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THE ESTONIAN LANGUAGE AND ITS INFLUENCE ON MUSIC: A COGNITIVE SCIENCES APPROACH

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Abstract: Musicology may seem a specific small sector of humanitarian scholarship to the layman, but it hides variety within from highly theoretical subjects such as music theory to the fieldwork with indigenous repertoires and their performance, as found in ethnomusicology. There is a shift in contemporary musicology, its focus moving more towards studies of musical performances and the use of empirical study designs to complement the analysis of musical scores. These interdisciplinary empirical studies cross the border of humanitarian scholarship and apply the methods of the natural sciences, for example spectrogram analysis of singing and the measurement of the temporal structure of recorded music. The cognitive sciences of music (CSM) can be looked at as an umbrella term for branches of musicology that use empirical research methods and draw their research questions from music related individual and group processes. One of the major topics of CSM relates to research in linguistics. Music and language, as well as speech, are closely linked as the human voice is a natural part of vocal music and is considered a quintessential element in musical thinking, vocal and instrumental alike. The music–language–speech relationship intrigues Estonian musicologists as research questions focusing on related topics arise in different fields of musicology, including natural settings and functional songs (musical development, spontaneous singing, runosong, ecclesiastical singing) to the vocal art music performed by professional singers (some chronological examples: Ross & Lehiste 2001; Raju 2015; Lippus & Ross 2017; Jõks 2021; Vurma et al. 2022). The purpose of this referative overview article is to introduce a selection of previous research and discuss the results. The endeavour of the authors is to find an abstract common denominator of selected CSM research projects to establish the most estimable useful knowledge that Estonian CSM has to offer to the international scholarly community, as well as to follow-up research in Estonia. Although we can see the results of that support, and we can

see the universal perception and cognitive processes of language and music in Estonian research, there are also several interesting prosodic-musical differences relating to the fact that Estonian belongs to the Uralic language family, more specifically Western Finnish language group. Indo-Germanic (mainly German, Russian, Latin, Italian, and English) language related prosody and singing culture does not necessarily support the natural language usage and therefore represses emotional and spontaneous involvement in singing. It seems that in the process in which Estonian scholars deal with their distinctive mother tongue, indigenous musical repertoires, and idiomatic singing, intuition – more precisely a scholarly intuition –, might play an important role.

Keywords: idiomatic singing, language, music–language link

1. INTRODUCTION

Musicology may seem a specific and small sector of the humanities to the layman, but in fact it hides variety within. Contemporary musicology is in constant development. Initial flirtation with innovative analysis methods has today become a more or less stable cohabitation that proposes new scholarly solutions with every passing year. The previous relationship between musicology and philosophy, general history, theology, and mathematics has grown into interaction of different branches of musicology with social sciences, pedagogy, linguistics, computer science, medical and cognitive sciences and psychotherapy. To put it in a nutshell, development is clearly towards interdisciplinarity. The reason behind this development is probably exhaustion of the tools of literature-based classical humanitarian scholarship in the 20th century, in which musicology is not an exception. Other branches of humanitarian scholarship such as theology have also turned towards the natural sciences, for example neurotheology tries to explain religious behaviour and religious experience through the prism of neuroscience (in Estonia, for example Karo 2005, 2009).

Another example of the clear interdisciplinary tendency is a relatively new and growing branch of artistic research that combines a systematic methodological approach with active creative processes. The Estonian Artistic Research Framework Agreement (2021: 3) says: "Artistic research is research expressed in and based on creative activity, the aim of which is to create new knowledge, new forms of culture and new creative and research methods or techniques, and thereby contribute to the development of research fields, society and economy." This innovation has probably emerged due to the advent of artistic studies at the doctoral level in the 1990s, with performers and composers having gained doctorates in music since then. Their qualification is not designed as 'mainstream' musicological study, rather they are well equipped to conduct a type of research that can produce new useful knowledge in the musicological discourse

that is possible only with creative musical components. In the early days there was strong tension between the ideas of artistic research and more conservative 'mainstream' musicology. Although this tension has substantially diminished it is still current in some countries. One of the reasons for such hesitation lies in a crucial differentiation of artistic research: in the classical research model the result must be repeatable with the same material and method used in an original research. In artistic research alas there is an insurmountable scientific blind spot – the creative component of the artistic researcher, which is isolated, unique, and unrepeatable. Therefore, in artistic research it is considered satisfactory if a reader can clearly follow the process of the creation process and link it with a theoretical research in the same work.

The robust way to approach musicology is through methodology, the research process can be (1) descriptive, observational and based on expert opinion, or (2) empirical in nature using qualitative or quantitative methods. In contemporary Estonian musicological discourse it is customary to think about four main categories of musicology: (1) music history, (2) music theory, (3) ethnomusicology, and (4) cognitive musicology (Maimets & Ross 2004: 9). In 2000 Jaan Ross listed three major achievements of the Estonian musicology of the 1990s: (1) widening the concept of the timeline in Estonian music history writing to include earlier periods than 19th century and starting methodological discussion of history-writing; (2) diversification of the discipline in research projects and academic syllabi; (3) beginning the graduate programs of musicology at the Estonian Academy of Music and Theatre (EAMT) and the University of Tartu (Estonian and Finno-Ugric philology included ethnomusicological courses) (Ross 2000: 1984). Now, about twenty years later we can complement the list with (4) founding the international academic journal *Res Musica* in 2009[1]; (5) building up a foundation from which to develop artistic research; (6) initiation of the major interdisciplinary collaboration projects[2] that bring together researchers from different disciplines but also encourage cooperation within the field of musicology.

The purpose of this article is to introduce a selection of previous research and discuss the results. The endeavour of the authors is to find an abstract common denominator in the selected CSM research projects and establish the most estimable knowledge that the Estonian CSM community has to offer to the international scholarly community and follow-up research in Estonia.

1.1. Main concepts and changes over time

According to the Western canon, a musical work can exist in the form of a score or performance. Scores, however, may be lacking in cultures or genres more

improvisational in their nature than the mainstream Western music. Meanwhile the concept of 'musical work' in Western music is also scrutinised by music philosophy – yet another scholarly field that is associated with cognitive musicology (for example Goehr 2007). In Estonia there is also some new interest in music philosophy. Student Aurora Ruus (b. 2001) has recently written (2022a, 2022b) about the problem of the definition and thus the identity of music and musical works. The aim of her research was to compare the identity of musical works and music itself as a metaphysical entity based on phenomenology and ontology, mainly using theories constructed by Roman Ingarden, Arthur Schopenhauer and Friedrich Nietzsche. Based on these theories the short conclusion of her research is that we cannot fully define the ontological identity of music because music would lose its metaphysical value. Nevertheless, when speaking about musical works and their phenomenological identity based on such qualities as notation or recording, etc., one has to admit that musical work isn't as easy to define due to its various and unstable characteristics (Ruus 2022a).

There is a shift in contemporary musicology, its focus moving more towards studies of musical performance instead of scores of musical works. While such an approach has traditionally been accepted in ethnomusicology, the concept of dynamic form has opened new ways of analysis in music history and music theory. John Butt has suggested that material that was meant to be performed should also be analysed through performance. Even more, "[---] performance might be a useful parameter in understanding how a piece of music came to be created and notated" (Butt 2002: xii). We now see research into the reception of music in Estonia in broader terms, meaning not only traditional and professional music as created and practiced by ethnic Estonians, but also music by other groups who have lived or presently live in Estonia, such as historical groups like Baltic Germans or coastal Swedes, and different marginalised subgroups who live in contemporary Estonia.

1.2. Cognitive sciences of music (CSM)

Cognitive sciences of music (CSM) can be looked at as an umbrella term for social sciences (music psychology[3] and music sociology) and musical acoustics. These disciplines use generally sociological research methods (interviews, questionnaires, observations) or designed perception experiments with constructed auditory stimuli, drawing their research questions from music-related cognitive individual and group processes. Acoustic research employs segmentation methods to measure and analyse sung text with the smallest perceivable units (Vurma 2017a, 2017b, 2020; Jõks 2009, 2014; Raju et al. 2010). Ross explains the

concept of CSM as meaning that the results of these studies can be discussed in a wider context than just psychology in its narrowest definition of only focusing on human behaviour. For example, music psychology focuses on the relationships between the individual and music in its different forms rather than just on the measurable behavioural aspects. Music sociology analyses music at different societal levels, including minority and marginalised groups (Ross 2007: 13).

1.3. Geographical, historical and linguistic influences of Estonian and of certain specifics of spoken Estonian

An important study sector in CSM is rooted in the research of language–speech–music relations. Estonian together with Finnish represents an exceptional linguistic oasis within the Indo-German cultural sphere. There are two language families in Europe: Indo-German and Indo-European, and Uralic and Uralian. Both Estonian and Finnish are Uralic, or to me more precise Western Finnish, languages, and both are surrounded by exclusively Indo-German languages.

When discussing the main special features of Estonian we must focus on at least five aspects.

(1) There are three degrees of length in the Estonian language, because it is a durational or quantitative language. This means that the duration of a phoneme may determine the meaning of a word. Let us look at three sentences: (a) "Palun anna mulle *sada* roosi", "Please give me a *hundred* (sada) roses"; (b) "Palun *saada* mulle *sada* roosi", "Please *send* (saada) me a *hundred* (sada) roses"; (c) "Ma soovin *saada sada* roosi", "I wish to *get* (saada) hundred (sada) roses". The word "*sada*" (the first degree of length), which means "one hundred", is spelt with a single *a*, pronounced with a short duration. The word "*saada*" (the second degree of length) in a meaning of "send" is spelt with two *a*s and pronounced with a long duration. The word "*saada*" (the third degree of length) in the meaning of "to get" is also spelt with two *a*s and is pronounced with a very long duration.

(2) There is no grammatical gender in the Estonian language. Estonian humanities scholar and polyglot Evald Saag (1912–2004) believed this to be an indication that Estonians are one of the few "*loodusrahvas*" (lit. "nature people") who have reached high culture (Saag 2004).[4]

(3) Descending intonation in all sentences, even in interrogative sentences. Willy Peters realised in 1920 that Estonian has predominantly descending intonation curves (Asu et al. 2016: 163). It has been confirmed in numerous

textbooks (for example Ariste 1953; Ehala 1998; Kraut et al. 2004) that Estonian has descending intonation in all types of sentence (see Asu et al. 2016: 174 for details). However, some analysis suggests (for example Pajupuu 1999 and Asu 2004) that there is much more variety in Estonian intonation if one can abandon the myth of monotony in Estonian (Asu et al. 2016: 163).

(4) Estonian is an initial syllable stress language. There are only very few exceptions, many of which are foreign words. One of the Estonian exceptions is "*aitäh*" (thank you) where the stress is on the second syllable.

(5) Extension of an unstressed syllable. From a (vocal) musical viewpoint the relationship between word stress and the extension of the stressed syllable has crucial importance. In German, the stressing and extension of a syllable are largely linked (Marasek 1997; Dogil & Williams 1999; Rapp 1994; Jessen et al. 1995; also, Jessen 1993; Dahmen & Weth 2018: 20). In other words, the main principle is that a syllable that is stressed is also extended. In Estonian there is no such regularity – an unstressed syllable can also be perceived as the longest syllable in the word. For example, "*tuba*" (room), which belongs to the first degree of length, has a stressed first syllable, while the second syllable is longer. If we change the duration of the first syllable (either just orally or in a written form) the result would be "*tuuba*", which belongs to the second degree of length and translates as tuba (brass musical instrument).

We have to admit that Estonian is in many respects rather different from Indo-Germanic languages. The dominant influence in Western culture, however, is Indo-Germanic languages. Estonians, although an ancient nation with an indigenous culture, are newcomers on the scene that we might call the family of Western European cultural nations. The full Estonian Bible translation was published only in 1739, whereas for example the first full German Bible was published in 1534, shortly after the beginning of the Reformation in 1517. Our written language was created by Baltic Germans, and only in the 19th century can we talk about the first Estonian linguists, as well as Estonian professional composers. Even some of our best-loved popular national songs are adaptations from German music.

2. ESTONIAN LANGUAGE AND MUSIC RELATED CSM RESEARCH

The next section of the article will give an overview of a representative selection of recent[5] research in music and the Estonian language covering different fields of interest and different methods. To give some brief historical background, it is important to state that early studies (up to the 20th century) did not have

intentional musicological aspiration but are, however, crucial reference for any language-related musicological study in Estonian linguistics. Long before the era of CSM, linguists had discovered and explained some of the music-related qualities of the Estonian language. As an example it would be proper to refer to Eduard Ahrens (1803–1863). Ahrens was a Baltic-German Lutheran minister who also studied Estonian. He was only one amongst many Baltic-Germans who can be called the 'midwives' of the Estonian written language.

> *The first linguists were foreigners who saw the prosodic system of Estonian through models developed based on German (and other Indo-Germanic languages). Lexical stress on the first syllable was probably known before it was mentioned in the grammar (Stahl 1637), while the existence of secondary stress was clearly stated by Hirschhausen (1827). However, Estonian perception was of the utmost importance in discovering three degrees of length, as the (supposed) first recording of three vowel lengths (*Agenda Parva*, 1622, author unknown, presumably of south Estonian origin) as well as their theoretical description (Masing 1824) were given by Estonians.* (Särg 2005: 226)

In 1865 Ahrens separated the static connection between stress and length in Estonian using Finnish as an example.

2.1. CSM and ethnomusicology

Estonian traditional songs (runosongs) have a strong emphasis on the lyrical content, serving therefore as a form of oral history and pedagogical guidance for younger generations. Rather simple melodies are often a cross used between different sets of lyrics in the traditional runosinging. This is possible due to the repeating prosodic rhythm – one verse of a traditional runosong text is usually a trochaic tetrameter. The first ground-breaking studies in Estonia that combined ethnomusicology and specific linguistic analysis tools arose from cooperation between Ilse Lehiste (1922–2010) and Jaan Ross (b. 1957), who started to segment and analyse old recordings with the help of computer software in the 1980s.

> *The temporal analysis has been done with recordings of runic song. When studying the temporal structure of vocal music with Balto-Finnic texts, Jaan Ross and Ilse Lehiste have concluded that, for example, in the performance of Karelian lament, there is one basic note value [BNV] of 450 milliseconds (ms), which is varied into notes with both longer and*

> *shorter durations (Ross & Lehiste 2001: 125–126). On the other hand, Jaan Ross has identified in the performance of the old Estonian swing song "The Swing Wants Gloves" (*Kiik tahab kindaid*) two different basic note values of 300–350 ms and 800–850 ms, both of which vary agogically (Ross 1989: 68). In a swing song, thanks to the impulses mimicking the movement of the swing, metric thinking arises, which creates another, longer base note value*[6]*."* (Jõks 2021: 148–149)

There is no doubt that their significance in the field of cognitive musicological studies cannot be overestimated. Only knowledge of the temporal structure of different styles of Estonian runic song is very important. Knowing that in ordinary Estonian runic singing there is one basic note value – approximately 400 ms –, which is agogically varied in both directions, introduces an important aspect of Estonian-language singing. These findings have had an important effect in further studies, for example studies of Estonian ecclesiastic chant by Eerik Jõks (these will be introduced later in this article).

However, an even brighter contribution by Lehiste and Ross lies in the empowerment of scholarly thinking. In order to measure the temporal structure of recorded music it is necessary to segment the music into sections divided by time.

> *There are two basic methods for measuring the temporal structure of the recording of a musical performance. The first is so called "taping". The principle of this method is to mark certain points along the time axis using specialist software. As a result, we will get a set of values that divide the recording into segments. The length of each segment is then easily calculable by subtracting the length of previous segments from a particular value on the time axis.* (Jõks 2009: 254)

However, this method is not satisfactory for precise measurement of the length of every note (ibid.: 256).

The second method, which is more accurate, demands digital segmentation of the syllables with specialist phonetic software, for example Praat. In the process of digitally segmenting a recording, there is a methodological problem that needs to be solved, i.e. how to detect boundaries between successive syllables. Is the boundary between notes marked by a change of pitch or stress on a new note? The main difficulty lies in the detection of boundaries between syllables where the involvement of consonants create ambiguity. There is no single solution to this problem and two alternative methods for digital segmentation are in use: (1) the onset to onset principle (STS), according to which segments (a syllable or a note in a multi-note syllable) are measured from the

beginning of the first or only phoneme to the end of the last or only phoneme; (2) the vowel onset principle (VTV), according to which notes are measured from the beginning of the initial vowel to the beginning of the initial vowel of the next segment. The VTV principle is widely accepted and is advocated by the grand old man of musical acoustics professor Johann Sundberg (for example Sundberg 2000: 98). Lehiste and Ross have questioned the use of the VTV principle in the segmentation process of Estonian runic song. They argued that Estonian, being a durational language, demands the STS approach. The most remarkable part of their argument was the claim that the VTV principle is "intuitively unacceptable" (Ross & Lehiste 2001: 66) in Estonian runic song.

2.2. Studies of child development

Studies of child development and singing have been a focus of Estonian musicologist and psychologist Marju Raju (b. 1982). Music and language are closely linked as the human voice is a natural part of vocal music (songs). One evolutionary hypothesis states that before the separation into two vocal communicative systems (spoken language and singing) there was a *musilanguage* – vocal communication with elements of both language and music, but which was not yet quite either. This hypothesis can be supported by the fact that overlapping regions in the brain support both music and language processing (Trainor & Hannon 2013: 462).

> *Well-known and frequently cited studies (Moog 1976; Davidson; Colley 1987; Davidson; Scripp 1988; Davidson; Welch 1988; Davidson 1994) state that the ability to sing develops at approximately two years of age: first, the lyrics appear, which shape the contour of melodies and provide rhythm for the songs; when the child grows older, the melodies become more recognisable and the ability to hold a key appears. This theory places language development as a precondition for the development of singing. However, due to easily available recording devices new evidence has recently emerged from case studies on children who were able to produce melodies of nursery rhymes before the appearance of spoken language* (see Raju 2015: 14–15 for more details).

The development of the process of speech and singing in childhood are so connected that distinguishing the two communicative domains is sometimes only down to methodological definitions, despite children being able to choose and clearly state their intention to either speak or sing at a very young age (before 2).

There is one developmental case study by Raju and Ross (2015) of one Estonian girl in which musical development and linguistic development were observed from birth to the 25th month. Raju and Ross used Music Micro Analysis Tools (MMATools) (Stadler Elmer & Elmer 2000) to analyse home video recordings in order to be able to visualise and analyse speech and singing data (see Figure 1). This method makes it possible to visualise unstable pitches or spoken syllables and information about joint singing with the child (Raju 2015: 22). The results confirmed the theory according to which the acquisition of language is a prerequisite for the development of singing skills. Although the child was able to separate the melody from the original set of lyrics and perform melodies only by humming or inventing new lyrics to them by the end of the observation period, the songs always had to be learnt as a whole first, while the learning process started with learning the lyrics. The child could hum the melody of a children's song only after she had learned it together with the lyrics. Her abilities to sing a children's repertoire and to vocally improvise developed in parallel. Initially, her musical self-expression appeared only on an individual level (as vocalised inner speech), whereas by 23 months of age she had started to appreciate singing as a social activity and developed an ability to sing along with others as well as starting to initiate such activities.

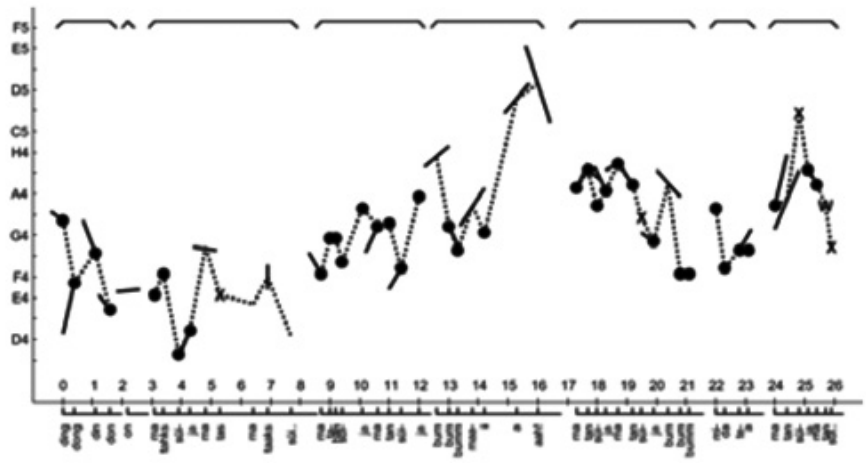


Figure 1. *Transcript of improvisational song by 24-month-old girl notated using MMATools. Symbols: dot, stable pitch; tailed dot, beginning of pitch is stable, after which the pitch declines (or vice versa, after unstable glissando the voice reaches a stable pitch); vertical dash, unstable pitch between notes; X, conjectural pitch due to technical difficulties; W, spoken syllable or word. Syllables and notes from the same phrase are connected with a dotted line (Raju & Ross 2015: 326).*

How children think about music, especially about singing, is also rooted in language and culture. A study by Raju, Välja and Ross (2015) of the song-making process used by Estonian children to describe a picture revealed different concepts of 'song' founded on two categories: lyrics and melody. Some children made a song consisting of original lyrics and melody, some borrowed a known melody and composed new lyrics, some hummed a melody without lyrics and some cited only a poem without melody. Similar results were also gained a few years earlier by Raju and Ross (2012) leading to the conclusion that one of the reasons for this breakdown could lie in the Estonian language. In Estonian, the word *laul* ('song') does not have a specifically musical meaning, as it is used to indicate poems in oral or written form, epic texts, or even stories, alongside singing in its narrower sense. *Laul* can also be used in the context of instrumental music; for example, in kindergartens, children learn to play new 'songs' on musical instruments (xylophones, etc.) that do not include singing at all. Comparing melodies and lyrics created by children in the study by Raju, Välja and Ross (2015), the focus of the song-making process was mainly on the lyrics rather than on the melody as new lyrics tend to be more original than melodies. There were also some gender-specific differences in the choice of words. For example, in response to iconic pictures of a red heart and yellow sun, the girls were inspired by emotion and often used the Estonian word *armas* (lovely, darling) in their songs. The boys seemed to take their song material from real life, for example, one boy sang about a heart being inside the human body and another sang about the planet Earth circling around the Sun (Raju et al. 2015: 288).

2.3. Studies of the sequence from spoken word to poetry to singing

Among many intriguing questions about music there is the aspiration to define what carries the identity of (art) music or a musical work. In the past musicologists tended to prefer scores rather than recordings for analysis. This is due to the wide variety of performances and recordings. Every musical interpretation is more or less unique because of its variations in intonation, timbre, dynamics, agogics and because of the undefined musicality of each and every performer and conductor. Another puzzle that has for a long time intrigued musicologists is the idea that music can reflect the rhythm of the composer's mother tongue, something that has been proven by Patel, Iversen and Rosenberg (2006) in the case of British English and French. Patel et al. used a linguistic method, the normalised Pairwise Variability Index (nPVI[7]), for the first time to analyse well-known art musical scores from different periods. Another study by Daniele and Patel (2004) showed that in German and Austrian music, there

is a clear tendency for the nPVI values to increase with time, i.e., that those values are greater in the work of composers for example from the 19th century than composers from the 17th century. These results also intrigued Estonian researchers, and only a few years later Raju, Asu and Ross (2010) used the nPVI to compare scores and different performances of the same solo songs by Estonian composers Artur Kapp (1878–1952), Mart Saar (1882–1963), Eduard Oja (1905–1950), Eduard Tubin (1905–1982) and Veljo Tormis (1930–2017). Raju, Asu and Ross (2010) decided to study (art) solo songs as they were more likely to reflect prosodic features of the language than instrumental music and should, at least in theory, show an nPVI more similar to speech rhythm. The recorded sound files were analysed with the speech analysis software Praat[8] (Boersma & Weenink 2007), which, as it is generally based on a spectrographic representation of sound, enables one to determine the inter-onset time intervals for successive notes in a performance. Raju, Asu and Ross carried out two studies (2010). In the first study, they hypothesised that the nPVI values calculated on the basis of recorded performances could be higher than those for the same works calculated on the basis of musical scores. The results, based on data from four Estonian composers (Kapp, Saar, Oja and Tubin), demonstrated that although the nPVI values for recorded vocal performances were higher than the nPVI values for scores of the same parts, the differences between the two were rarely significant. In the second study, nPVI values were calculated for a larger corpus of musical works by three composers on the basis of scores. One composer (Tormis) exhibited significantly different nPVI values in his works, as compared to the other two who worked earlier; this was attributed to a different aesthetic program underlying his creative activity. This result may indicate that the tendency of nPVI values to increase with time, i.e. that musical works created later have greater nPVI values, might not be universal (Raju et al. 2010: 65). On the question of whether the Estonian language is reflected in the Estonian music, the results compare nicely to the nPVI values for Saar (43.3–47.0) obtained on the basis of musical scores with the nPVI value for Estonian speech rhythm (44.0) measured on the basis of syllables (Asu & Nolan 2006; Nolan & Asu 2009). The nPVI value for Tubin (42.1) is also sufficiently close. The lower nPVI value for Tormis (22.1), on the other hand, is not surprising considering that his melodies are to a considerable extent of isochronous character, resembling those from Estonian runosong where speech rhythm is subordinate to melody.

Poetry can be considered a sort of a transitional form between prose text and singing. In his studies, music theorist Kerri Kotta (b. 1969) has analysed sound poetry pieces (*häälutused*)[9] by Estonian poet and performance artist Jaan Malin (b. 1960) (Kotta 2017; 2021).

> *In his works, Malin uses several techniques to achieve timbral continuity in a text, including repetition, fragmentation, and liquidation, timbral 'links', timbral palindromes or retrogrades, transformation of the sound of words, and formal overlaps and interpolations. Occasionally Malin applies metrical structures that characterise the main theme, i.e., the entire musical phrase or group of phrases in a musical work. To connect larger formal units, Malin sometimes uses 'links', i.e., the words or word-like fragments with similar sounds. Malin does not use the techniques of musical development for their own sake. Rather, he uses them to enter the dimension of music as he uses the semantic content of words to return to the dimension of language. From the perspective of language, switching between the two dimensions, can also be understood as semantic 'release' or 'recharge' accordingly.* (Kotta 2017: 121–122)

Kotta's analysis shows that although forms of Malin's text are describable using musical terminology (analogous with analysing a musical score), their real form is only perceivable by listening (and differs from solely text-based analysis). Despite performative style also being grounded in the text, there are certain limitations. Kotta showed that traditional score analysis methods from music theory can also be applied to other audible art forms that have some common characteristics with music (see Figure 2).

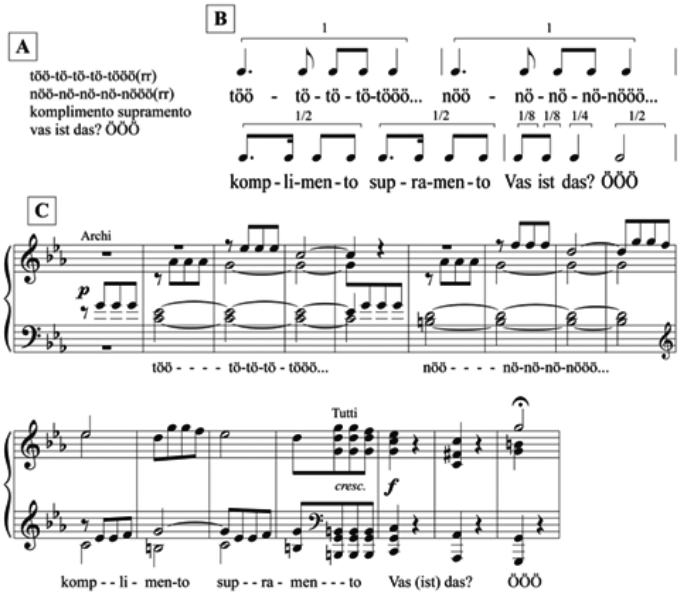


Figure 2. *The structure of long sentences in Malin's sound poetry "Ma-zö-zu-ää" (Estonian word play that resembles spoken French and means "I am going to eat you") and the phrase in Beethoven's 5th symphony (Kotta 2017: 109).*

A large proportion of mainstream music still needs analysis using a variety of methods. For example, rap music offers considerable difficulties for score-based musical analysis as it is created using short musical loops of electronic keyboard and percussion instruments and is not meant for to be transcribed into musical score. Being a word-centred musical genre, the main research focus is usually also on the lyrics analysis or cultural-semiotic analysis of the accompanying music video. Raju (2022) analysed Estonian rap musician nublu's (b. 1996)[10] early period music (the first songs to get him recognised by all age-groups in Estonia) using form analysis, analysis of lyrical content, interviews with listeners and rap music experts, and concluded that he uses *hooks* (refrains) very cleverly by borrowing lyrics from well-known Estonian pop and folk songs from different time periods, therefore making his song automatically familiar and easy to sing along to. Form analysis showed that songs that presented hooks more times and more regularly, also got more views in YouTube. Another component the respondents mentioned was nublu's word art, with several responses mentioning how his identity seems to be more that of a poet than just a singer.

2.4. Problems of the intelligibility of sung text

The most influential studies of the intelligibility of sung text in professional art music (opera) from the last decades, those by Allan Vurma (b. 1955), combine acoustic research, empirical experiments and practical applications. Vurma is a former opera singer and singing teacher and therefore acts as a good example of combining traditional and artistic research strategies. We can say that his work is a perfect example of true fundamental acoustic science rooted in artistic research with the prospect of applicable solutions in singing teaching. Vocalists are expected to sing with intelligible diction, although they also have to obey constraints dictated by the music. Thus, the methods used to enhance diction in speaking may not necessarily be fully applicable to singing. The standpoints of singers on how to achieve clear pronunciation are controversial, and studies on the subject are scarce (Vurma et al. 2022). In a study of opera singers Vurma and Ross (2003) showed that certain terms that have developed over the course of the history of vocal pedagogy ("place your voice forward/backward") lack a clearly delimited meaning. In addition, according to his numerous studies, Vurma (2007: 35) has concluded that both in performing music and more narrowly in singing, good intonation cannot be universally defined on the basis of the fundamental frequencies corresponding to equally tempered values. The relationship between these values and good intonation would be more appropriate to approach intonation as a compromise between various eventually

conflicting tendencies. Vurma (2007: 35) states that "…engaging in scientific research in addition to my professional activities as a musician has not only introduced me to new factual knowledge about my professional field but also improved my intuitive perception of it".

Vurma's ongoing research project aims to create a scientific basis for the further development of strategies to achieve a good balance between intelligibility and the requirements of the music, such as cantilena and phrasing, when singing in various acoustics and with the presence of accompaniment. Project includes two research hubs at the Estonian Academy of Music and Theatre and at Tallinn University of Technology's School of Information Technologies. The first results of the project from the pilot acoustic analysis showed that the length and intensity of plosives influence the intelligibility of a sung text, although there are some differences according to singer style ("operatic" (*bel canto*) vs "easy"). In addition, it is not clear how much playing room there is for the singer to alternate the plosives without affecting the quality of musical expression (Vurma et al. 2022). Results from perception tests where Estonian participants had to recognise the sung plosives /k/, /t/ and /p/, showed that increasing intensity does not facilitate the recognition of /t/ and /p/ in acoustic conditions that have a small level of reverberation, although the singer has to be more precise when singing /k/ to ensure its intelligibility to listeners. Singing in difficult acoustic conditions, such as halls with a large amount of reverberation, or singing far from the audience or with instrumental accompaniment obliges plosives /k/ and /t/ to be sung with greater intensity to help intelligibility, although with /p/ the singer must be more careful (Vurma et al. forthcoming).

2.5. Recent studies in ecclesiastical chant and its performance

Studies in linguistics are substantially and congenitally intertwined with musicological research because the root of Western professional music lies in vocal music, particularly in Medieval Sacred Latin Monody (MSLM). Western musical culture was predominantly a vocal musical culture until the Renaissance. Only in the baroque era did idiomatic instrumental thinking reach the same level (both in quality and quantity) as its vocal counterpart. This fact makes vocal music, with its quintessential textual component, a core of Western musical thinking and it therefore deserves special musicological attention. This is even more true in ecclesiastical chant as the earliest repertoire of chant, Medieval Sacred Latin Monody, especially Franco-Roman or Gregorian chant, is considered an absolute peak of so-called idiomatic or language-shaped music. The togetherness of text and melody in some genres of MSLM are so exclusive

that differentiation between text and melody seems not only impossible but also unnecessary. Therefore, it is only logical that ecclesiastical singing is an important field of study in CSM in the area of vernacular languages.

Eerik Jõks (b. 1970), a singer, musicologist and composer, began his CSM investigations into text and music with MSLM. Using the example of Jaan Ross (Ross 1989; Ross & Lehiste 2001) he measured the temporal structure of 35 specially made solo recordings of the gradual responsory *Haec dies*.[11] Most performers (19) had one basic note value (BNV), as in the recordings of Estonian runic song analysed by Lehiste and Ross, varying from 250 ms to 550 ms. Twelve performers had two BNVs, as in the Estonian swing song "The Swing Wants Gloves" analysed by Jaan Ross in 1989. However, there were four performers whose result was most intriguing. They did not have a BNV at all. All durations were equally distributed on the axis of duration. One of them was a performance by Professor Godehard Joppich (b. 1932) who is considered one of the most detail-sensitive Gregorian chant performers (Brunner 1982: 328; Jõks 2009: 276, 549). Due to his vast knowledge of Gregorian semiology, he treats every aspect of medieval notation with great care. This triggers a very agogically varied performance that results in a temporal structure with no detectable BNV (Jõks 2009).

Eerik Jõks' next CSM endeavour by was a complex perception experiment (Jõks 2014).

(1) Jõks recorded Gregorian chant (primary recording) by experienced performers (primary performers) who used original medieval chant notation (primary notation).

(2) By digitally measuring the recordings he created an accuracy-orientated transcription in Western classical notation (secondary notation).

(3) Singers who had little or no experience of Gregorian chant (secondary performers) recorded their performance from this transcription (secondary recording).

(4) Experts in Gregorian chant from all over the world compared these two sets of recordings by answering a questionnaire. The experts did not know the details of the experiment (Jõks 2014: 183). This project resulted with a highly nuanced modern notational version of Gregorian chant (see Figure 4). Comparison with the medieval notation (see Figure 3) showed the level of complexity of prose text ecclesiastical chant. This complexity fascinated Jõks and prompted him to look at the same complexity in Estonian prose text chant.

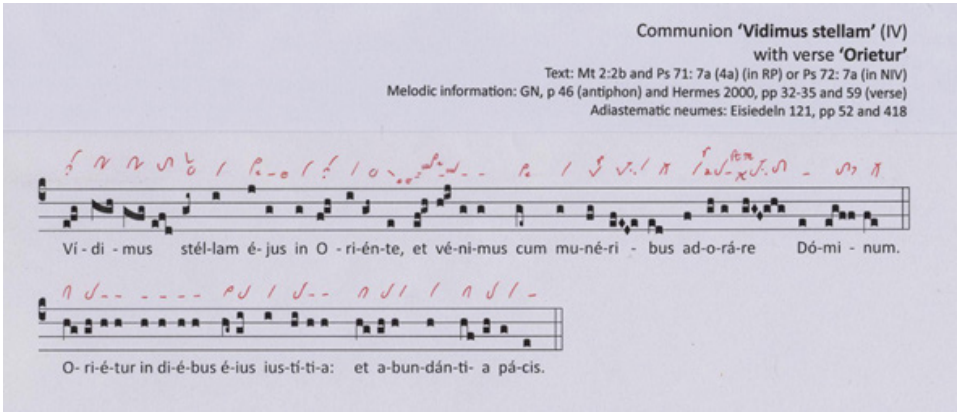
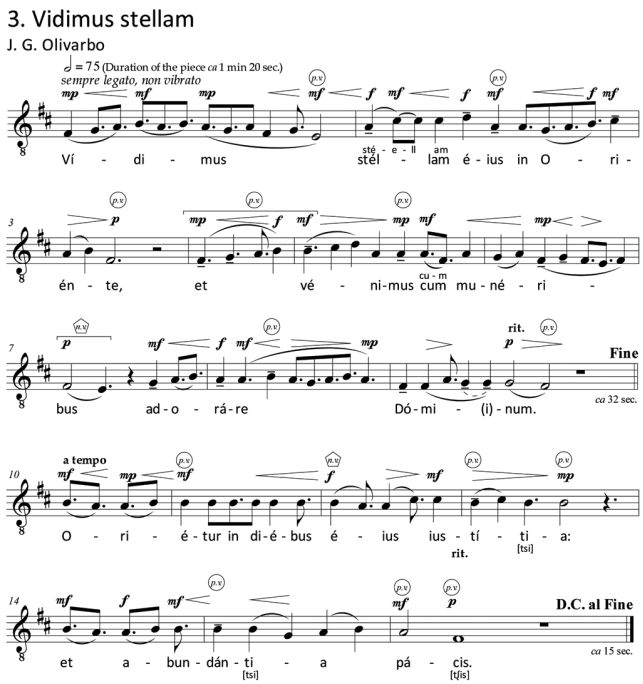


Figure 3. *Example of primary notation. Communion antiphon "Vidimus stellam" with a verse "Orietur". [---] (Jõks 2014: 157).*



Me oleme näinud tema tähte idas ja me oleme tulnud koos kingitustega, et kummardada Issandat.
Tema päevil õitseb õige ja rahu on külluslik.
Matteuse Evangeelium 2:2b põhjal; Psalm 72:7a

We have seen His star in the East and have come with the gifts to worship the Lord.
In His days the righteous shall flourish, and abundance of peace.
On the basis of the Gospel of Matthew 2:2b; Psalm 72:7a

Figure 4. *Example of secondary notation. Communion antiphon "Vidimus stellam" with a verse "Orietur". Transcription of a recording by primary performer "Abraham". The name J. G. Olivarbo is a fictional name for the composer that is derived from the original name of the performer. [---] (Jõks 2014: 160).*

Since 2014 Eerik Jõks has focused on Estonian ecclesiastical chant and the connection of language and music therein. He mainly concentrated on monodic and unaccompanied chanting with prose text. As there was no word for prose text chant in Estonian, Jõks instituted the Estonian neologism *pühalaul* (sacred chant) and devised a so-called speech curves method for composing *pühalaul* (Jõks 2017: 71–73). This method considers all three prosodic parameters of Estonian: intonation, duration, and dynamics. Jõks instituted another term *keelemuusika* (language music) that is a 'translation' of spoken text into melody. He has applied this method fruitfully and published a massive collection of Estonian pühalaul in *Eesti laulupsalter* (Jõks 2020). Inspired by outstanding specialities of the Estonian language Jõks devised a method of formula-based psalmody that takes into account features of Estonian prosody. For this he resurrected an ancient type of psalmody that uses cursive cadences instead of accentual cadences.[12] It is believed that because of the very simple principles, cursive cadences were used in Latin psalmody earlier than more complex accentual cadences (Bailey 1976). However, the use of cursive cadence falls into the era of oral tradition (before the 9th century), and that by the time of written tradition only remnants of cursive cadence remained in the vastly accentual cadence-dominated Latin psalmody.

Recently (2020–2021) Jõks also turned to the study of ecclesiastical chant that uses strophic poetry as its text (hymns or chorales). In order to consider prosodic idiomaticism, he introduced an analytical method to measure the compatibility of the rhythm of the Estonian text with that of a chorale melody. He also proposed methodological tools that could be used to improve conformity of the prosodic rhythm and the rhythm of the melody. The results of this research showed vividly the field of tension between Estonian prosodic rhythm and melodies that are born in the context of German. In so-called rhythmised chorales the deviation between the German melodies and Estonian text were as high as 57% and in some verses even 67%. This shows that there are more words the musical rhythms of which contradict natural prosodic rhythm than those resembling it. In isometric chorale tunes, the deviation was considerably lower or non-existent (Jõks 2021).

If we recall the temporal structure of runic song recordings analysed by Lehiste and Ross, we see a resemblance. An ordinary runic song performance has one basic note value that is agogically varied in both directions. Isometric notation allows the same phenomenon to happen in chorale as the main notational value is a quarter note that will probably vary the same way in performance if a static organ accompaniment does not quantise it.

Speaking and researching the Estonian language gives an opportunity to propose very specific new research questions and hypotheses that are not within

the scope of scientists not familiar with Estonian. For example, Eerik Jõks has recently proposed two hypotheses: (1) If we digitally measure a recording of an isometric chorale performance, we will probably end up with one basic note value, and in the case of a recording of a so-called rhythmised chorale we will have two basic note values (Jõks 2021: 149). It is very important that this hypothesis should be tested soon. In the same fashion we might suggest that the temporal structure of Estonian prose text chant will give the same kind of variation as found in the temporal structure of performance of Medieval Latin chant. It would be fascinating to compare both Latin and Estonian recordings of the Estonian performers. (2) Estonians are well-known for not having substantial Christian denominational allegiance (see for example Jõks & Soom 2016). Eerik Jõks has proposed that one of the factors that influences the void between Estonian and the Lutheran church is that ecclesiastical song in the church is not Estonian chant but German or Latin chant with Estonian words. We know the importance of chanting in Christian practice. Could it be that on the level of Estonian ecclesiastical song the core values of the Christian church have not yet reached the deeper consciousness of the Estonian nation (Jõks 2022)? To test this hypothesis there is a need for wider interdisciplinary study involving a qualitative sociological approach.

2.6. Comparison of historic and contemporary recordings

Language is in constant flux, something is most recognisable in changes of vocabulary, for example those that are apparent through a study of old thesauruses and dictionaries. Now, in the 21st century, we also have about a hundred years of recorded history that gives us a unique opportunity to analyse whether there have been developments in Estonian word prosody over the past century (Ross 2022). Linguist and phoneticist Pärtel Lippus (b. 1980) has conducted a study with Jaan Ross that compared parallel recordings of spoken (recited) and sung utterances of the same three songs from two groups of informants, historical (recorded in 1916[13]) and contemporary (recorded in 2011), by segmenting and measuring the speech and musical units (Lippus & Ross 2014, 2017; Ross 2022).

> *The results showed that song and group had no large-scale effects on normalised syllable duration, nor were there any significant interactions within group. Therefore, historic and contemporary participants were not differentiated from each other. There were highly significant main effects of mode and length, which means that the acoustic durations of the recited and sung syllables as well as of the phonologically short and long syllables*

> *were different from each other.* [...] *The findings of the present study do not suggest a significant diachronic change between the performance of contemporary singers and the material recorded 100 years ago.* (Lippus & Ross 2014: 194, 197)

In addition to a slightly faster speech rate in contemporary participants, the pitch is a little lower than in the historical data (Ross 2022).

3. DISCUSSION AND CONCLUSIONS

In recent decades Estonian CSM research has taken particular interest in music- and language-related research questions, using various methods, as the referenced studies showed in the previous chapter. Although we can see a variety of different research questions and interesting results, it is quite a challenge to include them under very specific research questions in this discussion as there has not been an overall common strategic approach in Estonian CSM in the language-specific research domain. On the other hand, Estonian researchers have had great academic freedom to choose their own research questions and methods. In addition to individual collegial relationships, institutional support mechanisms such as the Centre of Excellence in Estonian Studies have provided opportunities to build CSM as a discipline in Estonia and have provided a platform for researchers to present and publish their work in Estonian in addition to international journals in English. It is possible that in the next decades more systematic cooperation and larger-scale research projects will emerge.

Results show that we can use quantitative methods borrowed from linguistics such as nPVI to measure musical scores and performances, but we should also be careful when interpreting results based on only one characteristic (in the case of nPVI, the rhythmical contrast of the piece) as there is great variability within different composer's intentions, and between mainstream and niche music (this is also the case in the art music arena) (Raju et al. 2010). Studies with children (Raju & Ross 2012; Raju 2015) show some similarities with international studies, such as the universal aspects of developmental trajectories. On the other hand Estonian presents some linguistic and culturally specific features that influence children's concept of song, which they express through different emphasis when creating their own songs. Results from Vurma et al. (2022; forthcoming) show that illegibility of certain single sung plosives can differ under the same acoustic conditions for Estonian listeners. Although the design of the research by Vurma et al. (2022; forthcoming) is based on the concept of a 'bottom-up' perception, the question of possible influence of so-

called language templates remains as pronunciation nuances and sometimes even semantically meaningful units start from even single phonemes. Further studies with participants with different mother tongues can shed some light on the topic as well as applying a parallel qualitative approach, for example, by interviewing singers and singing teachers about their experiences, and perhaps even intuition, or by recruiting more singers to the field as researchers through the process of artistic research.

As scholars and scientists, we are usually not expected to rely on intuition, yet this particular word is already used by Ross & Lehiste (2001: 66) and Vurma (2007: 35) when describing their methods and conclusions. In addition, Ruus concluded that "we cannot fully define the ontological identity of music, because then music would lose its metaphysical value" (Ruus 2022a). In the case of Ross and Lehiste (2001) however, the intuitional argument to not apply the VTV principle of segmentation, sounds totally logical. If you have linguistic, melodic, ethnomusicological, and artistic components to be considered together, intuition seems to be quite an unavoidable tool. Even more so if we are talking about the researcher's mother tongue and native indigenous musical repertoire. Therefore, it is fairly important that Lehiste and Ross added intuitional tools to the toolbox of methodology. This is something other than an everyday intuition. We might call it "a legitimate scholarly intuition". Using such "a legitimate scholarly intuition" encourages us to open new doors to a deeper level of linguistic-musical studies. Vurma states that his studies and academic knowledge helped him to understand the process of singing and the choices he already made intuitively to achieve the best results balancing good text intelligibility and achieving the musical goals of the piece. Yet, intuition is highly subjective and comes with previous experiences and knowledge, therefore we still need a proper methodological approach and scientific facts.

As this overview article shows, future language- and music-specific research in Estonia already has solid ground on which to build. The unique, living and constantly changing Estonian language and our vivid and diverse music landscape offer new possibilities for both local and international research. Speaking and researching the Estonian language gives an opportunity to propose very specific new research questions and hypotheses that scientists not familiar with Estonian would not formulate (see for example new hypotheses raised by Jõks in the previous chapter).

The purpose of this article was to find an abstract common denominator from the works of the Estonian CSM community. The goal was achieved, and the common denominator can be considered the reliance on a certain amount of intuition in the study of language–speech–music connections. In all the scholarly works described, intuition has played an important role in forming the research

questions (studies by Jõks; Vurma; Kotta) or interpreting the results (Ross & Lehiste 2001; Raju & Ross 2012; Raju et al. 2015). The inclusion of intuition in the toolbox of cognitive musicology can be explained by the fact that scholars who deal with the connections between Estonian language–speech–music are forced to get out of the comfort zone of Indo-Germanic languages, which in many ways defines the background linguistic system of the world scientific and scholarly community. Intuition also plays an important role in creative research, where, unlike conventional research, it is not possible to achieve the same result using the same material and the same method because the unique artistic contribution of the creative person is decisive in the process. In creativity, intuition plays an important role, with any form of 'autopsy' of creativity remaining, at least for the time being, within a scientific blind spot.

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NOTES

[1] Over twenty years ago Ross (2000: 1979) considered the idea of having a national academic journal dedicated to musicology unrealistic, but luckily his predictions were overturned in 2009 when the internationally acknowledged peer-reviewed yearbook *Res Musica* was founded jointly by EAMT and Estonian Musicological Society (EMS). *Res Musica* provides a wide forum for published articles on Estonian musicology. In addition to articles based on musicological research, each issue of the journal includes a Review section and an overview of the past year in Estonian musicological life.

[2] For example, The Centre of Excellence in Estonian Studies (CEES) founded in 2016, and the Graduate School of Culture Studies and Arts (GSCSA) founded in 2009. Both initiatives are financed by the European Regional Development Fund.

[3] In the field of music psychology both concepts are sometimes used as synonymous, but the latter is used in the name of the European Society for the Cognitive Sciences of Music (ESCOM). ESCOM (founded in 1992) is an international non-profit society for the promotion of theoretical, experimental, and applied research in the cognitive sciences of music. ESCOM organises regular conferences and publishes the academic journal *Musicae Scientiae*.

[4] "Me oleme üks neid loodusrahvaid veel, kes on kõrgkultuuri jõudnud. Me võime kõiki õpetada" (Saag 2004).

[5] This article does not give a systematic bibliographical overview of the field of Estonian CMS as it focuses only on topics related to language.

[6] In addition to solving the question of temporal structure of Estonian runic song there are many other aspects in the scholarly work of Lehiste and Ross that will not be discussed here.

[7] PVI is widely used in linguistic research to quantify speech rhythm, which provides an alternative to the traditional view of rhythm isochrony according to which languages are divided into those that are "syllable-timed" and those that are "stress-timed". This metric enables the rhythmic differences between languages or varieties of the same language to be quantified by capturing the difference between adjacent linguistic units (for example syllables). The more syllable-timed a language or its variety, the lower is its PVI (Raju et al. 2010: 51–52). The letter 'n' means normalised value; after calculation the result is multiplied by 100.

[8] Praat software has also been used by Estonian researchers Allan Vurma, Jaan Ross and Eerik Jõks.

[9] Term "häälutused" used by this poet is not a real word in Estonian. In Estonian *"hääl"* means voice and *"luuletused"*poems. This new word consists of hints that these poems should be voiced out.

[10] Civil name Markkus Pulk. His Wikipedia page uses an initial upper case letter in his artist name (Nublu), while on his own official webpage and social media he uses initial lower case (nublu). He has patented the latter form of the name. Available at https://et.wikipedia.org/wiki/Nublu_(räppar), last accessed on 16 December 2022; https://nublufy.ee, last accessed on 16 December 2022; https://andmebaas.epa.ee/avalik/#/trademarks, last accessed on 16 December 2022.

[11] The gradual responsory is a liturgical song that is sung during Mass between the readings of the Old Testament and the Epistle. If there are only two readings (from the Epistle and the Gospel), the gradual is sung together with alleluia between these two readings. *Haec dies* is an Easter gradual.

[12] Most material in the formula-based psalmody is chanted on the same pitch. "There are two kinds of melodic formulas in Western plainchant: (1) formulas with accentual cadences, and (2) formulas with cursive cadences. Accentual cadence takes into consideration the prosodic principles of Latin as well as other Indo-European languages in which an accented syllable is usually perceived as the longest syllable of a word. This means that the accented syllables are always marked with dominant notes of a cadence. Cursive cadence, on the other hand, always applies the same amount of syllables in the cadences without any accentual considerations. Estonian prosody differs significantly from Indo-European prosody, as the accented syllable is not always the longest syllable of the word. Therefore, in Estonian formula-based plainchant a cursive principle should be preferred." (Jõks 2017: 81–82)

[13] For background and more information on these recordings, see Ross 2012.

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Eerik Jõks, MA 2001 (University of Limerick, Chant and Ritual Song), PhD 2010 (University of York, musicology), postdoctoral researcher 2011–2014 (Marie Curie Fellow, Estonian Academy of Music and Theatre) is an interdisciplinary musicologist, singer, composer, music educator, conductor, and lyricist. His interest is in the modern understanding of medieval sacred Latin sacred monody (Gregorian chant), which in the past decade have channelled into the promotion of vernacular ecclesiastical chant on a scientific, creative and pedagogical level. Eerik Jõks institutionalised and furnished the term "Estonian language music" (*eesti keelemuusika*) and has addressed it in scholarly studies as well as applied it in his creative work. He has also brought the term "*pühalaul*" (sacred chant) to the Estonian concept space for a prose-textual or prose-rhythmical ecclesiastical chant. In 2013, he founded "The School of Scared Chant" (*Pühalaulu Kool*), which still operates under his leadership to this day. Jõks is the author of dozens of hymn texts and hundreds of chants, and he has published extensive research papers in the field of hymnology. In 2020, his capacious collection of Estonian *pühalaul* "Eesti Laulupsalter" (Estonian Chant Psalter) was published. "The Estonian Chant Psalter" is a unique section-book that can be browsed simultaneously in three sections and gives an instant combination of 150 psalms with 180 psalm tones. The books also comprise the largest selection (300) of Estonian antiphons ever published.

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