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Old violins or new: which do players prefer?

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Most violinists believe that the instruments of Stradivari and Guarneri 'del Gesu' are tonally superior to other violins – and to new violins in particular. Many mechanical and acoustical factors have been proposed to account for this. However, the fundamental premise of tonal superiority has not yet been properly investigated. We therefore designed a playing test in which 21 experienced violinists each compared three violins by Stradivari and Guarneri 'del Gesu' with three high quality new instruments, under double-blind conditions in a room with relatively dry acoustics. We found that (1) the most-preferred violin was new and the least-preferred was by Stradivari; (2) there was very little correlation between an instrument's age and monetary value and its perceived quality, and (3) most players seemed unable to tell whether their most-preferred instrument was new or old. These results present a striking challenge to conventional wisdom. Differences in taste among individual players along with differences in playing qualities among individual instruments appear more important than any general differences between new and old violins.

1 Introduction

Almost all well-known violin soloists since the early 1800s have chosen to play instruments by Antonio Stradivari or Giuseppe Guarneri 'del Gesu,' the two most celebrated craftsmen of the so-called Golden Age of violin-making (c.1550 – c.1750). A long-standing goal of violin research has been to correlate the playing qualities of these instruments with specific attributes of their physical structure and dynamic behavior. Many sophisticated measurement tools have been used to study a broad range of violins [1], contributing greatly to our understanding of how the instrument works at a physical level. Though correlations between violin acoustics and perception have been attempted [2] it remains true that "*no* [objectively measurable] *specification which successfully defines even coarse divisions in instrument quality is known* (author's italics)" [3]. Stradivari and Guarneri 'del Gesu' may well be the greatest violin makers ever, but it takes an expert opinion based on visual and historical (rather than tonal) evidence to say whether a particular example is genuine. Playing and listening tests *never* enter the authentication process, and this suggests the difficulty of reliably rating playing qualities – and that they may not correlate well with an instrument's age and maker.

Weinreich [3] argues that any experienced player can classify a violin as 'student,' 'decent professional,' or 'fine solo' instrument; furthermore, "the judgment would not take more than about 30 s, and the opinions of different violinists would coincide absolutely." According to Langhoff [4], "any musician will tell you immediately whether an instrument he is playing on is an antique instrument or a modern one." Neither of these hypothetical statements has yet been tested, and apart from recent preliminary results [5], the research literature contains no well-controlled studies on how violinists rate violins, or whether they can distinguish old Italian violins from old French or new American violins *by their playing qualities alone*.

Could a violinist's preference for a Stradivari violin – and indeed, the pleasure he or she experiences in playing it – be in part attributable to an awareness of its multi-million dollar price tag and historical importance, both of which may be signalled by its distinctive appearance? Conversely, could the experience of playing a new violin be negatively affected by the belief that it is still centuries from tonal maturity? To avoid any such biases, we tested player preferences under double-blind conditions, using high-quality new violins together with distinguished 'old Italians.'

2 Methodology

2.1 Set of violins

The experiment took advantage of the fine violinists, violin-makers, and violins gathered for the 8th International Violin Competition of Indianapolis (IVCI) in September 2010. Six instruments were assembled – three new and three old. The new violins (N1, N2 and N3) were each by a different maker, and were between several days and several years old. The old violins consisted of one by Guarneri 'del Gesu' (c.1740) and two by Antonio Stradivari (c.1700, c.1715). These were loaned with the stipulation that they remain in the condition in which we received them (precluding any tonal adjustments, or even changing the strings), and that their identity remain confidential (hence the very general descriptions that follow). The earlier Stradivari (O1) was once the principal instrument of a well-known 20th Century violinist, and currently belongs to an institution that loans it to gifted violinists. It came to us from a soloist who had used it for numerous concerts and several commercial recordings in recent years. The later Stradivari (O3) is from the maker's 'Golden Period,' and has been used by a number of well-known violinists for concerts and recordings. The Guarneri 'del Gesu' (O2) is from the maker's late period, during which he made some of his most celebrated violins. The combined value of the old violins is approximately $10 million – roughly 100 times that of the new.

2.2 Participants

21 subjects took part in the study. Many of them were involved with the IVCI, as contestants (four), jury members (two), or members of the Indianapolis Symphony. Nineteen described themselves as professionals, ten had advanced degrees in music, and two were later chosen as competition laureates. The subjects ranged in age from 20 to 65 years, had played violin for 15 to 61 years, and owned violins between 3 and 328 years old, with approximate values from $1.8K (US) to $10M.

Numbers of subjects and instruments were small, it being difficult to persuade the owners of fragile, enormously valuable old violins to release them for extended periods into the hands of blind-folded strangers.

2.3 Venue

Most violinists prefer to try out violins in a room with relatively dry acoustics, where the direct sound from the instrument is not so much colored by room reflections. The

experiment was therefore conducted in a hotel room whose acoustics seemed well-suited to the task.

2.4 Procedure

Subjects were scheduled for individual, one-hour sessions. Throughout the sessions, subjects wore modified welders' goggles, which together with much-reduced ambient lighting made it impossible to identify instruments by eye. To mask any distinctive smells, a dab of scent was put under the chinrest of each violin. To preserve double-blind conditions, violins were passed from behind a cloth screen, which divided the room in two, to a researcher wearing goggles, who laid them on a bed in the order received. When trying out instruments, violinists typically use their own bows, which through constant use have become, in effect, extensions of their bow arms. In light of this, we asked subjects to bring their own bows. For the four who did not, a single good quality bow was provided.

Player preferences under two sets of conditions were explored. Only the second set will be presented here, the results of the other set being available in [6]. This set, designed to maximize ecological validity, emulated the way players choose instruments at a violin shop, where they typically try a selection of instruments before selecting one to take home for further testing. All six test instruments were laid out in random order on the bed. Subjects were then given 20 minutes to choose (1) the single instrument they would "most like to take home with them," and (2) the instruments they considered "best" and "worst" in each of four categories: *range of tone colors, projection, playability*, and *response*. These terms, all commonly used by players when evaluating instruments, were left undefined. If a term lacked clear meaning for a subject, he/she was told to not choose in that category. When making the best/worst selections, equal ranking between instruments was permitted (i.e., several could tie for best or worst), as was refraining from choosing. Subjects were free to play the instruments in any order, and in any manner they saw fit, including switching back and forth among them. They were also encouraged to comment out loud about the instruments and selection process.

3 Results

Figure 1 shows how often each violin was chosen as take-home choice (purple bar), and then as best or worst in four categories. Eight subjects voluntarily identified their least favourite instruments; these are shown in black beneath the *take-home* bar. Eight subjects had difficulty deciding which of two violins to take home: the times a violin was a *close 2nd* is shown above the *take-home* bar in light purple.

A single new instrument, N2, stands out as the most preferred: it was chosen eight times as *take-home,* three times as *close 2nd,* never as *least-favourite*, and just three times as worst-in-a-category. By contrast, O1 (c.1700 Stradivari) was chosen once as *take-home,* once as *close 2nd,* six times as *least-favourite*, and 16 times as worst-in-a-category.

While each violin was the take-home choice of at least one subject, four violins were also the *least-favourite* for at least one subject. This wide divergence in individual taste carries through into the four categories: With the notable exception of N2's projection, along with N3's and O3's playability, each instrument was chosen as best *and* worst at least once in each category.

The participants' spontaneous comments offer further evidence of a divergence in tastes. Appendix 1 lists the positive and negative comments made by players about each instrument. Most of the instruments received contradictory comments – and not just from pairs of players with differing tastes, but rather from groups of apparently like-minded players. For example, 4 players agreed that O3 was a bit nasal, while 6 agreed that it had a great sound.

What drives the subjects' choices? There is evidently some link between the take-home choice and the four criteria, since the take-home violin for each subject was selected as best for at least one criterion (Table 1). Moreover, the take-home choice was the highest-scored violin for all but four subjects, for whom there was clearly a trade-off among the four qualities.

Appendix 2 summarizes the reasons players gave to explain their choice of take-home instruments. The language used justifies a posteriori the four categories chosen by the authors. It also suggests that 'balance/evenness' and 'comfort' should be added to these four. It is interesting that players seem to agree on the qualities they are looking for in a violin, though not on which violins possess these qualities!

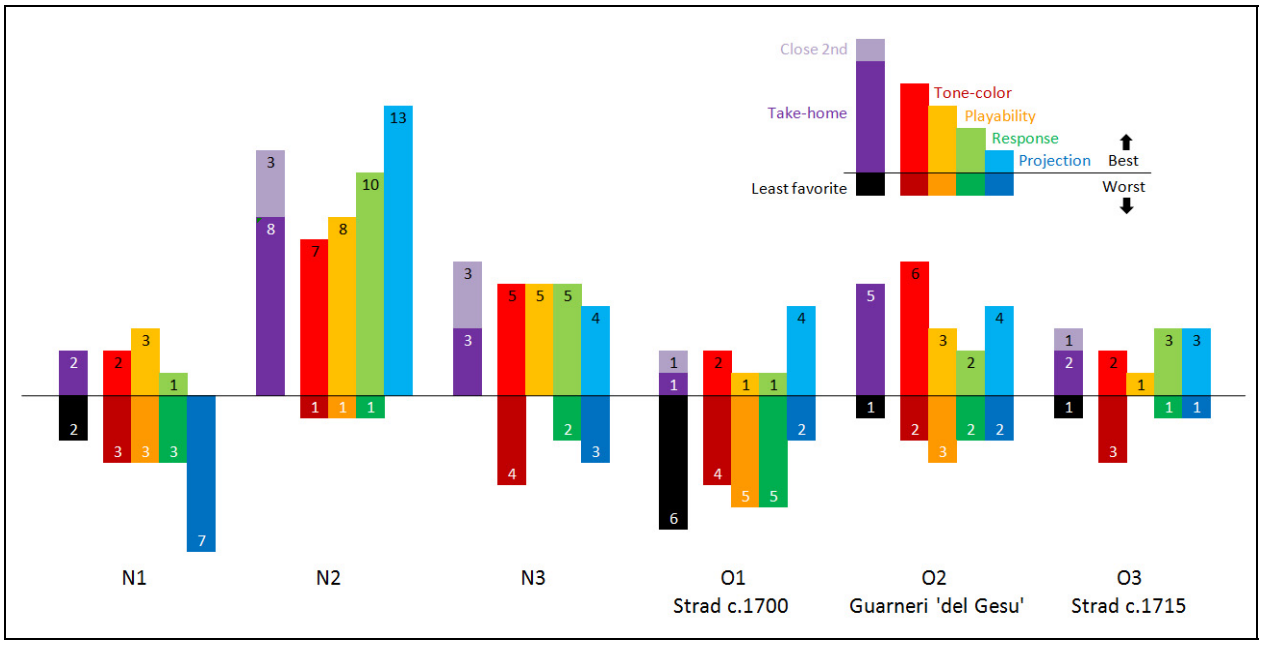

Figure 1: number of times each violin was selected for "take-home" (purple), and then as best or worst in each of 4 categories. Also shown are volunteered selections for "close 2nd" (light purple) and "least-preferred" (black).

Table 1: Number of subjects for whom the take-home violin was rated as best for a given number of criteria (between 0 and 4) [* Subject could not complete the task related to the four criteria.]

Number of criteria	4	3	2	1	0
Number of subjects	6	7	4	3	1*

Just 8 of 21 subjects (38.1%) chose an old violin to take home. Given the small sample size, this disinclination toward the old cannot be confidently inferred to experienced violinists in general (CI [18.1%; 61.6%]). Still, the upper limit for the CI is not high; moreover, the fact that a new violin was chosen over examples by Stradivari and Guarneri 'del Gesu' by 13 experienced violinists (including both jury members, who compared N2 and N3 favourably with their own Stradivari and Guarneri 'del Gesu' violins) stands as a bracing counter-example to conventional wisdom.

Can violinists tell new violins from old by their playing qualities alone? Table 2 shows that subjects rated new violins significantly more highly ($p < .02$) than old for playability and response, but no significant difference was seen for projection ($p=.62$) and tone colours ($p=.08$), so that uncertainty remains.

Table 2: Test for the equality of the means of the New and Old violins

	Effect	*t* (20 df)	*p*	95% CI
Playability	0.33	3.62	.002	[0.14 ; 0.53]
Projection	0.06	0.51	.618	[-0.20 ; 0.33]
Colours	0.19	1.87	.076	[-0.02 ; 0.40]
Response	0.27	2.58	.018	[0.05 ; 0.49]

We avoided questioning players directly about the age of instruments, believing they would be reluctant to answer questions which (unlike those concerning subjective preferences) could be gotten wrong. That said, at the end of each session players were (time permitting) informally invited to guess the "making-school" of their take-home instruments. We got 16 responses. Seven players said (in effect) they had no idea as to whether their take-home instrument was new or old. 9 players did hazard a guess, and along with these guesses, there were 12 unsolicited guesses made by various players during their sessions about various instruments (see Appendix 3). However, three of the guesses were ambivalent and so we had a total of 18 guesses as to whether individual violins were old or new. Ten were wrong and 8 were correct. In light of this, Langhoff's assertion [4] becomes difficult to sustain, as does the case for special playing qualities unique to old Italian violins.

Table 3: Guesses (solicited and spontaneous) about the age of each violin

	N1	N2	N3	O1	O2	O3
Right guess	1	2			4	
Wrong guess	2	4	2	1	1	1

The two most-preferred violins (N2 & O2) were for obvious reasons the most often guessed about (6 & 5 times respectively. Interestingly, both were thought to be old more often than new (4:2 times for N2, and 4:1 for O2), For N2, these guesses were of course incorrect. This suggests that players tended to assume (or hope, as did participant 7!) that instruments they liked were old. It also suggests why O1 (the least-preferred violin), was guessed to be new once, and then French (rather than Italian) in two other guesses. While sample sizes are too small to draw

conclusions, this apparent reluctance to attribute bad playing qualities to old Italian violins – or good playing qualities to new violins – underscores the importance of blind-testing in this field.

4 Conclusion

This double-blind experiment is the first to study player (rather than listener) preferences using new violins alongside distinguished old Italians. A preference for new violins was seen under two distinctly different sets of conditions. Under both sets, one particular Stradivari was the least-preferred instrument; under the second, a single new violin emerged as most-preferred. Subjects seemed not to distinguish between new violins and old, but rather to choose instruments whose playing qualities best fit their individual tastes.

Subjects seemed to agree on the qualities they look for in a violin: it should be responsive and easy to play; have good projection and a wide range of tone colors; be even and well-balanced tonally, and they should find it comfortable to play. However, they seemed not to agree on which particular instruments embodied which particular qualities. Clearly, there is little reason to look for physical measurements that correlate with individual playing qualities unless players can generally agree about the presence or absence of these qualities in the instruments to be measured. However, interesting information might be obtained by a closer look at the comments made by players. For instance, O3 was considered "nasal" by some players. Did their particular playing styles make the instrument sound nasal (meaning it would sound that way to an audience as well), or was it that the instrument's intrinsic sound quality (if such a thing exists) is heard as nasal by some, and not by others?

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Appendix 1

Some comments (positive in the left column and negative in the right column) made by participants that illustrate the divergence in their tastes.

Violin N1

Playability	
playable x2	can't control difficult to play
Projection, loudness, power	
it projects good projection on E-string	small doesn't project much a little more in a little muted
Sound quality	
interesting color complex sound very bright sweet x2 soft dark G-string rich	slightly nasal not clear x2 don't like the quality when played softly not completely focused no crystalline/penetrating quality high up on the D
Response	
some potential très libéré	not as responsive as the others x2

Violin O1

Playability	
it's easy to play good playability, very easy	definitely the hardest one to play very hard to play for me doesn't feel comfortable to play recalcitrant to speak
Projection, loudness, power	
good projection but not as harsh as N2 it's not muted but not shrill either ca peut projeter	sounds more in, doesn't project both registers are very muffled it feels a bit more close somehow. I don't feel like it will project in a hall
Sound quality	
a very sweet sound nice open sound the sound may be of good quality easy to get clarity, on the E-string specially	To my ear, it's bright It's very bright, doesn't have a depth, doesn't have a round ring. Une certaine opacité ; toutes les notes n'ont pas

not a bad sound good G- and E-strings the G is also bold but Good resonance. Good full body	d'harmoniques dark, fuzzy I don't like the A-string A bit nasal on the A x2 A bit nasal x 2
Evenness	
Very even	Very uneven which drives me crazy.

Violin O3

Sound quality	
Different quality than the others by far Opens up in the upper register Good quality of sound especially in the low range Has a pure kind of sound. Much more open than O2 too. A bit better than N2. Has a richer sound than N3 I can play soft up there (high E-string) and that's super cool. It's clear Interesting sound x2 It draws me in. I just love the sound, J'aime bien la couleur, très ouvert O3 has more of a richness and depth in the sound than N2 This one has really resonance, depth of sound and clarity Very crystalline, focused sound, rich	it's a bit nasal Quite nasal to my ear D and A are a bit nasal: this is my first impression but the more I play it, the less I hear this nasality it has a little nasal sound toujours des notes qui n'ont pas les harmoniques = une opacité sur certaines notes the E-string is not that good, the top is lacking.

Appendix 2

The reasons for the participants' preferences:

Projection, power:

It projects x3 / Good projection / Il a de la puissance / Powerful and projecting / Has probably the best projection / Very powerful / Sounds good under the ear but should carries as well

Timbre, sound quality:

Sweet sound x3 / Nice timbre / Quality of sound / Great sound / Interesting sound / Beautiful tone / Un timbre spécifique pour chaque corde / Has colors /Richesse de couleurs / It has many colors that I can adjust / Colors are complex / More subtleties, more colors / Good complex quality of sound / Richer sound / Son très ouvert / Has a real openess / Nice open sound /More open / Bcp d'harmoniques / Nice overtones / Nice color: the G string is dark enough, the E string is bright / It has the right amount of brightness but is at the same time dark / Nice dark quality / It's focused / There is warmth / A character to the sound / Combination of being warm but punch to the end / Warm and deep sound in the low register; it sings in the high register

Playability:

Le son part tout seul / Très facile à jouer / Straightfoward / Easy to play x3 / Very playable / The sounds opens up mithout much pressure / It's the easiest to control

Response:

Quick response / Fast response / Every note speaks like crazy: I can really dig into the F string / It plays nicely quickly, it responds well
Versatile / Changeability / Some potential
It vibrates, it's alive

Balance, evenness:

Consistent sound / Even (across the strings) x4 / No dead spot / You don't drop a few dB as you go along the strings

Comfort:

Comfortable x3 / Set up is right for me / Fits my hands very well / It feels good x3 / Physically feels good / Like the feeling

Appendix 3

Participants' comments about the age of the violins are given below. Solicited guesses about the making-school of take-home instruments are printed in bold. The other comments were made spontaneously.

[S2]: I have a bias to modern instruments**. My guess is that N3 is a modern instrument**. O2 is older.

[S3]: O1: French school, which is not appealing to me[1]

[S4]: **I think that O2 is maybe a Guarneri because of the dark color**. But I don't know for sure, it's just a guess. O3 feels like new. N2 feels new and raw.

[S7]: [about N2] **I hope it's an Italian!** [2]

[S8] - [S10] - [S11] - [S14] - [S15] - [S18]: No clue.

[S9]: No idea because I can't see!

[S12]: N2: something from a Guarnerius. But I can't say it's age ... [a few min later] **To my mind, it's nevertheless a modern instrument.**

[S16]: **O2 could be a Strad**. And N2 could be a del Gesu.

[S17]: **N2 is old** and O2 feels like a new instrument. O1 sounds like a French instrument, from 1800-1840[3]. N1 feels like a new instrument.

[S19]: **N3, I think it's an old Italian violin**, and N2 too.

[S20]: O1 definitely sounds like a modern violin because it's very bright, doesn't have a depth, doesn't have a round ring. N1 sounds like an old rare violin. **O2 is an old violin** and N2 is old too.

[S21]: **N1 is an old Italian violin, or not?**

[1] The player has not specified the period so this answer was not considered.

[2] This is ambivalent so was not taken into account.

[3] The way it is phrased, it is a subjective opinion about the kind of sound, not a guess about the age or making school, so it was omitted too.