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Daniel Goldberg

Timing of Unequal Beats in Bulgarian Drumming

In most metrically regular western art and popular music, the same amount of time seems to elapse between successive strokes of a conductor's baton or taps of a listener's foot. By contrast, the durations between similar metric time points in many musical performances from southeastern Europe sound different, in that some of these durations are clearly longer than others. This form of rhythmic organization has been theorized in several ways since the beginning of the 20th century, but most authors agree that its defining feature is a cyclic sequence of durations belonging to two different categories, short and long, in a fixed ratio of 2:3.¹ Common sequences in folk music from Bulgaria include short-short-long, long-short-short, short-short-short-long, and short-short-long-short-short. Drawing from a convention for notating these rhythms established by Bulgarian composer and folklorist Dobri Hristov,² in Example 1, I write the short durations as quarter notes and the long durations as dotted quarter notes. I refer to the short and long durations as beats and to each iteration of a repeating sequence as a measure or bar.



Example 1: Some sequences of unequal beats common in Bulgarian music

The present essay describes the timing that Bulgarian drummers use when performing such metric sequences in music for two common dance types, *rŭchenitsa* and *elenino horo*. My examples come from fieldwork conducted in Bulgaria from August 2014 to August 2015, when I interviewed and recorded performances by musicians who play the *tŭpan*, a large, double-sided drum. I used statistical tests to evaluate whether the timing of short and long beats varies, and if so, whether the variations reflect stylistic distinctions. The comparison shows that beat tim-

1 See, e.g., Hristov 1967; Bartók 1976; Brăiloiu 1984; Cler 1994; Arom 2004; London 2012.

2 Hristov 1967.

ing does vary, and although the differences are small, they are reliably connected to the dance type as well as local melodic grouping and the performer's home region of Bulgaria.

The idea that metric timing might be linked to stylistic factors derives from work by Justin London.³ London argues that meter inheres not in musical scores or sounds, but rather in the minds of musical participants. As he explains, meter is a cognitive mechanism which for a performer serves to »guide ... the motor behaviors used in the production of musical sounds«;⁴ for a listener, it enables dancing and other potential movements in coordination with music by creating expectations for when musical events will occur.

Through repeated playing, listening, and dancing, people learn to recognize and reproduce different meters with facility and precision, and according to London, the resulting metric repertoire is not necessarily limited by the range of time signatures available in conventional musical notation. In particular, London's »many meters hypothesis« holds that small but consistent timing differences, such as the tendency for the first beat of a Viennese waltz to be played relatively short and the second beat relatively long,⁵ could be learned as distinct meters that help to define a particular musical style.⁶

In principle, London's proposal admits the possibility that such fine-grained metric differentiation might occur in any style of music, but the categorical differences in the beat durations of southeast European folk musics make them especially interesting as a proving ground for the theory if the theoretical 2:3 ratio varies in performance. Within the wide range of rhythmic subjects in music from Bulgaria and its neighboring countries, I focus the present study on performances on the *tüpan*, because it is the sole percussion instrument in many folk ensembles, and is commonly regarded as serving to keep time for the group.⁷ Moreover, the sounds of drum strokes are the easiest type of note onset to pinpoint in analyzing an audio recording – a practical concern for timing measurements.

Dance types are one of the main categories of folk music that Bulgarian musicians perform. Like dance types from other parts of Europe, such as minuets and waltzes, in principle, any Bulgarian folk dance type may have numerous

3 London 2012.

4 Ibid., p. 2.

5 Bengtsson/Gabrielsson 1977, pp. 34–38.

6 London 2012, pp. 171–189.

7 See, e.g., Peycheva/Dimov 2002, p. 303.

different melodies, and the music may be performed with or without dancing. The two dance types under consideration here, *elenino horo* and *rūchenitsa*, provide a suitable basis for testing style-related timing variation because they have some points of similarity while remaining distinct types. Both are frequently understood according to a short-short-long beat sequence as notated in Example 1a, allowing for direct comparison of beat timing between the two dance types.⁸ Yet these pieces are defined with reference not just to different sets of specific dance steps, but also to different classes of dances. *Horo* is the name for any Bulgarian dance done in a curved line while holding hands with one's neighbors, and *elenino horo* is a popular and widespread dance of this kind, usually performed with the melody of a song called »Eleno mome«. ⁹ In contrast, *rūchenitsa* is a relatively freeform dance done individually or in small groups.¹⁰ Such a difference in how dancers engage with music seems like just the kind of stylistic distinction that might be reflected in metric timing.

In addition to the characteristics of the dance types being compared, numerous aspects of a performer's experience might also influence stylistic timing. Not surprisingly for a field study, controlling these types of variables proved impossible; every recorded performance occurred under different circumstances, and my collection of recordings was not large enough to isolate particular factors. The table in Example 2 lists details of the recorded performances included in the study. Most of these performances were from private recording sessions that took place in the recital hall of a community center (*chitalishte*) or a similar setting, and most ensembles consisted of the *tūpan* player and one to three other musicians playing pitched folk instruments. Most of the *tūpan* players were professionals without formal musical training, and their ages ranged from early 20s to mid 60s. All used some form of the same basic playing technique, hitting one side of the drum with a wooden beater and the other side with a thin, flexible switch.

8 In contrast with most dance types, the beat sequence of *elenino horo* is a subject of uncertainty and differences of opinion. The short-short-long interpretation that I use here is the simplest and possibly most common option, as well as the closest fit for the measured timing. For a more thorough consideration of metric conceptions and timing in *elenino horo*, see Goldberg 2016.

9 For a description of the dance step, see Dzhenev 1967. Stoin 1931, pp. 596–597, gives several variants of the song melody.

10 Katsarova 1977 offers a thorough presentation of the dance. *Rūchenitsa* choreographies in the form of a *horo* also exist.

Tüpan Player Information				Ensemble Information		Recording Context and Details				Dance Type
Name	Hometown	Home Region	Age Range	Group or Leader Name	Instrumentation	Event Type	Location and Date	Performance Duration	Number of Measures	
Minko Mustakov	Pleven	north	60s	Severyashki Ansambül	folk orchestra	ensemble rehearsal	Pleven, 4-Jun-15	3:37	138	<i>elenino horo</i>
								2:20	168	<i>rüchenitsa</i>
Miroslav Vasilev	Veliko Türnovo	north	40s	Ansambül Iskür	<i>kaval</i>	recording session	Veliko Türnovo, 2-Jun-15	1:47	63	<i>elenino horo</i>
								1:26	79	<i>rüchenitsa</i>
Misho Borisov	Montana	north	30s	Torlashki Napevi	<i>güdülka, tambura, voice</i>	recording session	Montana, 5-Jun-15	0:30	19	<i>elenino horo</i>
								1:05	41	<i>elenino horo</i>
								1:25	83	<i>rüchenitsa</i>
Gancho Dimov	Petrich	Pirin	30s	Salibenk	<i>zurna</i> (three)	recording session	Petrich, 27-Feb-15	2:38	88	<i>elenino horo</i>
								2:20	179	<i>rüchenitsa</i>
Ivan Nikolov	Razlog	Pirin	30s	Iliya Zangov	<i>zurna</i> (two)	recording session	Razlog, 11-Apr-15	1:49	67	<i>elenino horo</i>
								1:48	136	<i>rüchenitsa</i>
Ziya Mandzaka	Petrich	Pirin	50s	Shabidin Usev	<i>zurna</i> (three)	recording session	Petrich, 26-Feb-15	2:26	91	<i>elenino horo</i>
								2:53	189	<i>rüchenitsa</i>
Dilyan Petrov	Sliven	Thrace	20s	Chavdar Chenkov	<i>gaida</i>	recording session	Sliven, 8-Mar-15	1:35	63	<i>elenino horo</i>
								1:41	111	<i>rüchenitsa</i>
Mitko Mitev	Kermen	Thrace	60s	Orkestür Kabile	<i>kaval, gaida, tambura, accordion</i>	<i>tüpan</i> competition	Kabile, 18-Oct-14	1:50	79	<i>elenino horo</i>
								1:58	147	<i>rüchenitsa</i>
Rumen Randev	Kotel	Thrace	40s	Martin Pachanov	clarinet, accordion	recording session	Kotel, 12-Mar-15	2:07	87	<i>elenino horo</i>
								2:09	165	<i>rüchenitsa</i>

Example 2: Details of recorded performances used in the present study

A feature of performers' backgrounds that seems especially relevant to style is the place where the performer lives. Bulgarian folklorists divide the country into ethnographic regions, positing codified musical characteristics for each one,¹¹ and in my experience, performing musicians also acknowledge these distinctions. Three regions – northern Bulgaria, Thrace, and Pirin – are represented in my sample of recordings. The ethnographic region of northern Bulgaria consists of the entire northern part of the country except for the far northeast, Thrace encompasses central and southeastern Bulgaria, and Pirin occupies the south-western corner.

For a statistical comparison of timing, I selected a total of 18 recordings, with one performance of *rüchenitsa* and one performance of *elenino horo* by each of nine different *tüpan* players as listed in Example 2.¹² These players were balanced equally among the three ethnographic regions just mentioned, with three players from each region. The chosen recordings differ in length, so to

11 See, e.g., Kaufman 1977; Stoin 1981; Litova-Nikolova 2000.

12 One additional recording of *elenino horo* by Misho Borisov was included to ensure a minimum of 60 measures per performer and dance type.

maintain equal group sizes, I took random samples of 28 measures from each performance.

I used a combination of close listening, tapping along with the recording, audio analysis software, and original computer code to identify as precisely as possible the timing of the drum strokes that mark the beats in each bar and the durations between these drum strokes.¹³ I then tested the effect of these timing measurements on three variables: dance type, that is, *rŭchenitsa* or *elenino horo*; the performer's home region; and the position of a bar within a two-bar melodic group. This third variable accounts for the possibility that timing varies consistently across time spans longer than a single beat sequence, as an earlier study of similar music found.¹⁴ While Bulgarian melodies, including some versions of *rŭchenitsa*, may incorporate melodic groups that last for odd numbers of measures, the vast majority of measures in the 18 recordings sampled here have a clear and unproblematic duple melodic orientation.

The statistical tests indicate highly significant effects involving all three independent variables.¹⁵ For present purposes, rather than describing the details of these tests, I interpret the timing measurements for each dance type and region. Example 3 reports the average duration of each beat in milliseconds, the standard deviations of these means, and the theoretical beat durations according to a 2:3 ratio calculated with reference to the total mean duration of the two-bar group. Example 4 offers a different way of comparing the drum strokes and reckoning their relationship with theoretical timing by representing the average durations from Example 3 on a timeline of the span of a two-bar group, where time proceeds from left to right, and dotted vertical lines indicate the theoretical division of this span into equal durations equivalent to eighth notes in Example 1. In Example 4 the mean durations are normalized so that timings over the course of two measures can be compared irrespective of differences in tempo.

13 The methods are described in detail in Goldberg 2017.

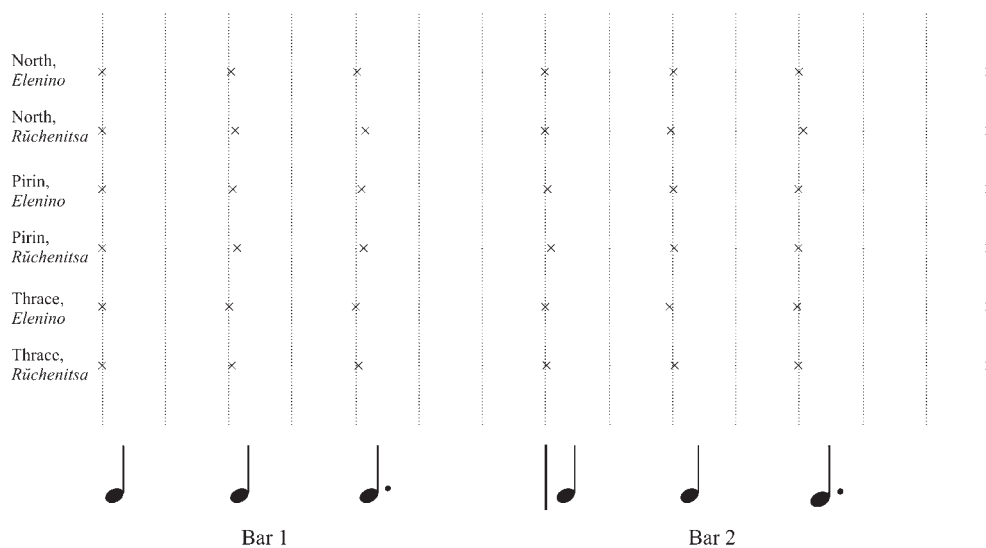
14 Goldberg 2015.

15 For further information about structure of the test, test statistics, and significance values, refer to Goldberg 2017.

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				Bar 1			Bar 2		
				Beat 1	Beat 2	Beat 3	Beat 1	Beat 2	Beat 3
North	<i>Elenino Horo</i>	Measured Duration (ms)	Mean	460	449	670	459	447	679
			SD	24	24	36	23	34	38
		Theoretical Duration (ms)	Mean	452	452	678	452	452	678
	<i>Rüchenitsa</i>	Measured Duration (ms)	Mean	293	287	395	277	292	410
			SD	37	43	58	39	54	56
		Theoretical Duration (ms)	Mean	279	279	419	279	279	419
Pirin	<i>Elenino Horo</i>	Measured Duration (ms)	Mean	466	459	662	448	445	680
			SD	27	24	41	19	27	46
		Theoretical Duration (ms)	Mean	451	451	677	451	451	677
	<i>Rüchenitsa</i>	Measured Duration (ms)	Mean	242	227	336	221	223	342
			SD	35	44	48	35	33	44
		Theoretical Duration (ms)	Mean	227	227	341	227	227	341
Thrace	<i>Elenino Horo</i>	Measured Duration (ms)	Mean	406	405	605	397	408	614
			SD	26	23	37	22	21	31
		Theoretical Duration (ms)	Mean	405	405	608	405	405	608
	<i>Rüchenitsa</i>	Measured Duration (ms)	Mean	238	233	346	235	227	351
			SD	30	30	32	18	24	27
		Theoretical Duration (ms)	Mean	233	233	349	233	233	349

Example 3: Average durations of beats in samples of measures from *tüpan* performances of *elenino horo* and *rüchenitsa*, grouped by ethnographic region. For each mean, the sample size is 42 measures.



Example 4: Average durations from Example 3 relative to the theoretical equal division of a two-bar span, normalized for comparison across different tempos

I did not test differences between measured and theoretical timing, and I am skeptical of the relevance of theoretical timing to the performers, many of whom do not normally use musical notation. Nevertheless, the theoretical values provide a useful reference point for interpretation, and comparison with them suggests that beat durations depart modestly from the exact 2:3 ratios. For example, the largest single difference in Example 3 between a mean beat duration and its theoretical duration is approximately 23 ms for the long beat in the first bar of northern Bulgarian *ruchenitsa* performances, and most other such differences are less than 10 ms. The smallest of these surely would not be statistically significant if tested, but differences of as little as about 7 ms attained significance in the comparisons among dance types, regions, and position in a two-bar group. Such a low threshold for statistical significance reflects the players' highly consistent timing. Indeed, a considerable portion of the variability that the standard deviations in Example 3 denotes results from tempo differences among the three performances that contribute to each mean, since the standard deviations all fall within a range of about 10 to 15 ms when the durations are normalized for tempo.

These timing differences are among the shortest that humans can perceive,¹⁶ and regardless of statistical significance, I do not insist that the musicians would

16 Estimates range from 6 to 50 ms, likely depending on context. See, e.g., Benadon 2007; Butterfield 2007, 2010; Clarke 1989.

be able to hear or play such a difference if asked to do so.¹⁷ Nonetheless, if a timing difference in live performance is as consistent as in the present examples, then it is arguably still worthy of study by virtue of its connection with performers' actions. Indeed, in a sense, barely audible timing patterns are more interesting than more obvious ones, for if musicians truly cannot detect such differences, their ability to produce these differences and their motivation to do so are inexplicable.

The present study does not furnish such an explanation, but the three variables tested offer clues about the relationship of timing with other musical features. First, timing is clearly linked with position in a two-bar melodic group, in that equivalent durations from the first and second measure of a group differ in most cases. Durations at the beginning and end of a two-bar unit tend to be relatively long, and durations in the middle of the group often appear shorter than the theoretical duration. For instance, in Example 4, drum strokes that mark the beginning of the second and third beats in the first measure have average timings after the theoretical reference point in every group of performances, except for *elenino horo* from Thrace, while the drum strokes at the beginning of the third beat in the second measure occur slightly before the reference point in all groups, except *rüchenitsa* from northern Bulgaria.

This pattern resembles a characteristic of timing in performances of 18th and 19th century piano music. Sometimes referred to as group-final lengthening, this phenomenon involves predictable differences in the timing of theoretically equal beats over the course of a melodic group.¹⁸ Although various timing patterns are possible, typically the durations of successive beats change gradually and are greatest at group boundaries, such that the relative lengthening over the course of a group suggests a curve or arch shape. Consistent with another recent study of timing in Balkan percussion performances,¹⁹ with respect to theoretical timing, the lengthening in Example 4 seems most pronounced at the beginnings of two-bar groups rather than at the ends.

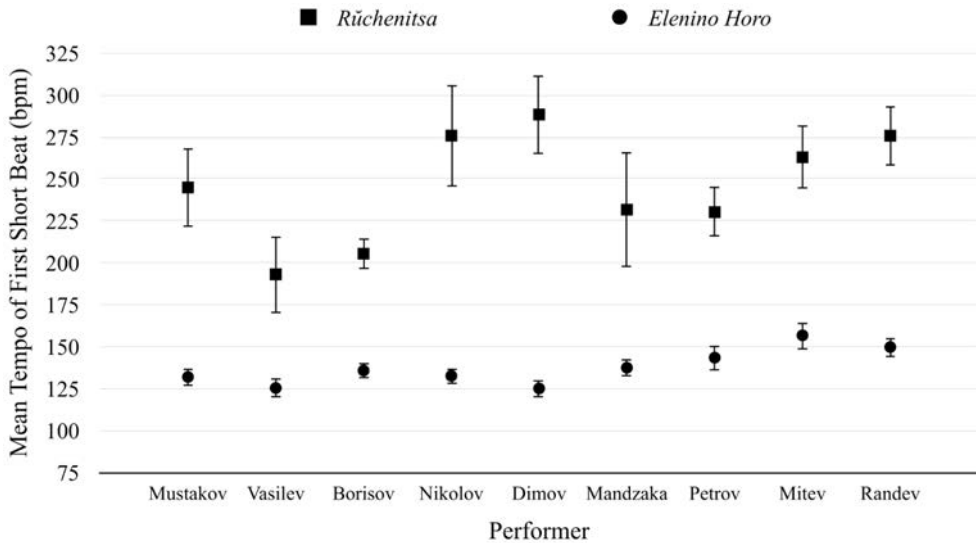
The extent of timing differences also depends on dance type. In general, the two measures in a group are less similar to each other, and differences from theoretical references appear larger, in performances of *rüchenitsa* than of *elenino horo*. This tendency can be seen by comparing each pair of dance types from the same region in Example 4.

17 Cf. Neuhoff/Polak/Fischinger 2014.

18 See, e.g., Todd 1985; Repp 1992; Ohringer 2011.

19 Goldberg 2015, p. 312.

tempo-metrical types.²⁰ Along these lines, perhaps for some *tŭpan* players, a metric level within a certain fairly slow tempo range serves to anchor rhythmic production and coordination with the rest of the ensemble. In *elenino horo*, the level of a single measure, which has an average tempo of about 39 bpm, might perform this function, while in *rŭchenitsa*, the level that falls into the appropriate range would correspond to spans of two bars, which have an average tempo of about 35 bpm.



Example 6: Mean tempo of the first short beat in performances of *rŭchenitsa* and *elenino horo*. For each mean, the sample size is 28 measures. Error bars show standard deviation.

Whatever the explanation for timing differences between *rŭchenitsa* and *elenino horo*, the variation relates not only to rhythm and/or tempo, but also to particular performers. Timing in the recordings by performers from Thrace, for example, generally differs less from theoretical reference points, and varies less in connection with dance type and melodic grouping, than does timing in performances from the two other regions. This lesser differentiation is suggestive in light of Thrace's stylistic dominance in Bulgarian folk ensembles. According to Donna Buchanan, when the Bulgarian socialist state professionalized and standardized the performance of folklore in the years after the Second World War, some stylistic features of the region of Thrace assumed the status of a baseline or default

²⁰ London 2012, pp. 94–96.

for folk music practice.²¹ If fine-grained timing was a component of stylistic individuality, then perhaps standardizing the repertoire and instrumentation and broadening the population of performers had the effect of erasing distinctive timing profiles, so that timing gravitated toward equal durations as a common denominator. As with all the possibilities I discuss, though, the observational nature and small size of the present study mean that too many variables are at play to justify firm conclusions about reasons for the differences among regions, or to be certain that the timing profiles are truly characteristic of the region rather than the particular performers sampled.

Still, the fact that *tŭpan* players from Pirin perform with timing that differs markedly from that of the other two regional groups suggests that beat timing is tied in some way to local style, since the recordings from Pirin represent the most stylistically distinct performances in the sample. Specifically, Pirin is the only part of Bulgaria where freelance Romani musicians pair *tŭpan* with *zurna*, a shawm-like double reed instrument, and the six performances from the region that I tested are by such ensembles.²² Thus, timing in my sample of performances from Pirin could be a function of style throughout the Pirin region, or of related features such as the *zurna* instrumentation or performance practices of Romani musicians.

In any case, drumming in recordings of *elenino horo* from Pirin shows larger timing asymmetry between the two measures of a melodic group than do recordings from the other two regions; in particular, beat timings appear to differ from theoretical timing in the first measure but not in the second measure. In Pirin performances of *rŭchenitsa*, the differences from theoretical timing owe primarily to a lengthened first beat, which the average beat durations in Example 3 reveal to be 15 to 20 ms longer than each of the three other short beats in the two-bar group. The average timing of the drum stroke at the beginning of the second measure in this group of performances after its theoretical reference point in Example 4 indicates that the lengthening at the beginning of the first measure impacts the relative durations of both measures. Indeed, the first measure in a group averages 19 and 12 ms longer than the second measure in Pirin performances of *rŭchenitsa* and *elenino horo*, respectively, whereas the durations of the two measures differ by no more than about 6 ms in the groups of performances from the other two regions. In this treatment of theoretically

21 Buchanan 2006, pp. 157–160.

22 For an ethnography of this type of ensemble in Bulgaria, see Peycheva/Dimov 2002.

equal measures, the performances from Pirin demonstrate more thoroughgoing inequality of durations than the other groups of performances do.

Although my analysis of timing in Bulgarian *tŭpan* playing raises many questions, the results are promising in revealing differences that vary with melodic grouping, dance type, and ethnographic region. This systematic and consistent variation offers support for connections among timing, meter, and style in Bulgarian folk music, and potentially in many other musics as well. Future research may eventually succeed in teasing apart some of the potential causes of the observed timing, but it is also possible that some stylistic factors will prove difficult to disambiguate even in a carefully controlled experiment. Indeed, perhaps differences that are barely accessible to conscious perception on their own can only serve to articulate a particular style if they occur as part of a collection of multiple sonic features or performer attributes, varying in conjunction with one another. In this way, studying timing, a single characteristic among the many facets of a performance, may ultimately shed light on the entire complex.

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