

Major and Minor: An Empirical Study of the Transition between Classicism and Romanticism

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ABSTRACT

An empirical study is reported tracing the changing use of the major and minor modes between the so-called “Classical” and “Romantic” periods. Specifically cluster analysis was carried out on a random sample of Western art music works spanning the period 1750-1900. The analysis examined modality, dynamics, tempo, and articulation. The resulting clusters are consistent with several affective or expressive categories, deemed *joyful, regal, tender/lyrical, light/effervescent, serious, passionate, sneaky, and sad/relaxed*. Changes across time are consistent with common musical intuitions regarding the shift from Classical to Romantic musical languages.

I. INTRODUCTION

The polarity between major and minor modes have existed in Western music for at least four centuries. For modern Western-enculturated listeners, the minor mode has strong associations with sadness. Hevner (1935) provided an empirical demonstration of this association by contrasting major and minor-mode versions of the same passages. Predictably, listeners associated the minor mode with sadness, and the major mode with joy. Hevner also showed that the minor mode carried other connotations apart from sadness, including “seriousness” and “exoticness.”

The minor mode tends to cluster with other basic musical features. For example, formal empirical research has shown that the minor mode is more likely to be associated with slower tempo (Post & Huron, 2009) and with quieter dynamics (Turner & Huron, 2008; Ladinig & Huron, 2010). One interpretation is that this cluster of features is consistent with the expression of “sadness.” For example, research in speech prosody has shown that sad speech is slower, quieter, lower in overall pitch, involves smaller pitch movements (i.e., monotone voice), and exhibits more mumbled articulation (Kraepelin 1899/1921). Experimental evidence in the perception of music is also consistent with these observations (Juslin & Laukka, 2003).

The association of the minor mode with slow tempo and quiet dynamic level, however, appears to be unstable. In particular, the association appears to be linked to historical period. For example, although Ladinig and Huron (2010) showed that music in the minor mode tends to be quieter in general, nineteenth-century music appears to exhibit the reverse association with major-mode music on average tending to be quieter than minor-mode music. Similarly, Post and Huron (2009) found that nineteenth-century music in the minor mode tends, on average, to be faster than music in the major mode from the same period.

In light of the observations of the changing nature of the minor mode between the Classical and Romantic periods, the

purpose of this study is to chronicle in greater detail possible changing uses of the major and minor modes in Western art music. Specifically, in this study, we use cluster analysis to trace changing uses of the major and minor modes over time. In brief, we assembled a sample of notated music, coded the music according to four basic features, and carried out cluster analyses over a 150-year period.

II. METHOD

Apart from pitch height, three additional factors are known to be important in speech prosody: the speed of speaking, the loudness, and the enunciation. Accordingly, we examined musical parallels for each of these three speech-related parameters: overall tempo (\approx speaking rate), dynamics (\approx loudness), and articulation (\approx mumbling/lenition).

It is common for works to modulate into different key areas – including modulations between major to minor. Similarly, works may change tempo and dynamic levels on a regular basis. Changes of articulation (staccato and legato) are also common. Nevertheless, for much music, it is not inappropriate to characterize the work or movement as “broadly” fast or slow, loud or quiet, major or minor, and staccato or legato. Although these categories are rather crude, they are known to be important in the affective character of musical passages. For example, loud-fast-staccato passages are linked with high physiological arousal whereas slow-quiet-legato passages are linked with low physiological arousal.

A. Sample

The “heyday” of the major/minor system appears to be the Classical period. Accordingly, we limited our study to the period 1750 to 1900. In principle, the method used here could be employed to study changes over a longer time frame.

Since our study examines changes over time, it is essential to tag each sampled work with an appropriate date. A straightforward approach might be to tag each piece with the date of composition, or (more conveniently) the date of publication – which is commonly easier to determine. However, a more nuanced approach might consider the stylistic language of a composer. Some composers live a long time, and continue to write music in a style that contemporaries might regard as anachronistic (e.g., J.S. Bach). In a study of chromaticism, Perttu (2007) found that composers like Bach, Haydn, Mozart, Beethoven, and Brahms, change very little over the course of their lives. For this reason, we chose a different way to code the “period” of a musical work. Specifically, we assumed that much

of a composer's "language" would be evident by the age of 25. Suppose that two composers were born in 1800, that one lived to 1835 and the other lived to 1880. Works written by the first composer in 1830, and by the second composer in 1870, might well resemble each other. Moreover, the composition written in 1870 by a 70-year-old composer might bear little resemblance to other works written in 1870 by a 25 year-old composer. Accordingly, we coded all compositions written by a given composer as representative of music in the decade in which they turned 25 years of age. For example, Brahms' Intermezzo Opus 117, No. 1, was composed in 1892, but in our data was tagged as representative of the decade 1850, since Brahms was born in 1833.

In general we aimed to sample no more than two works by any given composer. In some cases, scarcity of material for a particular period forced us to sample more than two works by a given composer. Sampled composers were selected from a list of Western Art music composers drawn from a Wikipedia article entitled "chronological list of composers" (http://en.wikipedia.org/wiki/List_of_Classical_era_composers). Composers' dates of birth were similarly determined from the same article. Composers were then grouped by decade of birth. For example, composers born between 1745 and 1754 would be coded as creating music representing the decade 1770 to 1779. Musical works were sampled from randomized composer lists for each decade. Individual works were sampled from the International Music Score Library Project (IMSLP.org). For six of the fifteen decades, fewer than 25 composers were listed. For these decades the target of two sampled works was exceeded. For example, only 15 composers were listed as having been born between 1825 and 1834 (considered to represent the decade 1850-1859). Accordingly, four to five pieces were sampled from these composers for this decade.

Works were randomly selected from the IMSLP repertoire list using a random procedure. Sampling continued until 50 works were selected for each decade. In some cases, no music was available through the IMSLP for composers listed in our original sampling list. In these cases, we simply moved on to the next composer on the randomized list. In total, we sampled 750 works from 330 composers, with an average of two sampled works from any given composer.

The emotional character of a musical work often remains the same or similar from beginning to end. On the other hand, many works appear to exhibit or represent several emotions. In our previous studies, we have sampled only from the beginnings of the works, however, introductory passages may not be representative of musical works in general. At the same time, some musical passages (such as transitional passages) may be regarded as less contentful than other passages. What people remember about musical works are typically what theorists would consider expository passages, such as themes and melodies. In our sampling procedure, it seems appropriate to aim to identify the more contentful musical material, while minimizing the bias towards the beginnings of works. Since we want to sample a relatively large amount of music, we recognized that carrying out a structural analysis of individual works would prove impractical. Accordingly, in our sampling

procedure, our aim is to employ a simple heuristic that has a high likelihood of selecting expository material, while reducing the sample bias towards beginnings of pieces.

The end of a section is often marked by the presence of an internal double barline or a repeat sign. At these points it is common for composers to introduce new material. As a simple operationalization, then, we elected to sample music from four possible locations: (1) at the beginning of the work, (2) immediately following a mid-work double barline, (3) immediately following repeat signs, and (4) immediately following a new tempo marking or a change of meter. For each sampled work, we identified the number of sections as defined by this operationalized criteria. We then sampled a single section, using a random procedure to ensure that each section was equally likely to be selected. Once again, the aim of this sampling procedure was to provide a simple way of increasing the likelihood of sampling expository material that might be regarded as representative of the musical content.

B. Data Coding

Each randomly-selected section was coded according to five properties: *mode*, *dynamic level*, *tempo*, *articulation*, and *date*. With regard to mode, we categorized each sampled section as (1) obviously major, (2) obviously minor, or (3) not obviously major or minor. In making this judgment, we focused on the first 4-8 measures, paying special attention to the harmony. Factors included the prevailing key signature, the presence and frequency of accidentals, cadences, and chord qualities. However, the principal determining factor was the implied functional harmony arising from the succession of chords within the sampled passage.

With regard to dynamic level, passages were coded according to the notated dynamic marking at the beginning of the selected passage. Dynamic levels are traditionally indicated using Italian terms. For the purpose of this study, we chose to code using one of eight conventional Italian terms (abbreviated *ppp*, *pp*, *p*, *mp*, *mf*, *f*, *ff*, *fff*). In rare circumstances dynamics may be indicated using other languages such as German or English (e.g., "quietly"), however, none of the sampled passages employed exclusively non-Italian dynamic terms. In some cases a section bears no dynamic marking. This is especially common in earlier music. In these cases we deemed the dynamic level to correspond with the most recent dynamic marking. Short-range dynamic changes, such as accents, sforzandi, crescendos, diminuendos, etc. were ignored. In 86 of the 750 cases, no dynamic marking was given at all, in which case the dynamic level was coded as "missing." In some cases, multiple dynamic markings were present. In these cases the coded dynamic marking was the one that extended for the greatest duration over the length of the selected passage. Of course many dynamic markings may reflect the predilections of editors rather than the intentions of composers. However, no effort was made to unravel the provenance of these markings. Whatever their origin, we assume that the markings are more likely to reflect reasonable musical intuitions than a random assignment of dynamic markings. At the same time, we recognize that dynamic markings at the beginnings of sections may exhibit a

bias toward quieter dynamics that may not be representative of the work as a whole. Despite these caveats, we will assume that this procedure is adequate for capturing broad changes in dynamics that may occur over the history of music.

With regard to tempo, a number of considerations arise. Explicit metronome markings are relatively rare and are more likely to occur in works from later historical periods. Moreover, although metronome markings may clearly specify the “speed” of a work, they don’t necessarily indicate whether the work is perceived as “fast” or “slow.” For example, a metronome marking of 86 quarter notes per minute may sound considerably faster if the texture is dominated by sixteenth or thirty-second notes than if the texture is dominated by half notes and quarter notes. Instead of relying on metronome markings, we chose to rely on conventional Italian tempo terms. Compared with terms for dynamic levels, there are many **more** possibilities. Regrettably, not all of the terms have clear meanings. However, this ambiguity does not necessarily invalidate the relative perceived tempos. In general, some terms clearly indicate slow passages (such as *Largo*, *Adagio* and *Grave*), whereas other terms clearly indicate fast passages (such as *Allegro* and *Presto*). Similarly, there are terms that clearly indicate moderato tempos – or at least tempos that are faster than *Largo* and slower than *Allegro*. Such terms include *Andante* and *Moderato*. Recognizing the imprecision of these terms, we nevertheless chose to follow an ordered list as representing an ordinal ranking of tempo terms from slow to fast. Rather than create a list ourselves – with the potential to introduce researcher bias – we elected to use an existing list given in the Wikipedia article on *tempo*. [FOOTNOTE: (<http://en.wikipedia.org/wiki/Tempo> accessed June 7, 2011)]

Table 1. Ordered List of Tempo Terms

<i>Larghissimo</i>
<i>Grave</i>
<i>Lento</i>
<i>Largo</i>
<i>Larghetto</i>
<i>Adagio</i>
<i>Adagietto</i>
<i>Andante</i>
<i>Andante moderato</i>
<i>Andantino</i>
<i>Moderato</i>
<i>Allegretto</i>
<i>Allegro moderato</i>
<i>Allegro</i>
<i>Vivace</i>
<i>Vivacissimo</i>
<i>Allegro</i>
<i>Presto</i>
<i>Prestissimo</i>

It must be acknowledged that there is little support for the specific ordering of neighboring terms on this list. For example, not all musicians would agree that *Andante moderato* is slower than *Andantino*. One could trim this list to a much smaller list of terms that would offer greater agreement concerning the ordering. However, a reduced list of tempo terms would necessitate excluding many more passages in the sampling

procedure. As in the case of dynamic markings, no effort was made to determine the provenance of the tempo terms – whether they originated with the composer or with an editor.

It is common for tempo specifications to include adjectives or modifiers, such as *Allegro assai* (very much), or *Allegro ma non troppo* (not too much). Also, terms are often mixed, as in *Allegro vivace*. In order to avoid excluding large numbers of sampled works, we elected to include all tempo designations given in Table 1, while ignoring the modifiers. Hence, *Allegro assai*, *Allegro ma non troppo* and *Allegro vivace* would all be coded as equivalent to “*Allegro*.” Clearly, this discards subtle information that may be important for performers. However, it still retains the idea that a particular passage is relatively fast (slow, moderate, etc.) in overall tempo.

With regard to articulation, passages were coded according to the prevailing texture in the first 4-8 measures of the sampled section. This was a subjective evaluation on the part of the researchers. Passages were coded as one of five possible designations: very staccato, generally staccato, balanced/unclear, generally legato, and very legato. In making this assessment, factors taken into account included explicit staccato markings, the presence of slurs (and their lengths), the appearance of many short rests, *sostenuto* pedal markings (in the case of piano music), *detaché* and other markings. Even if all of these markings originate with the composer, the interpretation of these markings are strongly influenced by contemporaneous performance practices. Nevertheless, for the purposes of this study we chose to treat these markings at face value without attempting a more nuanced historically-informed analysis.

All four musical properties were coded in numerical form. In the case of mode, major was coded as +1, minor as -1, and ambiguous was coded as 0. In the case of articulation, staccato was coded as +1, legato was coded as -1, with very staccato and very legato coded as +2 and -2 respectively. Unclear or balanced legato/staccato articulation was coded as 0. Dynamic level and tempo were similarly coded as ordinal data, with larger numbers representing louder (1-8) and faster (1-19) passages. In the case of the major/minor distinction, it is best to view this as nominal rather than ordinal data, however, for statistical analysis we treated all data as ordinal.

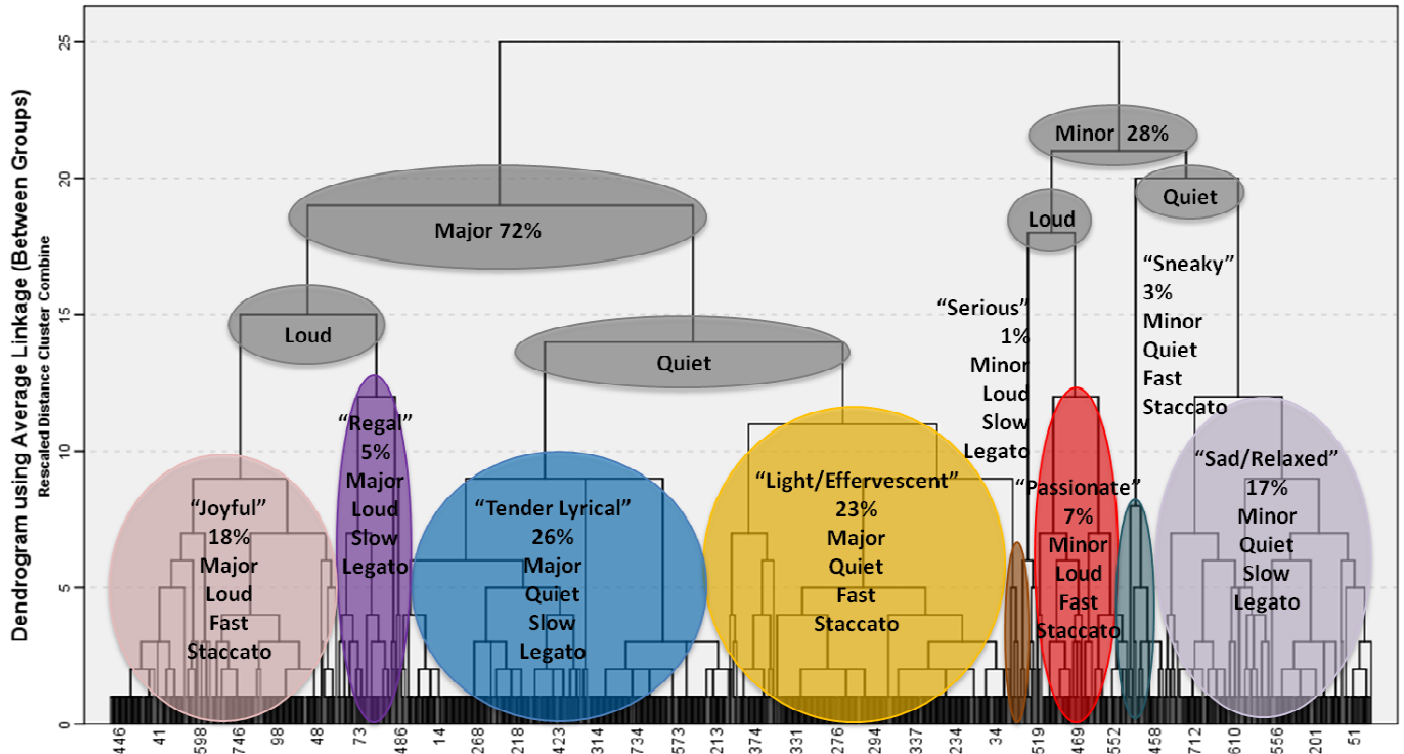
III. ANALYSIS

Recall that for each of the 750 sampled passages, we have five items of coded information: decade, mode, tempo, dynamic, and articulation. Fifty pieces are coded for each of the 15 decades (1750-59, 1760-69, ... 1890-1899). For the entire set of 750 passages, 71 percent were in the major mode, 25 percent were in the minor mode, and 4 percent were coded as having ambiguous modality. As can be seen in Example 1, tempos exhibit a bimodal distribution with many works falling into the broad categories of “fast” or “slow.” The most common tempo term was *allegro* (31 percent), with *andante* the second most common (17 percent). In coding the data, we observed that *allegro vivace* was a very common designation. In future research, it might be appropriate to treat *allegro vivace* as a separate tempo designation, faster than *allegro*. In addition, three of the target tempo terms were never encountered in our

mode (with 10 percent coded as ambiguous). In other words, the top-level clusters appear to represent the distinction between major- and minor-mode passages. Below this, both the major and minor clusters bifurcate into two broad categories. Once again, an examination of the individual passages within these groups suggests that the subdivisions represent the distinction between loud and quiet passages.

(minor/loud/fast/staccato passages), sneaky (minor/quiet/fast/staccato passages), and sad/relaxed (minor/quiet/slow/legato passages). It bears emphasizing that the various terms we use to designate these clusters are simply interpretive conveniences. For example, what we are calling tender/lyrical is really a shorthand for an underlying cluster of passages that are predominantly major, quiet, slow, and legato.

1750-1890



One level lower, tempo and articulation appear to combine in various ways. In general, passages that are staccato tend to be fast, whereas legato passages are more likely to be slow. At this lower level in the dendrogram, we propose that there are eight interpretable clusters. These generally correspond to the eight possible combinations of mode (major/minor), dynamics (quiet/loud), and tempo (slow/fast). For example, the passage in the left-most cluster generally exhibits a combination of major (93%), fast (80%), loud (87%), and staccato (44%) passages. Recall that cluster analysis only reveals the groupings evident within data without offering any interpretation. In cluster analysis, it is the prerogative of the researcher to propose such interpretations. Here we offer our own interpretations, with the full knowledge that other scholars may prefer some other characterization. In the case of the major/fast/loud/staccato group, we chose to label this cluster as joyful music. This cluster of nominally joyful music accounts for 18% of all sampled passages. Similarly, the combinations of various properties allow us to offer interpretations of the other clusters from left to right as follows: for the major-mode, in addition to joyful, we see regal (major/loud/slow/legato passages), tender/lyrical (major/quiet/slow/legato passages), and light/effervescent (major/quiet/fast/staccato passages); the four predominantly minor-mode clusters might be designated serious (minor/loud/slow/legato passages), passionate

Figure 4. Percent The vertical axis represents the level of dissimilarity. Thus, the higher the bar that connects two clusters the more dissimilar those clusters are. Inversely, the lower the top bar of a single cluster the more homogenous that cluster is. The horizontal axis has no particular meaning outside of identifying which passages were placed in which cluster. Whether a cluster lies more to the right or more to the left is arbitrary. We have highlighted here three levels of clusters. At the highest level, all of the music sampled in this study divides into two large clusters that primarily reflect mode. At the second level each mode cluster seems to divide by dynamic level. At the third level we find eight clusters that generally reflect the eight possible combinations of mode (major/minor), dynamic (loud/quiet), and tempo (slow/fast). The labels *joyful*, *regal* etc. are our interpretation of the affect most characteristic of each cluster. The percentages represent what proportion of all 750 pieces were sorted into each respective cluster. Distribution of Dynamic Marking for all 750 Musical Passages

At the same time, there is often considerable variability within the low level clusters. That is, all of the passages in a cluster might share the same mode and dynamic level, but might vary widely in other factors, like articulation. This can also cause difficulties in tracing the “same” cluster from one epoch to another. By way of illustration, consider the cluster dubbed “sneaky.” In the earlier epochs, the sneaky category consists

exclusively of minor- or ambiguous-mode works. However, by the late nineteenth century, this category includes some major-mode works (~15%) – raising the question of whether the clusters from these different eras should be regarded as the “same.”

In general, the clusters tend to be strongly dominated by modality. With only one exception (“sneaky”), all of the works within each of the eight low-level clusters in all of the dendrograms contain only major- or only minor-mode passages – with the occasional inclusion of ambiguous-mode passages. Moreover, most of the works deemed to exhibit an ambiguous mode tend to get clustered with minor-mode works. By contrast, tempo, dynamics, and articulation exhibit much greater variability.

As can be seen in Example 4, the various clusters differ considerably in size with joyful (18%), tender/lyrical (26%), light/effervescent (23%) and sad/relaxed (17%) dominating.

Turning now to the historical changes, Examples 5-7 display the dendrograms for the three 50-year target epochs. Note that Example 6 (for the period 1800-1849) resembles the dendrogram for the entire 150-year period.

The greatest differences are evident between the earliest and latest epochs (Examples 5 and 7). That is, the dendrogram for the 1800-1849 epoch appears to be intermediate between the 1750-1799 and 1850-1899 dendrograms. This pattern suggests that the middle period represents a genuine blend or intermediate stage between an earlier musical pattern and a later pattern, and that the middle period did not somehow represent a radically distinctive practice departing from both the earlier and later epochs. Accordingly, we will restrict our comments to the contrast between the earliest and latest periods in our study. Note that in choosing to focus on the earliest and latest periods we do not wish to imply that these periods somehow represent “cardinal” points and that the intermediate 50-year period represents a “transition.” We are simply observing that features of both the earlier and later periods are evident in the middle period of our study.

The proportions of the different clusters according to each epoch are summarized in Table 1.

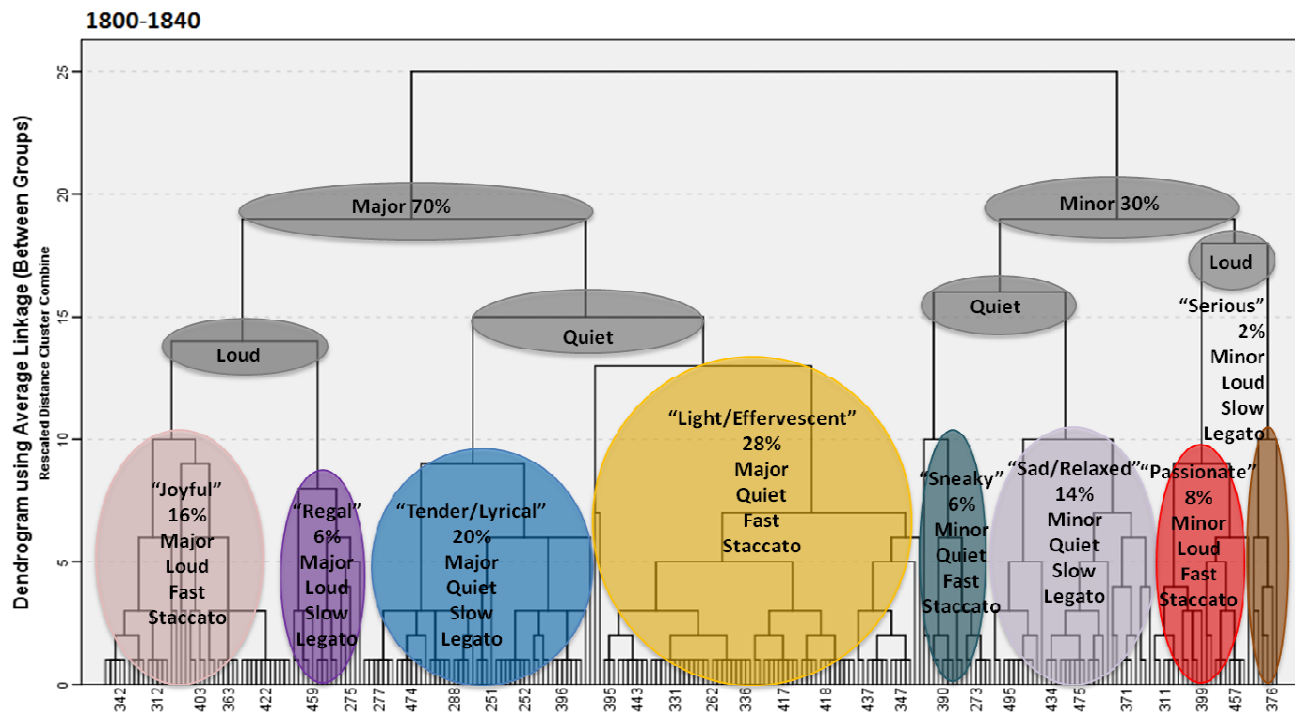


Figure 5. Dendrogram of the First 50 Year Epoch (250 Musical Passages from the Late Eighteenth Century)

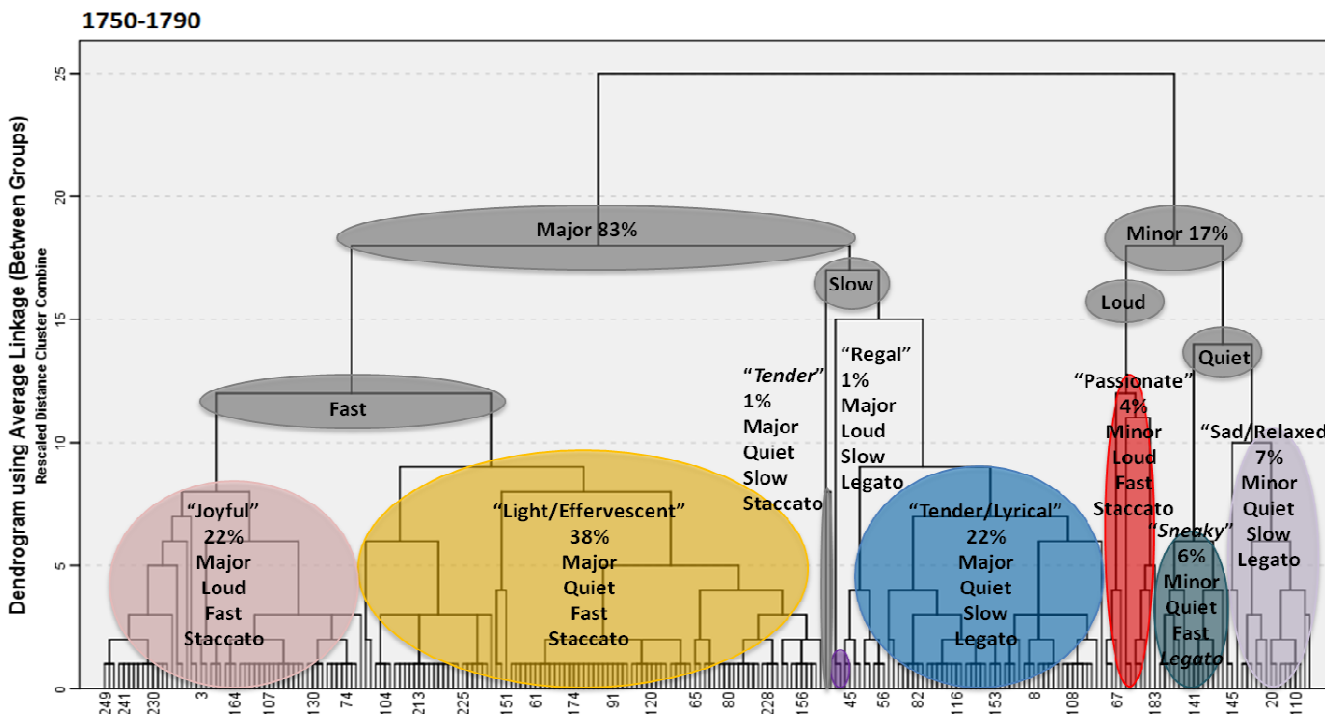


Figure 6. Dendrogram of the Second 50 Year Epoch (250 Musical Passages from the Early Nineteenth Century)

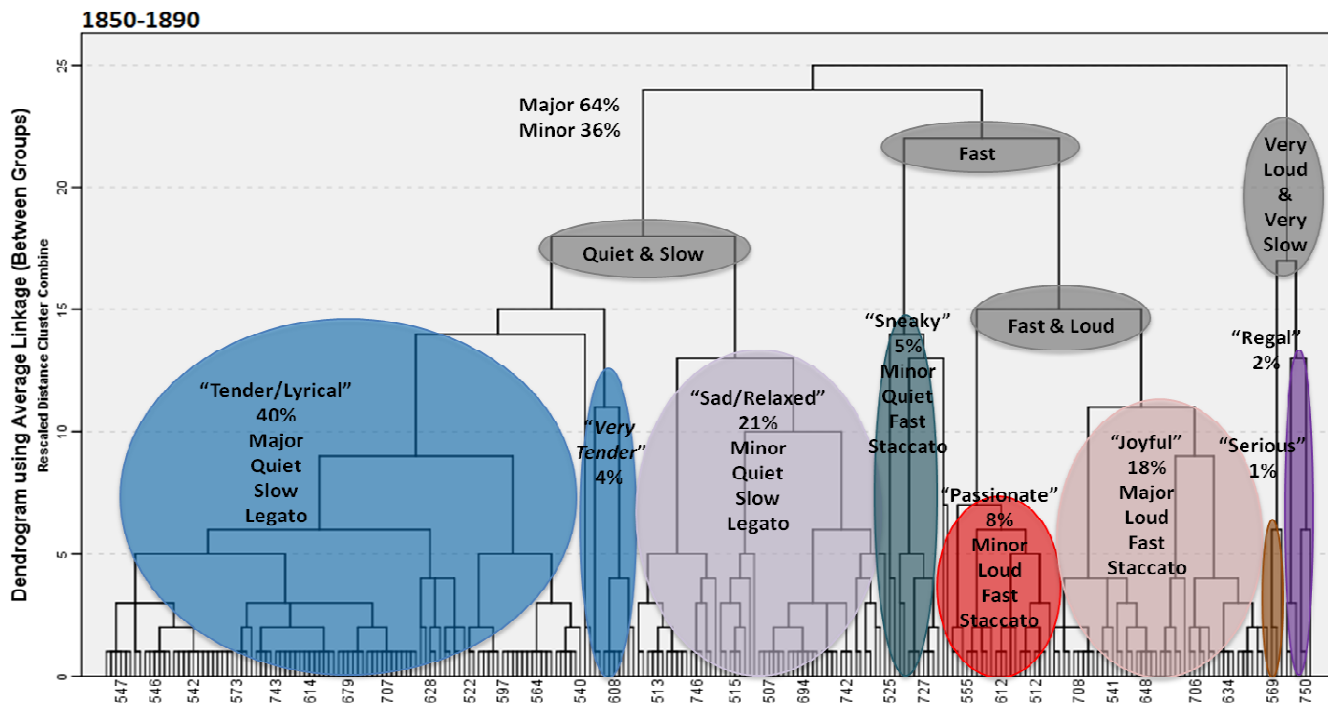


Figure 7. Dendrogram of the Third 50 Year Epoch (250 Musical Passages from the Late Nineteenth Century)

Table 1. Proportion of Each Cluster in Each Epoch

	1750-1790	1800-1840	1850-1890
Tender/Lyrical	22%	20%	44%
Light/Effervescent	38%	28%	0%
Joyful	22%	16%	18%
Regal	1%	6%	2%
Sad/Relaxed	7%	14%	21%
Passionate	4%	8%	8%
Sneaky	6%	6%	5%
Serious	0%	2%	1%

Perhaps the most obvious historical change is found in the nominally *light/effervescent* category. In the first epoch this category represents 38% of the 250 sampled works. By the late nineteenth century, this category completely disappears as a separate cluster. At the same time, the proportion of nominally *tender/lyrical* works doubles. Another striking change is the increase in the nominally *sad/relaxed* category, with the last epoch exhibiting three times the proportion of works as found in the first epoch. Less prominent changes include an increase in works nominally deemed *passionate*, and an apparent decline in the proportion of nominally *joyful* works. In addition, we see the appearance in the nineteenth century of a new cluster of works nominally deemed *serious*.

IV. DISCUSSION

Recall that for Western art music spanning the past four centuries, our previous studies have shown that there is a broad statistical association between the major mode and fast tempos,

and the minor mode and slow tempos. In addition, the major mode is associated with loud dynamics and staccato articulation, whereas the minor mode is associated with quiet dynamics and legato articulation. The combination of quieter, slower, legato, and lower in pitch is reminiscent of the prosodic features for sad speech (Kraepelin, 1899/1921). The combination of these properties is therefore consistent with the musical portrayal or representation of a sad emotion.

However, our earlier studies also showed that this general association between the minor mode and features consistent with sad affect (slower, quieter) breaks down in the nineteenth century. In fact, the association reverses, with the minor mode associated with faster tempos and louder dynamic levels than the major mode. Accordingly, we expected to see an increase in the proportion of the nominally *passionate* cluster in the 19th century. (i.e., minor/loud/fast). Although this cluster does indeed double (from 4% to 8%), these numbers are relatively small and so seem insufficient to account for the reversal in the changing association between the minor mode and fast/loud.

Instead, the principal shift appears to occur in the major mode. The largest cluster in the late nineteenth century is the major/quiet/slow/legato association (what we have dubbed *tender/lyrical*). This cluster accounts for 22% in the late 18th century, but blossoms to 44% in the late 19th century. In short, the results of the current study suggest that the breakdown of the conventional major/happy, minor/sad association is predominantly attributed to a newly developing penchant to link the major mode with slow and quiet rather than to link the minor mode with fast and loud. This result replicates the observations made by Ladinig and Huron (2010). Another historical development that contributes to this changing association can be found in the demise of the nominally *light/effervescent* category. In the late 18th century, the major/quiet/fast/staccato grouping accounts for 38%. By the end of the nineteenth century this category simply disappears. This change contributes to the erosion of the association of the major mode with fast tempo.

By way of summary, two major historical changes are evident over the 150-year period between 1750 and 1900. First,

there is a marked increase in the use of the minor mode, with a concomitant reduction in the use of the major mode. Looking at just the minor-mode works, there is little change in its affective use. That is, the clusters within the minor mode retain roughly the same proportions over this period. Second, looking at just the major-mode works, there is a notable shift in terms of how the major mode is used, with more nominally tender/lyrical passages and many fewer nominally light/effervescent passages.

The period covered by our study spans what historical musicologists have conventionally called the Classical and Romantic periods. In recent decades, musicologists have become more wary of such designations and have rightly questioned whether styles or periods can be clearly categorized. Our study provides empirical support for changing musical practices over the 150-year period. Moreover, these changes can be observed in gross musical features, like the various combinations of overall dynamic level, overall tempo, predominant articulation, and modality.

Conventionally, the transition from Classicism to Romanticism has been described as exhibiting an increase in passionate or extreme emotion (“Sturm und Drang”), accompanied by a reduction in “light” music. The results of our study provide some qualified support for this somewhat sweeping interpretation. First, the main observed difference is the reduction in the nominally light/effervescent category. At the same time, there are relatively large increases in the proportion of nominally passionate and sad/relaxed musics, although these categories represent small proportions of the overall musical use. Here, it is possible that Robert Hatten’s application of the “markedness” concept to music may help in interpreting the results (Hatten, 2004). According to the theory of markedness, those elements or patterns that are relatively infrequent are more likely to accrue specific meanings. (They are “marked” for consciousness.) Although representing just 4% of the total compositional output at the end of the 18th century, the doubling of the nominally passionate category (to 8%) might well be especially noticeable to listeners precisely because of their “marked” musical status – paradoxically, a consequence of their small numbers. Similarly, the tripling of the nominally sad/relaxed category (from 7% to 21%) may represent an especially salient or noticeable change.

This argument notwithstanding, according to our empirical results, the most prominent change is the increase in nominally tender/lyrical music. This latter change is not commonly identified in informal descriptions of “Romanticism.” It may be that the “passionate,” “sad,” and “serious” categories are simply more memorable or attract greater notice than the nominally tender/lyrical category.

The method of analysis employed in this study might be criticized both for being crudely mechanical, and simultaneously for relying heavily on the interpretation of the researchers. We admit that other interpretations may be better warranted in interpreting the dendrograms produced by the cluster analyses. At the same time, however, we contend that the use of exploratory empirical methods – such as cluster analysis – may lead to new insights in both the history and analysis of music.

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