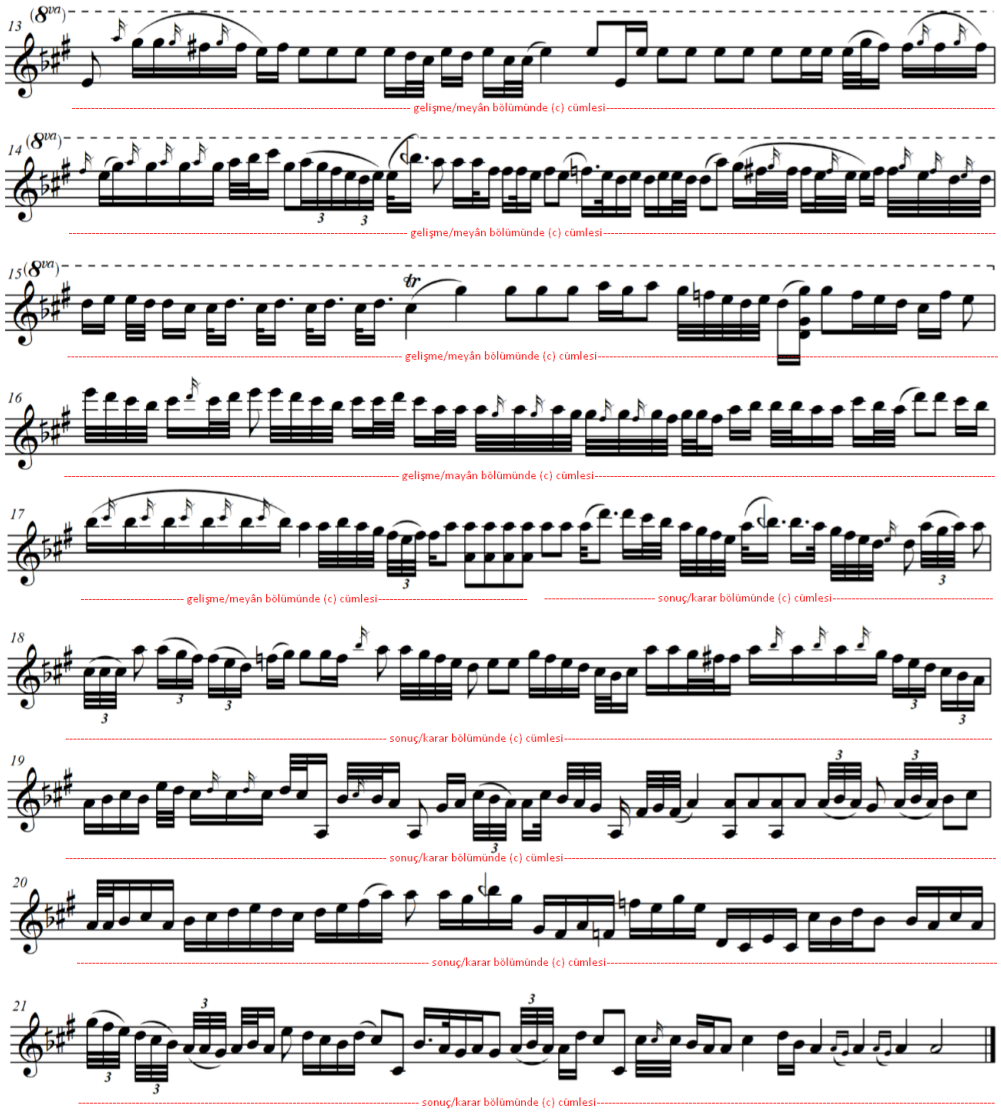



**Figure 5.** Sentence (c) in the B Section of the Uzzâl Taksim

In the development/meyân and conclusion/cadence (B) section of the taksim, sentence (c), which begins in the 13th line, starts on the gedâniyye pitch and concludes on the dügâh pitch in the 21st line. Sentence (c) does not contain any clause structures. The (c) sentence of the development section is also the part where the continuation of the meyân in the taksim is presented. In the 17th line, with the persistent emphasis on the muhayyer pitch, the progression of the melody toward resolution indicates that the taksim has now transitioned into the conclusion/cadence section.

**Frequently Used Rhythmic and Motif Structures in the Uzzâl Taksim**

It was determined that in the A (Introduction/Ground) and B (Development/Meyân) + (Conclusion/Cadence) sections of the Uzzâl taksim, there are frequently used rhythmic and motif structures.

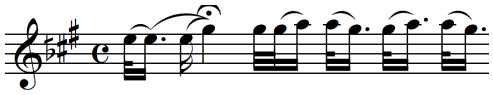


**Figure 6.** Repeated rhythmic structure in the (s) discourse of the A section

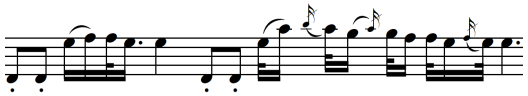


**Figure 7.** Repeated rhythmic and motif structure in clause (a2) of sentence (a) in the A section

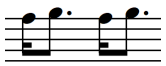


**Figure 8.** Repeated rhythmic structure in clause (a3) of sentence (a) in the A section

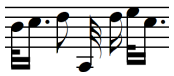


**Figure 9.** Repeated rhythmic structure in clause (a3) of sentence (a) in the A section

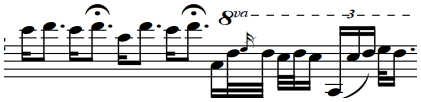


**Figure 10.** Repeated rhythmic and motif structure in discourses (s1) and (s2) of the B section

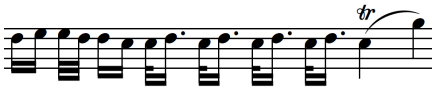


**Figure 11.** Repeated rhythmic structure in sentence (c) of the B section

In Figures 6, 7, 8, 9, 10, and 11, the frequently used dotted rhythmic/motif structures in the Uzzâl taksim are shown.

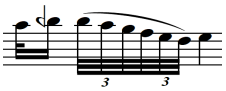


**Figure 12.** Repeated rhythmic structure in clause (a2) of sentence (a) in the A section

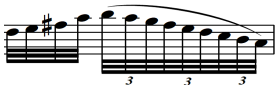


**Figure 13.** Repeated rhythmic structure in clause (a2) of sentence (a) in the A section

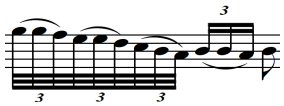


**Figure 14.** Repeated rhythmic structure in clause (a3) of sentence (a) in the A section

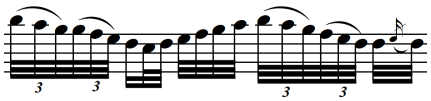


**Figure 15.** Repeated rhythmic and motif structure in clause (a3) of sentence (a) in the A section

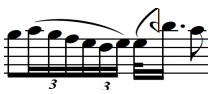


**Figure 16.** Repeated rhythmic structure in sentence (c) of the B section

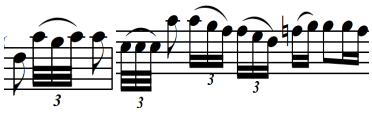


**Figure 17.** Repeated rhythmic structure in sentence (c) of the B section

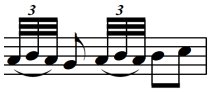


**Figure 18.** Repeated rhythmic and motif structure in sentence (c) of the B section

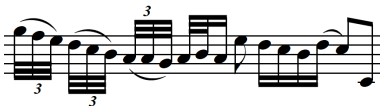


**Figure 19.** Repeated rhythmic structure in sentence (c) of the B section

In Figures 12, 13, 14, 15, 16, 17, 18, and 19, the frequently used triplet (triole) rhythms in the Uzzâl taksim are shown. Especially in Figures 12, 13, and 15, the triplet rhythms starting from the sümbüle pitch are seen to create recurring motif structures in descending progressions. In addition, it is observed that most of the rhythmic values are thirty-second notes.

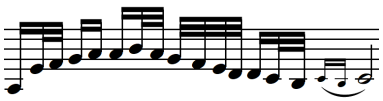


**Figure 20.** Repeated rhythmic structure in clause (a3) of sentence (a) in the A section

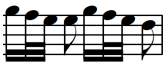


**Figure 21.** Repeated rhythmic and motif structure in clause (a3) of sentence (a) in the A section

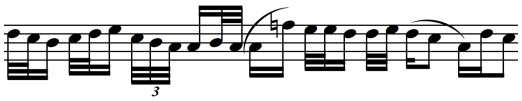


Figure 22. Repeated rhythmic structure in clause (a3) of sentence (a) in the A section

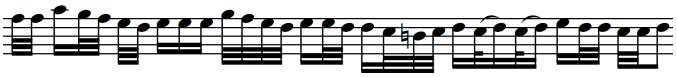


**Figure 23.** Repeated rhythmic structure in sentence (b) of the B section

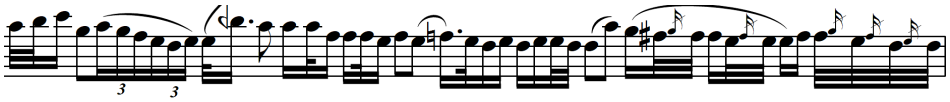


**Figure 24.** Repeated rhythmic and motif structure in sentence (c) of the B section

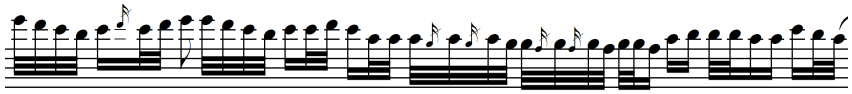


**Figure 25.** Repeated rhythmic and motif structure in sentence (c) of the B section

In Figures 20, 21, 22, 23, 24, and 25, the frequently used rhythms in the Uzzâl taksim, formed by the combination of thirty-second and sixteenth notes, are shown. It is considered that the motif structures created with these rhythms appear particularly in the development section of the Uzzâl taksim and increase the tempo of the melodic progression.

**Analysis of Sentence Structures in the Uzzâl Taksim According to the Criterion of Length and Brevity**

In Cinuçen Tanrıkorur's Uzzâl taksim, the identified sentences (a), (b), and (c) were notated vertically, evaluated, and interpreted within the framework of length and brevity criteria. In addition, the distribution of the identified sentence structures in the Uzzâl taksim according to sections is presented in Scheme 3.

Sentence (a)

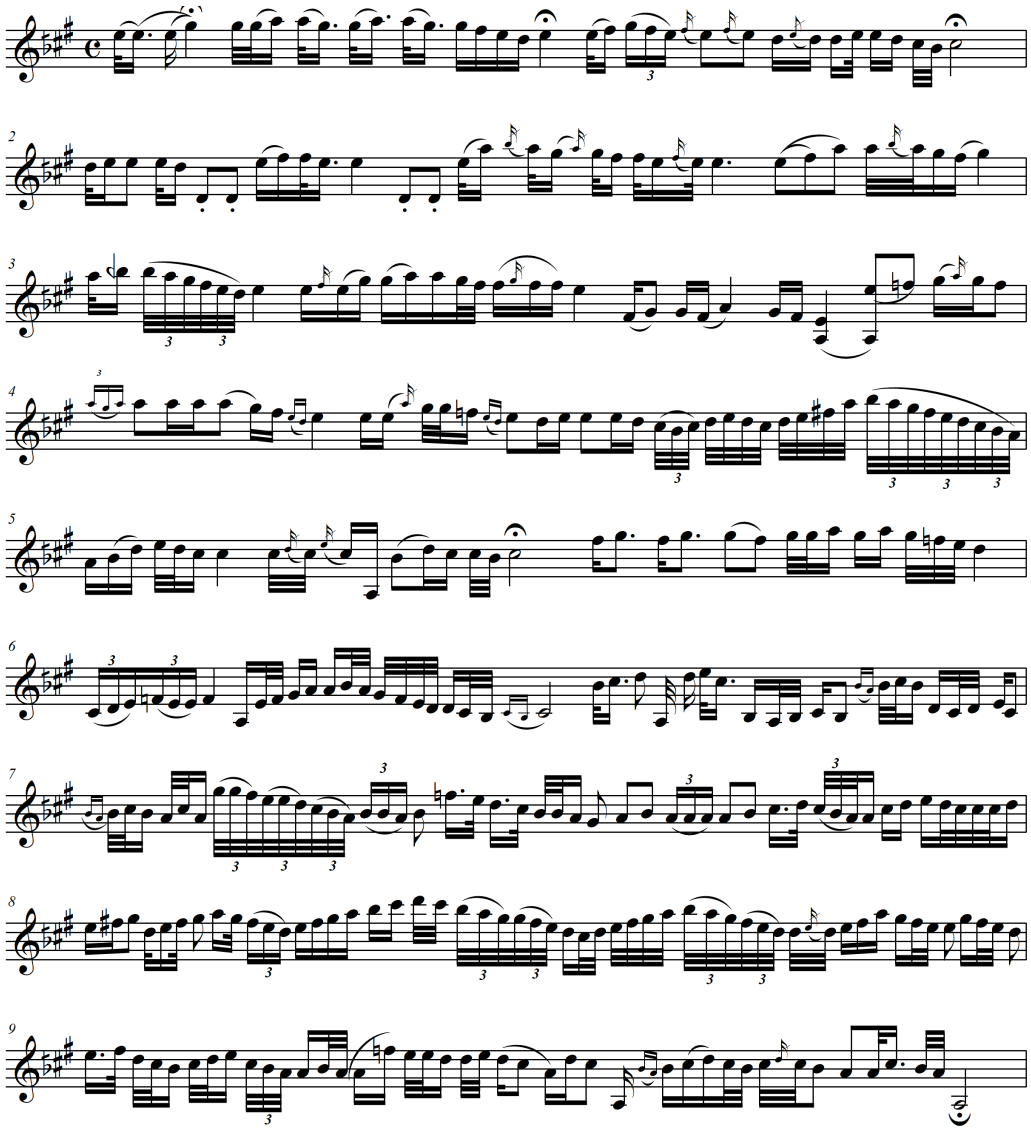


**Figure 26.** The First Sentence Structure in the Uzzâl Taksim

The first sentence shown in Figure 26, namely sentence (a), constitutes the entire introduction section of the taksim. This sentence structure, which was designed to be quite long, concludes on the dügâh pitch, the finalis of the mode. The Uzzâl taksim was structured by Cinuçen Tanrıkorur as an "introductory taksim." Accordingly, it carries significance in terms of fully reflecting the modal progression characteristics. From this perspective, it is observed that the pitches and cadences crucial to the modal progression are applied in this section and within this sentence. With the use of two discourse (s) structures, it is understood that the performer introduces the taksim in an original manner. In the subsequent first sentence structure, the frequently emphasized nim hicaz pitch and the brief pauses made on this pitch were identified as forming the clause structures. The inclusion of three identified clauses within this sentence structure can be considered the reason for its extended length. Compared with other sentence structures, it is observed that the melodic flow in the first sentence progresses more calmly due to the rhythmic values employed.

Sentence (b)

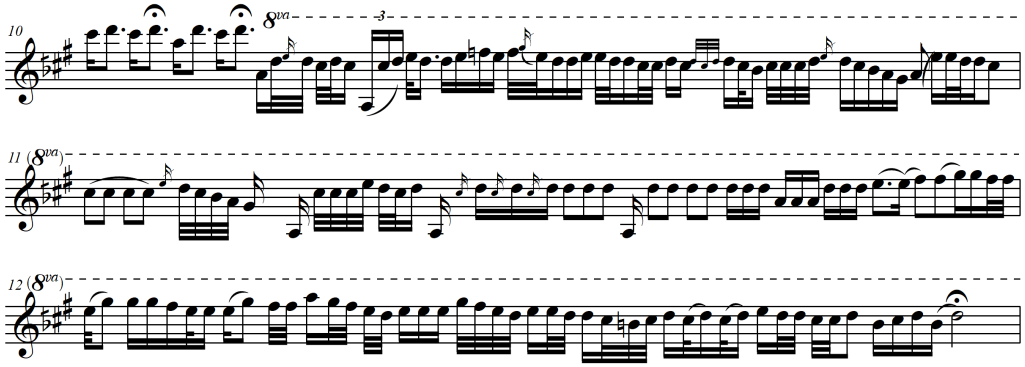


**Figure 27.** The Second Sentence Structure in the Uzzâl Taksim

The second sentence shown in Figure 27, namely sentence (b), constitutes the first part of the development section of the taksim. This sentence structure, which is shorter compared to the others, concludes on the important pitch nevâ. It is a half-cadential sentence structure. The development section of the Uzzâl taksim also serves as the meyân section, and the second sentence is located within this meyân. Tanrıkorur constructed the meyân section of the taksim by modulating to the Humâyûn mode and carrying this progression one octave higher. Therefore, it is observed that the pitches and cadences significant in the Humâyûn progression are applied in this section, specifically in this sentence. In the second sentence structure, the frequently emphasized pitch is nevâ. During the initial progression on nevâ, the acem pitch comes to the forefront, and at the end of the progression, the bûselik pitch is shown, concluding again on nevâ. Compared with other sentence structures, the second sentence displays greater melodic activity due to the rhythmic values employed.

Sentence (c)

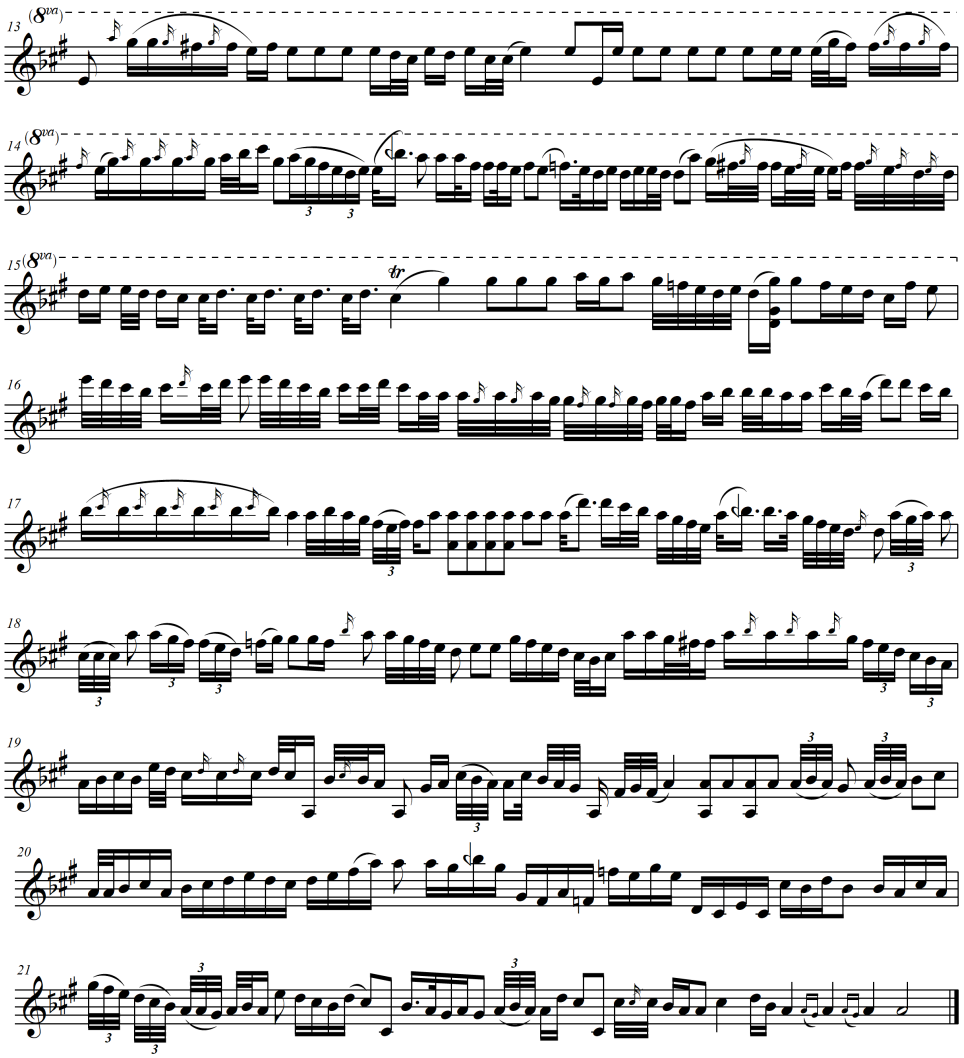
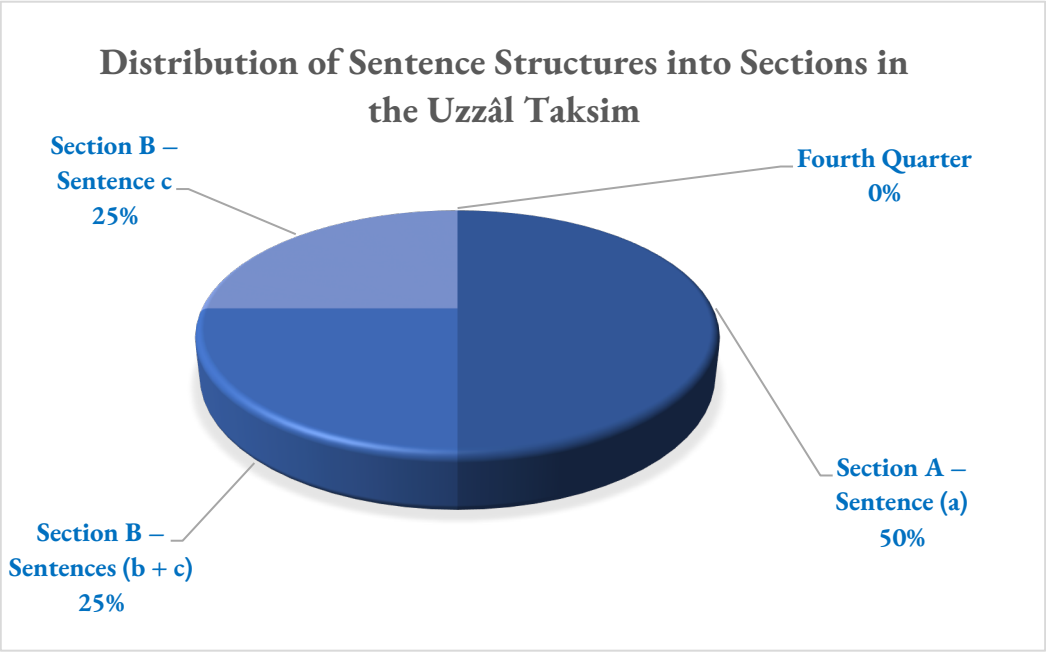


**Figure 28.** The Third Sentence Structure in the Uzzâl Taksim

The third sentence shown in Figure 28, namely sentence (c), constitutes both the development and conclusion sections of the taksim. Following the second sentence, which concludes on the pitch nevâ in the development section, the third sentence begins, and within the melodic progression, the Uzzâl seyir continues. The progression once again unfolds on pitches an octave higher. In the development section, the third sentence is also considered a meyân sentence, and it is evident that higher pitches are employed. Like the first sentence, the third sentence is quite long and concludes on the finalis dügâh.

In the third sentence structure, the frequently emphasized pitch is muhayyer, and the melodic activity is considerable. The third sentence divides into two parts, not due to clause structures, but because of the progression of the melody towards its final cadence. The third sentence begins in the development section on gerdaniye, continues with passages around this pitch moving to higher tones, and before reaching the conclusion section, emphatic gestures on muhayyer draw attention to a melodic sense of completion. The completion of this octave-above progression can be considered a clear marker of the transition into the conclusion section. From the point of muhayyer onwards, the third sentence, i.e., sentence (c), is regarded as the sentence of the conclusion section.

The sentence structures shown in Figures 24, 25, and 26, when analyzed in terms of length and brevity, demonstrate that the first and third sentences are quite long, while the second sentence is relatively short. The first and third sentences are full cadential, whereas the second sentence is half cadential. Furthermore, while the A section of the taksim consists of only one sentence structure, the B section comprises two sentence structures, namely the second and third. This indicates that the introduction section of the taksim is built upon a single sentence, while the development and conclusion sections are based on two sentences. Thus, the combination of the second and third sentence structures with the first results in a balanced and proportionate distribution across the sections. The graphtic representation of this is as follows:




**Graph 1.** Distribution of Sentence Structures by Sections in the Uzzâl Taksim

**Melodic Connections and Evaluations Among Sentence Structures in the Uzzâl Taksim**

When the three sentence structures identified in Cinuçen Tanrıkorur's Uzzâl taksim are evaluated in terms of melodic movement, it is observed that in the first sentence structure, with the use of rhythmic values, a calm progression emerges, and through the formation of phrase structures, brief pauses in the melody occur at certain pitches. This differs in the second and third sentence structures, where especially the b+c sentences forming the development/meyan section become dense in terms of melodic movement. The third sentence structure also shows a resolving characteristic; the melodic progression descending from a higher octave concludes within this sentence, and the makam proceeds toward

resolution from muhayyer within its own melodic framework. It is considered that the progression of the development/meyan section in a higher octave causes the intensification of melodic movement.

In the b+c sentence structures forming the development/meyan section of the Uzzâl taksim, sentence (b) is constructed around the high neva pitch and, beginning with holding the high neva, it is again completed at the high neva. The frequent use of the neva pitch, arriving at and lingering on it with the buselik pitch, indicates that the Humâyûn modulation is carried out throughout sentence (b). The third sentence structure reintroduces Uzzâl and continues with intense melodic movement in the high octave Uzzâl progression. Upon reaching muhayyer, the high octave Uzzâl progression is completed, but the sentence continues. Within the ongoing melody of the third sentence structure, the piece progresses toward dügâh, forming the conclusion section, and the Uzzâl progression is completed a second time at this pitch.

**Factors Creating Aesthetic Beauty and Artistic Value in the Uzzâl Taksim**

**Question-and-answer sentence and discourse structures**

The presence of question-and-answer sentence structures in the taksim is quite important for preventing monotony and fatigue in the listener. This situation, which enhances musical expression, positively affects the aesthetic strength of the overall composition. Just as in literary works, in musical works as well, when sentence structures are not presented on the same level but within different constructs, they increase the sense of curiosity and excitement in the listener. Thus, in composition, question-and-answer sentence structures facilitate listening and prevent distraction.

In Cinuçen Tanrıkorur's Uzzâl taksim, it is observed that question-and-answer sentence structures and question-and-answer discourse structures are frequently used. A question clause or discourse arises with the desire to seek an answer, and the waiting phase of this desire creates a sense of tension. The desired answer comes with the response clause or discourse, which eliminates the tension and instead creates a sense of resolution. In this way, a sense of completion is produced in the listener.

To prevent the listener from experiencing feelings of fatigue and monotony.

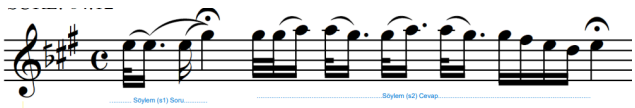



**Figure 29.** Question-and-answer discourse structure in the introduction section of the Uzzâl taksim

In the discourse structure shown in Figure 29, the melody pauses on the gerdâniye pitch with a short motif to form a question, and then resolves on the hüseyni pitch with a longer motif as an answer to the previous one.

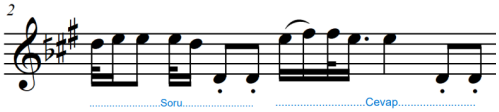



**Figure 30.** Question-and-answer structure in sentence (a) of the introduction section of the Uzzâl taksim

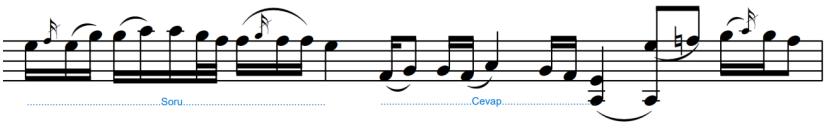



**Figure 31.** Question-and-answer structure in sentence (a) of the introduction section of the Uzzâl taksim

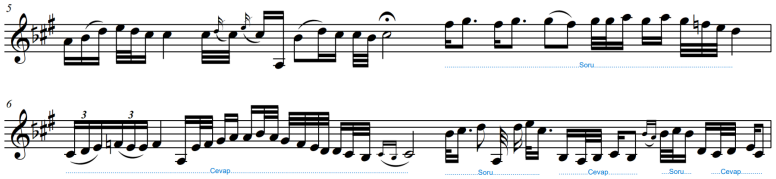



**Figure 32.** Question-and-answer structures in sentence (a) of the introduction section of the Uzzâl taksim

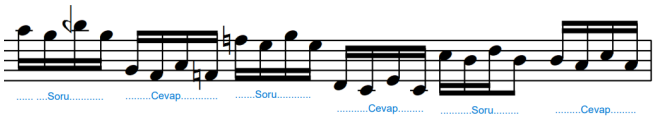



**Figure 33.** Question-and-answer structures in sentence (c) of the conclusion section of the Uzzâl taksim

The question-and-answer structures shown in Figures 30, 31, and 32 are located only within sentence (a) and the introduction section of the taksim. Such structures were not observed in the development section. The structure shown in Figure 33, however, was identified in the conclusion section of the taksim. A common feature of all these examples is that the answer structures are constructed in lower pitches compared to the pitch where the question structures are formed. This contributes to making the question-and-answer structures clearer. At the same time, implementing the question-and-answer structures in a high–low pitch manner enhances the expressive power and aesthetic balance within the composition.

**Modulation in the Uzzâl Taksim**

In Cinuçen Tanrıkorur's Uzzâl taksim, it has been determined that a modulation to the Humâyûn mode occurs in the B (Development/Meyân + Conclusion/Cadence) section within the (b) sentence structure. This section extends into a higher octave beyond the general melodic range. Accordingly, the progression begins from the high nevâ pitch, explores around it using acem, emphasizes high nevâ frequently, and resolves on this pitch through the use of bûselik.

**Transitions between Sections**

In a taksim, the lack of clarity in compositional elements may cause feelings of monotony and weariness. Just as in literature, where the structure of introduction–development–conclusion is expected to be presented in an orderly manner, the same construction is anticipated in a musical work. This structural clarity enhances both comprehension and emotional impact. When the sections of a taksim become clearly distinguishable and are arranged in a connected sequence, the performer's expressive power is reinforced, and aesthetic concerns are reduced.

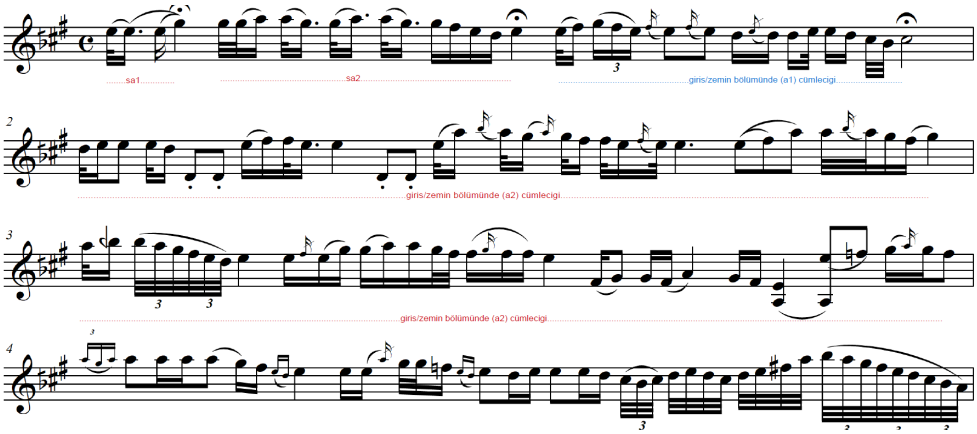



**Figure 34.** A Section from the Introduction of the Uzzâl Taksim

In Figure 34, a portion of the introduction section of the taksim is shown. It is observed that this section differs slightly from the others in terms of rhythmic values used, with the expected simplicity and calmness being constructed due to its role as the introduction. The fact that the Uzzâl taksim is designed as an introductory taksim, and therefore intended more to display the characteristics of the mode rather than technicality, can be considered the reason why the introduction section was structured in this manner.

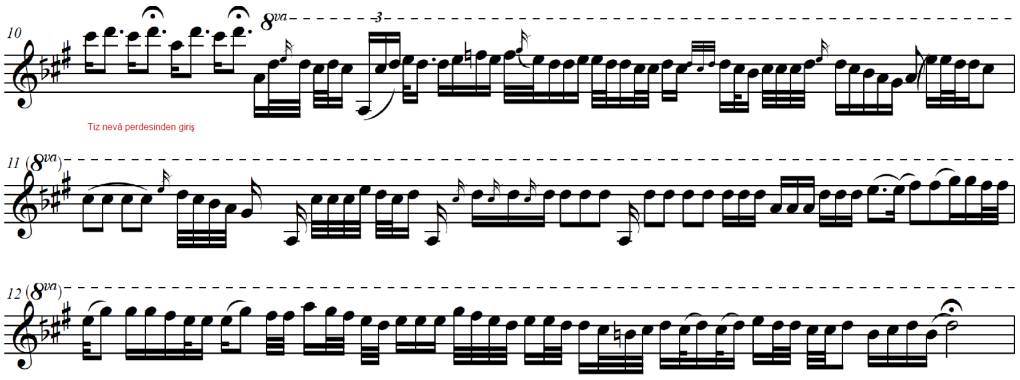



**Figure 35.** A Section from the Development of the Uzzâl Taksim

In Figure 35, a section from the development part of the Uzzâl taksim is shown. In the introduction, the modal progression was carried out around the hüseyni pitch, while in the development it began around the neva pitch one octave higher. After the modulation to the Humâyûn makam, the Uzzâl progression continued in the higher octave. The most important feature distinguishing the development section from the introduction and conclusion is that it proceeds in the higher octave, outside the usual modal range. The modulation and the movement through high pitches are key factors in defining this section as the meyân. With the construction of the development in the high octave, both the use of higher pitches and the increase in tempo within the melodic progression stand out. With these characteristics, the development section, situated between the introduction and conclusion, is thought to have been structured in a highly vibrant way that excites the listener. At the same time, by displaying a modulation that transitions into a different sentiment, this section contributes to the taksim's aesthetic beauty and artistic value, counteracting any sense of monotony or weariness for the listener.

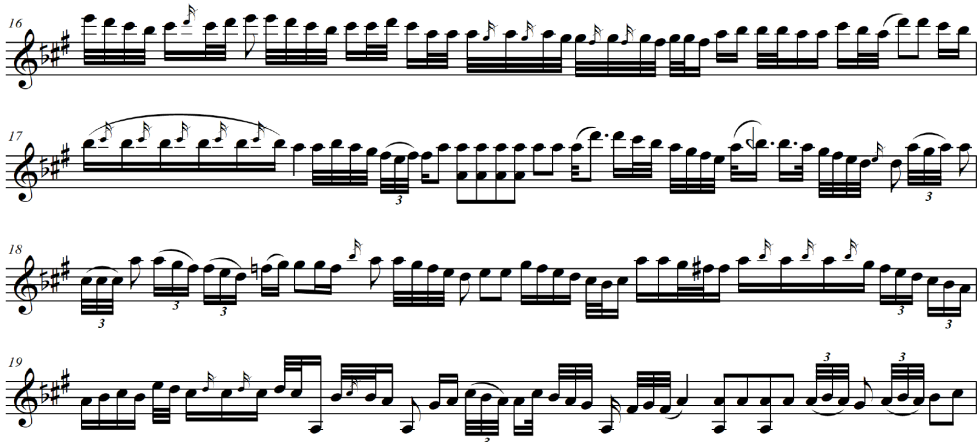


**Figure 36**. A Section from the Conclusion of the Uzzâl Taksim

In Figure 36, a section from the conclusion part is shown. In terms of rhythmic values used, it does not differ from the development section. The tempo felt in the melodic progression of the development continues here as well. However, there is no simplification or calmness in the structure that would indicate the end has been reached. What distinguishes this section from the development is the return to the modal range after having ascended to the higher octave. In the progression carried out in the higher octave, the Uzzâl seyir first moved around the upper hüseyni pitch, then reached the muhayyer pitch, and finally descended with cadential phrases to resolve on dügâh.

In the taksim, the introduction, development, and conclusion sections show a large degree of rhythmic similarity. That is, the overall tempo of the melodic progression remained consistent and balanced across all three sections. The most distinctive feature of transitions between sections is the use of areas outside the modal range. In other words, the modal range employed in the introduction and conclusion is quite different from the one in the development section.

**Conscious and appropriate use of methods for motif and melodic development**

The study shows that the Uzzâl taksim, besides being an example of improvisation, gains the quality of a composition through its sectional division and the deliberate structuring of sentence patterns. Therefore, it possesses certain formal

and structural characteristics. Among the formal elements of a composition, one of the key features contributing to its aesthetic beauty and artistic value is the use of methods for motif and melodic development.

Akdoğu (1996) categorized the methods of motif and melodic development under four headings:

- Expanding or narrowing the pitch range of a motif or melody
- Lengthening or shortening the note durations of a motif or melody
- Inverting the motif horizontally or vertically
- Exact repetition of the motif or melody (p.15)

In the analyzed Uzzâl taksim, only two of the methods mentioned by Akdoğu were identified: expanding/narrowing the pitch range of a motif or melody, and horizontal or vertical inversion of the motif.

**Examples of expanding or narrowing the pitch range of the motif identified in Cinuçen Tanrıkorur's Uzzâl taksim**

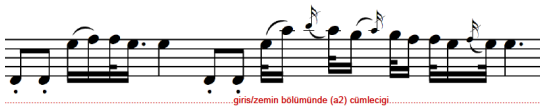



**Figure 37.** Motif structure created by expanding the pitch range within the (a) sentence structure in the introduction section of the Uzzâl Taksim

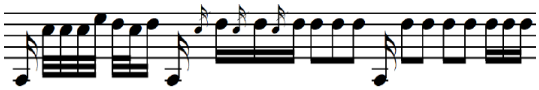


**Figure 38**. Motif structure created by expanding the pitch range within the (b) sentence structure in the development/meyan section of the Uzzâl Taksim

In Figures 37 and 38, a second motif structure, constructed by expanding the pitch range within a motif structure identified in the (a) sentence structure of the introduction section of the Uzzâl Taksim, is shown.

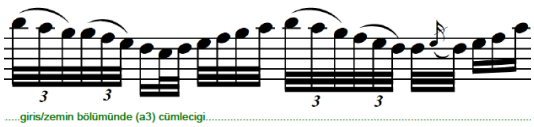



**Figure 39.** Motif structure created by narrowing the pitch range within the (a) sentence structure in the introduction section of the Uzzâl Taksim

In Figure 39, a second motif structure constructed by narrowing the pitch range within a motif identified in the (a) sentence structure of the introduction section of the Uzzâl Taksim is shown.

**Examples of motif inversion (horizontal or vertical) identified in Cinuçen Tanrıkorur's Uzzâl Taksim**

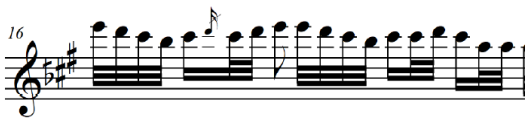



**Figure 40.** Horizontal inversion of the motif within the (c) sentence structure in the development/meyân section of the Uzzâl Taksim

In Figure 40, within the (c) sentence structure of the development/meyân section of the Uzzâl Taksim, the horizontal inversion of a motif structure is shown. In the first motif, the final note is the high hüseyni pitch, which forms the upper third of the preceding high çargâh note. In the repeated structure, however, the motif is inverted so that the lower third of high çargâh becomes the muhayyer pitch.

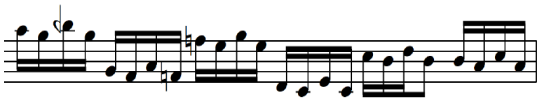


**Figure 41.** Vertical inversion of the motif within the (c) sentence structure in the conclusion/decision section of the Uzzâl Taksim

In Figure 41, within the (c) sentence structure of the conclusion/decision section of the Uzzâl Taksim, the vertical inversion of a motif structure is shown. In the first motif, the opening note is *muhayyer*, followed by a lower note, and after the high *segâh*, its third, *gerdâniyye*, is presented. The same structure is then repeated starting from the lower seventh of *muhayyer*. It is understood that these motif repetitions, created at different intervals, are constructed by vertical inversion in relation to one another.

## Conclusion and Recommendations

The research, which covers the analysis of sentence structures in Cinuçen Tanrıkorur's Uzzâl taksim, reveals that:

- The Uzzâl taksim gained the quality of a composition, with a formal structure arranged in the sequence of introduction–development–conclusion.
- The formal structure scheme of the Uzzâl taksim is:
  **A [sa (sa1+sa2) + a (a1+a2+a3)] + B [sb (sb1+sb2) + b + c]**
- In the taksim, the introduction section has 1 (a sentence), the development section has 2 (b+c sentences), and the conclusion section continues with the (c) sentence from the development, making a total of 3 sentence structures.
- Rhythmic structures composed of thirty-second notes, and combinations of thirty-second and sixteenth notes, as well as dotted rhythms and triplet (triole) rhythms, were frequently used.
- Frequently recurring rhythmic, motif, and sentence structures were mostly used in the A (Introduction/Foundation) and B (Development/Meyân) sections.
- The 1st sentence in the introduction and the 3rd sentence in the development/conclusion sections were significantly long, while the 2nd sentence was shorter in comparison.
- In the B (Development/Meyân + Conclusion/Decision) section, the (b) sentence structure showed modulation (*geçki*) to the *Humâyûn* makam.
- Question-and-answer phrases and sentence structures were designed to prevent monotony and fatigue.
- Section transitions were clearly highlighted, especially with the introduction being followed by a continuation one octave higher, and with modulation applied, eliminating monotony and fatigue.
- Among motif and melodic development techniques, applications of expanding/reducing pitch range and horizontal/vertical inversion were identified.
- Through the use of motif, phrase, sentence, and expression structures, aesthetic beauty and artistic value became evident, demonstrating Tanrıkorur's musical identity and expressive power in a unique way.

The results indicate that the formal structure and features formed by the combination of multiple elements contributed to the taksim gaining the quality of a composition. Although performed improvisationally, the taksim form can be shaped and analyzed like a composed piece. The crucial point is to reveal the sentence structures within the taksim and to reach the overall structure through them. Therefore, in addition to analyzing makam progression and instrumental techniques, it is suggested that future analyses of taksims should also include their formal elements.

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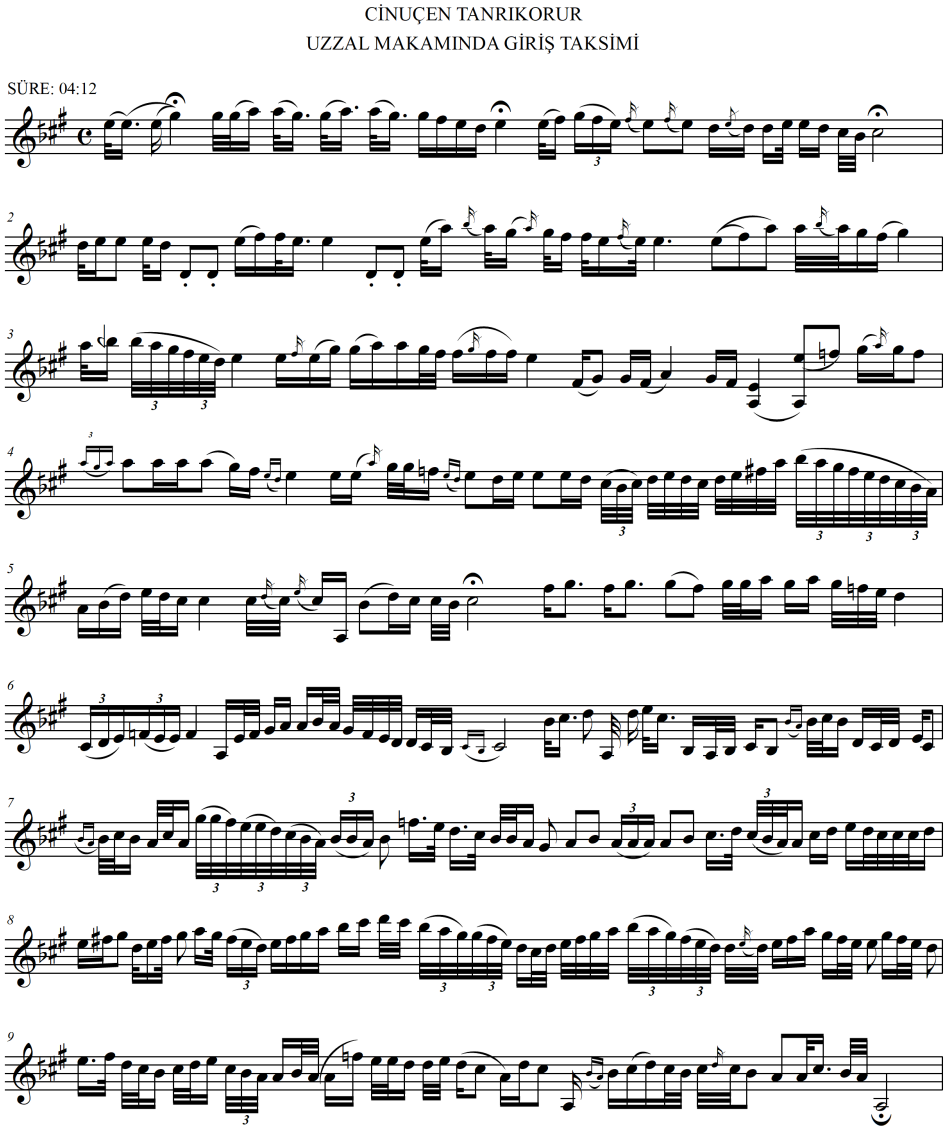
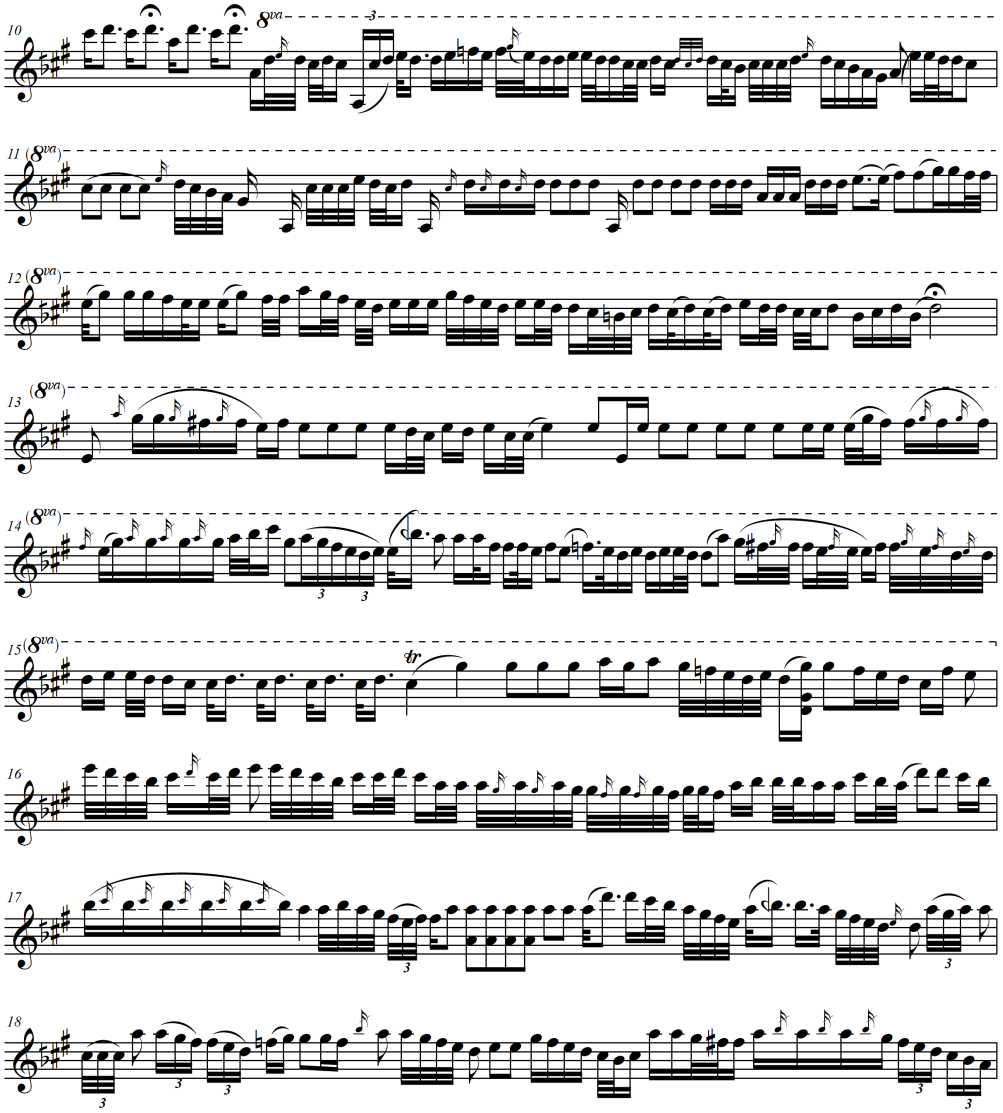
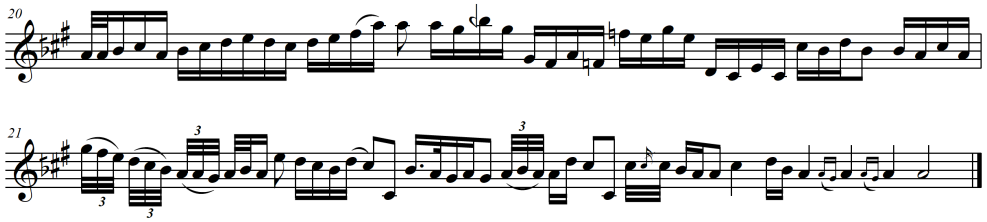
**Appendix 1.** Transcription of Cinuçen Tanrıkorur's Taksim in Uzzâl Maqam



UZZAL MAKAMINDA GİRİŞ TAKSİMİ TAKSİM -2-



UZZAL MAKAMINDA GİRİŞ TAKSİMİ TAKSİM -3-



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**Research Article**

# Reclaiming somatic intelligence: A Sumerian Minahasan embodied framework for music education in the AI era

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AI human complementarity



**Abstract**

This study strengthens embodied musical cognition through Directional Chord Symbols (DCS), a spatial kinesthetic system synthesizing Sumerian sexagesimal principles with Minahasan cosmology, responding to concerns about diminishing human somatic intelligence as Artificial Intelligence becomes increasingly central in musical creation and performance. Music education faces institutional crisis worldwide, with UK universities closing music departments and Indonesia cutting arts funding by eight trillion rupiah, reflecting precarious institutional positioning dominated by STEM disciplines and perpetuating talent gatekeeping that excludes learners who believe they lack musical gift. The research employed Arts-Based Research integrated with Participatory Action Research to privilege embodied knowledge production through collaborative inquiry with participants and educators. Purposive mixed-ability sampling recruited eighteen middle school students (ages 12-15) from Central Java, Indonesia, including nine students with formal music training and nine self-identified non-musicians. Video analysis documented trajectory adherence and tempo maintenance, while participant reflections, focus group discussions, and educator field notes captured qualitative dimensions of embodied learning experiences. Thematic analysis employed constant comparison methods, with descriptive statistics characterizing spatial navigation patterns and triangulation across multiple data sources enhancing validity. Students achieved 92.3 percent plus minus 5.8 percent accuracy in directional trajectories and maintained tempos of 118.2 plus minus 3.9 BPM, with qualitative findings revealing talent barrier dissolution, heightened motivation, and cultural resonance among Minahasan learners associating movements with Lumimuut rotational knowledge. The study recommends positioning music departments as Embodied Cognition Centers to secure STEM alignment, institutional resilience, and relevance in the AI era while promoting epistemic justice and expanding access for diverse neurotypes.

**To cite this article**

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## Introduction

Music education confronts an institutional crisis worldwide: between 2004 and 2023, at least ten UK universities closed music departments, including Reading, Exeter, Lancaster, Essex, and Oxford Brookes (Pace, 2023), while Jacksonville University eliminated its program entirely in 2025 (Scanlan, 2025). Indonesia's Ministry of Education reduced arts funding from IDR 33.5 to 25.5 trillion, an eight trillion rupiah cut affecting teacher welfare and program viability (Kompas, 2025).

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These closures reflect not music's diminished value but its precarious institutional position in educational landscapes dominated by STEM disciplines. This vulnerability stems from a conceptual error: the nineteenth-century separation of arts from sciences that severed the medieval Quadrivium's integration of music with arithmetic, geometry, and astronomy (Wang, 2022). This division created dual exclusion. First, talent gatekeeping: learners who believe they lack "musical gift" avoid music entirely. Second, epistemic marginalization: non-Western knowledge systems are dismissed as folklore rather than recognized as sophisticated STEM frameworks (Hallam, 2010).

Indigenous frameworks such as Minahasan Lumimuut rotations and Sumerian sexagesimal counting exemplify this marginalization. Ancient Sumerians developed base-60 mathematics that enabled precise astronomical calculation, forming the foundations of our 60-second minutes and 360-degree circles. Minahasan cosmology from North Sulawesi encoded spatial geometry through cultural practices, including Lumimuut's 360-degree mythological rotation and the Kabasaran dance's nine directional movements (Joseph, 2010; Latuni et al., 2023).

**Table 1.** Arts-sciences epistemological divide

| Framework | Medieval Quadrivium | 19th-Century Romantic |
|---|---|---|
| Music Classification | Mathematical science | Fine art/emotion |
| Access Model | Universal reasoning | Talent-dependent |
| Economic Viability | Interdisciplinary | Isolated funding |

## Literature Review

### Historical epistemological unity and separation

Historically, music was integrated within the Quadrivium, the medieval educational curriculum alongside arithmetic, geometry, and astronomy, affirming its mathematical and scientific status (Wang, 2022). Ancient Sumerians formalized sexagesimal (base-60) counting, laying foundations for time measurement and musical intervals encoded in precise harmonic ratios (Wright, 2009). Minahasan cosmology, practiced in North Sulawesi, complements this by embedding spatial geometry in cultural practices such as the Lumimuut dance, which encodes 360-degree astronomical rotations, and Kabasaran choreography, featuring nine-direction spatial mappings (Latuni et al., 2023; Kaseke, 2025). These non-Western systems have been marginalized within dominant Eurocentric music epistemologies, often dismissed as folklore rather than rigorous STEM knowledge (Joseph, 2010).

### STEAM integration research

Recent research demonstrates music's positive transfer effects on STEM skills through embodied learning. González-Martín et al. (2024) documented significant gains in spatial reasoning and mathematics following integrated STEAM music instruction. Rodrigues et al. (2020) found musicians exhibit superior visual-spatial working memory supporting STEM-related cognitive domains. Kim and Kemple (2011) reported that movement-based music interventions improved kindergarten readiness skills through embodied cognition. These studies converge on the importance of physical enactment of musical concepts to enhance mathematical understanding.

### Decolonial and inclusive pedagogy

Decolonial frameworks advocate validating non-Western epistemologies on empirical grounds, dismantling epistemic hierarchies privileging Western staff notation (del Barrio & Arús, 2024). Chávez and Skelchy (2019) assert that inclusive music learning leverages diverse cognitive strengths including visual-spatial and tactile modalities beneficial to Deaf learners. DCS builds on this perspective by transforming auditory harmonic abstractions into spatial-kinesthetic journeys accessible across ability spectrums.

**Table 2.** Comparative analysis of music education models

| Dimension | Traditional Music Education | STEM-Integrated Embodied Models |
|---|---|---|
| Entry Barriers | Talent and equipment dependent | Universal spatial navigation skills |
| Pedagogical Focus | Auditory, abstract notation learning | Visual-spatial and kinesthetic learning |
| Cost | High (instruments, tuition) | Low to zero (chalk, floor grids) |
| Accessibility | Hearing-centric | Inclusive of Deaf and disabled learners |
| Institutional Funding | Arts budgets vulnerable | STEM grants and interdisciplinary support |

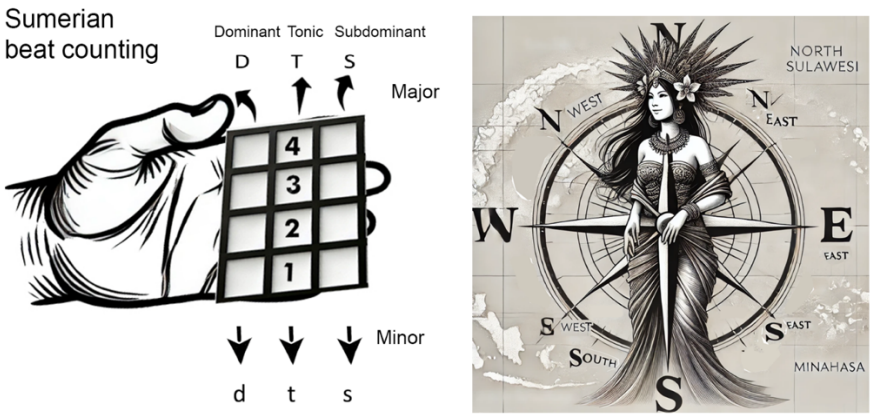
## Theoretical Framework

### Sumerian Sexagesimal Foundations

Sumerian mathematics (circa 4000 BCE) established base-60 (sexagesimal) counting derived from 60 finger joints, originating modern timekeeping (60 seconds/minutes) and geometric divisions (360° circles) (Kramer, 1963). This system encoded musical intervals through precise ratios such as octave (2:1) and perfect fifth (3:2), integrated with astronomical observation. Cuneiform tablets document heptatonic scales via reciprocal calculations, demonstrating music as empirical science rather than mystical art (Robson, 2008).

### Minahasan Spatial Cosmology

Minahasan cosmology (North Sulawesi) parallels Sumerian sophistication through embodied spatial geometry. The Lumimuut dance enacts 360° astronomical rotations, operationalizing circumference calculations via human movement. Kabasaran choreography structures nine spatial directions (eight compass points plus vertical), constituting 3D coordinate systems navigable without instrumentation (Latuni et al., 2023; Kaseke, 2025). The Kolintang xylophone arranges pitches linearly by spatial progression, embodying harmonic relationships as measurable distances.




Left: Sumerian sexagesimal beat counting mapping major/minor harmonic functions (D-T-S/d-t-s) onto base-60 finger joints. Right: Minahasan cosmological compass depicting Lumimuut's 360° rotation with nine-directional Kabasaran choreography

**Figure 1**. Theoretical foundations of directional chord symbols note

### Directional Chord Symbols (DCS): Operational Synthesis

DCS translates abstract harmony into physical navigation by mapping chord functions onto floor grids:

**Center (I) → Right (IV) → Left (V) → Center (I)**

Spatial metrics include distance (d), velocity (v = d/t), and coordinates (x, y). Implemented via 30×30 centimeter chalk grids, DCS externalizes cognition through universal navigation skills (Lakoff & Núñez, 2000). I-IV-V-I progressions become calculable journeys accessible to learners regardless of musical training or hearing ability.

### Embodied cognition integration

The theoretical foundation rests on embodied cognition: abstract concepts gain meaning through sensorimotor enactment (Azaryahu et al., 2024). Bremmer and Nijs (2022) provide a theoretical and practical account of embodied music pedagogy, detailing the dynamic role of the body in music education that DCS operationalizes through floor-grid

navigation. DCS leverages prefrontal-spatial integration as documented in music-movement research (Toiviainen et al., 2010). Visual-spatial pathways advantageous for Deaf learners transform music from an auditory privilege to a universal cognitive competency (Jensen, 2014).

**Embodied pedagogy in the AI Era**

As computational systems increasingly handle complex musical analysis, questions arise about the continued relevance of embodied music pedagogy (Ghvinjilia, 2023). DCS offers a response grounded in phenomenological distinction: while AI excels at chord calculation and pattern recognition, it cannot replicate somatic musical experience (Ghvinjilia, 2025).

Floor-grid navigation generates embodied intentionality, with harmonic tension experienced as leftward movement toward the dominant (V) and resolution felt as a return to the tonic center (I), a dimension absent in algorithmic processing. This suggests that the future role of music education is not an obsolete practice but an essential human complement, in which computational systems provide calculative precision while embodied approaches preserve biological intelligence that remains irreducible to digital simulation.

**Conceptual Model**

Ancient Systems → Embodied Pedagogy → Modern Application
Sumerian Base-60 → DCS Floor Navigation → AI-Human Synthesis
Minahasan 360° → Spatial Coordinates → Somatic Experience + Calculation

This framework hypothesizes that spatial embodiment universalizes music access; indigenous systems demonstrate empirical rigor; and zero-cost replication addresses Global South constraints while preserving cultural epistemologies.

**Research Aim and Problem**

This study proposes Directional Chord Symbols (DCS) as a pathway to restore Quadrivium unity. Synthesizing Sumerian sexagesimal counting with Minahasan spatial cosmology, DCS enables zero-cost floor-grid navigation that translates abstract harmony into measurable spatial journeys accessible across diverse ability spectra.

Implemented with Central Java middle school students (ages 12-15), DCS transforms abstract chord progressions into navigable space: Center (I) to Right (IV) to Left (V) to Center (I) becomes a physical pathway. Participants walked these sequences using the Turkish children's song "Ali Babanın Çiftliği," generating measurable trajectories. Zero-cost implementation addresses Global South constraints while validating indigenous epistemologies empirically. At the institutional level, repositioning music as "Embodied Cognition Centers" offers potential to attract STEM grants and stimulate cross-disciplinary enrollment (Cabello et al., 2021). Research problems are;

- Can Sumerian-Minahasan frameworks enable music access across ability levels?
- Does embodied spatial pedagogy lower traditional talent barriers?
- How might DCS reposition music departments institutionally?

## Methodology

**Research Design**

This study employed Arts-Based Research (ABR) integrated with Participatory Action Research (PAR), privileging embodied knowledge production through collaborative inquiry with participants and educators (Smith, 1999/2012). This approach validates experiential epistemologies while ensuring cultural responsiveness.

**Participants and Context**

Participants comprised 18 middle school students (aged 12-15, M=13.4 years) from Central Java, Indonesia, selected through purposive mixed-ability sampling. The sample included nine students with formal music training (3+ years) and nine self-identified non-musicians. Implementation occurred during regular extracurricular periods using existing school infrastructure.

**DCS Intervention**

Three parallel 10-meter pathways using standard 30×30 cm floor tiles mapped harmonic functions spatially: Center (Tonic/I), Right (Subdominant/IV), Left (Dominant/V). Participants physically walked I-IV-V-I progressions using the Turkish children's song "Ali Babanın Çiftliği," with each chord occupying one forward step and changes requiring lateral movement. Zero-cost materials (chalk, existing tiles) ensured replicability in resource-constrained settings. Implementation followed a four-week protocol: Week 1: Spatial orientation and basic navigation, Week 2: Chord function mapping and progression practice, Week 3: Velocity calculation (distance/tempo), Week 4: Coordinate plotting and reflection

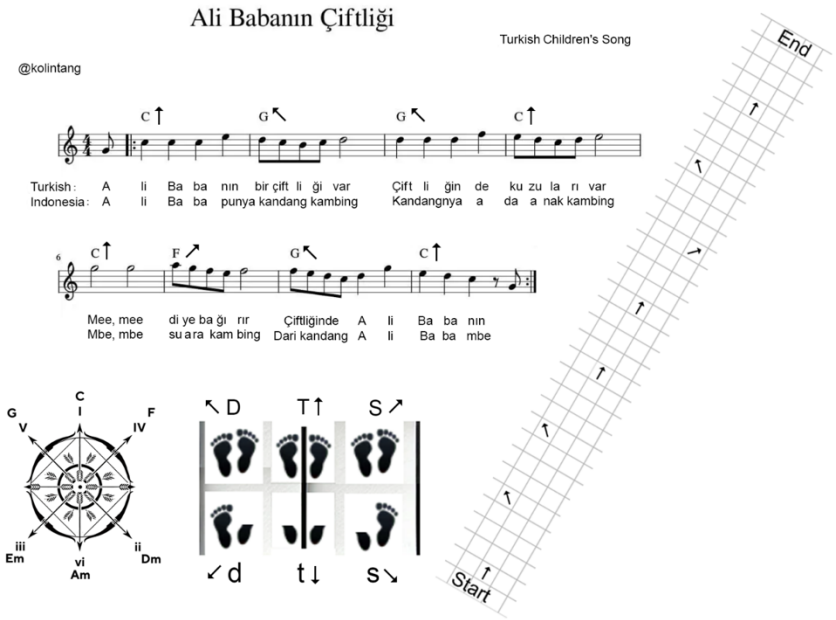



**Figure 2.** DCS Floor-Grid Navigation Using "Ali Babanın Çiftliği". Turkish song with I-IV-V-I analysis (C-F-G-C), directional vectors, footprint trajectory, and three-lane grid (30×30 cm, 10m)

**Data Collection and Analysis**

Qualitative data included participant reflections, focus group discussions, and educator field notes. Quantitative data from video analysis documented trajectory adherence, tempo maintenance, and movement fluency. Thematic analysis employed constant comparison methods, while descriptive statistics characterized navigation patterns. Triangulation across data sources enhanced validity.

**Ethical Considerations**

Institutional review board approval, informed assent, and parental consent were secured. Cultural sensitivity guided Minahasan framework implementation, respecting indigenous knowledge protocols. All data were anonymized.

**Rigor Framework**

Credibility: Member checking of reflections

Transferability: Thick description of context

Dependability: Audit trail documentation

Confirmability: Reflexive researcher journal

## Results

**Participant Engagement Patterns**

All invited participants actively engaged with the DCS floor-grid intervention, demonstrating willingness to navigate chord progressions irrespective of prior musical training. Non-musicians who initially expressed reservations about lacking talent participated fully once harmony became spatial movement, evidencing lowered entry barriers through embodied enactment (Kim & Kemple, 2011).

### Spatial Navigation Proficiency

Video analysis revealed consistent patterns in trajectory adherence: participants reliably followed Center (I) → Right (IV) → Left (V) → Center (I) pathways after initial familiarization. Movement fluency increased across sessions, with smoother transitions between chord positions indicating growing spatial-musical integration. Basic kinematic observations documented purposeful directionality aligning with harmonic function.

**Table 3.** DCS spatial navigation performance metrics (week 4, n=18)

| Metric | Mean ± SD | Range | Notes |
|---|---|---|---|
| Trajectory adherence (%) | 92.3 ± 5.8 | 82–100 | Correct path selection |
| Tempo maintenance (BPM) | 118.2 ± 3.9 | 112–126 | Target: 120 BPM |
| Completed distance (m) | 12.4 ± 1.3 | 10.2–14.8 | I-IV-V-I progression |
| Transition fluency (1-5)* | 4.1 ± 0.7 | 3–5 | *Educator-rated scale |
| Reflection themes per student | 3.2 ± 0.9 | 2–5 | Qualitative depth |

Note: Metrics represent final session performance after 4-week intervention

### Qualitative themes from reflections

Thematic analysis identified three dominant motifs:

***Talent Barrier Dissolution:*** One participant reflected that "mathematics aligns with my musical engagement," indicating cognitive-affective integration. This captured the paradigmatic shift from talent anxiety to spatial confidence. Non-musicians reported newfound confidence navigating abstract harmony physically.

***Spatial-Mathematical Connection:*** Participants frequently noted parallels between floor-grid coordinates and classroom geometry: "Walking chords feels like plotting points on a map."

***Cultural Resonance:*** Minahasan students connected DCS navigation to Lumimuut rotations: "This is like our ancestors tracking stars with their feet" (Latuni et al., 2023; Kaseke, 2025).

### Educator observations

Classroom facilitators documented heightened cross-domain transfer: students spontaneously applied spatial reasoning from DCS to mathematics lessons. Traditional musicians valued novel embodiment of familiar theory, while beginners gained foundational harmonic intuition without notation prerequisites.

### Cross-ability comparison

Mixed-ability sampling yielded comparative insights: trained musicians adapted rapidly but discovered spatial embodiment enhanced existing knowledge; non-musicians exhibited equivalent engagement levels, supporting DCS universality claims. No participant required exclusion due to ability levels.

### Key observation summary

- Universal navigation participation observed
- Affective shift from talent anxiety to spatial confidence
- Bidirectional math-music cognitive transfer
- Cultural validation of Minahasan frameworks

## Discussion

### Theoretical validation

Findings empirically affirm Sumerian-Minahasan frameworks as viable STEM epistemologies when operationalized through DCS. Universal navigation engagement across ability levels validates embodied cognition theory: abstract harmony gains accessibility through spatial enactment (Lakoff & Núñez, 2000). Participant reflections evidence bidirectional transfer paralleling González-Martín et al.'s (2024) STEAM integration outcomes.

### Epistemic justice achieved

DCS disrupts colonial hierarchies positioning Western notation as singularly rigorous. Minahasan Lumimuut rotations and Sumerian sexagesimal ratios demonstrate equivalent methodological sophistication through replicable spatial

outcomes (Joseph, 2010; Latuni et al., 2023). This constitutes decolonial praxis validating indigenous knowledge via universal metrics rather than cultural assertion (Smith, 1999/2012).

**Institutional survival strategy**

Amid ten UK music department closures between 2004 and 2023 (Pace, 2023) and Indonesia's IDR 8 trillion education budget cut, DCS enables strategic repositioning as Embodied Cognition Centers. Music faculty teaching spatial mathematics to STEM cohorts generates cross-disciplinary revenue streams and accesses larger grant opportunities than vulnerable arts budgets (Cabello et al., 2021). Zero-cost implementation addresses fiscal constraints while preserving cultural heritage.

**Embodied pedagogy in the AI era**

Recent scholarship on transhumanist educational paradigms emphasizes the importance of distinguishing human capacities from computational capabilities. DCS operationalizes this distinction pedagogically. While AI can perform chord calculation and pattern recognition, floor-grid navigation generates embodied intentionality, in which harmonic tension is experienced as leftward movement toward the dominant (V) and resolution is felt as a return to the tonic center (I). This phenomenological dimension is absent in algorithmic processing. This positions music education not as obsolete within computational contexts but as an essential human complement. Computational systems provide calculative precision, whereas embodied approaches preserve biological intelligence, often described as the human capacity for somatic cognition, which remains irreducible to digital simulation. DCS therefore demonstrates that certain forms of musical knowledge require physical enactment that cannot be captured through screen-based or algorithmic mediation.

**Inclusive access realized**

Visual-spatial-kinesthetic DCS inherently accommodates Deaf learners leveraging documented sequence memory strengths (Rodrigues et al., 2020). Floor-grid navigation bypasses auditory privilege, transforming music from elite domain to universal cognitive competency accessible across neurodiversity spectrums (Jensen, 2014).

## Conclusion

This study demonstrates the viability of reintegrating music education with STEM by operationalizing ancient mathematical frameworks through contemporary embodied pedagogy. Directional Chord Symbols validate Sumerian sexagesimal and Minahasan spatial systems as rigorous alternatives to Eurocentric music theory, achieving meaningful engagement across ability spectra through zero-cost floor-grid navigation.

In educational contexts where computational systems increasingly handle analytical tasks, embodied approaches preserve distinctively human dimensions: physical movement generates experiential knowledge irreducible to algorithmic processing. This positions music departments not as obsolete luxuries but as essential sites for developing integrated spatial-temporal cognition complementary to digital tools.

Findings support three practical implications:

***Institutional Repositioning:*** Music departments can reclaim their Quadrivium heritage by integrating with STEM faculties as "Embodied Cognition Centers," enabling interdisciplinary grants, cross-department enrollment, and curriculum innovation.

***Economic and Epistemic Justice:*** Zero-cost embodied methodologies ensure universal access, addressing fiscal constraints while validating indigenous knowledge systems empirically. Sumerian and Minahasan frameworks prove methodologically rigorous alternatives to Western-only pedagogy, advancing decolonization through measurable outcomes.

***AI-Human Complementarity:*** In evolving computational contexts, music education provides irreplaceable human dimensions. Embodied pedagogy cultivates spatial reasoning and temporal coordination that complement rather than compete with computational capabilities, preserving what computational systems cannot replicate: the lived experience of harmonic tension and resolution through movement.

## Recommendations

### Recommendations for Practice

- Systematic rollout of DCS through teacher workshops in diverse cultural contexts
- Integration of embodied music curricula with STEM credits
- Research validating non-Western epistemologies through empirical methods

### Future Research

- Longitudinal, cross-cultural, multimodal methodologies examining cognitive, affective, and social impacts at scale
- Augmented reality enhancement of DCS scalability while preserving core embodied learning principles
- Extension to complex harmonic structures and varied musical traditions

Music education reimagined as STEM discipline fulfills multiple justice imperatives while securing institutional survival. The artificial boundary between science and art serves gatekeeping functions rather than pedagogical necessity. Dissolving this division creates integrated learning reflecting how humans naturally develop understanding: through embodied movement, spatial reasoning, and temporal coordination operating seamlessly across domains. When harmony becomes a journey anyone can walk using universal competencies, music fulfills its potential as cognitive birthright rather than elite privilege.

## Limitations

Exploratory ABR design prioritizes depth over generalizability: single-site implementation requires multi-context validation across cultures and age groups. Descriptive metrics suit pedagogical proof-of-concept rather than statistical hypothesis testing. Cultural framing demands adaptation for non-Minahasan contexts, though underlying spatial logic remains stable.

The present study illustrates the system through I–IV–V progressions as an accessible entry point. Future work can extend the grid into three-dimensional or multi-layer structures capable of mapping extended harmonies, chromatic voice-leading paths, and non-diatonic progressions. Longitudinal studies will evaluate how learners interpret expanded chord spaces over time, alongside cross-cultural implementations examining spatial representations in varied musical traditions. Augmented reality offers additional potential by visualizing complex harmonic relationships while retaining movement-based design.

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**Research Article**

# Music theory in the digital age: Transformation of traditional theory in popular music production, analytical approaches, and a systematic literature review on DAW-based practices

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**Abstract**

This study examines how traditional music theory concepts are transformed and reconceptualized in contemporary popular music production through a systematic literature review. Core categories of classical music theory—harmony, counterpoint, rhythm, form, and timbre/orchestration—are reconsidered within the context of Digital Audio Workstation (DAW)-based production practices, loop-based composition, sampling, and electronic sound design. Analytical studies in genres such as pop, rock, hip-hop, and Electronic Dance Music (EDM) demonstrate that functional harmony has evolved into cyclical and layered structures, meter and pulse theory has shifted toward microtime and groove concepts, and traditional orchestration understanding has transformed into track-based and timbre-focused approaches. This review examines academic sources published between 2000 and 2025, emphasizing the need to expand music theory education to encompass popular music practices, and proposes DAW-based analytical methods, groove-oriented theoretical frameworks, and the treatment of timbre/mix as structural categories. The study systematically compares conceptual differences between traditional and digital approaches through comparative frameworks and supports findings with concrete examples from contemporary artists including The Weeknd, Billie Eilish, and Calvin Harris.

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## Introduction

Traditional music theory is a conceptual toolkit derived from the Western art music tradition, typically establishing a notation-based analytical framework. This toolkit is organized under fundamental headings such as harmony (chord progressions, functional tonality, cadences), counterpoint (polyphonic writing, voice-leading rules), rhythm and tempo (meter, pulse, rhythmic motifs), form (structures such as sonata form, rondo, theme and variations), and orchestration/timbre (instrument families, register, dynamic balance) (Danielsen, 2016, pp. 1-15; von Appen et al., 2016, pp. 1-20). These concepts have been developed over centuries within the context of European classical music and constitute the foundational pillars of music education.

However, since the second half of the 20th century, the prominence of popular music genres (pop, rock, jazz, R&B, hip-hop, electronic dance music) in global music production and consumption has steadily increased. Particularly after the 1980s, the proliferation of digital technologies, the standardization of the MIDI (Musical Instrument Digital

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Interface: technical standard enabling musical instruments to communicate with computers) protocol, and the accessibility of Digital Audio Workstations (DAWs) on desktop computers by the 2000s have fundamentally transformed music production practices (Reuter, 2021, pp. 3-8). Today, professional and amateur musicians conduct a production process based on loop-based (recurring sound fragments), sampling-focused (extraction of sound segments from existing recordings), and timbre/sound design-centered approaches in DAW environments, rather than notation-based composition (Brovig-Hanssen et al., 2021, pp. 274-280).

This transformation has raised a significant question for the music theory discipline: To what extent is traditional music theory adequate in explaining popular music productions? Classical music theory was developed to analyze works created for acoustic instruments, predominantly notation-based, and produced within a specific composition-performance hierarchy. However, popular music operates within a production ecology centered on recorded sound, where production and mixing processes hold compositional significance, notation is often absent, and listener experience is shaped as much by studio recordings as by live performance (von Appen et al., 2016, pp. 25-40). Therefore, the direct application of traditional theoretical concepts to popular music carries risks of ignoring genre-specific practices and analytical inadequacy.

Digital Audio Workstations have democratized and transformed the music production process. The capabilities of equipment once found only in professional studios in the 1990s have become accessible through software such as Logic Pro, Ableton Live, or FL Studio running on laptop computers. This accessibility has moved music production to home studios and led to the emergence of a new musician profile referred to as the 'bedroom producer.' Consequently, a significant portion of contemporary popular music is produced by producers who have not received traditional conservatory education but have specialized in DAW software.

This paradigm shift has created a serious disconnect in music theory education and research. While music theory curricula still predominantly focus on 18th and 19th-century European art music repertoire, the music students consume and often produce in their daily lives cannot be adequately explained by these theoretical frameworks. Moore (2012, pp. 15-22) criticizes this 'repertoire gap' in music theory education and argues that the discipline must become more inclusive. Similarly, Temperley (2018, pp. 5-10) emphasizes the limitations of traditional theoretical tools in popular music analysis and proposes the development of new methodologies.

Over the past twenty-five years, numerous studies seeking to answer this question have been published in music theory and musicology literature. These studies discuss how traditional theoretical concepts transform in the context of popular music, what new concepts need to be developed, and how analytical methods should be diversified. While some researchers argue that classical theoretical tools can be adapted to popular music (Duinker, 2019; Exarchos, 2020, pp. 105-115), others propose that new analytical frameworks based on production practices, recorded sound, and DAW workflows need to be developed (Danielsen, 2016, pp. 45-70; Brovig-Hanssen et al., 2021, pp. 280-290; Reuter, 2021, pp. 10-15).

**Research Question and Objective**

The fundamental research question of this study is formulated as follows: How are traditional music theory concepts (harmony, counterpoint, rhythm, form, timbre/orchestration) being transformed in the digital production practices of contemporary popular music genres? What new conceptual frameworks are being developed?

To address this research question, the study systematically compiles and synthesizes academic sources published between 2000 and 2025. The sub-objectives are:

- To present methodological debates regarding the relationship between traditional music theory and popular music,
- To document conceptual transformations in the fields of harmony and counterpoint,
- To examine the reconceptualization of rhythm and meter theory in the context of microtime and groove concepts,
- To address changes in form understanding and loop-based structures,
- To discuss the repositioning of timbre, sound design, and mix as theoretical categories,

- To provide recommendations for music theory education.

**Scope and Limitations of the Study**

This systematic literature review does not merely describe existing approaches; rather than completely abandoning traditional music theory tools or directly adapting them, it advocates as an original argument the necessity of a hybrid analytical model enriched with timbral and spatial parameters. This model presents a new theoretical framework capable of grasping the digital production uniqueness of popular music by integrating functional harmony with 'timbral harmony,' rhythm theory with 'spatial groove,' and form analysis with 'mix topology.' The article constructs this argument through both literature synthesis and current analyses.

While this study compiles existing knowledge through a systematic literature review method, it employs targeted case analyses (The Weeknd, Billie Eilish, Calvin Harris) to substantiate and support its central theoretical argument. These case analyses contain analytical interpretations that apply theoretical concepts from the literature to concrete musical examples. The scope of the study is limited to pop, rock, hip-hop, R&B, EDM, and related genres. Areas such as jazz and experimental electronic music are addressed only insofar as they directly relate to popular music productions. The research focuses on academic journal articles, book chapters, doctoral and master's theses, and conference proceedings. Music theory textbooks, production guides, and commercial publications are excluded. A time constraint of 2000-2025 is established because the proliferation of DAW-based production practices occurred during this period.

**Structure of the Article**

Following the introduction, the study is structured as follows: The second section explains the systematic literature review methodology. The third section addresses the general literature and fundamental methodological debates concerning the relationship between traditional music theory and popular music. The fourth section examines transformations in the field of harmony and counterpoint; the fifth section addresses reconceptualizations in the field of rhythm and meter; the sixth section examines changes in form understanding; and the seventh section investigates the treatment of timbre, sound design, and mix as theoretical categories. The eighth section synthesizes the findings obtained from the literature and provides recommendations for music theory education.

## Methodology

This study was conducted using a systematic literature review approach. The systematic literature review approach is defined as a comprehensive, transparent, and replicable evidence synthesis process focusing on a specific research question (Petticrew & Roberts, 2006, p. 19).

**Data Sources and Search Strategy**

The literature search was conducted through three primary academic databases: JSTOR (Journal Storage: access to academic journals in arts, humanities, and social sciences), RILM (Répertoire International de Littérature Musicale: the most comprehensive bibliographic database in musicology), and Google Scholar. These databases provide access to current and prestigious publications in the fields of music theory, musicology, and popular music studies.

The search strategy was developed using English keyword combinations. The primary search terms are: 'music theory,' 'popular music,' 'pop music,' 'rock music,' 'hip-hop,' 'EDM,' 'electronic dance music,' 'DAW,' 'digital audio workstation,' 'production,' 'mixing,' 'harmony,' 'rhythm,' 'groove,' 'form,' 'timbre,' 'sound design,' 'sampling,' 'loop-based composition,' 'microtime,' and various combinations of these terms. The search covers publications from 2000 to 2025.

**Inclusion and Exclusion Criteria**

Specific inclusion and exclusion criteria were applied in the literature search. Inclusion criteria:

- Studies examining how traditional music theory concepts transform in the context of popular music,
- Studies addressing the effects of DAW-based production practices on music theory,
- Articles published in peer-reviewed academic journals, book chapters from reputable publishers, doctoral and master's theses from accredited universities,
- Studies containing analytical examination of popular music genres (pop, rock, hip-hop, R&B, EDM).

**Exclusion criteria:**

- Studies focusing solely on jazz or experimental electronic music (unless their relationship to popular music is clear),
- Textbooks and production guides,
- Publications for which full text is not accessible,
- Publications that have not undergone peer review.

**Data Analysis and Synthesis**

The collected sources were examined using thematic analysis. For each conceptual category (harmony, counterpoint, rhythm, form, timbre), transformations, new concepts, and analytical approaches proposed in the literature were systematically recorded. Methodological differences among sources (adaptation of classical tools vs. development of new models) were identified and these differences were discussed. The study adopted a descriptive and critical synthesis approach: fundamental arguments in the literature were summarized, different approaches were compared, and research gaps were identified.

## Results

### Literature on the Relationship Between Traditional Music Theory and Popular Music

The relationship between traditional music theory and popular music has been a long-debated topic in the music theory and musicology disciplines. These debates are fundamentally shaped around three different methodological positions: adaptation of classical theoretical tools to popular music, development of new models based on production practices, and hybrid approaches combining these two.

### Adaptation of Classical Theoretical Tools

The first methodological position argues that classical music theory tools can be adapted to the popular music repertoire. Researchers adopting this approach propose that traditional concepts such as Schenkerian analysis (an analytical method developed by Heinrich Schenker that reveals the fundamental structural layers of music), functional harmony, and voice-leading rules can be adapted to account for guitar/keyboard idioms and unnotated features.

For example, Duinker (2019, paragraphs 12-18), when analyzing chord loops (recurring chord sequences) frequently encountered in pop music, maintains traditional tonal concepts but expands these concepts by proposing new terms such as 'hybrid tonic' (an ambiguous center alternating between two tonic functions). Proponents of this approach emphasize that traditional theory offers a universal analytical framework and that popular music also contains fundamental musical parameters such as tonality, harmony, and form.

### New Models Based on Production Practices

The second methodological position argues that popular music's production techniques, sampling, and recording practices require new models that emphasize process, medium, and technology rather than notation-based paradigms alone. Danielsen (2016, pp. 85-110) proposes that musical rhythm in the age of digital reproduction cannot be explained solely by notation-based meter and pulse concepts; instead, waveform analysis, DAW examination, and analysis of producer discourses must be incorporated into the analytical process.

This approach advocates a 'practice-first' analysis of popular music. Methods such as producer interviews, examination of DAW session files, and spectral analysis of audio recordings should be used alongside or instead of notation-based transcription. Von Appen et al. (2016, pp. 100-125) emphasize that in interpreting 21st-century pop music, the physical and technological characteristics of recorded sound must be centralized. This production-oriented approach can be further deepened with a software studies perspective. Manovich (2013, pp. 40-65) emphasizes that software is not merely a 'tool'; rather, it is a 'cultural actor' that actively shapes the user's thinking and creation methods. DAW interfaces transform how musicians conceptualize music by representing musical material as 'tracks,' 'clips,' and 'parameter automation curves.' Fuller (2008, pp. 15-30) explains this transformation through the concept of 'software as ideology': DAWs universalize this production logic by 'naturalizing' loop-based composition, layered thinking, and parametric manipulation. This perspective demonstrates that popular music theory must also consider the

epistemological effects of DAW interfaces. Not only the question 'What is being done in the DAW?' but also 'How does the DAW shape musical thought?' must be incorporated into theoretical analysis.

**Hybrid Approaches and Practical Challenges**

The third methodological position proposes combining classical theoretical tools with production-oriented methods. This approach argues that completely abandoning traditional concepts is unnecessary; however, these concepts must be expanded and reinterpreted to account for the unique practices of popular music. From a practical application perspective, this hybrid approach presents certain challenges. First, access to DAW session files is not always possible; for most commercial recordings, only the final mix is available. Second, the reliability of producer and artist discourses can be questioned; musicians do not always make conscious theoretical decisions, often acting with intuitive and practical priorities.

**Transformations in the Fields of Harmony and Counterpoint**

In traditional music theory, harmony is addressed within the framework of functional tonality. Tonic, dominant, and subdominant functions, cadences, and modulations are the fundamental tools of classical harmonic analysis. Counterpoint examines voice-leading rules and inter-voice relationships in polyphonic writing. However, in popular music productions, these concepts undergo significant transformations.

**Cyclical and Static Harmonic Structures**

In popular music, particularly in post-2000 productions, cyclical chord structures (chord loops) have become widespread. Duinker (2019, paragraphs 20-28) terms these structures as 'plateau loops' and notes that, unlike traditional functional harmony, a fixed loop revolves around a tonal center. For example, the I-V-vi-IV sequence (in C major: C-G-Am-F) is extremely common in pop music, and this loop creates a continuously repeating cycle rather than resolving the tonic-dominant progression in the classical sense.

**Modal Ambiguity and Hybrid Tonics**

In many pop songs, ambiguity between major and minor modes is observed. Duinker's concept of 'hybrid tonic' attempts to explain this ambiguity. For example, a song may alternate between C major and A minor; the tonic function is not fixed to a single chord. This situation is rarely seen in classical tonal analysis but is a frequently encountered phenomenon in popular music.

This modal ambiguity is part of a broader phenomenon in popular music called 'tonal ambiguity.' For instance, the I-♭VII-♭VI-♭VII (Aeolian modal interchange) progression, which became widespread in EDM and pop music throughout the 2010s, contains parallel fifths and a ♭VII-I cadence that could be considered an 'error' in classical tonal theory. However, this progression is perceived as an extremely natural and acceptable sound in popular music. Richards (2017, pp. 88-95) documents that such modal borrowing techniques have become increasingly common in pop harmony from 1960s rock music to the present.

**Case Analysis: The Weeknd – Blinding Lights (2019)**

The Weeknd's 'Blinding Lights' is a striking example of cyclical harmonic structure. The entire song is built upon the Fm-Eb-Bb-Db chord loop. This loop never changes from intro to outro; only the vocal melody and production layers change. In traditional functional harmonic analysis, finding a clear tonic-dominant relationship in this loop is difficult. Although the Fm chord appears to be the tonal center, the loop is in constant motion and there is no prolonged rest on any chord. From a production perspective, chord changes are emphasized by synthesizer arpeggios; each chord change is also perceived as a timbral change. This example demonstrates that harmonic analysis must be integrated with production analysis.

When examined more deeply from a production perspective, the harmonic structure of 'Blinding Lights' forms an inseparable whole with synthesizer timbres. The song's characteristic arpeggio sound is created using an emulation of the Roland Juno-106 synthesizer. With each chord change, the timbral character of the arpeggio changes slightly; this allows chord changes to be perceived not only at the pitch level but also at the timbral level. The use of automation to control filter cutoff and resonance parameters imparts a dynamic timbral development to a static chord loop. This observation

supports the concept of 'timbral harmony' proposed by Sanden (2013, pp. 65-70): in popular music, harmony is constructed not only through pitch relationships but also through timbral transformations.

**Reconceptualizations in the Fields of Rhythm and Meter**

This analysis significantly expands the discussion of 'functional harmony' in the literature. While Duinker's (2019) concept of 'hybrid tonic' explains tonic ambiguity, it still offers a pitch-centered perspective. However, the 'Blinding Lights' example demonstrates that harmony is constructed not only through pitch relationships but also through timbral transformations. Sanden's (2013) concept of 'timbral harmony' is critical at this point: the combination of chord changes with filter cutoff and resonance automation transforms 'harmony' from a one-dimensional (pitch) category into a multi-dimensional (pitch + timbre + automation) category. This finding demonstrates that merely 'adapting' traditional harmony theory is insufficient; the theoretical definition of harmony needs to be expanded. Production parameters can no longer be addressed under the 'orchestration' category; they directly constitute the harmonic structure itself.

In traditional music theory, rhythm and meter are defined by concepts of measure, pulse, note values, and metronomic tempo. However, in digital production, particularly in hip-hop and EDM, the understanding of rhythm has been enriched with new concepts such as microtime, groove, and quantization aesthetics.

**Microtime and the Concept of Groove**

Danielsen (2016, pp. 120-145) emphasizes that musical rhythm in the age of digital reproduction cannot be fully explained by notation-based meter and pulse concepts. Instead, the concepts of microtime (time differences at the millisecond level) and groove (rhythmic pattern creating a specific feel) come to the forefront. Groove is not merely a notation-based rhythmic figure; it is also a perceptual whole created by subtle variations in sound intensity, timing deviations, and timbral variations.

**Quantization Aesthetics**

In DAWs, quantization is the process of aligning MIDI notes to a specific grid. However, perfect quantization often creates a mechanical feel. Therefore, many producers use humanize and swing settings to simulate the natural timing deviations of human performers. Brovig-Hanssen et al. (2021, pp. 278-285) propose the concept of a flexible grid in EDM.

**Case Analysis: Billie Eilish – Bad Guy (2019)**

Billie Eilish's 'Bad Guy' is a striking example of minimal and microtime-focused rhythmic understanding. The song's fundamental groove is built upon very few sound elements: a bass sound, finger snaps, and minimal electronic beats. However, within this minimal structure, the timing and velocity of each sound are adjusted with extreme precision. The bass sound's slight deviation from the grid creates a lazy feel; the finger snap, standing precisely on the grid, creates a contrast. DAW analysis reveals that this groove is not completely quantized; rather, it is constructed with selective humanization. Traditional notation cannot display these subtle timing differences. This example reveals that groove analysis requires digital tools such as DAW visualization and waveform examination.

**Disciplinary Consequences of These Reconceptualizations**

These transformations in the field of rhythm and meter question one of music theory's fundamental tools—notation. Traditional notation represents rhythms with discrete symbols (♩, ♪, ♬) and cannot display timing differences at the millisecond level. This reveals the limitation of notation transcription in popular music analysis. DAWs' waveform and MIDI views have become the new 'notation' of rhythmic analysis. However, this is not merely a technical change; it is also an indicator of an epistemological shift. Music theory is evolving from a discipline centered on the 'written work' to one centered on 'recorded sound.' The deepest consequence of this shift is: 'Musical knowledge' now resides not in the score but in the audio file. This necessitates the addition of new skills such as 'spectral listening' and 'DAW analysis' alongside traditional practices like 'solfège' and 'dictation' in music theory education.

This microtime-focused approach in the field of rhythm and groove does not operate solely at the beat level. Groove also affects larger-scale formal structure. The addition/removal of layers and the management of the energy profile are

the reflection of rhythmic groove at the formal level. This connection is critical for understanding the transformations in form theory to be discussed in the next section.

**Changes in Form Understanding**

This analysis fills an important gap by expanding Danielsen's (2016) concept of 'microtime': the role of silence and spatial space as a formal element in minimal production. While Danielsen addresses microtime through 'timing deviations,' the 'Bad Guy' example demonstrates that what is NOT played is as critical as microtime. The song's groove comes from the spaces between the bass and finger snaps. These spaces could be viewed as a 'deficiency' in traditional form theory; however, in minimal EDM and trap music, these spaces construct form. Zagorski-Thomas's (2014) concept of 'spectral space' gains new meaning here: space is a structural category not only in the frequency spectrum but also in the time spectrum. This finding reveals that rhythm theory must analyze not only 'beats' but also 'spaces between beats.'

In traditional music theory, form is built upon principles of thematic development, contrast, and repetition. In popular music, form is generally defined by a verse-chorus structure and section-based organization. However, in the digital production age, particularly in EDM and hip-hop, form understanding is shaped by new concepts such as loop-based structures, layering, and the drop.

**Loop-Based Form and Layering**

In EDM and hip-hop, rather than thematic development in the traditional sense, form is constructed through the addition and removal of loops. Sfetcu (2018, pp. 30-42), when examining EDM forms, proposes concepts such as reverse extension and embedded grouping dissonance. Layering is a fundamental component of formal structure. A single synth loop begins in an intro; drums and bass are added in the verse; additional melodic layers enter in the chorus; and all layers converge at maximum energy in the drop.

This loop-based form understanding is explained by Butler (2006, pp. 90-110) through the metaphor of 'unlocking the groove.' According to Butler, form in EDM is organized not around a linear narrative or thematic development but around the infinite repetition of loops and the trance-like experience this repetition creates in the listener. The addition of each new layer draws the listener into a deeper groove experience; the removal of layers creates a kind of 'sonic space' that allows for breathing.

In academic literature, various new concepts have been developed to analyze EDM forms. Sfetcu (2018, pp. 35-40) proposes the concept of 'tension-release cycles,' emphasizing that each build-up/drop pair creates a physiological tension-release cycle in the listener. Peres (2016, pp. 228-235) uses the term 'climax-oriented form' to explain that EDM tracks are organized around single or multiple climax points. These concepts radically differ from the exposition-development-recapitulation structure in classical form theory.

**The Drop and Energy Management**

In EDM, the drop is the most critical moment of form. Typically following a build-up section, the drop is the moment when energy reaches its maximum, when bass and drum sounds are most intense. Le (2022, pp. 48-52) explains the drop through the concept of topological space: the drop can be conceived as a spatial point where the density of musical material reaches its peak.

**Case Analysis: Calvin Harris – Summer (2014)**

Calvin Harris's 'Summer' is a typical example of EDM formal structure. The song consists of the following sections: Intro (16 bars, minimal synth loop), Verse 1 (16 bars, vocal + synth), Pre-Chorus (8 bars, build-up), Chorus/Drop 1 (16 bars, maximum energy), Breakdown (16 bars), Verse 2 (16 bars), Pre-Chorus 2 (8 bars), Chorus/Drop 2 (32 bars, extended drop), Outro (16 bars). In this structure, there is no theme in the traditional sense; only the vocal melody and synth riff repeat. The formal structure is constructed through the addition/removal of layers and the management of energy level. Drop moments are defined by the density of bass frequencies, the complexity of drum patterns, and the number of synth layers.

This analysis proposes a new synthesis by bringing together Sfetcu's (2018) concept of 'reverse extension' and Le's (2022) concept of 'topological space': 'mix topology.' Traditional form theory treats form as a temporal category

(sequential structures like A-B-A). However, the 'Summer' example demonstrates that form in EDM is also a spatial/topological category. Drop moments are perceived not only as 'a point in time' but also as 'a space where the frequency spectrum intensifies.' This reveals that mix cannot be addressed solely under the 'timbre' category; mix directly constitutes formal structure. Filter opening during the build-up functions not merely as a 'timbral change' but as a formal 'transition.' This finding requires a new conceptual framework that eliminates the rigid distinction between 'form' and 'timbre' in music theory, integrating these two categories: 'Timbral form.'

**The Ontological Shift in Form Theory**

These transformations in the field of form raise the fundamental ontological question of what 'form' is. In classical theory, form is defined as 'the temporal organization of thematic content.' However, in EDM, there is no theme; there are only repeating loops and layers. In this case, the question of what defines form becomes critical. This literature review's analysis demonstrates that form in EDM operates in three dimensions: (1) Temporal dimension (sequence of sections), (2) Vertical/spectral dimension (addition/removal of layers), (3) Energy dimension (density profile). This multi-dimensional form understanding parallels Cook's (2013) 'performance-centered' musicology approach: form exists not in 'the written score' but in 'the realized sonic event.' In music theory education, when teaching sonata form or rondo, it should be emphasized that these forms are valid only for a specific repertoire (18th-19th century European classical music); in EDM, however, an entirely different formal logic operates.

The relationship between traditional music theory and popular music has been a long-debated topic in the music theory and musicology disciplines. These debates are fundamentally shaped around three different methodological positions: adaptation of classical theoretical tools to popular music, development of new models based on production practices, and hybrid approaches combining these two.

**Adaptation of Classical Theoretical Tools**

The first methodological position argues that classical music theory tools can be adapted to the popular music repertoire. Researchers adopting this approach propose that traditional concepts such as Schenkerian analysis (an analytical method developed by Heinrich Schenker that reveals the fundamental structural layers of music), functional harmony, and voice-leading rules can be adapted to account for guitar/keyboard idioms and unnotated features.

For example, Duinker (2019, paragraphs 12-18), when analyzing chord loops (recurring chord sequences) frequently encountered in pop music, maintains traditional tonal concepts but expands these concepts by proposing new terms such as 'hybrid tonic' (an ambiguous center alternating between two tonic functions). Proponents of this approach emphasize that traditional theory offers a universal analytical framework and that popular music also contains fundamental musical parameters such as tonality, harmony, and form.

**New Models Based on Production Practices**

The second methodological position argues that popular music's production techniques, sampling, and recording practices require new models that emphasize process, medium, and technology rather than notation-based paradigms alone. Danielsen (2016, pp. 85-110) proposes that musical rhythm in the age of digital reproduction cannot be explained solely by notation-based meter and pulse concepts; instead, waveform analysis, DAW examination, and analysis of producer discourses must be incorporated into the analytical process.

This approach advocates a 'practice-first' analysis of popular music. Methods such as producer interviews, examination of DAW session files, and spectral analysis of audio recordings should be used alongside or instead of notation-based transcription. Von Appen et al. (2016, pp. 100-125) emphasize that in interpreting 21st-century pop music, the physical and technological characteristics of recorded sound must be centralized. This production-oriented approach can be further deepened with a software studies perspective. Manovich (2013, pp. 40-65) emphasizes that software is not merely a 'tool'; rather, it is a 'cultural actor' that actively shapes the user's thinking and creation methods. DAW interfaces transform how musicians conceptualize music by representing musical material as 'tracks,' 'clips,' and 'parameter automation curves.' Fuller (2008, pp. 15-30) explains this transformation through the concept of 'software as ideology': DAWs universalize this production logic by 'naturalizing' loop-based composition, layered thinking, and

parametric manipulation. This perspective demonstrates that popular music theory must also consider the epistemological effects of DAW interfaces. Not only the question 'What is being done in the DAW?' but also 'How does the DAW shape musical thought?' must be incorporated into theoretical analysis.

**Hybrid Approaches and Practical Challenges**

The third methodological position proposes combining classical theoretical tools with production-oriented methods. This approach argues that completely abandoning traditional concepts is unnecessary; however, these concepts must be expanded and reinterpreted to account for the unique practices of popular music. From a practical application perspective, this hybrid approach presents certain challenges. First, access to DAW session files is not always possible; for most commercial recordings, only the final mix is available. Second, the reliability of producer and artist discourses can be questioned; musicians do not always make conscious theoretical decisions, often acting with intuitive and practical priorities.

**Transformations in the Fields of Harmony and Counterpoint**

In traditional music theory, harmony is addressed within the framework of functional tonality. Tonic, dominant, and subdominant functions, cadences, and modulations are the fundamental tools of classical harmonic analysis. Counterpoint examines voice-leading rules and inter-voice relationships in polyphonic writing. However, in popular music productions, these concepts undergo significant transformations.

**Cyclical and Static Harmonic Structures**

In popular music, particularly in post-2000 productions, cyclical chord structures (chord loops) have become widespread. Duinker (2019, paragraphs 20-28) terms these structures as 'plateau loops' and notes that, unlike traditional functional harmony, a fixed loop revolves around a tonal center. For example, the I-V-vi-IV sequence (in C major: C-G-Am-F) is extremely common in pop music, and this loop creates a continuously repeating cycle rather than resolving the tonic-dominant progression in the classical sense.

**Modal Ambiguity and Hybrid Tonics**

In many pop songs, ambiguity between major and minor modes is observed. Duinker's concept of 'hybrid tonic' attempts to explain this ambiguity. For example, a song may alternate between C major and A minor; the tonic function is not fixed to a single chord. This situation is rarely seen in classical tonal analysis but is a frequently encountered phenomenon in popular music.

This modal ambiguity is part of a broader phenomenon in popular music called 'tonal ambiguity.' For instance, the I-♭VII-♭VI-♭VII (Aeolian modal interchange) progression, which became widespread in EDM and pop music throughout the 2010s, contains parallel fifths and a ♭VII-I cadence that could be considered an 'error' in classical tonal theory. However, this progression is perceived as an extremely natural and acceptable sound in popular music. Richards (2017, pp. 88-95) documents that such modal borrowing techniques have become increasingly common in pop harmony from 1960s rock music to the present.

**Case Analysis: The Weeknd – Blinding Lights (2019)**

The Weeknd's 'Blinding Lights' is a striking example of cyclical harmonic structure. The entire song is built upon the Fm-Eb-Bb-Db chord loop. This loop never changes from intro to outro; only the vocal melody and production layers change. In traditional functional harmonic analysis, finding a clear tonic-dominant relationship in this loop is difficult. Although the Fm chord appears to be the tonal center, the loop is in constant motion and there is no prolonged rest on any chord. From a production perspective, chord changes are emphasized by synthesizer arpeggios; each chord change is also perceived as a timbral change. This example demonstrates that harmonic analysis must be integrated with production analysis.

When examined more deeply from a production perspective, the harmonic structure of 'Blinding Lights' forms an inseparable whole with synthesizer timbres. The song's characteristic arpeggio sound is created using an emulation of the Roland Juno-106 synthesizer. With each chord change, the timbral character of the arpeggio changes slightly; this allows chord changes to be perceived not only at the pitch level but also at the timbral level. The use of automation to control

filter cutoff and resonance parameters imparts a dynamic timbral development to a static chord loop. This observation supports the concept of 'timbral harmony' proposed by Sanden (2013, pp. 65-70): in popular music, harmony is constructed not only through pitch relationships but also through timbral transformations.

**Reconceptualizations in the Fields of Rhythm and Meter**

This analysis significantly expands the discussion of 'functional harmony' in the literature. While Duinker's (2019) concept of 'hybrid tonic' explains tonic ambiguity, it still offers a pitch-centered perspective. However, the 'Blinding Lights' example demonstrates that harmony is constructed not only through pitch relationships but also through timbral transformations. Sanden's (2013) concept of 'timbral harmony' is critical at this point: the combination of chord changes with filter cutoff and resonance automation transforms 'harmony' from a one-dimensional (pitch) category into a multi-dimensional (pitch + timbre + automation) category. This finding demonstrates that merely 'adapting' traditional harmony theory is insufficient; the theoretical definition of harmony needs to be expanded. Production parameters can no longer be addressed under the 'orchestration' category; they directly constitute the harmonic structure itself.

In traditional music theory, rhythm and meter are defined by concepts of measure, pulse, note values, and metronomic tempo. However, in digital production, particularly in hip-hop and EDM, the understanding of rhythm has been enriched with new concepts such as microtime, groove, and quantization aesthetics.

**Microtime and the Concept of Groove**

Danielsen (2016, pp. 120-145) emphasizes that musical rhythm in the age of digital reproduction cannot be fully explained by notation-based meter and pulse concepts. Instead, the concepts of microtime (time differences at the millisecond level) and groove (rhythmic pattern creating a specific feel) come to the forefront. Groove is not merely a notation-based rhythmic figure; it is also a perceptual whole created by subtle variations in sound intensity, timing deviations, and timbral variations.

**Quantization Aesthetics**

In DAWs, quantization is the process of aligning MIDI notes to a specific grid. However, perfect quantization often creates a mechanical feel. Therefore, many producers use humanize and swing settings to simulate the natural timing deviations of human performers. Brovig-Hanssen et al. (2021, pp. 278-285) propose the concept of a flexible grid in EDM.

**Case Analysis: Billie Eilish – Bad Guy (2019)**

Billie Eilish's 'Bad Guy' is a striking example of minimal and microtime-focused rhythmic understanding. The song's fundamental groove is built upon very few sound elements: a bass sound, finger snaps, and minimal electronic beats. However, within this minimal structure, the timing and velocity of each sound are adjusted with extreme precision. The bass sound's slight deviation from the grid creates a lazy feel; the finger snap, standing precisely on the grid, creates a contrast. DAW analysis reveals that this groove is not completely quantized; rather, it is constructed with selective humanization. Traditional notation cannot display these subtle timing differences. This example reveals that groove analysis requires digital tools such as DAW visualization and waveform examination.

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These transformations in the field of rhythm and meter question one of music theory's fundamental tools—notation. Traditional notation represents rhythms with discrete symbols (♩, ♪, ♬) and cannot display timing differences at the millisecond level. This reveals the limitation of notation transcription in popular music analysis. DAWs' waveform and MIDI views have become the new 'notation' of rhythmic analysis. However, this is not merely a technical change; it is also an indicator of an epistemological shift. Music theory is evolving from a discipline centered on the 'written work' to one centered on 'recorded sound.' The deepest consequence of this shift is: 'Musical knowledge' now resides not in the score but in the audio file. This necessitates the addition of new skills such as 'spectral listening' and 'DAW analysis' alongside traditional practices like 'solfège' and 'dictation' in music theory education.

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In traditional music theory, form is built upon principles of thematic development, contrast, and repetition. In popular music, form is generally defined by a verse-chorus structure and section-based organization. However, in the digital production age, particularly in EDM and hip-hop, form understanding is shaped by new concepts such as loop-based structures, layering, and the drop.

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These transformations in the field of form raise the fundamental ontological question of what 'form' is. In classical theory, form is defined as 'the temporal organization of thematic content.' However, in EDM, there is no theme; there are only repeating loops and layers. In this case, the question of what defines form becomes critical. This literature review's analysis demonstrates that form in EDM operates in three dimensions: (1) Temporal dimension (sequence of sections), (2) Vertical/spectral dimension (addition/removal of layers), (3) Energy dimension (density profile). This multi-dimensional form understanding parallels Cook's (2013) 'performance-centered' musicology approach: form exists not in 'the written score' but in 'the realized sonic event.' In music theory education, when teaching sonata form or rondo, it should be emphasized that these forms are valid only for a specific repertoire (18th-19th century European classical music); in EDM, however, an entirely different formal logic operates.

## Conclusion and Discussion

This final section brings together the conceptual transformations discussed in the previous four analytical sections (Harmony, Rhythm, Form, Timbre/mix) to formulate the article's central argument. In Section 4, we saw that harmony has become an integrated category of pitch + timbre + automation; in Section 5, that rhythm is defined by microtime and spatial spaces; in Section 6, that form is constructed through timbral transformations. These three observations converge at a common point: Timbre and mix are no longer a secondary parameter but a fundamental analytical dimension that shapes all theoretical categories. This synthesis proposes a fourth path beyond the three methodological approaches in the literature (adaptation of classical tools, development of new models, hybrid approach): the timbre-centered hybrid paradigm.

The conceptual transformations examined in previous sections (cyclical harmony, microtime, layering) converge at a common point: the fact that timbre and mix have become too central to be addressed solely under the 'orchestration' category. This section constructs the article's main argument: In popular music, timbre and mix are no longer a secondary parameter but a fundamental analytical dimension that shapes all theoretical categories from harmony to form, from rhythm to counterpoint. This synthesis proposes a fourth path beyond the three methodological approaches in the literature (adaptation, new model, hybrid): the timbre-centered hybrid model.

Traditional orchestration theory examines the timbral characteristics of instrument families, register usage, and how instruments blend together. However, in popular music production, timbre is not merely instrument selection; it is also a product of sound design and mixing processes.

**Track Identity and Sound Design**

In DAW-based production, each track has its own identity. A bass track is defined not only by bass notes but also by the synth preset used, filter settings, distortion amount, and reverb character. This track identity is a concept without correspondence in traditional orchestration theory.

**Mix Aesthetics and the Structural Role of Timbre**

In popular music, mixing is not merely a technical finishing process; it is also a compositional decision. Decisions about which tracks will be in the foreground, which in the background, and how tightly bass and drums will integrate directly affect the perception of musical structure. Side-chain compression (one sound temporarily silencing other sounds), as a technique where timbre and rhythm merge, becomes part of the formal structure. Brovig-Hanssen et al. (2021, pp. 288-290) argue that mix should be treated as an aesthetic category.

### Theoretical Foundations of the Timbre-Centered Model

The fundamental argument of this article is that in popular music analysis, timbre and mix must be elevated to a status equal to (and in some cases prioritized over) traditional theoretical categories. This argument is based on three fundamental observations:

First, as the analyses demonstrate, harmony can no longer be defined solely by pitch relationships. In the 'Blinding Lights' example, chord changes form an inseparable whole with timbral automations. This validates and expands Sanden's (2013) concept of 'timbral harmony': harmony is an integrated category of pitch + timbre + automation.

Second, rhythm and groove can be grasped not only through notation but through waveform analysis. In the 'Bad Guy' example, the microtime differences and spatial spaces that constitute the groove are outside traditional notation. This supports Danielsen's (2016) microtime concept and combines it with Zagorski-Thomas's (2014) spectral space concept.

Third, form is now constructed not only through thematic development but through timbral transformations. In the 'Summer' example, build-ups and drops occur through timbral changes (filter opening, layer addition). This validates Le's (2022) topological space concept and necessitates the 'timbral form' concept.

These three observations allow us to reach the following conclusion: In popular music, timbre and mix are no longer a 'sub-category' but the analytical center.

### Analytical Application of the Timbre-Centered Model

This model proposes the following practical steps in popular music analysis: (1) Multi-layered listening: Analysis should be conducted not only with the stereo mix but, when possible, with DAW session files. Listening to each track separately reveals the structural importance of timbral decisions. (2) Spectral visualization: Waveform and spectrogram views display timbral and temporal details that notation cannot capture. This should be a fundamental part of the analytical process, not merely an 'auxiliary tool.' (3) Parametric mapping: Automation of production parameters such as filters, EQ, and compressors should be mapped for formal analysis. A filter opening is as significant a formal event as a 'modulation' in traditional form theory. (4) Integrated transcription: Notation transcription should be done if possible but should not be considered sufficient alone. Timbral parameters, mixing decisions, and spectral information must be added to notation.

The literature review reveals four fundamental conceptual transformations. First is the shift from functional tonality to cyclical and static structures in harmony. Traditional tonic-dominant-subdominant relationships are being replaced in popular music by new concepts such as plateau loops and hybrid tonics. Researchers such as Duinker (2019) and Exarchos (2020) have systematically documented this transformation and proposed new analytical terms.

Second is the shift in rhythm from meter and pulse theory to microtime and groove concepts. Danielsen's (2016) work demonstrates that traditional notation-based rhythm analysis cannot capture the subtle timing differences of digital production. DAW-based concepts such as quantization aesthetics, humanization, and swing have become new tools of rhythm theory.

Third is the transformation in form from thematic development to layering and energy management. Researchers such as Sfetcu (2018) and Le (2022) have emphasized that formal techniques in EDM such as drop, build-up, and reverse extension require new analytical categories without correspondence in classical form theory.

Fourth is the shift in the field of timbre and orchestration from instrument families to sound design and mix aesthetics. Track identity, side-chain compression, and the treatment of mix as a compositional category have become central in popular music analysis.

## Recommendations

### Methodological Debates and Practical Challenges

Three fundamental methodological positions are identified in the literature: adaptation of classical theoretical tools, development of new models based on production practices, and hybrid approaches. The ongoing debate among these three positions questions the epistemological foundations of the music theory discipline. The approach of adapting

classical tools is criticized for its universality claim; production-oriented new models are accused of ignoring traditional theoretical knowledge.

Practical challenges include: limited access to DAW session files, reliability issues with producer discourses, the technical gap between notation-based transcription and waveform analysis, and music theory educators' lack of digital production knowledge. To overcome these challenges, interdisciplinary collaborations (music theory, music technology, audio engineering) and integration of DAW literacy into music theory curricula are necessary.

**Recommendations for Music Theory Education and Pedagogy**

The findings of this literature review offer important implications for music theory education. Traditional music theory curricula typically focus on Western art music repertoire and emphasize notation-based analytical methods. However, today most students are consumers and/or producers of popular music. Therefore, music theory education must be expanded to include popular music practices.

In terms of curriculum design, by incorporating DAW literacy, critical listening oriented toward production techniques, and practice-based projects, students should learn analysis based on recorded sound production (Bontempi et al., 2023, pp. 12-15; Reuter, 2021, pp. 16-18). For example, students could open a pop song in a DAW, examine each track separately, observe effect automations, and analyze how production decisions shape musical structure.

In terms of computational and perceptual studies, encouraging interdisciplinary work combining Music Information Retrieval (MIR: technologies for extracting musical information from digital audio recordings), controlled listening experiments, and ethnographic producer studies is recommended (Agres et al., 2017, pp. 14-16). For instance, studies empirically testing the effects of different groove templates on listener perception, or research examining how timbral changes affect formal section perception, can operationalize new analytical categories.

**Recommendations for Future Research**

Future research should include empirical testing of these new conceptual frameworks, their application to different genres and cultural contexts, and practical integration into music theory education. While remaining sensitive to genre conventions, production possibilities, and cultural practices, analytical studies centering popular music's unique practices should be encouraged rather than uncritically reflecting classical norms.

The following research areas are particularly prioritized: (1) Empirical studies measuring the effects of different quantization aesthetic applications on listener perception, (2) Experimental research examining how track identity and mix aesthetics affect formal perception, (3) Case studies documenting how sampling practice transforms harmony and form understanding in genres such as hip-hop and trap, (4) Large-scale corpus studies based on systematic analysis of DAW session files, (5) Ethnographic examination of producer and artist discourses.

**The Future of the Discipline: Toward a Timbre-Centered Paradigm**

Evaluated collectively, the literature advocates a pluralistic and production-informed music theory that develops new concepts and methods adapted to contemporary popular music practices and materials while preserving classical insights (Danielsen, 2016; von Appen et al., 2016; Brovig-Hanssen et al., 2021; Bontempi et al., 2023; Reuter, 2021). Traditional music theory concepts need not be completely abandoned; however, these concepts must be expanded and reinterpreted to account for popular music's unique features such as digital production practices, loop-based composition, sampling, sound design, and mixing.

The timbre-centered model advocated by this article requires three fundamental transformations for the future of the music theory discipline:

First, epistemological transformation: Music theory must transition from a 'written work'-centered epistemology to a 'recorded sound'-centered epistemology. Born's (2010) 'ontological pluralism' and Cook's (2013) 'performance-centered musicology' approaches provide the theoretical foundation for this transition. Musical knowledge is now extracted not from scores but from audio files and DAW session files.

Second, methodological transformation: The tools of analysis must expand. Notation transcription, spectral analysis, DAW examination, and producer ethnography should be used together. Fuller and Manovich's software studies

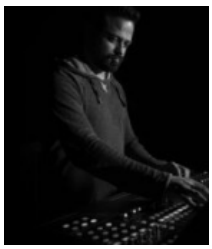
perspective emphasizes that DAWs are not merely 'neutral tools' but also 'cultural actors' that shape musical thought. This makes critical analysis of DAWs part of the analytical process.

Third, pedagogical transformation: Music theory education should not focus solely on classical repertoire. DAW literacy, spectral analysis, timbral analysis, and mix aesthetics should be incorporated into the curriculum as fundamental skills alongside solfège and harmony. Sterne's (2003) history of sound technologies perspective demonstrates that the historical and cultural context of these skills must also be taught.

These transformations will bring music theory into alignment with the dominant music practice of the 21st century. However, this is not a rejection of traditional theory; it is an expansion to encompass popular music's unique practices. The timbre-centered model provides the analytical framework for this expansion.

This compilation emphasizes that the music theory discipline must evolve to encompass the dominant music production and consumption practices of the 21st century. The new conceptualizations and analytical approaches emerging in the fields of harmony, rhythm, form, and timbre will enable music theorists, educators, and researchers to understand and analyze popular music more deeply. This transformation is not merely an academic debate; it is a process of vital importance for the future of music production, criticism, and education.

**Biodata of Author**



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Vol 3 No 2 December 2025 Winter

## Contents

***A music theoretical history of two continents. German and European roots and (re)reception of pitch-class set theory***
***Stephan Lewandowski***

***A historical and statistical view on Old-Roman, Gallican, and Gregorian Chant***
***Dirk van Kampen***

***Analysis of sentence structures in Uzzâl oud taksim of Cinuçen Tanrikorur***
***Kibele Kıvılcım Çiftçi***

***Reclaiming somatic intelligence: A Sumerian Minahasan embodied framework for music education in the AI era***
***Soegiarto Hartono***

***Music theory in the digital age: Transformation of traditional theory in popular music production, analytical approaches, and a systematic literature review on DAW-based practices***
***Serkan Çolak***

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