

‘Eighty Pulse Beats in a Minute’: Johann Joachim Quantz and Time in Music¹

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In his 1752 treatise, *On Playing the Flute*, Johann Joachim Quantz advocated for choosing tempo based on the speed of eighty pulse beats to a minute.² He instructed that an approximate performance speed for a musical composition (tempo) could be determined by measuring “the pulse beat at the hand of a healthy person.”³ Why would someone in the eighteenth century use the hand pulse (heart rate) as an indication of tempo? Were all pieces of music to be played at that rate? What responsibility did the composer have? The performer?

Quantz indicated that Étienne Loulié’s chronometer designed in 1698⁴ had fallen into universal oblivion and questioned the usefulness of such a device. In 1752, Quantz couldn’t have known the ubiquitous place the metronome would inhabit by the early nineteenth century. Throughout the eighteenth century, musicians continued to use the heartbeat as the guiding pulse. (In some circles, where pocket watches were more common, musicians may have used watches to help govern time in music.)

Before the eighteenth century, time in music was connected to motion in space. There was a rigorous *tactus* against which musical units were calculated and designated through notation. By the time of Beethoven, however, composers determined interpretative choices, including the speed at which music should be performed. These indications were written out in scores in the form of numeric metronome markings as well as descriptive words. In the 1700s, there was an intersection of natural pulse (*tactus*) and mechanized time (metronome). Eighteenth-century tempo was governed by meter, note values, and affect.⁵ Musical language determined tempo by a combination of metrical indications, form/structure, and written instruction.

Measuring Time in Music Before the Eighteenth Century

Performers know how quickly or slowly to perform notes based on note values printed in his/her musical score. Gioseffo Zarlino’s treatise *Le Istitutioni harmoniche* (1558) is representative of music theory in the late Renaissance. The connection of time to motion persists throughout these writings.⁶

Before the eighteenth century, time was measured in *tactus*. *Tactus* derives from Latin *tactus* and German *tact*—meaning “to touch.” In music, *Tactus* is the amount of time of a descending

¹ Musical examples demonstrations included the following excerpts: Pierre Danican Philidor, Cinquième Suite (Paris, 1717) and Georg Phillip Telemann, *12 Fantasies à traversière sans basse*, TWV 40:2-15 (Hamburg, 1732). Performers were Leighann Daihl Ragusa (traverso), Sarah Huebsch Schilling (oboe), Eric Fisher (viola da gamba), and Hsuan Chang (harpsichord). Double-manual Flemish Harpsichord courtesy Jacobs School of Music Historical Performance Institute.

² Johann Joachim Quantz, *On Playing the Flute*. Orig: *Versuch einer Anweisung die Flöte traversiere zu spielen*. Translated by Edward R Reilly (Berlin, 1752; London: Faber, 1966), 289.

³ Quantz, 283.

⁴ This design was also envisioned by Mersenne in the seventeenth century. Roger Mathew Grant, *Beating Time and Measuring Music in the Early Modern Era* (Oxford: Oxford University Press, 2014), 184.

⁵ Tempo indicates the speed of music and affect governs the mood of the music.

⁶ Grant, 23.

and ascending motion of the hand relative to the “manner of the human pulse.”⁷ Zarlino calls this measuring of time the *battuta* (measure). He compares pulse in music to human pulse, described by Galen as “tightening, or lifting and falling, of the heart and arteries.”⁸ The hand moves down and up regardless of the meter. The downward motion is called *position* and the upward motion is *levatoine*. If the meter is equal (that is, divisible by two), the downward motion is one count and the upward motion is one count. If the meter is unequal, that is, divisible by three, the downward motion is two counts and the upward motion is one count. In this case, the down is longer (1, 2) and the up is shorter (3).⁹ Although these motions may resemble modern conducting, they are tracking time in a different way. Tactus shows time for proportional note values rather than measured note values.

Time kept by tactus shows the performer the speed of a specific note value—the *breve* (rectangle). “Sancti Mei” by sixteenth-century composer Orlando de Lasso, shown in figure 1, exemplifies mensural notation; in this notation, proportional units describe a note’s rhythmic value.



Figure 1. Orlando di Lasso “Sancti Mei” from *Nouae aliquot et ante hac non ita vsitate ad duas voces cantiones suauissimae* (London, 1598)—note that there are no barlines, no indication of music divided into measure.

New Measures: The Bar Line

The increased use of a barline allowed musicians to think of the measure as a distinct unit.¹⁰ Étienne Loulié’s 1696 treatise evidences the separation of the measure (that is, the distance from one bar-line to the next bar-line) from beat (*temps*). Loulié defines meter: “Meter (*mesure*) signifies a number of equal beats which serve to regulate the duration of sounds.”¹¹ As with Zarlino, Loulié describes a descending and ascending motion of the hand as a regulation of time: “the

⁷ Gioseffo Zarlino, *On the Modes: Part Four of Le Institutioni Harmoniche*, 1558, translated by Vered Cohen, edited by Claude V Palisca (Venice, 1558; New Haven: Yale University Press, 1983), 116.

⁸ Zarlino, ch. 48.

⁹ “Thesis” for upward and “arsis” for downward are also used.

¹⁰ “Notational changes, including the more frequent use of regular barlines, afforded the possibility to treat the measure as a distinct object.” Grant, 37.

¹¹ “La Mesure est un nombre de battements égaux qui fevent à rager la durée des Sons” in Etienne Loulié, *Èlèments ou principes de musique* (Christophe Ballard, 1696), 33-34 cited in Etienne Loulié, *Elements or Principles of Music*, translated and edited by Albert Cohen (New York: Institute of Mediaeval Music, 1965), 26-27.

beat [*battlement*] is movement of a foot or hand down and up. In contrast, the tempo is the duration of the *battement*.”

Along with the use of barlines separating music into measures, came a new system of rhythmic hierarchy: *quantitas intrinseca*. Additionally, the word “beat” changed from a physical movement of the hand to the rhythmic placement of notes between two barlines on the printed page. *Quantitas Intrinseca* is the idea that some notes are “good” and others are “bad,” often dependent on their beat placement in a measure relative to the time signature. Performance instructions are implied by *quantitas intrinseca*. The sign for a down bowing still used today derives from *nobilis* for “good,” and *villis* for “bad.” Performers emphasize good beats and minimize bad beats. The downward motion of eighteenth-century violin bows creates a louder sound than the up-bow, which is weaker.¹² There are similar indications for the down and upward hand motions of plucked string players (lute, guitar, etc.) as well as correlating instruction for wind instrument articulation.¹³

Meter, Tempo, Affect

In *General-Baß-Schule* theorist Johann Mattheson writes, “*Tact[us]* is nothing other than a raising and lowering of the hand.”¹⁴ This dismissive definition of *tactus* shows the separation of time from motion Loulié had described in 1695. Throughout the eighteenth century, performers and academics argued over ways to measure time in music. The Berlin Academy was founded in 1700; members gathered to compare research, read papers, and hold academic contests. The Newton-Leibniz debate was a central controversy of the Berlin Academy. Newton (and Newtonian descendants) conceived of an absolute time that divorced from motion.¹⁵ Carrying on the Scholastic tradition of Descartes, Gottfried Leibniz argued that time and motion are connected; time is a measurement of motion.¹⁶

Tempo Indicators

In the mid eighteenth century, composers began writing detailed instructions for performers. Time signatures¹⁷ were combined with tempo words like *Allegro* and *Largo* to determine the “*tempo giusto*”—the “correct” tempo. In the same way that the key or mode of a piece assisted in determining affect, so too did its rhythmic qualities. Composers began writing in all manner of new key signatures. Compositions written in an older style, *stile antico*, continued using some of the old mensural signs¹⁸ and simple signatures like 3/1, 3/2.¹⁹

Performers interpreted notation and text to determine tempo. Increasingly, tempo words, usually in Italian, were written at the beginning of a piece or section of a piece to indicate the speed and character of a piece. *Allegro* means gay as well as fast. *Adagio* means slow and is usually

¹² Werner Bachmann, Robert E. Seletsky, David D. Boyden, Jaak Liivoja-Lorius, Peter Walls, and Peter Cooke, “Bowstrokes to c1780” from “Bow” in *Grove Music Online*. 14 Jul. 2018.

¹³ Quantz, 71-86.

¹⁴ “Der Tact sey nichts anders, als ein Aufheben und Niederschlagen der Hand.” Johann Mattheson, *Kleine General-Baß-Schule*, facsimile ed. (1735; Laaber: Laaber-Verlag, 1980), 92.

¹⁵ Grant, 102-103.

¹⁶ *ibid.*

¹⁷ Time signature is used interchangeably with meter by musicians today.

¹⁸ C and Cut C, written .

¹⁹ George Houle, *Meter in Music 1600-1800: Performance, Perception, and Notation* (Bloomington: Indiana University Press, 1987), 35.

somber or serious. Together with time signature and descriptors, these tempo words clarify character and performance speed of a piece. *Allegro con brio* (gay with brilliance) is faster than *Allegro* and much faster than *Allegro moderato*.²⁰

The time signature of a piece is also an indicator of tempo. In *Anleitung zum Clavierspielen*, Marpurg shows thirteen distinct time signatures and other variations. Typical of tables of the period, note values and regular patterns are shown in figure 2.

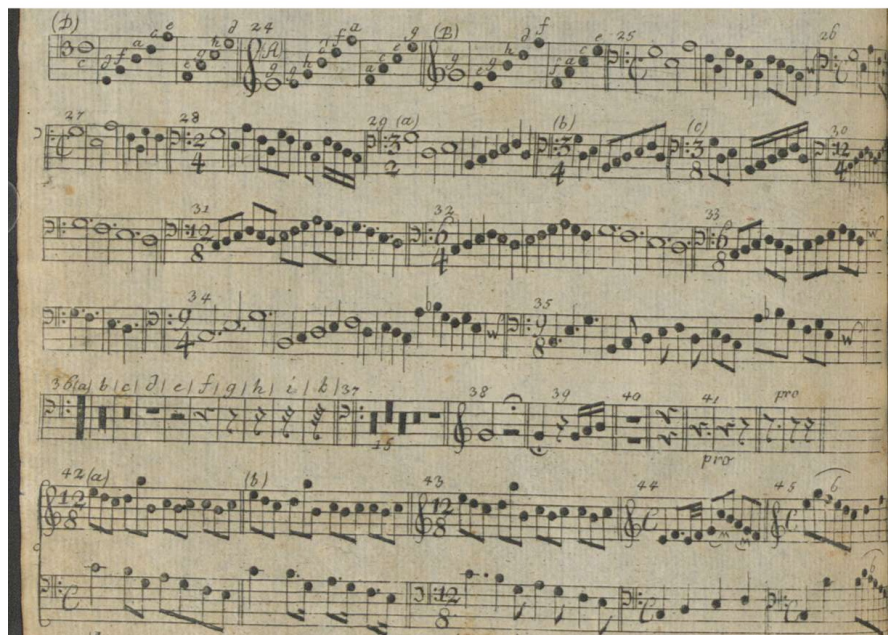


Figure 2. from Table 1, Friedrich Wilhelm Marpurg, *Anleitung zum Clavierspielen* (Berlin: A. Haude & J. C. Spener, 1755), [86].

Within each tempo there are further graduations of speed and character to consider. Quantz spends a chapter instructing performers on how to play pieces marked *Adagio*, stating, “In playing you must regulate yourself in accordance with the prevailing sentiment, so that you do not play a very melancholy Adagio too quickly or a cantabile Adagio too slowly.”²¹

Mechanized Time

We do not have chronometer or metronome markings from any major eighteenth-century composer.²² Despite attempts to clarify tempo choices from a combination of descriptive words and time signature, some musicians wrote that the speed of a piece cannot be determined by the-

²⁰ Tempos in order of slow to fast, according to Quantz include: slow (Grave, Largo, Larghetto, Adagio, Lento); moderate (Andantino, Tempo di Minuetto, Andante, Moderato, Allegretto); and fast (Allegro Moderato, Allegro, Vivace, Alla breve, Presto, Vif, Prestissimo).

²¹ Time signatures increasing in speed according to Quantz include: Cut C or 3/2, 4/4 or 3/4, 2/4 or 6/8. Quantz puts slow tempos in order of most melancholy to least melancholy; these are shown in increasing speeds within Adagio: Adagio di molto or Lento assai; Grave; Adagio spiritoso; Cantabile or Arioso (3/8); Andante or Larghetto (3/4); alla Siciliana (12/8). Quantz 164-165.

²² Clive Brown, *Classical and Romantic Performing Practice 1750-1900* (Oxford: Oxford University Press, 1999), 297.

se descriptors alone. In the same way that early eighteenth-century composers disassociated time from motion, nineteenth-century composers disassociated meter (time signature) from tempo.²³ In his *Neue Sing-Schule* from 1804, Johann Friedrich Schubert contends:

The correct tempo or degree of speed cannot be determined by any heading and can only be gathered from the inner characteristics of a composition itself [...] An Allegro in a church style or oratorio must have a slower tempo than an Allegro in a theater or chamber style. [...] Differences in compositional style or manner and national taste also necessitate a faster or slower tempo.²⁴

It is challenging for today's performers to understand how tempos were chosen during the eighteenth century. Nationalist stereotypes were already becoming entangled with aesthetic choices—eighteenth-century audience members wrote that “Haydn liked his finales faster than Mozart,”²⁵ or that Viennese allegros were quicker than northern-German ones.²⁶ Reviewers commented on the weight and majesty of German voices and the frivolity and lightness of Italian ones.

The new metronome, designed by Johann Nepomuk Maelzel, came into regular use soon after its invention. Like other time measuring devices before it, Maelzel's metronome, shown in figure 3, used weighted pendulum motion. It was distinctive, and immediately useful, for its calculated divisions of time against a minute. One could set the metronome for “80 pulse beats in a minute,” or “120 beats in a minute,” and so on. Beethoven²⁷ and Schubert immediately took to the new device. Publishers and metronome advocates began publishing music with written in metronome markings to suggest tempos for pieces by Mozart, Haydn, Handel, and others.

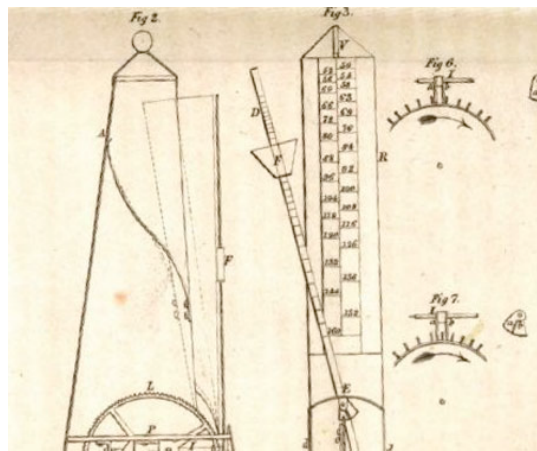


Figure 3. Maelzel's Metronome design patent from *The Repertory of Arts, Manufactures, and Agriculture...patent inventions*, vol. 33, ser. 2 (Printed for J. Wyatt, London, 1818), [9a].]

²³ Grant, 186.

²⁴ Johann Friedrich Schubert, *Neue Sing-Schule oder gründliche und vollständige Anweisung zur Singkunst in 3 Abtheilungen mit hinlänglichen Übungsstücken* (Leipzig: Breitkopf & Härtel, [1804]) no.1 ~72.

²⁵ *Allgemeine musikalische Zeitung*, 13, no. 44 (Leipzig: J. Rieter-Biedermann, 1811), 737.

²⁶ Brown, 297.

²⁷ Susan Forsén, Harry B. Gray, L. K. Olof Lindgren, and Shiley B. Gray, “Was Something Wrong with Beethoven's Metronome,” *Notices of the AMS*, Vol. 60, no. 9; Peter Standlen, “Beethoven and the Metronome,” *Music and Letters* 48 no. 4, 1967, pp. 330-349; Grant, 185; and others.

Conclusion

The eighteenth century witnessed a shift from musical time that was moderated by tactus to musical time that was monitored by metronome. Even with these technological advances, the heartbeat continued to be a reference for speed. Even today, playing “rhythmically” is a compliment, but playing “metronomically” is an insult. The idea of playing “musically” implies that musicians may practice with a metronome ... but they perform with their hearts.