What's the Meter of *Elenino Horo*? Rhythm and Timing in Drumming for a Bulgarian Folk Dance

Daniel Goldberg

Dedicated to Miroslav Vasilev

BULGARIAN folk music is famous for its meters. Many songs and pieces of instrumental dance music from Bulgaria feature repeating sequences composed of two categorically different durations, short and long, with a ratio of approximately 2:3.[1] Similar metric sequences occur in musics from many places other than Bulgaria, but in the middle of the twentieth century ethnomusicologists linked the phenomenon especially with this country: Béla Bartók ([1938] 1976), for instance, popularized the patterns as "Bulgarian rhythms," and Romanian ethnomusicologist Constantin Brăiloiu ([1949] 1984, 17) claimed that his colleagues to the south, "taking this kind of rhythm to be eminently national, have explored it unflaggingly, in preference to any other peculiarity, form, mode or function."[2]

This theorization and codification of Bulgarian meters by folklorists including Dobri Hristov ([1925] 1967), Vasil Stoin (1927), Stoyan Dzhudzhev (1970), and Todor Dzhidzhev (1981) has produced a straightforward system of notating the durations of unequal metric sequences with two sixteenth notes for every short duration and three sixteenth notes for every long duration; at slower tempos, eighth notes replace sixteenths.[3] Table 1 lists several common durational sequences and time signatures in Bulgarian music, along with the names of folk dances with which the meters are associated. This notational convention has been used extensively in Bulgaria both descriptively, by scholars transcribing folk songs, and prescriptively, by composers and arrangers writing for performers of folk music who have formal musical training.[4]

This notational system seems reasonably well suited for most Bulgarian music with sequences of unequal durations. However, one of the most widely known pieces of folk dance

1. See Moelants (2006) and the timing analysis below for examples of recordings in which the ratio is not exactly 2:3.
2. To be clear, not all Bulgarian folk music employs metric sequences of categorically unequal durations; many pieces can be notated with time signatures such as 2/4 or 6/8.
3. The terms "short" and "long" may be more common in English-language treatments of meters with unequal durations, but these and similar words are also present in Bulgarian sources. For example, Hristov ([1925] 1967, 37) refers to "short and extended parts" of a measure (кратки и протегнати тактови части) and Dzhidzhev (1981, 77) describes "short (ordinary) and hemiolically elongated" pulses (кратки [обикновени] и хемиолно удължени времена). Some texts specify a meter by identifying the time signature and the long duration, as in "7/16 meter with a third long part" of the measure (размер 7/16 с трети дълъг дял; Petrov 2008, 100), and multiple musicians I spoke with similarly referred to "the elongated pulse" (удълженото време) or "long part" of the measure (дълъг дял).
4. On the distinction between descriptive and prescriptive musical notation, see Seeger (1958).

Time Signature	Sequence of Durations	Example of Dance Type
7/16	♪♪♪.	*Rŭchenitsa*
7/16	♪.♪♪	*Chetvorno horo*
9/16	♪♪♪♪.	*Daichovo horo*
11/16	♪♪♪.♪♪	*Kopanitsa*

Table 1. Four common Bulgarian time signatures and sequences of durations, along with an example of a type of folk dance associated with each meter.

music, *elenino horo*, stands out from other Bulgarian dance types for the disagreement and uncertainty that both published sources and contemporary musicians express about its time signature. Several different time signatures have been used for *elenino horo*, including 7/8, 13/16, and 12/16, and some texts and musicians express strong opinions about which option is correct, while other musicians are unsure about the appropriate time signature despite their ability to perform the music.[5]

To examine the meter of *elenino horo*, I draw on interviews, lessons, and other experiences while studying drumming in Bulgaria for a period of twelve months, and put musicians' statements and my participant observations in dialogue with existing metric theory and quantitative analysis of rhythm in my field recordings. My primary objective is not to settle the debate about *elenino horo*—though I do take a position about which time signature fits most current performances—but rather to consider what this point of contention suggests about how a meter with unequal durations can be organized and about how Bulgarian musicians conceptualize meter. After introducing the cultural and stylistic focus of the study, I interpret the metric organization of *elenino horo* in terms of cognitive theory of meter, arguing that the meter of the dance type contradicts current assumptions about constraints on metric structure. I corroborate my perception of durations in the music by analyzing timing in a sample of recordings. In the second part of the article, I turn to musicians' conceptions of meter in the form of rhythmic templates that many Bulgarian percussionists use instead of time signatures or notation when discussing and demonstrating dance types. To my knowledge the use of rhythmic templates has not previously been described quantitatively in literature on Bulgarian folk music. By examining frequencies of rhythmic patterns and drum strokes in recordings, I show that these templates often approximate drummers' processes of generating rhythms in performance, and I identify ways in which commonly used rhythmic patterns communicate meter to listeners and reflect stylistic differences among performers.

5. *Elenino horo* is not the only piece of Bulgarian folk music that has been notated with multiple time signatures, but in my experience it is the most common and frequently discussed example of this kind of discrepancy.

METER, TIME SIGNATURES, AND TIMING

Bulgarian *Tŭpan* Playing

As Kalin Kirilov (2015, 9) explains, Bulgarians use the term "folk music" (*narodna muzika*) to refer to a wide range of styles, from amateur music-making to elaborately arranged choral or instrumental pieces (*obrabotki*) and jazz-inflected wedding music (*svatbarska muzika*). The present study is limited to styles that employ a large doubled-sided drum called *tŭpan*. Normally one side of the *tŭpan* is struck with a thick wooden beater to produce a low sound, and the other side of the drum is played with a thin, flexible switch to make a higher, often buzzy sound. Bulgarian musicians and listeners understand *tŭpan* to be relatively traditional in comparison with drum set or other ostensibly foreign percussion instruments that are also used in folk music. Like many aspects of current Bulgarian folk music, this conception of the traditional is shaped by institutions, policies, and regulations that originated with the Bulgarian state-socialist government in the decades after the Second World War (Levy 1985, 284; see also Rice 1994, ch. 7).

My focus on *tŭpan* in the present study derives not from these aesthetic and political connotations, but rather from practical considerations. Interactions among musicians, dancers, and listeners, as well as the complete musical texture produced through their coordination, are essential to how meter contributes to the temporal organization of a live performance. For the sake of simplicity, though, I orient my analysis toward meter as employed by only one of the individuals involved in a given performance. *Tŭpan* is the sole percussion instrument in many ensembles, and is often regarded as the instrument that keeps time for both musicians and dancers (Peycheva and Dimov 2002, 303), making the *tŭpan* player a plausible choice for the individual at the center of a study of meter in Bulgarian music.

Tŭpan is typically used in small ensembles featuring pitched instruments that are considered Bulgarian, western European, or Romani, as well as in larger folk orchestras that did not exist before the Communist era.[6] Although an individual *tŭpan* player might work with multiple ensembles in differing contexts, some types of ensembles rarely overlap in their personnel. The most consistent division is between Romani and Slavic Bulgarian groups. Roma are a marginalized minority in Bulgaria, and certain ensembles and styles are effectively exclusively Romani; for instance, with rare exceptions, all musicians who perform in the type of ensemble that pairs *tŭpan* with two or more of the shawm-like double reed instrument called *zurna* are Muslim Roma (Peycheva and Dimov 2002, 307–308, 441–42, 448–52).

6. Pitched Bulgarian folk instruments include *gaida*, a bagpipe; *gŭdulka*, a bowed string instrument; *kaval*, an end-blown flute; and *tambura*, a plucked or strummed string instrument. Accordion and clarinet are among the Western European instruments that may be accompanied by *tŭpan*, and an instrument associated with Roma in Bulgaria is *zurna*, a double reed. On the origins of Bulgarian folk orchestras, see Buchanan (2006, ch. 4).

Tŭpan players also differ in their training and degree of professionalism, ranging from amateurs who have not studied music formally and who play the instrument as a hobby, to professionals who attended music conservatories and who work for government-supported folk orchestras. Most *tŭpan* players involved in the present study are professionals or semi-professionals, in the sense that they at least occasionally earn money for their playing. However, because *tŭpan*, unlike most other standard Bulgarian folk instruments, is not offered as a specialization in the conservatory system, these musicians either do not have formal musical education or originally specialized in a performance area other than *tŭpan*, such as a pitched instrument, classical percussion, or choreography.

Another potential source of differences among Bulgarian musicians is place: Bulgarian folklorists divide the country into ethnographic regions, positing codified musical characteristics for each one (see, e.g., Stoin 1981; Rice 2004, ch. 3), and performing musicians also recognize these distinctions. The map in Figure 1 shows that three of the six largest regions—northern Bulgaria, Thrace, and Pirin—are represented in the sample of recordings that I analyze below. The boundaries of these regions on the map are approximate.

Figure 1. Map of Bulgaria showing ethnographic regions and locations mentioned in this paper. Home towns of the dancers and musicians in Examples 1, 3, and 4 are marked with open circles, and home towns of the *tŭpan* players from Table 2 are marked with filled-in circles. Data in this figure are adapted from Google Maps.

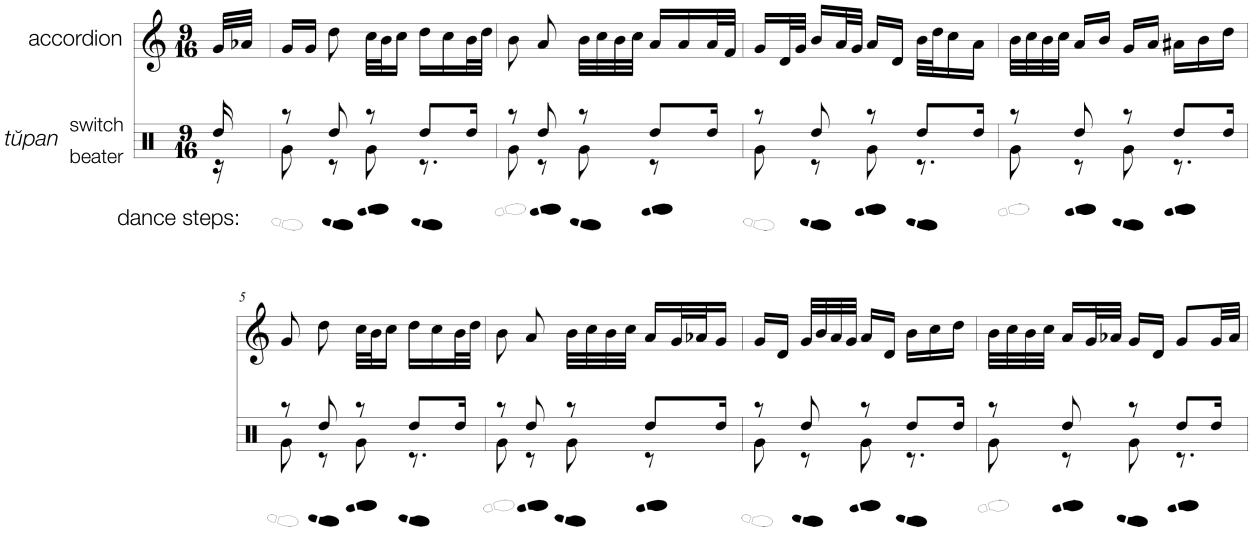
Bulgarian Dances and Meter

While the full repertoires of the ensembles I worked with might overlap relatively little, all musicians in these groups know how to perform music that is identified with a small number of common folk dances. Although it is not unusual for Bulgarian dance music to be performed without dancing in settings such as concerts, Bulgarian musicians frequently play for dancing audience members at parties or for choreographed dancing on stage. Most of these dances belong to a class of dances called *hora* (singular *horo*) in which dancers hold hands, belts, or shoulders to form an open circle or line. Like dance types from other parts of Europe such as minuets and waltzes, in principle any Bulgarian folk dance type may have numerous different melodies. The dance type that I focus on, *elenino horo*, is closely associated with a specific song called "Eleno mome," and while other melodies for *elenino horo* exist, almost every ensemble I recorded played a variant of "Eleno mome."[7]

As suggested in Table 1 above, most Bulgarian dance types are associated with particular meters.[8] In many cases the rhythms of the melody, drumming, and dance steps align closely with the sequence of short and long metric durations. Consider, for instance, Example 1, which provides a video excerpt and transcription from a performance of *daichovo horo* (see Table 1) at the 2015 Koprivshtitsa folklore festival by an amateur dance group from the village of Hairedin in northwestern Bulgaria.[9] The transcription of a single phrase (known as a *kolyano*; see Buchanan and Folse 2006, 70) from the beginning of the performance shows the melodic line in the accordion, drum strokes in the *tŭpan*, and approximate timing of the dancers' steps.

Despite my eventual argument in this article that notation is not central to *tŭpan* players' conceptions of rhythm, I provide transcriptions and make use of notational terminology to help communicate my interpretations of music and dance. These transcriptions are intended to offer an accessible visualization rather than a thorough description of musical sound.[10] Here and in the following transcriptions of *tŭpan* playing, I adapt a system for notating drum strokes on a staff that Mitko Popov, the *tŭpan* player in the folk orchestra of Ensemble Thrace (Ансамбъл "Тракия"), uses when teaching.[11] In my simplified version of Popov's notation,

7. In the past Bulgarian folk dances and songs were closely linked. Dancers would often sing while dancing, and Bulgarian folklorists' function-based classification system for folk songs includes a large category for "dance-leading songs" (хороводни песни; see, e.g., Kaufman 1977, 20–23; Buchanan 2006, 91).
8. However, there is not a one-to-one mapping between dances and time signatures. Multiple dance types correspond to music that is written with the same time signature, and certain patterns of dance steps correspond to multiple pieces of music that have different time signatures. The latter are described in Goldberg (2018).
9. For more information about the quinquennial festival in Koprivshtitsa, see Mellish (2013) and MacMillen (2015).
10. Stover (2009, 17–28) gives a justification for a similar use of transcriptions. Note, however, that Bulgarian musicians would ordinarily notate many of the shortest note values in the accordion melody in Example 1 as mordents or other types of ornaments. On notational conventions for melodic ornamentation in Bulgarian music, see Kirilov (2015, 46–47).
11. Like other professional folk ensembles of its kind, Ensemble Thrace consists of a folk orchestra, a women's choir, and a dance troupe. See Buchanan (2006) for more information about such ensembles.



Example 1. Video excerpt and transcription from a performance of the dance *daichovo horo*, from the Eleventh National Festival of Bulgarian Folk Creativity in Koprivshtitsa, Bulgaria, 7 August 2015. Performed by the Mixed Dance Team at the Enlightenment Community Center, founded 1909 (Народно читалище "Просвета 1909") from Hairedin, Bulgaria, with choreography and *tŭpan* playing by Tsvetelin Ivanov and accordion playing by Todor Angelov. Video recorded by the author.

upward note stems indicate strokes with the switch, and downward stems indicate strokes with the beater. Beaming, note values, and rests are intended to make the sequence of unequal metric durations clear and have no connection with details of timing or how long the sound of a drum stroke resonates for. I follow notational convention by using the sequence of durations to determine the placement of barlines in my transcriptions and by referring to one iteration of the sequence as a measure. In my notation of dance steps, a filled-in footprint indicates a step and the outline of a footprint denotes some other movement of the foot, in this case lifting while performing a hop on the other foot. Of course, this notation of steps omits many of the movements that define the dance, such as the direction of the dance steps, the gestures that dancers make with their feet and legs, and the periodicity of the cycle of dance movements.

Example 1 demonstrates a common and apparently straightforward type of relationship between rhythm and meter in Bulgarian music and dance, in that multiple rhythmic patterns in the performance trace the sequence of four unequal metric durations of *daichovo horo*. For instance, while some *tŭpan* playing features more rhythmic variation, here Tsvetelin Ivanov repeats the same pattern of drum strokes in each measure, articulating the beginning of each eighth note in the metric sequence and adding a sixteenth note at the end of the measure to create a span of a dotted eighth note and to lead into the next measure. The dancers' movements fit the metric sequence even more closely than does the *tŭpan* rhythm, since the rhythm of dance steps matches the four durations in the sequence, and the hop marks the

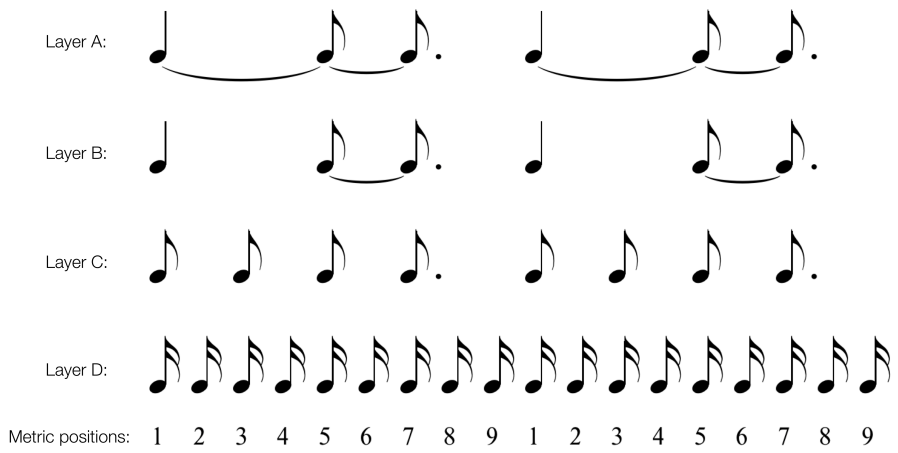
beginning of the measure—as does the forward swinging of the dancers' hands visible in the video.[12]

Following Justin London (2012, 4), I regard rhythm as the temporal relationships among events in sounding music, and meter as a largely unconscious mental framework for organizing musical time that allows performing musicians, dancers, and listeners to produce, interpret, and synchronize with these musical events. According to this perspective, a given meter organizes time into a recurring cycle or period that is subject to constraints on human perceptual and motor abilities. Moments in time within the cycle, which I call metric positions, are differentiated according to the ways in which a performer or listener creates or responds to a change in sound that occurs at that time.

Like any cognitive construct, meter understood in this way cannot be observed directly, so in this paper I treat testimony from musicians and analysis of performed rhythms as two complementary sources of indirect evidence about meter. In the case of *daichovo horo*, Bulgarian musicians and published sources (e.g., Kyuchukov 1967; Vŭglarov 1976, 157–58, 219–20; Petrov 2008, 135–38) give the 9/16 time signature and four-duration sequence listed in Table 1, and the rhythmic patterns just discussed in connection with Example 1 corroborate these claims. Considering the importance of dance for understanding meter in other styles of music (Agawu 2006, 18–24), as well as the orientation of meter toward body movement (London 2012, 5; Patel and Iversen 2014), the rhythm of the dance steps and their coordination with the drumming appear particularly relevant to the meter. Note that since meter, in this view, is a cognitive phenomenon rather than a feature of musical sound or notation, in principle each participant in the scene in Example 1 could be using a slightly different meter to engage with the music. However, the role of meter in enabling synchronization means that most people with similar musical backgrounds will likely use similar meters in a given context.

Like many metric theorists (e.g., Krebs 1999; Cohn 2001; Temperley 2001; Mirka 2009), London (2012) follows Yeston (1976) and Lerdahl and Jackendoff (1983) in conceiving of the framework that meter provides for organizing musical time as consisting of two or more coordinated layers of time points.[13] Whereas most earlier authors concentrate on modeling meter in Western art music, London (2012) extends the theory to accommodate meters from other musical styles that feature unequal durations. Example 2 sketches such a framework for *daichovo horo*, with each of four metric layers represented by a row of note values (cf. London 2012, 124).[14] All metric positions that the framework recognizes within a single measure are

12. While Example 1 demonstrates the basic pattern of steps for *daichovo horo*, numerous more elaborate versions of the dance steps exist. For descriptions of two variants, see Petrov (2008, 135–38, 157–60).
13. An important contrasting conception of meter is laid out by Hasty (1997).
14. Note values are not inherent to the metric framework; I use note values here instead of the rows of dots in Lerdahl and Jackendoff's (1983) similar diagrams to clarify the relationship between Example 2 and the transcription in Example 1. I also view metric time points and durations as two sides of the same coin: each duration, as represented by a note value, begins and ends with a pair of time points, and each time point is



Example 2. Representation of two measures of the meter of *daichovo horo* as a multi-layered framework.

labeled with numbers. The layer with onsets in every metric position, Layer D, is the fastest metric layer shown, in the sense that Layer D has the shortest durations between positions of any layer in the diagram and thus represents a faster rate of motion than any other layers do. An even faster layer of thirty-second notes, making for 18 metric positions per measure, could also be added to Example 2 to capture the shortest durations in the accordion. The two measures shown in the example are not differentiated from each other metrically, but slower layers with time points separated by durations of two, four, and eight measures might be added based on the hypermetrically regular *kolyano* phrase structure of the melody mentioned in the description of Example 1 above.

Two of the four metric layers in Example 2 have unequal durations: layer C, the sequence of eighth-note and dotted-eighth-note durations that is normally considered referential for *daichovo horo*, as well as layer B, a pattern with two durations per measure that matches the rhythm of drum strokes with the beater in Example 1. By including layer B in Example 2, I am claiming, based on my experience of playing and listening to *tŭpan*, that Ivanov's strokes with the beater materialize part of the underlying metric framework that guides his playing, in a way that the more varied rhythms of Angelov's accordion playing do not. This multi-layered model of meter may or may not correspond to actual patterns of neural activity in the way that Edward Large (2008) proposes, but representations like Example 2 seem like a reasonable metaphor for metric structure, especially for listeners who have learned to focus their attention on metric layers.

Notation and Meter for *Elenino Horo*

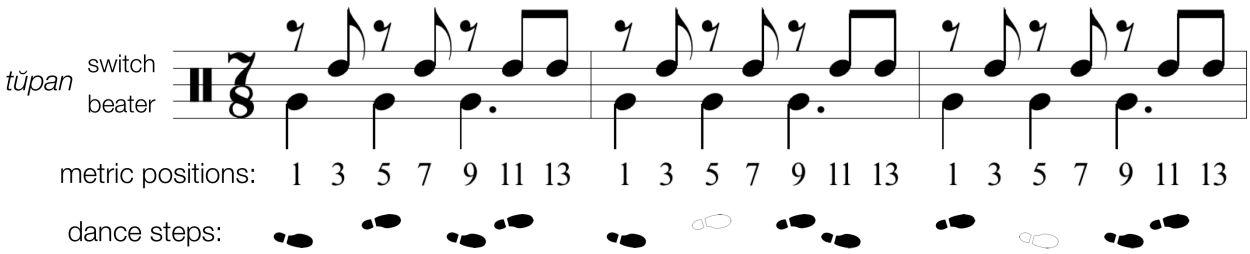
The approach to interpreting meter just demonstrated for *daichovo horo* can also be applied to the dance type that is the main focus of this paper, *elenino horo*. The video in

separated from other time points by durations. I thus use the term "duration" to mean any time span, not only a time span that is filled by a particular sound.

Example 3 shows people dancing *elenino horo* at a festival that took place in October 2014 in the village of Kabile. Some dancers in this video vary their steps, but all maintain a basic pattern of steps in a three-measure cycle, with four movements in each measure. The musical ensemble in this video, Orchestra Krasen from the town of Pazardzhik, uses drum set as their percussion instrument instead of *tŭpan*. Thus, to allow for better comparison with other examples in this paper, in Example 4 I align the rhythm of the dance steps with a transcription from a solo demonstration of the rhythm for *elenino horo* by Daniel Stankov, a *tŭpan* player from Svilengrad.[15] Putting the rhythm of the dance steps in terms of the metric positions in Example 4, in one measure dancers take walking steps on metric positions 1 and 5 followed by more energetic steps on positions 9 and 11, hopping slightly in the step to position 9 and then crossing one foot behind the other to land on position 11. The movements in the other two measures of the cycle of dance steps are similar, but instead of taking a step on metric position 5, a dancer holds one foot above the ground and marks this metric position by touching the heel of the other foot to the ground.[16]

Example 5 represents two measures of a metric framework for *elenino horo*, with note values that match the transcription. This meter is more controversial than is the framework for *daichovo horo* in Example 2. Theorists of the multi-layered model of meter have posited

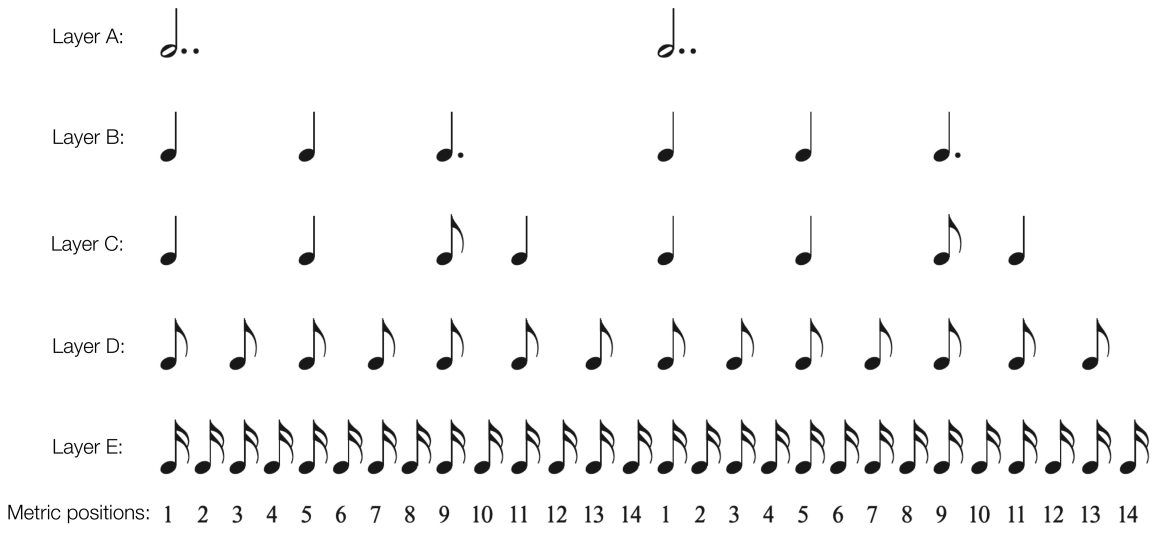
Example 3. Video excerpt of the dance *elenino horo*, from the First National Angel Krŭstev *Tŭpan* Festival in Kabile, Bulgaria, 18 October 2014. Music performed live by Orchestra Krasen from Pazardzhik. Video recorded by the author.



Example 4. Audio excerpt and transcription of the rhythm for *elenino horo* as demonstrated by Daniel Stankov, aligned with the rhythm of the dance steps.

15. I made the recording in Example 4 at an outdoor folk festival in Rozhen, Bulgaria, on July 19, 2015. The distant vocal music audible in the background is not part of the demonstration. Although the recording of Stankov's playing in Example 4 includes only two durations short enough to be written as sixteenth notes (in the sixth measure from the start of the excerpt), the metric positions are numbered at the rate of sixteenth notes for consistency with subsequent examples. With regard to the ensemble in Example 3, the Bulgarian word "orchestra" (оркестър) has a meaning similar to "band" in English, in that Orchestra Krasen consists of seven musicians, each playing a different instrument or singing.

16. More detailed descriptions of the dance step, along with a common version of the melody of "Eleno mome," appear in Dzhenev (1967) and Vŭglarov (1976, 173–75). The same dance and melody are also performed in North Macedonia and Greece, but Leibman (1992, 138) claims that the dance originated in Bulgaria. In any case, the discussion of *elenino horo* in the present paper is limited to Bulgarian contexts.



Example 5. Representation of two measures of the meter of *elenino horo* as a multi-layered framework.

that metric layers and the relationships among them follow principles of organization that can be expressed as rules, comparable in some ways to rules of linguistic grammar (e.g., Lerdahl and Jackendoff 1983, ch. 4; Temperley 2001, 37; London 2012, 92). One such rule prohibits a given duration from occurring in more than one layer, according to the reasoning that a clear distinction between layers depends on their inclusion of different durations, and that this distinction is necessary to maintain the hierarchical integrity of the set of layers (London 2012, 92–94). In Example 5, though, the duration of a quarter note appears in both layer B and layer C, while an eighth note appears in layers C and D. Though I will offer other support for this interpretation below, I base the decision to include layer C first of all on my participant observation of *elenino horo*, especially as a dancer. The rhythm of steps in a Bulgarian dance does not necessarily match the durations of a metric layer, but in this case the emphasis that the dance movements lend to the final step in each measure suggests that position 11 is metrically important: the shorter duration between the third and fourth steps, combined with the turning of the body when crossing one foot behind the other, leads to a feeling of landing on the fourth step, which completes a gesture and stabilizes the body weight before the step at the beginning of the next measure.[17]

The rule of metric organization that layer C contradicts was originally formulated for the meters prevalent in Western art music, in which each layer consists of an unbroken series of conceptually equal durations. That theory of meters with equal durations provided a simple way to differentiate between rhythm and meter, because metric layers by definition could not include any unequal durations. Expanding the theory to encompass meters with unequal

17. For other discussions of correspondence between dance and music from southeastern Europe, see Singer (1974) and Blom (1978). Blom's (1978, 4, 8–9) study includes *elenino horo*, but his interpretation of the rhythm of the music, which shows 15 sixteenth notes in a measure, is not consistent with the timing measurements that I report below or with any time signature that I have seen attributed to the dance type in Bulgarian scholarship.

durations makes this axiomatic approach difficult to sustain; instead, in my view, meters in various musical styles will need to be examined on a case-by-case basis before general principles of metric organization can be fully reformulated, and there is no guarantee that a single, concise set of principles will be able to accommodate all meters (cf. Murphy 2016, par. 4.3).

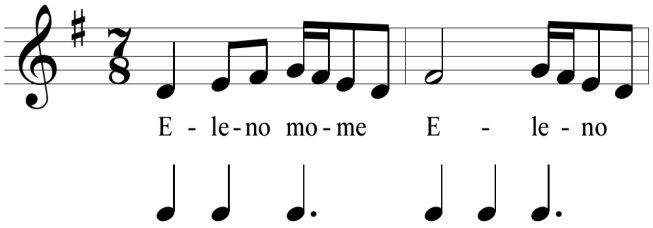
Along these lines, based on their analysis of the shortest durations in Malian drumming, Rainer Polak and Justin London (2014, pars. 107–114) propose a partial exception to London's (2012, 92) rule against the same duration occurring in multiple layers. The relationship between layers B and C in Example 5 resembles the relationship between the two fastest metric layers in meters that Polak and London (2014, fig. 7.1) discuss, where a comparatively long duration in one layer is broken into two shorter durations in another layer, while other durations are identical across the two layers. *Elenino horo* shows that this type of metric relationship also occurs between metric layers moving at a slower rate, notwithstanding the conceptual ambiguity that the pattern introduces into the metric hierarchy.

I am not the first author to identify the sequence in layer C as metrically significant for *elenino horo*. For instance, Kirilov (2015, 36–37) includes the sequence ♩.♩.♪♩ in his description of a multi-layered metric structure for *elenino horo* that resembles Example 5, but he does not address the implications of this structure for metric theory. Treating the durations in layer C as metric entails not only relaxing the rule that a given duration should not occur in more than one metric layer, but also reducing constraints on the ratios between durations in a single layer. London (2012, 128) requires the shorter of two unequal durations in a single metric layer to be more than half as long as the longer duration, but in the metric layer of *elenino horo* in question the shorter duration, the single eighth note in the sequence ♩.♩.♪♩, is written as exactly half the length of the three longer durations that surround it. As introduced above, Bulgarian-language definitions of meter with unequal durations are usually even more restrictive, specifying that the ratio between short and long durations in a metric sequence can only be 2:3.[18]

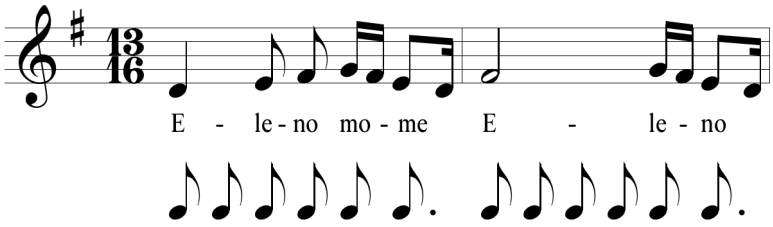
Attempts to reconcile a sequence of unequal metric durations that have a 1:2 ratio of short to long with the accepted 2:3 framework constitute one of several possible explanations for the exceptional range of interpretations of meter for *elenino horo* in Bulgarian scholarship. In contrast with the consensus about time signatures for other common dance types, published transcriptions of the characteristic melody of "Eleno mome" use various time signatures, including 7/8, 12/16, 11/16, and 13/16 (Djoudjeff 1931, 151; Dzhudzhev 1945, 361;

18. A precedent for including durations with a 1:2 ratio within a single metric layer lies in the sixteenth- and seventeenth-century method of beating a triple measure with two, unequally timed hand movements that Grant (2014, ch. 3) describes. This formulation of unequal triple meter might be generalized such that any triple metric duration would encompass two unequal metric durations in a 1:2 ratio, as in the relationship between the dotted quarter note in layer B of Example 5 and the eighth note and final quarter note in a measure in layer C. However, such a generalization would call for much more support than the present case study of *elenino horo* can provide.

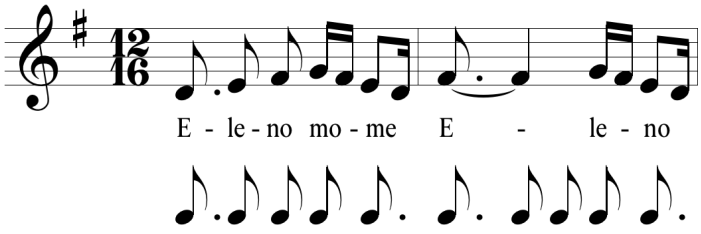
Stoin 1931, 596, 806), representing different interpretations of the sequence of metric durations and sparking debate among twentieth-century music folklorists (e.g., Dzhudzhev 1970, 64–65; Motsev 1949, 286–99; Dzhidzhev 1981, 28–29). Example 6 notates the beginning of a common variant of the melody according to three of these time signatures, with beaming following the sequence of durations shown below each version. In Examples 6b and 6c, the last two note values of the metric sequence, which correspond to the eighth note and final quarter note in the sequence ♩♩♪♩, are instead an eighth note and a dotted eighth note, such that the time signatures 13/16 and 12/16 appear to normalize the ratio of short to long from 1:2 to 2:3.



a. 7/8 (cf. Dzhudzhev 1931, 151).



b. 13/16 (cf. Stoin 1931, 806).



c. 12/16 (cf. Dzhudzhev 1945, 361).

Example 6. The beginning of the melody of "Eleno mome," notated according to three different time signatures. The sequence of unequal metric durations implied by the time signature appears below each version. The three excerpts in this example all have the pitches and lyrics of a single version of the melody, so that they differ only in their time signatures and note values. The sources cited in each excerpt's caption are transcriptions of other variants of this melody that use the indicated time signature.

In their polemics about the meter of *elenino horo*, twentieth-century Bulgarian authors tend to assume that there exists only one correct time signature for the dance type. Todor Dzhidzhev (1981, 29–30), for instance, argues that 7/8 best represents the four-element rhythm of the dance step and the rhythmic patterns in the melody.[19] He expresses ambivalence, though, about the metric status of the rhythm ♩.♩.♪♩, claiming that *elenino horo* occupies a transitional position in a historical transformation from a meter with fundamentally unequal pulses that would be written as ♩.♩.♩. to a meter with seven equal eighth-note pulses in which the 2:3 relationship of short to long in the ♩.♩.♩. sequence occurs "on a higher level" (на по-високо равнище, 26). Dzhidzhev thus acknowledges that the ♩.♩.♪♩ rhythm is central to *elenino horo*, but stops short of revising his metric theory to allow for metric durations with a 1:2 ratio.

The axiomatic standing of 2:3 as the only possible relationship of unequal metric durations in Bulgarian music dates back to Dobri Hristov, the composer and folklorist who first systematized the notation of Bulgarian meter with unequal durations (Todorov 1981, 63) and who published multiple articles emphasizing this point about notation. In one such article, Hristov ([1928] 1970, 88) brings up the rhythm ♩.♩.♪♩ in 7/8 when he introduces the time signature 13/16, warning against writing the four-element rhythm because this pattern is "foreign to our music" (чужд за нашата музика). As Svetlana Zaharieva (2000) and Karen Peters (2003) have noted, Hristov's concern with notation is bound up with a nationalist agenda, according to which special characteristics of meter set Bulgarian folk music apart from that of other peoples. Similar themes manifest in Dzhidzhev's (1981) work, as one of the main conclusions of his comparative study of Bulgarian and Romanian folk music is that the presence of meters with unequal durations in Romania derives from contact with Bulgarian culture. As such, reluctance to allow for unequal metric durations with a 1:2 ratio in Bulgarian metric theory may relate to ideological commitments.[20]

Timing in *Elenino Horo*

Up to this point I have discussed meter in *elenino horo* as though the note values in Example 4 accurately reflect the sounding durations. My decision to transcribe the music in 7/8 is based primarily on listening—I hear a series of seven essentially equal durations in the repeating rhythmic cycle of drumming for *elenino horo*—but it is possible that I fail to perceive nuances of timing that would make a different time signature more fitting. To check my perception of the rhythm and its relationship to time signatures, I measure timing in a selection of nine field recordings of *elenino horo*, each by a different *tŭpan* player. Specifically, I use a combination of close listening, tapping along with the recording, audio analysis software, and simple computer code to identify as precisely as possible the beginning, or onset, of the sound of each drum stroke. This procedure includes relying on my judgment as an informed listener to assign each onset to one of 14 hypothetical metric positions, which

19. See also Kaufman (1977, 43–44), whom Dzhidzhev (1981, 74) cites, and Katzarova-Kukudova and Djenev (1976, 66–67) on ♩.♩.♪♩ as a characteristic rhythm for *elenino horo*.
20. Of course, this is not to say that any other writings about music, including the present one, are independent from ideology, or that any writing about music can or should be so.

would correspond to sixteenth notes if the rhythm were notated with a time signature of 7/8 along the lines of Example 4.[21] The nine recorded performances that I analyze, listed in Table 2, are mostly from private recording sessions that I conducted in locations such as the recital hall of a community center (*chitalishte*), and ensembles usually consisted of the *tŭpan* player and one to three other musicians playing pitched instruments.[22] Most *tŭpan* players were professionals without formal musical training, and their ages range from mid 20s to mid 60s.

The rhythmic patterns that these *tŭpan* players use when performing *elenino horo* show regional and individual differences, which I address later in this article. However, in most performances the rhythm during any one iteration of the metric cycle likely includes drum strokes articulating the seven metric positions labeled with odd numbers in Example 4 above. For the purpose of timing comparison, I select measures from the recordings in Table 2 in which all seven positions are articulated, ignoring information such as which drum stick the

***Tŭpan* Player Information**						**Ensemble Information**		**Recording Context and Details**			
Name	**Home Town**	**Home Region**	**Age Range**	**Professional Status**	**Ethnicity**	**Group or Leader Name**	**Instrumentation**	**Event Type**	**Location and Date**	**Performance Duration**	**Number of Measures**
Misho Borisov	Montana	north	30s	semi-professional	Slavic	Torlak Songs (Торлашки напеви)	*güdulka*, *tambura*, voice	recording session	Montana, 5-Jun-15	0:30	19
										1:05	41
Minko Mustakov	Pleven	north	60s	folk orchestra professional	Slavic	Northern Ensemble (Северняшки ансамбъл "Иван Вълев")	folk orchestra	ensemble rehearsal	Pleven, 4-Jun-15	3:37	138
Miroslav Vasilev	Veliko Tŭrnovo	north	40s	folk orchestra professional	Slavic	Ensemble Iskra (ПФА "Искра")	*kaval*	recording session	Veliko Tŭrnovo, 2-Jun-15	1:47	63
Gancho Dimov	Petrich	Pirin	30s	freelance professional	Romani	Salibenk	*zurna* (three)	recording session	Petrich, 27-Feb-15	2:38	88
Ziya Mandzaka	Petrich	Pirin	50s	freelance professional	Romani	Shabidin Usev	*zurna* (three)	recording session	Petrich, 26-Feb-15	2:26	91
Ivan Nikolov	Razlog	Pirin	30s	freelance professional	Romani	Iliya Zangov	*zurna* (two)	recording session	Razlog, 11-Apr-15	1:49	67
Mitko Mitev	Kermen	Thrace	60s	amateur	Slavic	Orkestra Kabile	*kaval*, *gaida*, *tambura*, accordion	*tŭpan* competition	Kabile, 18-Oct-14	1:50	79
Dilyan Petrov	Sliven	Thrace	20s	semi-professional	Slavic	Chavdar Chenkov	*gaida*	recording session	Sliven, 8-Mar-15	1:35	63
Rumen Randev	Kotel	Thrace	40s	freelance professional	Romani	Martin Pachanov	clarinet, accordion	recording session	Kotel, 12-Mar-15	2:07	87

Table 2. Details about the selection of nine field recordings of *elenino horo*.

21. As such, the analysis is not completely free from my individual perceptual biases; I cannot avoid hearing the music according to a metric framework in 7/8. This perception could influence the timing measurements, even if in principle the measurements themselves should remain the same regardless of how a listener experiences the onsets. For a detailed description of the method of identifying onsets, see Goldberg (2017, 89–100). The program that I use for most audio analysis is Sonic Visualiser (Cannam, Landone, and Sandler 2010).
22. In the case of one performer, Misho Borisov, recordings of two very similar performances are included in order to reach enough measures for comparison with the other recordings.

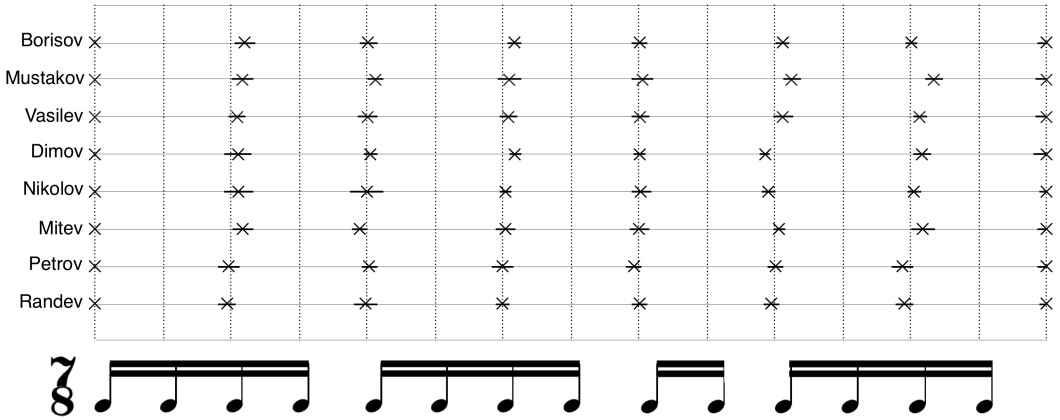
player uses or whether the rhythmic pattern during a given measure articulates any other metric positions.[23]

Using this framework, Figure 2 graphs durations between onsets—often referred to as interonset intervals, or IOIs—from eight of the nine recordings and compares these measurements with theoretical timing based on the three time signatures for *elenino horo* shown above in Example 6. IOIs for each performer are graphed horizontally, with the *tŭpan* players listed in the same order as in Table 2 (but with Ziya Mandzaka's performance omitted, as mentioned in footnote 23). The line following a performer's name represents the IOIs between onsets that mark the seven metric positions. Specifically, each successive pair of *x*'s on the line marks the boundaries of an IOI measured from the onset of a drum stroke articulating one metric position to the onset of the drum stroke that marks the next position. In the graphs these IOIs are averaged from samples of 25 measures from each performance, and the horizontal line surrounding the *x* on the right boundary of each IOI extends one standard deviation in either direction from the mean. The values in the graphs have been standardized to show the percentage of a measure that each IOI takes up, such that the beginnings and ends of all measures are exactly aligned. Appendix 1 reports the unstandardized means and standard deviations in milliseconds.

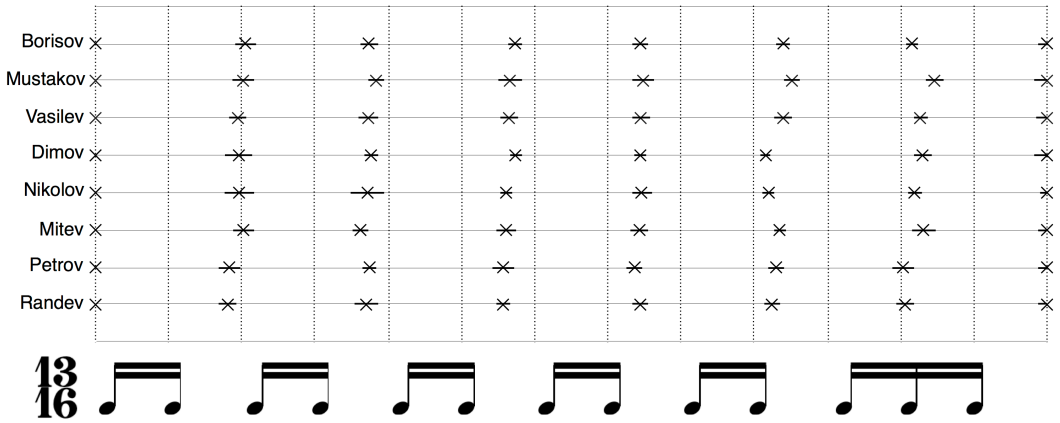
The three graphs in Figure 2 are identical to one another except for the vertical dotted lines, which give theoretical reference points based on a different time signature in each case. In Figure 2a, the vertical lines represent beginnings of sixteenth notes in 7/8 according to a division of the duration of the measure into 14 equal parts. The note values below the graph mark the sixteenth notes in this time signature, with beaming according to the ♩♩♪♩ sequence from layer C of Example 5. Vertical lines in Figures 2b and 2c instead divide the measure into 13 or 12 equal parts for time signatures of 13/16 and 12/16, again with sixteenth notes below the graph beamed according to the sequences of unequal durations that these time signatures indicate.

Deriving theoretical timing for time signatures from the equal division of a measure is subject to debate. Psychologically oriented theories of meters with unequal durations have tended to assume that the unequal durations depend on a faster, continuous series of equal metric units (e.g., London 1995, 69; Clayton 2000, 41), an approach that may originate partly from translating the convention for notating short and long durations into the realm of cognition. Critics of this assumption have adduced counterexamples from analyses of timing in musical styles including Scandinavian fiddle playing and West African drumming (Kvifte 2007; Polak 2010), and a goal of the present study, too, is to distance metric theory from

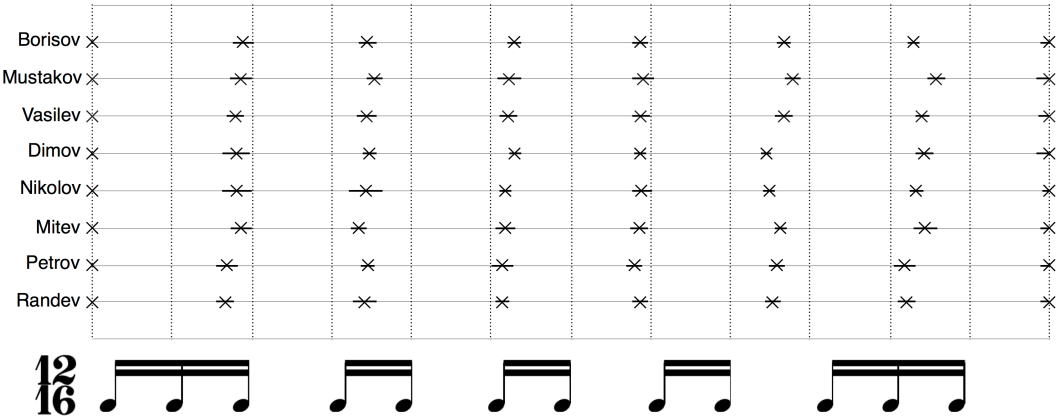
23. A limitation of this method is that by excluding measures in which all seven odd-numbered metric positions are not articulated, I selected for certain rhythmic patterns such that the measurements do not represent timing in each performance as a whole. This constraint meant limiting the sample size to 25 measures and leaving out the performance by Ziya Mandzaka, since he marks all seven positions in fewer than ten of the measures in the recording.



a. Relative to division of a measure according to a 7/8 time signature.



b. Relative to division of a measure according to a 13/16 time signature.



c. Relative to division of a measure according to a 12/16 time signature.

Figure 2. Average timing in eight performances of *elenino horo*.

notation of rhythm. Yet even a theory that posits fast equal durations as a substrate for unequal durations might well generate predictions for performance timing other than a division of the measure into exactly equal parts—for instance, a factor such as rhythmic context could also affect timing, or timing could depend on a shorter span than that of the measure (on the latter, see Benadon 2007, pars. 4–6).

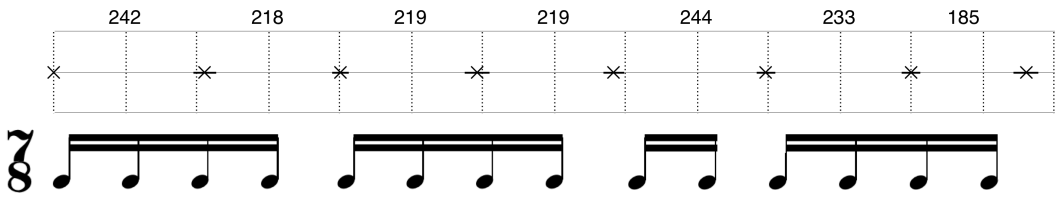
In spite of this qualification, the graphs in Figure 2 establish that 13/16 and 12/16 poorly fit the timing of the eight performances shown. In Figures 2b and 2c, most of the boundaries of measured IOIs lie far from the reference points determined by the time signature. If the timing derived from either of the durational sequences that these time signatures specify, one would expect the successions of mean IOIs to align more closely with at least some of the vertical lines in these two graphs, even allowing for imperfections in my method of measurement.

By contrast, in Figure 2a the measured IOIs are generally close to all of the theoretical reference points, showing 7/8 to be the most plausible fit for the timing from among the common alternatives.[24] Other musicians might well use timing patterns not present in my selection of eight recordings, but since the ages as well as the educational and geographic backgrounds of the performers I recorded vary considerably, I am willing to assume that an implied time signature other than 7/8 is uncommon in current Bulgarian *tŭpan* performances of *elenino horo*.

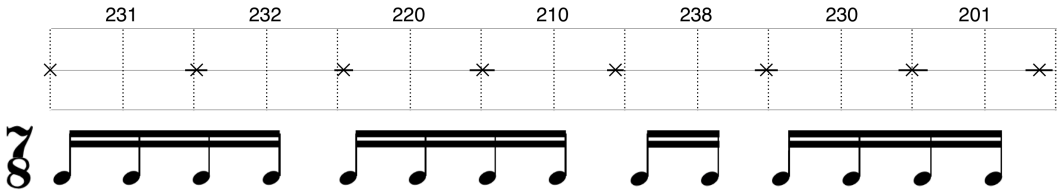
This is not to say that timing according to a 7/8 time signature is a perfect match for the performed IOIs. For instance, the performances by Misho Borisov, Minko Mustakov, and Gancho Dimov each include three IOI boundaries that are more than one standard deviation away from the theoretical timing as represented here. Such differences show that timing depends on metric position, in that the IOI between a pair of successive metric positions at one point in the measure often differs consistently from the IOI between a pair of successive positions at another point in the measure. In other words, the durations of, say, the first eighth note in each measure of 7/8 and the last eighth note in a measure may be different despite their identical written note values and their adjacency in the metric cycle.

To examine just one of these cases in more detail, in Mustakov's performance, the final mean IOI in a measure is notably shorter than any of the other six IOIs. Figure 3a highlights this feature by graphing the mean IOIs relative to theoretical reference points for 7/8 that are

24. Besides the three alternatives compared in Figure 2, two other time signatures for *elenino horo* that musicians I met mentioned are 11/16 and 14/16. In my experience the former is the least common possibility, though a notated example can be found in Stoin (1931, 596). Unlike in the other comparisons, the difference between 7/8 and 14/16 when notating the rhythm of *elenino horo* is not a matter of the unequal durational sequence as I define it, but rather of the interpretation of the rates of motion in the meter in connection with tempo, along the lines of Dzhidzhev's (1981, 74–78) distinction between "equally and unequally measured meter" (равномерен и неравномерен метрум). While this type of distinction is relevant to music perception, the difference does not affect the theoretical timing that I discuss, so for present purposes I treat 7/8 and 14/16 as equivalent.



a. The recording of Minko Mustakov from Figure 2.



b. A commercial recording of Ivan Shibilev on accordion.

Figure 3. Short final IOIs in two performances of *elenino horo*. The row of numbers above the graph lists the mean duration of each eighth-note IOI in milliseconds.

calculated from the average of the first six IOIs instead of all seven. From this perspective, the first six IOIs mostly meet expectations for the series of equal eighth notes that the time signature entails, but the short final IOI creates a gap of about 44 milliseconds between the actual end of the measure, denoted by the last *x* in the row, and the expected endpoint, shown by the dotted line on the right side of the graph. Since the gap is less than half a sixteenth note in terms of the theoretical timing in Figure 2a, 7/8 remains the closest fit among accepted time signatures, but the correspondence is imperfect.

Mustakov's performance is the only one of the nine field recordings in Table 2 that exhibits this apparently short seventh IOI, but other Bulgarian musicians might use similar timing patterns. Figure 3b graphs mean IOIs in a sample of 25 measures from a commercial recording of *elenino horo* by accordionist Ivan Shibilev with orchestral accompaniment (Shibilev [1956?]). Shibilev (1974) published an arrangement of *elenino horo* in 13/16, so he likely conceived of the music according to this time signature.[25] The age of the recording means that the timing measurements in Figure 3b are less precise than those from my field recordings, and since Shibilev's orchestra lacks a percussionist, the onsets correspond to the melody and chords instead of drum strokes. Still, the two timing profiles are similar, and in particular, the last IOI is the shortest in both cases. If an abbreviated final IOI proves to be a consistent feature of timing that a certain subset of Bulgarian performers share, then this pattern offers limited support for Kvifte's (2007) and Polak's (2010) arguments against the idea that a constant series of fast, strictly equal metric units must govern timing, because such a theory of

25. I am grateful to Ilian Iliev for drawing my attention to this recording and score.

equal timing would be forced to posit unplayably short metric units to account for the short IOI.

Small but consistently recurring timing differences have been labeled as "expressive deviations" in music performance literature (e.g., Clarke 1985; Sloboda 2000; Sadakata, Desain, and Honing 2006) and as a form of "participatory discrepancies" in ethnomusicological literature (e.g., Keil 1995, Prögler 1995, Washburne 1998, Gerischer 2006). When applied to the moments in a metric cycle when a single performer's timing does not match an equally timed grid, though, the terms "deviation" and "discrepancy" imply that such a grid forms part of the performer's conception of the music by acting as a reference point that the performer has chosen not to conform to. While Figure 2 suggests that many *tŭpan* players do perform with nearly equal durations on the metric layer that I notate with eighth notes, I argue that the equal timing represented in Western musical notation should not be treated as normative *a priori*, and thus that the differences among average durations in Figures 2 and 3 do not necessarily represent expressive deviations or participatory discrepancies.

Participatory discrepancies are also better conceived of in a context that extends beyond timing as performed by individual musicians. Although Charles Keil's (1995, 2–4) definition of participatory discrepancies includes nonconformance to an idealized standard, for him and others participatory discrepancies more commonly refer to slight mismatches in rhythm, pitch, timbre, and other musical features among members of an ensemble that are negotiated and maintained in the act of performance, and my study does not address this ensemble dynamic. In Keil's formulation and in related work by Steven Feld (Keil and Feld 1994), these small differences and their interplay create the grooves that give musics in various styles their living, processual character.

Several studies suggest, however, that the role of timing in creating groove may have been overstated, in that the relationship between details of performance timing and the experience of rhythmic quality or groove has proven difficult to substantiate. For example, in a test of listeners' abilities to detect asynchronies between drum and bass onsets on jazz recordings, Matthew Butterfield (2010, 160) found that most participants could not reliably discern which instrument played earlier or later than the other, either in explicit terms or by way of the putative experiential correlates of "assertion" and "passivity." Two other studies that manipulated the timing variations in synthesized rhythm-section performances of funk, jazz, samba, and rock also failed to confirm the predictions of a theory of groove as a result of timing (Davies et al. 2013; Frühauf, Kopiez, and Platz 2013). With the exception of jazz timing, which did not seem to affect groove, listeners in these studies gave the highest groove ratings to stimuli with perfectly grid-based timing; in fact, the greater the magnitude of a stimulus's departures from the grid, the lower its groove rating. Especially considering the uncertainty that these studies open up about the factors at play, I reserve the terms participatory discrepancies and groove for holistic concepts incorporating multiple musical domains. In order to avoid collapsing their meanings into the single dimension of rhythmic phenomena that I focus on, I do not engage with them further in the present study.

Returning instead to the question of time signatures for *elenino horo*, the timing pattern in Figure 3 also allows for another speculative explanation of why the time signature 13/16 has been used for *elenino horo*: if a transcriber noticed that the final IOI of every measure was slightly shorter than expected, they might represent the difference from other music transcribed in 7/8 by decreasing the length of a measure by the shortest plausible metric unit, a sixteenth note. The resulting transcription would have a time signature of 13/16, exaggerating the shortening at the end of the measure.

Past justifications for notating *elenino horo* in 13/16 seem consistent with this type of misapprehension of timing. For instance, in a comprehensive and influential textbook, Stoyan Dzhudzhev (1970, 64–65) claims that transcribers with a higher tolerance for flexible timing use a time signature of 7/8 when writing *elenino horo*, whereas transcribers who allow for less "approximation" (приближение) in translating sounding durations into note values use 13/16. Without the benefit of timing measurement, the more precise transcribers in Dzhudzhev's account might have made just the miscalculation that I describe. Similarly, Dobri Hristov ([1930?] 1967, 110) comments about 13/16 that "the fast tempo of songs with such a meter often deludes the musician into hearing these songs in . . . 7/8."[26] Perhaps it was not the fast tempo, but rather timing that cannot be expressed in Hristov's system of notation, that made the songs written in 13/16 unusually easy to mistake for others in 7/8.

Of course, my origin story is not verifiable, since recordings are not available to check the timing that prompted most transcriptions, and performers' timing patterns may well have changed during the century or so since Bulgarian folklorists began writing music in 13/16.[27] It is also quite plausible that, contrary to the assumption underlying twentieth-century debates about the correct time signature for *elenino horo*, the durations and meters used when singing or playing "Eleno mome" differed substantially among individual performers. Indeed, in addition to the potential for regional or individual variation in performances of a given melody, experienced Bulgarian musicians are able to adapt melodic material to different metric contexts (Rice 1994, 198; Rice 2000, 205; Buchanan and Folse 2006, 88).

Basic Rhythms and Meter in Performance

Basic Rhythms

Regardless of how particular time signatures came into use, the above timing analysis suggests that performance of *elenino horo* is often not closely tied to the time signature—at least if a time signature is understood as specifying durations according to a literal interpretation of note values. By the same token, my identification of 7/8 as an appropriate time signature for performed IOIs does not necessarily provide much information about how players conceive of meter. Accordingly, in the remainder of this article I pursue an analysis of

26. Живото темпо на песни с такъв такт заблуждава често музиканта да ги слуша в . . . 7/8.
27. On the first transcriptions of folk songs in 13/16, see Hristov ([1925] 1967, 64).

rhythm and meter in *tŭpan* performances of *elenino horo* that derives from how musicians discuss and teach drumming.

Most musicians I spoke with identified one of the options given in published sources as the time signature for the dance type, so discrepancies among publications such as textbooks may be a source of the continuing differences of opinion about meter in *elenino horo*. However, connotations of metric organization that accompany time signatures in the literature are not always part of current performers' conceptions. For instance, Tim Rice (2000, 203) notes that Bulgarian village musicians mark the unequal metric durations rather than the faster units represented in time signatures when asked to count along with their playing, and Mark Levy (1985, 236–37) reports that bagpipers from south-central Bulgaria who do not have formal training understand meter in terms of beats and dance steps rather than time signatures, sometimes providing unconventional or inconsistent explanations of a time signature's meaning.

My experience in interviewing *tŭpan* players was similar. For instance, I sometimes encountered discrepancies between a musician's conception of metric organization, as implied by counting with the music, and the metric organization indicated by the time signature that the same musician named. To be sure, a few of the *tŭpan* players I spoke with clearly were well aware of conventional meanings of time signatures with respect to sequences of unequal durations, and formed their preferences for the time signature of *elenino horo* based on this awareness. Still, I believe that for many players time signatures constitute labels or facts about dance types that may be worth memorizing—for the sake, for instance, of the prestige that declarative knowledge about music affords—but that are not necessary for or even relevant to performance.[28] In this context a player's counting seems more informative about their perception of the meter, and indeed, three counting patterns that different musicians demonstrated to me for *elenino horo* correspond to the representation of meter in Example 5 above: individuals either counted to three, matching the ♩♩♩. durations of layer B in Example 5; or they matched the ♩♩♪♩ sequence from layer C by counting with a four-element cycle, 1-2-1-2, where underlined numbers represent longer durations; or they counted a cycle of seven equal durations as 1-2-1-2-1-2-3, corresponding to layer D with the numbers grouped according to layer B.

Counting, however, is not a means of explaining meter that *tŭpan* players chose spontaneously; they only counted when I specifically requested it. Instead, when I asked about the rhythm of a dance type, musicians often responded not with a verbal description, but by performing a repeating rhythm, each iteration of which might cycle through the sequence of unequal durations for the dance type in question one or two times. Some players call these patterns "basic rhythms" (основни ритми) or "schemas" (схеми). The drumming

28. I must emphasize that this claim does not imply any form of criticism of musicians' knowledge or skills; nothing I observed indicates that degree of fluency with notation has a bearing on *tŭpan* players' musical proficiency.

transcribed in Example 4 above is an example of this type of demonstration.[29]

Tŭpan teachers including Mitko Popov, who performs with the professional folk orchestra of Ensemble Thrace, and Zhivko Mihov, a recent graduate of the Academy for Music, Dance, and Fine Arts in Plovdiv, explained the basic rhythms for numerous dance types to me as templates that may be repeated and varied in performance according to factors such as melodic grouping and interaction with other members of the ensemble. While a great deal of variation is possible, including adding ornamentation and creating syncopation against the sequence of unequal durations, I was taught not to stray too far from the basic rhythm so that my playing would be appropriate for the particular dance type being performed. Considering the limited relevance of time signatures for performers, these basic rhythms appear to reflect performers' conceptions of the underlying temporal framework for their playing more closely than time signatures do.

Note that, although I define rhythm above in terms of temporal relationships among musical events, basic rhythms are defined not only by patterns of duration and timing, but also by sticking—meaning that the identity of a basic rhythm depends in part on which strokes are played with the beater and which are played with the switch. This less abstract conception of rhythmic patterns calls to mind the theorization of rhythmic modes in the Turkish *usul* and Arab *īqā'* systems, which similarly differentiate between two percussion timbres (Bates 2011, 54–60). Indeed, the drumming pattern for *daichovo horo* transcribed in Example 1 above closely resembles the durations and alternating *düm* and *tek* timbres that Bates (2011, 58) gives for the Turkish *aksak usulü*, differing only by the addition of the short note played with the switch at the very end of each measure of *daichovo horo*. The similarity is not surprising considering that the territory of present-day Bulgaria was part of the Ottoman Empire for roughly 500 years, and the *tŭpan* itself is quite similar to the Turkish *askı-davul* drum (Bates 2011, 27).[30] In the context of the present study, the relevance of sticking for basic rhythms means that from this point forward my criteria for identifying rhythms incorporate which stick a player uses to articulate each onset.

Rhythm in the nine recordings introduced in Table 2 supports the idea that templates similar to basic rhythms serve to organize *tŭpan* performance in an ensemble context. Table 3 summarizes the frequencies of one-measure rhythms in the recordings, based on samples of 60 measures from each performance. In this tally, the definition of a distinct rhythm depends on the presence or absence of an onset in each of the 14 metric positions, as well as on two common features of articulation: whether an onset is articulated with the beater, the switch, or both sticks simultaneously; and whether the drum stroke is a single stroke or a double stroke.

29. Kaufman (1977, 43–51) and Peycheva and Dimov (2002, 346–47) mention the association between dance types and rhythmic formulas or schemas, but they do not examine the formulas systematically.
30. While a few twentieth-century Bulgarian authors compare common meters in Bulgarian music with *usul* (e.g., Hristov [1925] 1967; Dzhudzhev 1977), connections between Bulgarian and Turkish music were largely overlooked due to nationalistic efforts to distance Bulgaria from its Ottoman past (see Buchanan 2006, 292–94).

Performer	Total Number of Different Rhythms	Frequencies of the Performer's Four Most Common Rhythms			
Misho Borisov	8	42	5 (2 tied)	3	2
Minko Mustakov	36	9 (2 tied)	5	2 (4 tied)	1 (29 tied)
Miroslav Vasilev	30	13	6 (2 tied)	3 (3 tied)	2 (2 tied)
Gancho Dimov	15	15	9	7	6
Ziya Mandzaka	36	10	5 (2 tied)	3 (2 tied)	2 (3 tied)
Ivan Nikolov	56	3	2 (2 tied)	1 (53 tied)	none
Mitko Mitev	30	6	5	4 (4 tied)	3 (4 tied)
Dilyan Petrov	37	11	4	2 (10 tied)	1 (25 tied)
Rumen Randev	39	10	5	3 (3 tied)	2 (2 tied)

Table 3. Frequencies of one-measure rhythms in 60-measure samples from ensemble performances of *elenino horo*.

Thus, measures with drum strokes marking the same series of metric positions but with differences in the sticking pattern used to play this series are considered different rhythms, but the classification does not depend on other differences in sticking technique or on the loudness of a drum stroke, which can range from booming to barely audible.[31] The four most common rhythms listed in Table 3 are not the same for different performers; their placement in columns simply follows the frequency rank in each recording.

In most performances one or two rhythms occur much more frequently than any others. For example, in five of the nine performances—those by Misho Borisov, Miroslav Vasilev, Ziya Mandzaka, Dilyan Petrov, and Rumen Randev—the most common rhythm occurs at least twice as many times as the second-most common, with a sharp decline in frequencies of other rhythms so that each of the third- and fourth-most common rhythms is played three times or fewer in the 60-measure sample. Gancho Dimov and Minko Mustakov do not perform with quite as pronounced a difference in frequency, but they still play one or two rhythms substantially more often than they play any other rhythms. This uneven distribution of particular rhythms suggests that the concept of a basic rhythm is not only a pedagogical device; rather, *tŭpan* players also tend to favor a particular rhythm when playing in an ensemble, and features of the common rhythms may provide useful information about the underlying meter. The two exceptions to the pattern of preferring certain rhythms, the performances by Mitko Mitev and Ivan Nikolov, establish that it is nonetheless possible to perform with a more nearly equal mix of different rhythms. In this respect Nikolov stands out

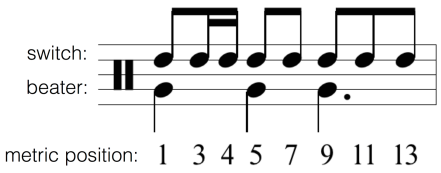
31. Additionally, because I categorize drum strokes by ear, the definitions used for classifying rhythms might not always match the movements involved in playing the drum. For example, I define an onset with both sticks as any stroke when both drum heads are audible, and this definition potentially includes instances when the switch vibrates against one drum head because the player is pressing the switch against the drum head while striking the opposite head with the beater. Along similar lines, I define a double stroke as a single motion of the hand that causes the stick to strike the drum twice before the following metric position, but pairs of strokes with the same stick that mark two successive metric positions, which I always classify as single strokes, might sometimes be played with a single motion of the hand.

for avoiding repetition of one-measure rhythms almost entirely. Favoring individual rhythms, then, would seem to result from learned rather than innate cognitive processes, at least for the fairly high degree of rhythmic particularity that defines the one-measure rhythms in the table.

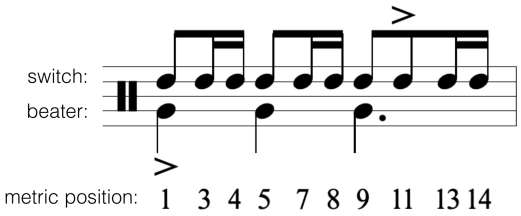
Example 7 provides a transcription of the rhythm in each performance with the highest frequency as listed in Table 3, along with audio excerpts from the recordings—though since most players mix in less frequent rhythms throughout the performance, the excerpts include other rhythms besides those transcribed.[32] All performances except for Borisov's feature the melody of the song "Eleno mome."[33] In the transcriptions, a diagonal slash through the stem of a note indicates a double stroke. Beyond the features that contribute to defining these rhythms in the tallies in Table 3, the transcriptions include accent marks for drum strokes that I hear as bearing dynamic accent relative to neighboring strokes with the same stick, as well as slurs to mark a type of gesture that combines strokes with different sticks. Mitko Popov refers to such gestures as "elements" and asks his students to practice playing them many times in succession in order to build fluency.[34] A slur connecting two strokes that mark successive metric positions, one with the beater and one with the switch, indicates a likely instance of a drumming element in Popov's sense.

Example 7 shows that the rhythms that *tŭpan* players choose most often in performance tend to be somewhat more complicated than the pattern in Example 4 used to define or teach *tŭpan* playing for *elenino horo*. No two players in the sample favor exactly the same rhythm, at least when sticking is included, and substantial differences can be heard between some of the recordings. In particular, the common rhythms played by Dimov, Mandzaka, and Nikolov (transcribed as Example 7e, 7f, and 7g) stand out from those from the remaining recordings, especially with respect to accents and drumming elements.[35] The examples by these performers feature a particular sticking pattern in the middle of the measure, with accented strokes in metric positions 5, 8, and 11. This pattern involves an element that links a quiet beater stroke in position 9 to a switch stroke in position 10, and Dimov and Nikolov also illustrate two other ways of using elements: as an anacrusis to the stroke that begins the next measure in metric positions 13 and 14 of Dimov's rhythm, and as a symmetrical pair (switch–beater–beater–switch) that articulates four successive metric positions beginning with position 11 in Nikolov's rhythm. Although these techniques can be heard occasionally in the other recordings, their frequent and similar use sets Dimov, Mandzaka, and Nikolov apart.

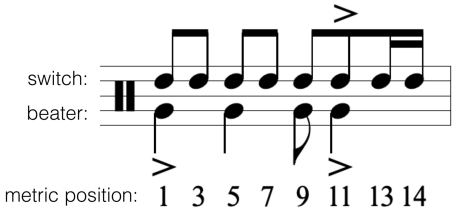
32. As Table 3 shows, two different rhythms occur with the same highest frequency in Mustakov's performance. Both of these rhythms are transcribed in Example 7.
33. Borisov's ensemble performs the melody of the song "Tsone, milo chedo." This song, which Hristov ([1930?] 1967, 110) cites as an example of music in 13/16, is also associated with a different dance step, but the group played it in response to my request for music for *elenino horo*.
34. Popov's elements bear a resemblance to "rudiments" often used in snare drum pedagogy such as types of rolls and paradiddles, but since elements consist of only two or three strokes, they are shorter than most rudiments.
35. The drumming in these three recordings is also likely the most challenging to match with the transcription for listeners unfamiliar with the style. To orient the sound and notation, it may be helpful to listen for a short–long–short–long pattern played with the switch in most measures. This rhythm articulates metric positions 7, 8, 10, and 11 in the transcriptions.



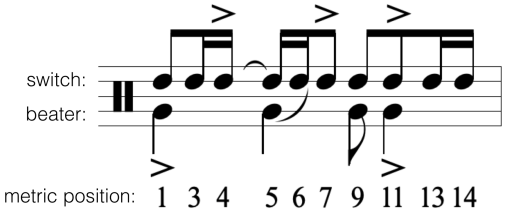
a. Misho Borisov — Audio



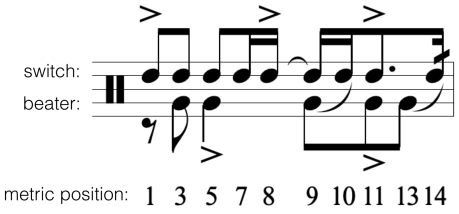
b. Miroslav Vasilev — Audio



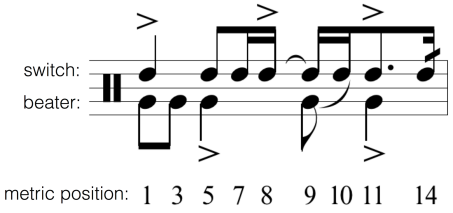
c. Minko Mustakov 1 — Audio



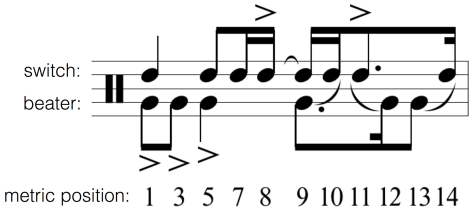
d. Minko Mustakov 2 — Audio



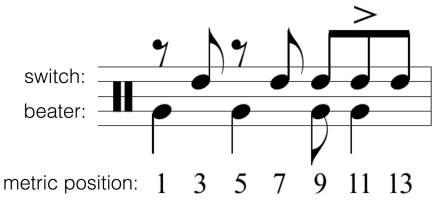
e. Gancho Dimov — Audio



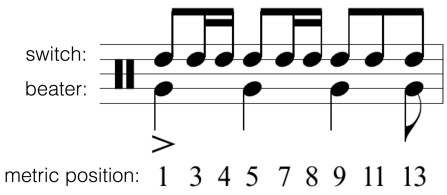
f. Ziya Mandzaka — Audio



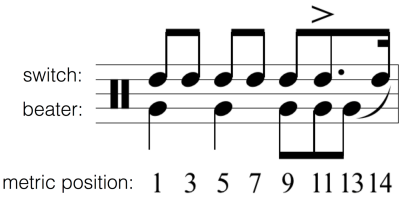
g. Ivan Nikolov — Audio



h. Mitko Mitev — Audio



i. Dilyan Petrov — Audio



j. Rumen Randev — Audio

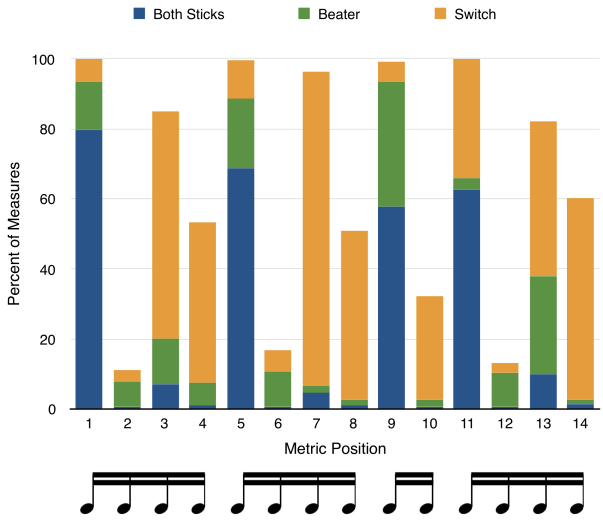
Example 7. Transcriptions of the most common one-measure rhythm in each performance.

This difference in common rhythms corresponds to a clear stylistic distinction among the performances. The three recordings that I have highlighted are by *tŭpan* players from the Pirin region of southwestern Bulgaria, performing with the type of ensemble, mentioned above, that consists of professional Romani musicians playing *tŭpan* and *zurna*; in fact, Pirin is the only region of the country where *zurna* and *tŭpan* groups are based.[36] In Bulgaria, as in other countries in southeastern Europe, Romani musicians have a reputation as talented, innovative performers that contrasts with the overt discrimination that they still face throughout society (see Silverman 2012, 12–13). Svanibor Pettan (1992, 1996) identifies several examples of alterations that Romani musicians in Kosovo make to existing music in the course of performance, and the distinctive *tŭpan* rhythms that Roma from Pirin play for *elenino horo* appear similarly to illustrate a creative and sophisticated approach to articulating the dance rhythm. Rumen Randev, a Romani *tŭpan* player from Thrace who performed along with clarinet and accordion players for the recording in this study, does not use the same series of accents in the middle of the measure in his most frequent rhythm (see Example 7j), so the shared features of Dimov's, Mandzaka's, and Nikolov's rhythms appear to be components of a style particular to *zurna* ensembles in Pirin. To be sure, the present sample of recordings is not large enough to draw strong conclusions about differences among performers based on demographics; for instance, Slavic musicians from Pirin, Romani musicians from Pirin performing with other types of ensembles, and more musicians from other regions would need to be included in order to determine how stylistically specific the pattern is. Nonetheless, the set of selected recordings shows that common rhythms can reflect differences in style even when other musical features, such as dance type, remain constant.

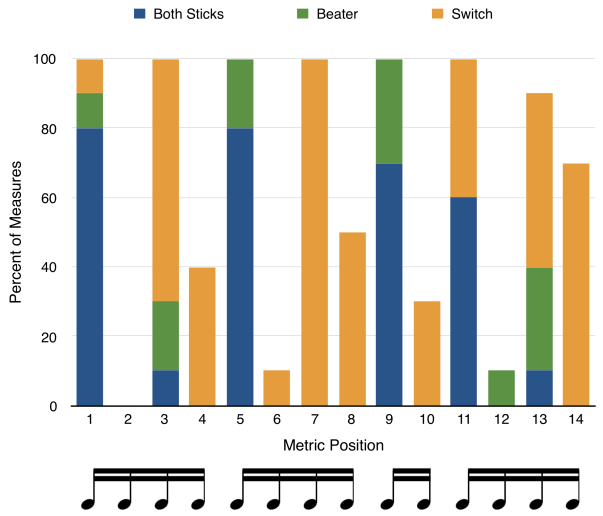
Interpreting Drum Strokes

In light of the variation among common rhythms, consideration of multiple performances together will help clarify the defining characteristics of rhythmic patterns for *elenino horo* in practice and how those characteristics serve to convey meter to listeners. The graph in Figure 4a includes all of the 60-measure samples used to determine the common rhythms in Example 7, and shows the percentages of these 540 total measures in which players use the beater, the switch, or both sticks together to articulate each metric position. Comparing Figure 4a with Figure 4b, which copies the notation from the ten common rhythms in Example 7 into a frequency graph, establishes that these commonly played rhythms are representative of *tŭpan* playing in the recordings as a whole—that is, adding in the less common one-measure rhythmic patterns that are not included in the transcriptions does not substantially alter the frequencies. This finding reinforces the supposition that most *tŭpan* players generate the rhythm for this dance type by repeating, varying, or otherwise approximating a small number of models that are similar to the basic rhythms that players demonstrate when not performing.

36. For a study of *zurna* musicians and their music in Pirin, see Peycheva and Dimov (2002). Pirin is part of geographic Macedonia along with North Macedonia and parts of northern Greece; on the same type of ensemble in those countries, see Rice (1982), Angelov (2014), and Keil et al. (2002).



a. Overall frequencies of drum strokes in 60-measure samples from the recordings of *elenino horo* (*n* = 540).



b. Frequencies of drum strokes in the ten transcriptions of common rhythms from Example 7 (*n* = 10).

Figure 4. Frequencies of drum strokes in nine recordings of *elenino horo*.

The percentages in Figure 4a establish, first of all, a basic distinction between odd-numbered and even-numbered metric positions, in that each of the former are articulated in at least 80% of measures, while players mark the even-numbered positions much less often, in as few as about 11% of measures in the case of metric position 2. Though all odd-numbered metric positions are frequent, they differ in how often players tend to employ each stick. Positions 3, 7, and 13 are played predominantly with the switch alone and rarely with both sticks at the same time, while the remaining four odd-numbered metric positions, 1, 5, 9, and

11, instead have high frequencies of strokes that include the beater. Note in particular that each of these four metric positions is articulated by both sticks together in over 50% of measures, and no other metric position features both sticks at once in more than 10% of measures.

Tŭpan players' descriptions of how the switch and beater are used can contribute to interpreting this differentiation between metric positions. Zhivko Mihov, the recent conservatory graduate mentioned above, emphasized to me that beater strokes must always be clearly audible, and that they are not interchangeable with strokes played with the switch. Minko Mustakov, who performed professionally for decades with the Northern Ensemble in Pleven (Северняшки ансамбъл "Иван Вълев"), noted that sticking technique varies quite a bit depending on a drummer's abilities, but "usually the beater maintains the first pulse. It should, especially if there's a dance ensemble; the rhythm should be robust so that the dancers can dance well. One shouldn't keep time like that . . . on other, second, third, fourth, fifth pulses, because this starts to confuse them."[37] Ivan Nikolov, the *tŭpan* player from Pirin who performs with minimal repetition, explained that the beater is used for the basic measure (основния такт), while with the switch "you rhythm continuously . . . it doesn't stop."[38] Peycheva and Dimov (2002, 348) provide several similar quotations from musicians in *zurna* ensembles about the roles of the two drum sticks.

These statements suggest that many Bulgarian musicians, dancers, and listeners share an understanding of drum strokes with the beater as contributing to metric orientation and of strokes played with the switch as less constrained and perhaps less metrically informative. As Mustakov mentioned, this interpretation does not follow a hard and fast rule: some playing techniques involve rapid strokes or frequent ornamentation with the beater, and the use of such gestures depends on both the individual *tŭpan* player and the performing context. Still, Figure 4 indicates a great deal of consistency among players in deploying beater strokes.

To interpret the metrically referential status of the beater in terms of the model of meter that this article employs, a beater stroke signals that a metric position likely belongs to a relatively slow layer. The frequencies in Figure 4a then correspond closely to metric layers for *elenino horo* in Example 5: sixteenth notes in layer E may be articulated only rarely, while the odd-numbered metric positions in layer D are articulated in most measures; among these odd-numbered positions, the beater differentiates positions 1, 5, 9, and 11 to signal the ♩.♩.♪.♩ sequence of layer C.[39] This relationship to metric layers is broadly similar to results of

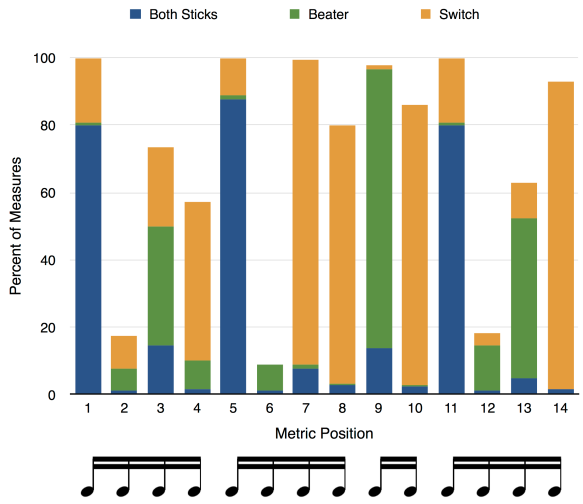
37. Обикновено киякът държи първото време. Би трябвал, особено ако има танцов състав. Трябва да са . . . ритъмът да е здрав, за да могат да играят добре танцьорите. Не бива да приклоква така . . . на други, втори, трети, четвърти, пети времена, защото започва да ги бурка.
38. "Ритмираш постоянно . . . не спира." Nikolov's usage of the word "rhythm" (ритъм) as a verb (ритмирам) and of the word "measure" (такт) in a general sense close to the meaning of meter is considered nonstandard; on the latter, see Peycheva and Dimov (2002, 346) and Levy (1985, 236).
39. The somewhat higher rate of beater use for positions 1, 5, and 9 in comparison with position 11 could be taken to further distinguish the sequence ♩.♩.♩. of layer B. However, the more detailed analysis reported in Figure 5 below suggests that this difference in frequency results mostly from differences between performers.

previous studies of onset frequencies in samples of Western art music (Palmer and Krumhansl 1990; Huron 2006, 180), European folk songs (Temperley 2010), and Turkish *makam* music (Holzapfel 2015), though those studies do not track differences in drum strokes or other features of the onsets beyond their simple frequency. Attending to the type of drum stroke offers valuable information in this context, since the frequent use of the beater to articulate metric position 11 appears significant in serving to establish the nonstandard durational sequence of layer C, likely marking the drumming as appropriate for *elenino horo* rather than for other dance types with a meter that could also be written in 7/8 but that lacks this particular four-element metric layer.

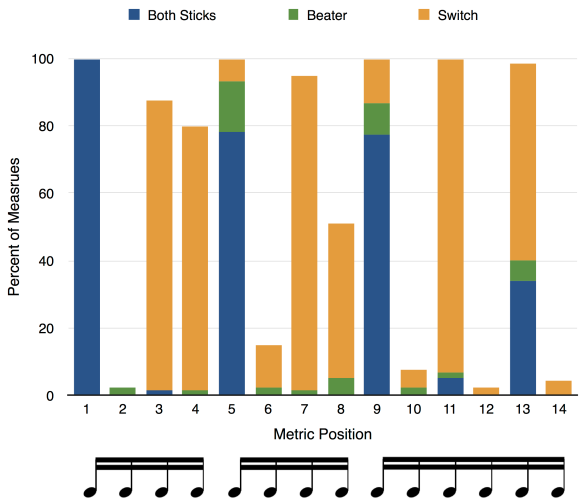
To bring sticking frequencies to bear on the stylistic differences among performers noted above, I organize the nine recordings into three groups based on comparison of the common rhythms from Example 7. The three *tŭpan* players from Pirin make up one of these groups, and membership in the other two groups depends on whether metric position 11 is articulated with the beater. Thus, Misho Borisov and Dilyan Petrov, whose common rhythms do not include beater strokes on position 11, form one group, and the remaining four players belong to the third group.[40]

Figure 5 divides up the frequencies of drum strokes from Figure 4a according to these three groups of performances. In general, the graphs in Figure 5 continue to suggest that the common rhythms from Example 7 reflect tendencies for the recordings as a whole. For example, in the group from Pirin, strokes articulating metric positions 8, 9, and 10 with the switch, beater, and switch, respectively, belong to the distinctive pattern mentioned above in the middle of the measure in these players' common rhythms, and the high frequency of these strokes in Figure 5a results from that rhythmic figure occurring in many other one-measure rhythms besides the single most common rhythms from Example 7. The fact that the frequency graph in Figure 5a reflects this type of figure also complicates its relationship to metric layers in comparison with the more general Figure 4a; now that the frequencies are more style- and performer-specific, it seems that they are more likely to capture recurring rhythmic patterns that do not necessarily articulate metric organization as directly. This tendency is consistent with London, Polak, and Jacoby's (2017) caution about interpreting frequency graphs metrically, and as they suggest, listeners familiar with the style have likely learned to treat particular rhythms as cues for metric orientation or structure beyond simply hearing beater strokes as having metric priority. In this case, the gesture from metric position 5 to metric position 11 discussed above, with the sticking, accents, and tempo used in these three recordings, could evoke the meter of *elenino horo* for frequent listeners of Pirin *zurna* music—especially since the rhythmic drive to metric position 11 in this pattern complements the feeling of landing on that metric position when dancing.

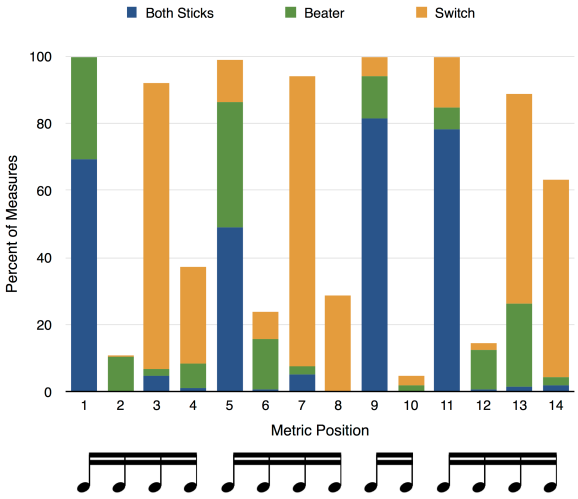
40. This grouping might appear inconsistent in that Ivan Nikolov's most frequent rhythm also does not have a beater stroke in metric position 11. As discussed above, though, Nikolov plays with an exceptional variety of one-measure rhythms, so that his common rhythm reveals less about his performance as a whole than do most other rhythms in Example 7. The listing of Nikolov's strokes in Appendix 2 indicates that he uses the beater and the switch together for position 11 in the majority of measures in his recording.



a. Dimov, Mandzaka, and Nikolov (*n* = 180)



b. Borisov and Petrov (*n* = 120)



c. Mustakov, Vasilev, Mitev, and Randev (*n* = 240)

Figure 5. Frequencies of drum strokes in 60-measure samples from the recordings of *elenino horo*, divided into three groups.

Since no two recordings feature exactly the same common rhythm, it is not surprising that some of the recordings that are grouped together in Figure 5 do not show entirely homogeneous sticking frequencies. In Figure 5b, for instance, all measures in which both sticks mark metric position 13 are from Petrov's performance, and in Figure 5c, the comparatively high frequencies of playing positions 1 and 5 with the beater alone can be

attributed to Mitev.[41] These individual tendencies again amplify characteristics of the common rhythms from Example 7.

With respect to drum strokes articulating metric layer C from Example 5, though, each group appears homogeneous. Despite substantial differences between Figures 5a and 5c, the performers in both of these groups normally use the beater and switch together, or in certain cases the beater alone, to articulate metric positions 1, 5, 9, and 11. By contrast, the two performers in Figure 5b rarely use the beater for position 11, primarily marking only positions 1, 5, and 9 with the two sticks together. In all three groups, metric position 13 receives the most frequent articulation with the beater after the three or four other positions just listed, but these frequencies are considerably lower—around 25% to 50% of measures for position 13 as opposed to 80% to 100% for positions 1, 5, 9, and 11—and in many cases beater strokes in position 13 seemingly belong to anacrustic drumming elements leading to the following downbeat. The *tŭpan* players in the recordings included in Figures 5a and 5c thus project the ♩♩♪♩ durational sequence in their drumming, and in so doing reinforce this pattern as a metric layer, while Misho Borisov and Dilyan Petrov articulate only the ♩♩♩. sequence of metric layer B.

A view of meter as a means of guiding perception and movement allows for differences among the meters that individuals use to create or respond to the same music (London 2012, 22–23). It is thus possible that the two players in Figure 5b rely on a different meter to guide their playing for *elenino horo* than do the remaining seven players in the sample, a meter that differs not in terms of its time signature, but in the omission of layer C. Since the translation between a performed rhythm and its underlying meter is not necessarily straightforward, it is also possible that Borisov and Petrov's internal representations of meter still do include layer C, but that they make this sequence less apparent in their drumming. In either case, such differences among performers could relate to the style of playing appropriate for the contexts in which the performer has learned to play, or to other types of individual experiences—for instance, some *tŭpan* players have professional experience as dancers or choreographers, while others do not dance more than a few of the most popular steps.

* * *

This article contains several answers to its titular question. In terms of a cognitive model of multi-layered meter, the meter of *elenino horo* consists of several coordinated cycles of time points, including a layer that runs counter to current metric theory in its 1:2 durational ratio and its overlap with durations in other layers in the meter. The time signature most suitable for the durations in this meter, given existing notational conventions, is 7/8, and other time signatures that have been used for *elenino horo* may have resulted from attempts to fit the meter or timing of the music into established theoretical frameworks, or from metric

41. Refer to Appendix 2 for frequencies of drum strokes with each performance listed separately.

alternatives that are no longer common in Bulgarian performance practice. For many *tŭpan* players, time signatures and notated durations are not essential to the meter; instead, rhythmic templates called basic rhythms are often more useful for communicating about meter in discussion and in performance. The frequencies and types of drum strokes in these templates contain information about the metric layers that likely allows listeners to identify and synchronize with the correct meter for the dance, and the rhythms that *tŭpan* players gravitate toward during performance also differ among individuals in ways that appear to reflect consistent features of style as well as possible differences in the exact meter that a performer employs. In this way, though most people who know *elenino horo* probably experience the meter similarly, the dance type does not necessarily have one and only one meter.

This article also demonstrates a way of balancing ethnographic observation and quantitative analysis of rhythm whereby the two methods interact, with analytical interests motivating the attention to rhythmic detail in fieldwork, and performers' rhythmic concepts determining categories for analysis other than those given by a system of musical notation or a theory of meter. If neither is treated as authoritative, ethnographic and analytical methods can furnish complementary and potentially converging evidence, leading to insights that neither method would suggest on its own.

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APPENDIX 1

Means and standard deviations of IOIs from Figure 2, before the standardization with respect to the duration of the measure used for the graphs in that figure. All values are in milliseconds and $n = 25$ for each mean.

Performer		IOI							
		1	2	3	4	5	6	7	Bar
Borisov	**Mean**	239	197	234	200	228	205	215	1517
	SD	16	14	10	12	11	8	14	29
Mustakov	**Mean**	242	218	219	219	244	233	185	1560
	SD	18	12	19	17	14	14	20	44
Vasilev	**Mean**	250	229	247	231	250	240	223	1668
	SD	15	17	14	16	17	12	18	58
Dimov	**Mean**	249	230	251	218	218	273	217	1655
	SD	24	13	10	10	9	14	23	35
Nikolov	**Mean**	237	213	229	224	211	241	220	1575
	SD	24	28	9	16	10	11	12	40
Mitev	**Mean**	206	217	206	203	218	196	222	1469
	SD	16	12	18	12	11	17	14	37
Petrov	**Mean**	212	168	209	191	200	206	177	1363
	SD	15	11	15	14	9	17	14	45
Randev	**Mean**	196	205	203	204	195	198	211	1412
	SD	14	18	11	11	12	13	12	40

APPENDIX 2

Frequencies of drum strokes in 60-measure samples from the recordings of *elenino horo*, with each *tŭpan* player listed separately.

Performer		Metric Position													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Borisov	**Beater**	0	0	0	0	1	0	0	0	1	0	0	0	0	0
	Switch	0	0	58	52	0	0	60	9	0	0	56	0	60	1
	Both Sticks	60	0	0	0	59	0	0	0	59	0	4	0	0	0
Mustakov	**Beater**	2	2	0	0	28	2	0	0	20	3	0	0	0	0
	Switch	1	0	55	23	1	14	53	23	2	0	2	0	48	55
	Both Sticks	57	0	0	0	29	0	0	0	38	0	58	0	0	0
Vasilev	**Beater**	2	0	0	0	5	0	0	0	1	0	0	0	5	0
	Switch	0	0	55	31	2	4	60	32	0	0	15	4	43	38
	Both Sticks	58	0	5	0	53	0	0	0	59	0	45	0	3	0
Dimov	**Beater**	0	0	12	12	0	0	0	0	58	0	0	0	55	0
	Switch	30	0	26	0	0	0	60	60	0	60	9	0	4	59
	Both Sticks	30	0	22	0	60	1	0	0	0	0	51	0	0	1
Mandzaka	**Beater**	1	0	37	12	2	8	0	0	59	0	0	0	5	0
	Switch	0	3	0	25	1	0	57	42	0	60	0	0	0	60
	Both Sticks	59	1	2	1	57	0	3	1	0	0	60	0	0	0
Nikolov	**Beater**	0	12	15	3	0	6	2	1	32	1	1	24	25	0
	Switch	5	14	16	48	19	0	46	36	2	30	26	7	15	45
	Both Sticks	55	1	2	2	41	1	11	4	25	4	33	2	9	2
Mitev	**Beater**	58	21	0	0	55	23	0	0	1	0	15	22	0	0
	Switch	0	0	48	7	3	0	56	0	4	0	4	0	57	2
	Both Sticks	2	0	1	0	2	2	0	0	55	0	41	2	0	0
Petrov	**Beater**	0	3	0	2	17	3	2	6	10	3	2	0	7	0
	Switch	0	0	45	42	8	15	52	46	16	6	56	3	10	4
	Both Sticks	60	0	2	0	35	0	0	0	34	0	2	0	41	0
Randev	**Beater**	11	1	5	17	1	11	6	1	10	2	0	6	54	5
	Switch	0	1	47	8	24	1	39	13	6	6	15	1	2	47
	Both Sticks	49	1	5	3	34	0	12	0	43	0	44	0	1	5