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The Amount of Live Classical Music Heard by an American

Music is an incredibly important part of human society, and no well-known genre carries a history as rich as that of Classical Music. Live performances especially are important in the classical community, but I have to wonder how much live classical music people hear nowadays. While others have estimated the number of concerts per year in the United States, no one, as far as I know, has estimated the number of actual notes that are heard by Americans on a yearly (and daily) basis. Note that I am estimating the amount of live classical music heard *in person* (so not including people listening to live recordings). Given that this is an estimate, take these numbers with a grain of salt.

In order to estimate the amount of live classical music heard by Americans, I have to make a few assumptions to simplify things a bit. I conjecture that the majority of music is performed by orchestras, especially on a per note basis, given that there are around a hundred people each playing the same notes. This conjecture is somewhat supported by 2017 data from "BachTrack."

Who were the busiest performers in 2017?

Concert Conductors	Conductors of all genres	Orchestras worldwide
1. Yannick Nézet-Séguin (80)	1. Philippe Jordan (97)	1. New York Philharmonic (135)
2. Andris Nelsons (79)	2. Valery Gergiev (92)	2. Chicago Symphony (116)
3. Alan Gilbert (73)	3.= Yannick Nézet-Séguin, Sir Antonio Pappano (89)	3. San Francisco Symphony (115)
4. Herbert Blomstedt (71)	5. Koen Kessels, (87)	4. Berliner Philharmoniker (112)
5. Vasily Petrenko (67)	6.= Andris Nelsons, Sir Simon Rattle (84)	5. Royal Philharmonic (103)
6. Daniel Barenboim (65)	8.= Paolo Carignani, Jakub Hrůša (81)	6. Nordwestdeutsche Philharmonie (102)
7.= Christoph Eschenbach, Andrés Orozco-Estrada (64)	10. Daniel Barenboim (78)	7. Bournemouth Symphony (97)
9. Jakub Hrůša (63)		8. Los Angeles Philharmonic (94)
10.= Valery Gergiev, Riccardo Muti, Sir Simon Rattle (62)		9.= Philadelphia Orchestra, Wiener Philharmoniker (91)

Who were the busiest instrumentalists?

Pianists	Violinists	Cellists
1. Dénes Várjon (64)	1. Leonidas Kavakos (52)	1. István Várdai (75)
2.= Daniil Trifonov, Yuja Wang (57)	2. Ray Chen (47)	2. Truls Mørk (43)
4.= Leif Ove Andsnes, Sir András Schiff (53)	3. Nicola Benedetti (46)	3. Gautier Capuçon (42)
6. Emanuel Ax (52)	4.= Joshua Bell, Anne-Sophie Mutter (44)	4. Sol Gabetta (41)
7. Denis Kozhukhin (49)	6.= Baiba Skride, Christian Tetzlaff (41)	5. Daniel Müller-Schott (35)
8. Jean-Yves Thibaudet (45)	8.= James Ehnes, Patricia Kopatchinskaja, Gil Shaham, Kristóf Baráti (40)	6. Jean-Guihen Queyras (32)
9. Pierre-Laurent Aimard (44)		7. Steven Isserlis (30)
10. Kirill Gerstein (43)		8. Johannes Moser (28)
		9. Alisa Weilerstein (24)
		10. Alice Neary (21)

One can see that orchestras tend to have more concerts than soloists (the top orchestra has 135 concerts while the top cellist has 75 concerts), which combined with the numerous people playing at once, allows me to assume that the majority of music (on a per note basis) is played by orchestras, and thus to base my estimate on this.

My next conjecture is that the majority of music played by orchestras is played by the string section, given that the strings are almost always the busiest section and comprise the majority of symphony orchestra members.

Lastly, I will assume that most of the works performed by orchestras are classical, or at least based enough on classical music to fit the genre.

Now, onto the actual estimate. There are around 1200 symphony orchestras in the United States. I would say there are maybe 50 to 150 members in an orchestra from my experience in

concerts and performances, which has a geometric mean of around 87 players (people) per orchestra. Since only one orchestra plays at a time:

$$\sqrt{50 \times 150} \frac{players}{orchestra} \approx 87 \frac{players}{orchestra} = 87\ players \text{ (Note that one orchestra plays at a time in a}$$

concert)

The length of a typical concert is around 1.5 hours, or 5400 seconds. I would estimate that the common range of tempos (speed of the music) is approximately 50-150 beats per minute from my experience as a classical pianist, which has a geometric mean of 87 beats per minute. Note that I am talking about pulses in a measure, not necessarily the time signature when I refer to beats. For example, in a piece in 6/8, there are usually two main beats, which are the beats I refer to here.

In a measure of music (a unit of a piece of music), there are maybe 1-4 beats, with a geometric mean of 2 beats per measure. Combining some of these numbers so far, we have

$$\textit{Typical time length of a measure } = \frac{2 \frac{beats}{measure}}{87 \frac{beats}{minute}} \approx \left(\frac{2}{9}\right) \times 10^{-1} \frac{minutes}{measure} \approx 0.02 \frac{minutes}{measure} \approx 1.2 \frac{seconds}{measure}$$

The string players plays a range of 1-24 notes per measure. This has a geometric mean of

$$\sqrt{1 * 24} \frac{notes\ played}{measure \times player} \approx 5 \frac{notes\ played}{measure \times player}$$

A measure of the [Tchaikovsky's First Piano Concerto Violin II's part](#) (24 notes in a measure), which is the one of the highest note counts you will likely see in a single measure (the 32 notes in a measure situation is even rarer, to the point that it is assumed to not happen for this estimate).

Combining these numbers with the typical length of a concert from before, we have

$$\frac{5 \frac{notes\ played}{measure \times player}}{1.2 \frac{seconds}{measure}} \times 5400 \frac{seconds}{concert} \times 87\ players \approx 2 \times 10^6 \frac{notes\ played}{concert}$$

Less "professional" orchestras typically have around 5 concerts per year while the top orchestras can get up to 3 concerts per week, or around 150 concerts a year. This has a geometric mean of

$$\sqrt{5 \times 150} \frac{concerts}{year \times orchestra} \approx 27 \frac{concerts}{year \times orchestra}$$

And leads to

$$27 \frac{concerts}{year \times orchestra} \times 1200\ orchestras \approx 32000 \frac{concerts}{year}$$

Combining all of these numbers, we get

$$32000 \frac{concerts}{year} \times 2 \times 10^6 \frac{notes\ played}{concert} \approx 6.4 \times 10^{10} \frac{notes\ played}{year} = 6.4 \times 10^{10} \frac{notes\ heard}{year \times listener}$$

Note that *notes played* $= \frac{notes\ heard}{listener}$ (because multiple listeners hear the same notes) and listeners are audience members. To find the total number of notes actually heard, we need the audience base of concerts. I would say that the number of people at a typical concert generally would range from 100-3000 people (the upper limit is rounded based on [the seating capacity of Carnegie Hall](#))

Seating Capacity

Parquet	1,021
Blavatnik Family First Tier Boxes*	264
Second Tier Boxes	238
Center Second Tier Boxes	136
Side Second Tier Boxes	102
Dress Circle	444
Balcony	837
Center Balcony	571
Side Balcony	266
Total	**2,804**

from Carnegie Hall's website. I rounded the number of seats to 3000.

The geometric mean of the number of concert goers is

$$\sqrt{100 \times 3000}\ \tfrac{listeners}{concert} \approx 550\ \tfrac{listeners}{concert}$$

Which means $550\ \tfrac{listeners}{concert} \times 32000\ concerts \approx 18 \times 10^6\ listeners = 18\ million\ listeners$ is the audience base for a year. The number of notes heard is thus

$$6.4 \times 10^{10}\ \tfrac{notes\ heard}{year \times listener} \times 18\ million\ listeners \approx 1.2 \times 10^{18}\ \tfrac{notes\ heard}{year} \times \frac{year}{365\ days} \approx 3 \times 10^{15}\ \tfrac{notes\ heard}{day}$$

The US population is around [300 million people](#) and so

$$\frac{3 \times 10^{15}\ \tfrac{notes\ heard}{day}}{3 \times 10^8\ people} \approx 1 \times 10^7\ \tfrac{notes\ heard}{day \times person} \Rightarrow The\ average\ US\ citizen\ hears\ 10^7\ notes\ of\ live\ classical\ music\ per\ day$$

Sanity Checks:

The following numbers are estimates of many of the intermediate numbers I found, which provide sanity checks and tells me my estimate seems to be not far off. I can say my estimates are comparable to the real numbers if they are within the same order of magnitude (not off by a factor of more than 10).

[Number of concerts in 2014 = 28,000 concerts](#), which is comparable to my 32,000 concerts estimate.

Number of concerts goers (audience) = 25 million listeners, which is close to my 18 million listeners estimate.

The number of measures in Beethoven's 9th Symphony ~ 2000 measures (by adding all of the measure counts of each movement of the piece). This popular piece is around 1 hour long, so in a concert there are around

$$2000 \frac{measures}{hr} \times 1.5 \frac{hr}{concert} = 3000 \frac{measures}{concert} \text{ , which is comparable to}$$

$$\frac{5400 \frac{seconds}{concert}}{1.2 \frac{seconds}{measure}} = 4500 \frac{measures}{concert} \text{ found using my estimated numbers.}$$

Conclusion:

To make my estimate easier to compare to, I will convert it to seconds of live music played per day (performed for the typical American).

$$10^7 \frac{notes\ heard}{day \times person} \times \frac{measure \times player}{5\ notes\ played} \times \frac{1}{87\ players} \times \frac{listener \times notes\ played}{notes\ heard} \times \frac{1}{18 \times 10^6 listeners} \times 1.2 \frac{seconds}{measure} \approx 1.5 \times 10^{-3} \frac{seconds}{day \times person}$$

This puts into context how small the amount of live classical music played per day is. It also shows that while the number of notes heard seems huge, this actually makes up a pretty small time length. When you compare this to how much music is played in general per day (so any genre and not necessarily live), which is around 4.5 hours or 16,200 seconds, the estimate truly is miniscule. Live classical music accounts for $\frac{1.5 \times 10^{-3}}{16200} \approx 9 \times 10^{-6}\%$ of all music listened to in the United States. Given that classical music is one of the least popular of the well-known genres today (unfortunately) and that most people listen to recorded music rather than live (even for classical music), this seems possible.

Although the final numbers seems really small, one needs to take into account that I averaged this over the entire US population, which is greater than the population of classical music listeners. Additionally, given the nature of an estimate, these numbers may not be accurate. Finally, these calculations in no way indicate the state of classical music in the world today. I believe that it is still thriving and will continue to be an integral part of society for the foreseeable future.

I hope this was as fun to read as it was to write and calculate.

All sources used are hyperlinked when first mentioned.