

THE INTERPLAY OF LINGUISTIC AND HISTORICAL INFLUENCES ON MUSICAL RHYTHM IN DIFFERENT CULTURES

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ABSTRACT

New techniques for comparing rhythm in language and music [1] and new data on musical rhythm from a range of Western societies [2] provide an opportunity to study the relationship between linguistic and musical rhythm in a number of cultures. Specifically, one can ask if “stress-timed” and “syllable-timed” languages are associated with distinctive musical rhythms. If so, then it might make sense to speak of stress-timed and syllable-timed music. In conducting such studies it is important to bear in mind that in any given culture there may be historical musical influences which run counter to linguistic influences. We illustrate this point with an examination of German/Austrian music. German is a stress-timed language but it appears that the rhythm of much German/Austrian music (especially during the Baroque and Classical eras) does not reflect this linguistic rhythm [2]. This may be due to the well-known influence of Italian music on German music during these eras [3]. Some support for this idea comes from a historical analysis of German/Austrian music, which shows that this music becomes more “stress-timed” after the end of the Classical period.

1. INTRODUCTION

Among musicologists and linguists there has been long-standing interest in the hypothesis that the rhythm of a nation’s music reflects the rhythm of its language. Recent empirical research has provided support for this idea. Patel and Daniele [1] examined English and French speech and music, and found that the greater durational contrast between successive vowels in English vs. French speech was reflected in greater durational contrast between successive notes in English vs. French instrumental music.

The quantitative measure of durational contrast they used was the normalized pairwise variability index or nPVI, which was originally developed to study speech rhythm [4]. Patel and Daniele [1] showed that the nPVI was significantly higher for English than for French in both the linguistic and musical domains. The source of the speech material was a corpus of sentences analyzed by Ramus [5], while the source of the musical material was *A Dictionary of Musical Themes* [6]. The composers examined were those whose lives spanned the turn of the 20th century.

Huron and Ollen [2] have recently replicated the English-French findings on a much larger sample of musical themes, spanning a broader historical range. They also report musical nPVI values for other nations where stress-timed vs. syllable-timed languages are spoken. (Stress-timing and syllable-timing are categories used by linguists to classify speech rhythm. Stress-timed languages include English and German, which have high linguistic nPVI values, while syllable-timed languages include French, Italian, and Spanish,

which have low linguistic nPVI values, see [5,7]). Using the data provided by Huron and Ollen, one can begin to address whether stress-timed languages and syllable-timed languages are associated with distinctive musical rhythms. Should this be the case, it would provide broader support for the notion that musical rhythm reflects speech rhythm.

Using the new data of Huron and Ollen [2], we sought to determine if music from nations with stress-timed languages had higher nPVI values than music from nations with syllable-timed languages. In the event that exceptions to this pattern were found, we sought to determine if the exceptions might be due to historical influences that ran counter to linguistic influences.

2. METHODS

Of the 12 nationalities listed by Huron and Ollen [2], we identified 5 with stress-timed languages and 3 with syllable-timed languages based on published classifications by linguists [7,8]. Note that Huron and Ollen’s “Scandinavian” category includes Swedish, Danish, and Norwegian. The nationalities and the musical nPVI values of each are shown in Table 1 (musical data from [2]). Linguistic nPVI values are also shown for those languages where published data are available [5,7].

Table 1

<u>Nationalities with stress-timed languages</u>	nPVI	
	<u>music</u>	<u>language</u>
American	46.3	
Austrian	42.0	
English	45.6	70.0
German	42.0	59.7
Scandinavian	45.9	
<u>Nationalities with syllable-timed languages</u>		
French	43.7	49.3
Italian	42.7	46.0
Spanish	42.5	42.1

[Note added in proof: Huron and Ollen (pers. comm.) have indicated that the musical nPVI values published in [2] need to be revised due to an error in their database. Thus at this point it is unclear how much the musical nPVI values shown in Table 1 will

change. Note that this error does not effect the original results of Patel and Daniele [1] or the results presented here on historical changes in German/Austrian musical nPVI values, as these were computed independently of Huron and Ollen's database]

Consulting Table 1, three out of the five nationalities with stress-timed languages (American, English, Scandinavian) do indeed have higher musical nPVI values than nations with syllable-timed languages. Two nationalities with stress-timed languages, however, (Austrian and German) have low nPVI values, despite the fact that German has a high linguistic nPVI value. One hypothesis for this exception is the well-known influence of Italian music on German/Austrian concert music [3]. Since Italian music has a low nPVI, the stylistic influence of this music might outweigh any linguistic influence of the German language on the nPVI of German and Austrian music.

We examined this idea by studying German/Austrian musical nPVI values in a historical perspective (as a function of composer's birth year). We computed the nPVI of all composers in Barlow and Morgenstern who were born in Germany or Austria and who had German as their first and dominant language. Composers had to have at least 15 usable themes in order to be included in our sample. Usable themes were defined as those which were not excluded for any of the reasons given in Table 2.

Table 2

Vocally-conceived music

- Had "song" in the title
- Had a title that implied singing (e.g. oratorio, cantata, chorale)
- Came from an opera

External Rhythmic Agenda

- Marches
- Music for ballet

"Exotic" works

- Children's music
- Had a title indicating that the music was meant to represent an animal
- Had a title that referred to another culture (e.g. Polonaise, Sicilienne, Anglais)
- Had a title indicating that the music was a tribute to another composer

Durational Uncertainties

- Themes with fermatas
- Themes with grace notes

In contrast to the exclusion criteria in Patel and Daniele (2003), stylized dances such as waltzes and giges were included in the analysis, in order to have a larger sample of themes, as a great deal of music is written in such forms.

Our resulting sample included 20 composers (14 German and 6 Austrian), born between 1637 and 1895. If composer had more than 40 usable themes, 40 were randomly chosen from the available themes. If fewer than 40 usable themes were available (but more than 15), all were used.

For each musical theme, the nPVI was computed directly from music notation. In the equation below, m is the number of notes in a theme and d_k is the duration of the k th note. (see [1] for examples of musical nPVI computations).

$$nPVI = \frac{100}{m-1} \times \sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{\frac{d_k + d_{k+1}}{2}} \right|$$

In contrast to [1], themes with internal rests were permitted, as long as there was at least one continuous sequence of 7 or more notes without a rest. For such themes, the nPVI was computed for each continuous sequence of 7 or more notes and the mean of these nPVI values was taken as the nPVI of the theme.

3. RESULTS

Figure 1 shows the result of our historical analysis of nPVI.

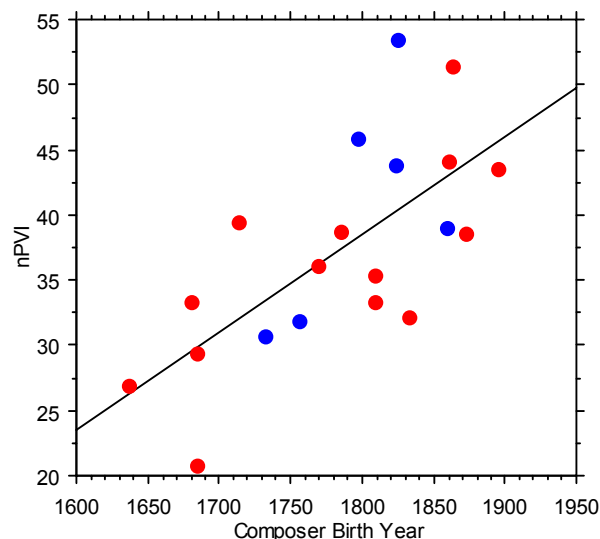


Figure 1. Musical nPVI values for 14 German composers (lighter red dots) and 6 Austrian composers (darker blue dots), as a function of composer birth year. Equation for best-fitting regression line is: $nPVI = (.075 * \text{birth year}) - 96.524$.

As can be seen, there is a dramatic trend for nPVI to increase in German/Austrian music over 250 years, almost doubling in value. This trend is highly significant ($r^2 = .48$, $df = 18$, $p < .01$).

It is unlikely that this result reflects changes in the German language over this time period (i.e. a shift from more syllable-timed to more stress-timed speech rhythm). Instead, we believe it reflects the changing historical influence of Italian music on German/Austrian music. If one takes a low musical nPVI to be evidence of an Italian influence, then it appears that the influence of Italian music was particularly pronounced during the Baroque (1600-1750) and Classical (1750-1825) eras, with waning influence during the Romantic era (1825-1900).

Table 3 lists the German composers examined in this study in chronological order of birth year, and Table 4 lists the Austrian composers by birth year.

Table 3

Composer	Birth year	mean nPVI	# themes
Buxtehude	1637	26.9	15
Telemann	1681	33.3	29
Bach	1685	20.7	40
Handel	1685	29.3	40
C.P.E. Bach	1714	39.4	15
Beethoven	1770	36.0	40
Weber	1786	38.7	21
Mendelssohn	1809	33.3	40
Schumann	1810	35.3	40
Brahms	1833	32.1	40
Loeffler	1861	44.1	20
Richard Strauss	1864	51.3	40
Reger	1873	38.5	19
Hindemith	1895	43.4	31

Table 4

Composer	Birth year	mean nPVI	# themes
Haydn	1732	30.6	40
Mozart	1756	31.9	40
Schubert	1797	45.8	40
Bruckner	1824	43.7	40
Johan Strauss, Jr.	1825	53.4	40
Mahler	1860	39.0	40

4. DISCUSSION

Recent empirical data on linguistic and musical rhythm from a number of different cultures supports the idea that musical rhythm reflects speech rhythm. Nations where “stress-timed” languages are spoken tend to have greater durational contrast between successive vowels in sentences and successive notes in musical themes than nations where “syllable-timed” languages are spoken. An apparent exception concerns Germany and Austria, where the speech is stress-timed but the music shows a syllable-timed pattern of low durational contrast. This could be due to the influence of Italian music on German and Austrian music, a hypothesis supported by a striking trend for durational contrast to increase in German and Austrian music between 1600 and 1900. That is, the rhythm of this music was more “syllable-timed” during the Baroque and Classical eras, when the influence of Italian music is thought to have been strongest [3].

To further test this hypothesis, it would be interesting to conduct historical analyses of durational contrast in the music of other nations with putatively less influence from the Italian style (e.g. American, English, and Scandinavian). One might predict that a lesser influence of Italian music would be reflected in a shallower slope of the line relating composer birth year to the nPVI of their music.

Of course, it is possible that the historical trend we have discovered in German/Austrian music reflects pan-European changes in musical style between 1600 and 1900. If this is the case, then equally strong trends should be found in the music of other nations. Only comparative historical data can help resolve this issue. We look forward to seeing the results of such analyses.

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