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# Weights of Violin, Viola, and Cello

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## ABSTRACT

Data on weights for 80 violins, 20 violas, and 11 celli are presented along with descriptions of set up and fittings used on each instrument. Data are presented for classic European instruments as old as the late 16<sup>th</sup> Century, plus a selection of modern instruments by professional American makers.

Classic violins, ready to play with chin rest, average about 428 g, compared to 439 g for a sample of good contemporary violins. Viola weights show a large spread (511-731 g), depending on body size and fittings. Full-size celli weight about 2900-3000 g, depending on accessories.

We have noticed a correlation between weight and instrument quality and marketability. There are few instruments that interest us above and below certain threshold weights. Specifically, we often favor new violins that weigh 430-460 g (although exceptions are possible).

## INTRODUCTION

We believe that as more data are accumulated, more understanding is possible. This even applies to fields that at first glance seem incomprehensible (including violin acoustics). This belief is also held by many scientists, marketers, pollsters, and statisticians in many difficult and challenging fields. For example, pollsters who study the seemingly nonsensical voting habits of large numbers of people are able to make predictions with remarkable accuracy. Similarly, marketers formulate well-informed strategies based on studying the public's often spurious and impulsive buying preferences. There is no doubt that a "database" approach works, possibly better than any other method, for answering basic questions about highly variable systems. Conversely, you can't learn much by studying one or two data points!

Like other violin shop owners, we have noticed a correlation between instrument weight and the time it takes to sell the instrument [1].

Generally, lighter instruments sell faster. Consequently, we have made a serious attempt to weigh every instrument that comes our way, including a number of great Old Master instruments. From studying these data, combined with our sales experience, we think we know roughly what a marketable violin/viola/cello weighs, and we are disinclined to deal in instruments that are outside of certain weight ranges.

Tables 1, 2, and 3 report weights of a variety of instruments ranging from museum pieces in original condition to hard-working instruments used by professional players. Instruments by a variety of early makers are given, followed by a sample of good modern instruments made in the last ten years by professional American makers. Instruments that we know to be of inferior quality or tone are excluded. A brief description of set-up and fittings is included, because the wood used for pegs, tailpiece, and chin rest can have a considerable effect on total instrument weight.

Many conclusions can be drawn from these data, such as general differences between old and new instruments, and the effect on overall instrument weight of using various types of woods for fittings (fittings and fingerboard can constitute one quarter of instrument weight). Other things being equal, wood density seems to be a critical factor and light instruments having normal graduations must be made of very light wood. We thank the National Music Museum, the Library of Congress, and many instrument owners for allowing access to their instruments. Note: Weights were obtained using Ohaus scales; a digital model accurate to the nearest gram, and a triple-beam balance is accurate to 0.1 g. "Complete" indicates ready to play, with chin rest. Abbreviations are as follows: "fb", fingerboard; "tp", tailpiece.

## RESULTS

The lightest violins are the oldest ones (Figure 1), especially those with Baroque setup (partly because of a lighter maple fingerboard). Moreover, violins with modern setup (no chin rest) seem to show a

**Table 1.** Violin (full size unless otherwise noted)

<b>Maker (location)</b>	<b>Date</b>	<b>Description and Fittings</b>	<b>Weight (grams)</b>
Andrea Amati (Cremona, Italy)	1574	7/8 violin; no chin rest, all else ebony	346
Andrea Amati (Cremona, Italy)	1577	No chin rest, all else ebony	353
Hieronimus Amati (Cremona, Italy)	1609	7/8 violin; no chin rest, all else ebony	322
Nicolo Amati (Cremona, Italy)	1628	No chin rest, all else boxwood	381
Nicolo Amati (Cremona, Italy)	1654	"Brookings"; Complete- all ebony	419.7
Antonio Bagatella (Padua, Italy)	—	Complete- ebony pegs & chin rest, boxwood tp	482
Anselmo Bellosio (Venice, Italy)	c1780	No chin rest, all else boxwood	357
Carlo Bergonzi (Cremona, Italy)	1732	"Tarisio"; No chin rest, all else boxwood	355
M.I. Brandstaetter (Vienna, Austria)	1824	Original condition, no chin rest, all else ebony	393
Brescian School (Brescia, Italy)	c1630	No chin rest, baroque setup; boxwood pegs & ebony tp	330
Brescian School (Brescia, Italy)	c1640	No chin rest, boxwood pegs & ebony tp	402
Giofredo Cappa (Saluzzo, Italy)	—	Complete- all ebony	436
Tomaso Carcassi (Florence, Italy)	1759	No chin rest, ebony pegs & tp	380
Marco A. Cerin (Venice, Italy)	1792	Original baroque condition; no chin rest, ebony pegs & tp	358
Marco A. Cerin (Venice, Italy)	1792	No chin rest, baroque set up, boxwood pegs	356.2
G.B. Ceruti (Cremona, Italy)	c1800	No chin rest, ebony pegs & tp	410
François Chanot (Paris, France)	1819	Guitar shaped violin; no chin rest, boxwood pegs	444
Pietro A. Dalla Costa (Treviso, Italy)	1749	No chin rest, all else boxwood	358
Michele Deconet (Venice, Italy)	c1748	Birdseye maple back and sides-Complete-all boxwood	410.25
Luigi Fabris (Venice, Italy)	1854	Complete, rosewood except boxwood chin rest	462.5
Luigi Fabris (Venice, Italy)	1885	Complete, all boxwood	436
G.B. Gabrielli (Florence, Italy)	—	Complete- all boxwood	426.2
G.B. Gabrielli (Florence, Italy)	1761	No chin rest	373.6
G.B. Gabrielli (Florence, Italy)	—	Stripped, no accessories	306.5
Allesandro Gagliano (Naples, Italy)	1696	Complete- all boxwood	418.2
Ferdinando Gagliano (Naples, Italy)	1784	No chin rest, all else ebony	370
Joseph Gagliano (Naples, Italy)	1791	No chin rest, rosewood pegs, boxwood tp	362
Francesco Gobetti (Venice, Italy)	1702	Complete, all ebony	402
Francesco Gobetti (Venice, Italy)	1717	No chin rest, rosewood pegs & tp	390.5
Matteo Gofriller (Venice, Italy)	c1700	Complete- all boxwood	444.7
Matteo Gofriller (Venice, Italy)	1715	Complete- all boxwood	394.7
Matteo Gofriller (Venice, Italy)	c1700	Complete- ebony chin rest & tp, rosewood pegs	421
G.B. Guadagnini (Italy)	—	Complete- all ebony	397
Peter Guarneri (Venice, Italy)	c1730	Complete- all boxwood	412.5
Peter Guarneri (Venice, Italy)	1732	No chin rest, all else boxwood	371.5
Antonio Gragnani (Livorno, Italy)	1788	Original baroque condition, no chin rest, ebony fittings	354
Guarneri del Gesù (Cremona, Italy)	1733	"Kreisler"; Complete- all ebony	434.8
J.G. Hamm (Markneukirchen, Ger)	1796	No chin rest; baroque set up, all else ebony	398
Mathias Hornsteiner (Mittenwald, Ger)	1803	No chin rest; all else ebony	367
George Klotz II (Mittenwald, Ger)	1780	No chin rest; all else ebony	395
Carlo F. Landolfi (Milan, Italy)	c1760	No chin rest; all else ebony	394
Giovanni P. Maggini (Brescia, Italy)	1623	No chin rest; all else ebony	398
Johann G. Meisel (Klingenthal, Ger)	1735	No chin rest; all else ebony	405
Dom. Montagnana (Venice, Italy)	c1715	Complete- all boxwood	403.75
Dom. Montagnana (Venice, Italy)	1742	Complete- boxwood pegs & tp, rosewood chin rest	448
Dom. Montagnana (Venice, Italy)	1731	Complete- all rosewood	463.8
Pietro G. Rogeri (Brescia, Italy)	1715	3/4 violin; no chin rest, baroque set up, ebony fittings	316
Gorgio Seraphin (Venice, Italy)	c1750	Complete all boxwood	428.2
Santo Seraphin (Venice, Italy)	c1730	Complete, all rosewood	423.2
Santo Seraphin (Venice, Italy)	1732	Complete- all boxwood	435
Santo Seraphin (Venice, Italy)	1735	Complete- all boxwood except ebony chin rest	432.6
Santo Seraphin (Venice, Italy)	1746	No chin rest- all else boxwood	376
Jacob Stainer (Absam, Italy)	1668	Original baroque condition; no chin rest, ebony fittings	319
Antonio Stradivari (Cremona, Italy)	1694	"Harrison"; no chin rest, rosewood pegs, ebony tp	386

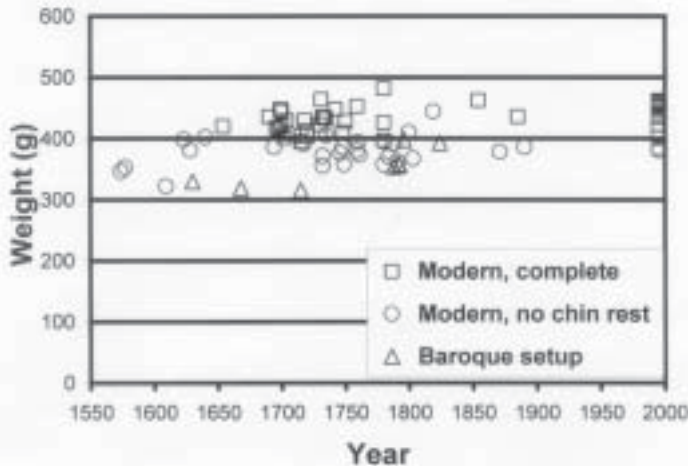
**Table 1.** Violin (full size unless otherwise noted) *continued*

<b>Maker (location)</b>	<b>Date</b>	<b>Description and Fittings</b>	<b>Weight (grams)</b>
Antonio Stradivari (Cremona, Italy)	1698	"Lark"; Complete- all boxwood	415
Antonio Stradivari (Cremona, Italy)	1699	"Castlebarco"; Complete-boxwood pegs & tp, ebony chin rest	448.5
Antonio Stradivari (Cremona, Italy)	1700	"Ward"; Complete-all boxwood	427.7
Antonio Stradivari (Cremona, Italy)	1704	"Betts"; Complete-all boxwood	429.3
Carlo A. Testore (Milan, Italy)	1759	Complete- all ebony	453
Carlo A. Testore (Milan, Italy)	1748	No chin rest, all else ebony	385
Carlo Tononi (Venice, Italy)	1718	Complete- all ebony	429.7
Carlo Tononi (Venice, Italy)	—	Complete- all rosewood except boxwood chin rest	412.8
Carlo Tononi (Venice, Italy)	—	All boxwood except rosewood chin rest	404
Johann G. Voigt (Markneukirchen, Ger)	1788	No chin rest; all else boxwood	391
Voller Brothers (London, England)	1890	No chin rest; all else boxwood	386
J.B.Vuillaume (Paris, France)	1871	No chin rest; all else boxwood	378
Contemporary (USA)	—	Complete- all boxwood	454
Contemporary (USA)	—	Complete- all boxwood	434
Contemporary (USA)	—	Complete- all rosewood	460
Contemporary (USA)	—	No chinrest- otherwise all boxwood	381
Contemporary (USA)	—	Complete- all ebony	384.5
Contemporary (USA)	—	Complete- all boxwood	451
Contemporary (USA)	—	Complete- all rosewood	446.5
Contemporary (USA)	—	Complete- all boxwood	423.5
Contemporary (USA)	—	Complete- all boxwood	438
Contemporary (USA)	—	Complete- all ebony	457
Contemporary (USA)	—	Complete- all boxwood	401
Contemporary (USA)	—	Complete- all rosewood	462.5
Contemporary (USA)	—	Complete- all rosewood	457
Contemporary (USA)	—	Complete- all almond wood	445

**Table 2.** Viola.

<b>Maker (location)</b>	<b>Date</b>	<b>Description and Fittings</b>	<b>Weight (grams)</b>
Andrea Amati (Cremona, Italy)	c1577	No chin rest, all else ebony	576
Anselmo Bellosio (Venice, Italy)	—	Complete- all ebony	583.8
Nicola Bergonzi (Cremona, Italy)	1781	No chin rest; boxwood pegs & ebony tp	561
D. Busan (Venice, Italy)	—	Complete- all ebony, Wittner tp	731
Gasparo da Salo (Brescia, Italy)	c1609	No chin rest- all else ebony	649
Michele Deconet (Venice, Italy)	1780	No chin rest- all else rosewood	511.5
F. Gofriller (Venice, Italy)	c1730	No chin rest- all else ebony	583.6
Pietro G. Mantegazza (Milan, Italy)	1793	Baroque set up, no chin rest- all else ebony	534
Ansaldo Poggi (Bologna, Italy)	—	Complete- all boxwood	643
Jacob Stainer (Absam, Italy)	c1650	Original baroque condition; no chin rest, maple fb & tp	561
Peregrino di Zanetto (Brescia, Italy)	c1564	No chin rest; all else ebony	665
Contemporary (USA)	—	Complete- all ebony	615
Contemporary (USA)	—	No chin rest- otherwise all boxwood	560
Contemporary (USA)	—	Complete- ebony chin rest- boxwood pegs, tp	564
Contemporary (USA)	—	Complete- all ebony	637
Contemporary (USA)	—	Complete- all ebony	666
Contemporary (USA)	—	Complete- all boxwood	605.6
Contemporary (USA)	—	Complete- all boxwood	565.2
Contemporary (USA)	—	Complete- all boxwood	630
Contemporary (USA)	—	Complete- all ebony	587.3

**Figure 1.** Variation of violin weight according to date of construction. Includes 79 violins from Table 1 (the stripped Gabbrielli is omitted). Average values are as follows: Modern setup, complete, pre-1900 (n=29), 428.1 g; Modern setup, complete, contemporary (n=14), 439.3 g; Modern setup, no chin rest (n=28), 379.2 g; Baroque setup (n=8), 353.0 g.

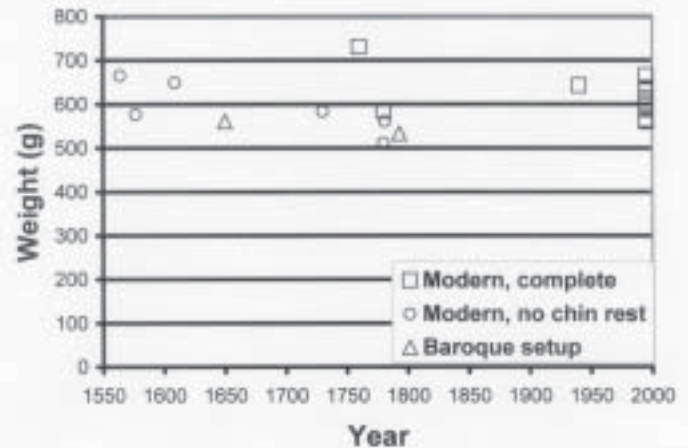


slight weight increase with time, from about 320-350 g prior to 1620 to 380-400 for most 19<sup>th</sup> Century violins. Violins with Baroque setup average 353.0 g, versus 379.2 g for those with modern setup but no chinrest. Modern violins with complete setup are split into two classes: pre-1900, which average 428.1 g, and contemporary, which average 439.3 g. Hence, there is little difference (2.5%) in weight between fine contemporary violins and a selection of old classics, other things being equal.

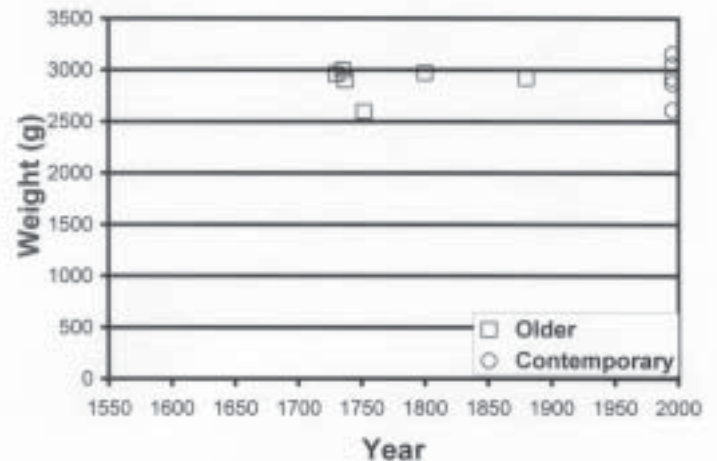
A breakdown of component weights for a complete violin weighing 450 g is presented by Jansson [2], who suggests that “The 450 g is, however, probably a little high, and a total weight of 400 g seems reasonable to aim at”. Our opinion is that 400 g is on the light side of the acceptable range and might indicate that the graduations are too thin (one should be as wary of too light weight as of too heavy weight). The range 430-450 g seems like a safer target for modern violins with ordinary graduation patterns, depending of course on fittings. We find very few violins that interest us above a weight threshold of about 460 g (complete set up).

Viola weights show a large spread from 511 to 731 g (Figure 2). Average weights for classes (older vs. contemporary) show little difference, although this chart does not take body size into account, which is partly responsible for the large spread in the data. The Stainer (body length 465 mm; 18.3 inches) and the da Salo (body length 442 mm; 17.4 inches) are large, but most of the other violas are thought to be in the standard range 406-419 mm (16-16.5 inches).

**Figure 2.** Variation in viola weight according to date of construction (n=20). Average weights are as follows: Modern setup, complete, older (n=9), 611.5 g; Modern, complete, contemporary (n=9), 603.3 g; Baroque setup (n=2), 547.5 g.



**Figure 3.** Variation in cello weight according to date of construction (n=11). Average weights are as follows: Older celli (n=9), 2891.8 g; contemporary (n=5), 2921.2 g.



Weights of cello (Figure 3) show little difference, on average, between older and contemporary instruments. The slightly heavier weights for contemporary cello can be attributed partly to the use of ebony accessories, compared to rosewood and boxwood for several of the older cello. Also, the older cello include a 7/8 size Gagliano that is light (2597 g) compared to the full-size cello (range 2610-3156 g). It seems fair to conclude that good full-size cello weigh about 2900-3000 g.

Table 3. Cello

<b>Maker (location)</b>	<b>Date</b>	<b>Description and Fittings</b>	<b>Weight (grams)</b>
Giovanni B. Ceruti (Cremona, Italy)	—	Complete- boxwood pegs, alum tp- steel rod	2972
N. Gagliano(Naples, Italy)	1752	7/8 size; Complete- steel endpin	2597
Dom. Montagnana (Venice, Italy)	1730	Complete- all rosewood, steel endpin, 4 tuners	2962
Dom. Montagnana (Venice, Italy)	1737	Complete- steel rod, boxwood pegs, Wittner tp	2900
Dom. Montagnana (Venice, Italy)	1735	Complete- rosewood pegs, steel rod, Wittner tp	3000
Vincenzo Postiglioni (Naples, Italy)	—	Complete- all ebony- steel endpin	2920
Contemporary (USA)	—	Complete- steel endpin. rosewood pegs & tp, 4 tuners	2870
Contemporary (USA)	—	Complete- steel endpin, all ebony	3050
Contemporary (USA)	—	Complete- steel endpin, mtn mahog. pegs, boxwood tp	2920
Contemporary (USA)	—	Complete- all ebony, steel endpin	2610
Contemporary (USA)	—	Complete	3156

**CONCLUSION**

Collection of weight data on violin/viola/cello of various ages and nationalities helps to set limits for screening instruments that are too heavy or too light. The data show that it is possible for contemporary makers to construct instruments that weigh roughly within the range set by classic old European instruments. Additional work is needed on the problem of wood density, especially for older fine instruments that are unusually light but meet high performance standards.

**REFERENCES**

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- [2] Jansson, E., 2002, Acoustics for violin and guitar makers (4<sup>th</sup> Ed.): KTH, Stockholm, available on web at <http://www.speech.kth.se/music/acviguit4/index.html>