Old Italian versus new violins: the soloists' perspective

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Many researchers have sought explanations for the purported tonal superiority of Old Italian violins by investigating varnish and wood properties, plate tuning systems, and the spectral balance of the radiated sound. Nevertheless, the fundamental premise of tonal superiority has been investigated scientifically only once (1), and results showed a general preference for new violins, and that players were unable to reliably distinguish new violins from old. The study was however relatively small in terms of the number of violins tested (six), the time allotted to each player (an hour), and the size of the test space (a hotel room). In this study 10 renowned soloists each blind-tested six Old Italian violins (including five by Stradivari) and six new during two 1h15 sessions – the first in a rehearsal room, the second in a 300-seat concert hall. When asked to choose a violin to replace their own for a hypothetical concert tour, six of the ten soloists chose a new instrument. A single new violin was easily the most-preferred of the 12. On average, soloists rated their favorite new violins more highly than their favorite old for playability, articulation, and projection, and at least equal to old in terms of timbre. Soloists failed to distinguish new from old at better than chance levels. These results confirm and extend those of the earlier study, and present a striking challenge to near-canonical beliefs about Old Italian violins.

1 Introduction

The violins of Stradivari, Guarneri 'del Gesu,' and other Italian makers of the 17th & 18th centuries are widely believed to possess playing qualities that are both immediately discernable to experienced players and not found in new instruments. Over the past two centuries, numerous playing and listening tests have challenged this belief by pitting new violins against old [1, 2, 3]. Though results often favored new instruments, the tests typically lacked sufficient rigor for the results to stand as scientific evidence.

It is only recently that well controlled studies of player-preference have appeared in the literature [4, 5, 6]. In a 2010 double-blind test held in a hotel room at the International Violin Competition of Indianapolis [4], 21 experienced violinists compared three new violins with two by Stradivari and one by Guarneri 'del Gesu.' Results showed that the most-preferred violin was new, the least-preferred was by Stradivari, and players seemed unable to tell whether their most-preferred instrument was new or old. However, the small number of violins and brief evaluation periods (less than an hour for each player) left many questions unanswered, the most obvious being whether results would hold with a larger set of test violins, a different group of players, longer evaluation periods, and more true-to-life test conditions.

The current study was designed to re-test the Indianapolis findings with a larger number of violins, and then explore how well judgments carry from a small venue to a larger one. Where the Indianapolis study relied on 21 players of various levels, this study concentrated on the judgments of 10 renowned soloists. Blind tests were conducted in both a small rehearsal room and a concert hall, with the option of piano accompaniment and listener feedback in the latter.

2 Materials and methods

2.1 The team

Though it is unusual to describe the team, given the nature of this experiment we believe it important to provide some details. Designing an ecologically valid experiment that answers questions relevant to the violin world requires a variety of experts with differing interests. The team thus included several scientists, a violin maker and researcher who builds and sells new violins, a violin soloist who owns and plays an Old Italian violin, a professional violist and

instrument dealer who owns several old Italian instruments, and a string engineer and amateur violinist who owns and plays an Old Italian violin.

2.2 General design

The experiment was designed around the hypothetical premise that each soloist was looking for a violin to replace his or her own instrument for an upcoming solo tour. Tests were structured to emulate as far as possible the way a player might do this in real-life. Typically, a number of instruments are informally tested at a violin shop, then one or more are taken away for testing in other contexts – almost certainly including a concert hall, with one or more colleagues present to give feedback. We decided to allow the soloists the greatest possible freedom to test instruments as each saw fit, believing this would give the most meaningful results – as opposed to standardizing interactions between players and test instruments (e.g., by requiring players to spend the same amount of time with each instrument, or to play the same musical excerpts on each), which would however have the advantage of eliminating some variables.

We believed that 12 violins (6 old, 6 new) would allow a nice variety of instruments, yet still be manageable for the players. In a real-life situation, players would rarely be presented with so many instruments at once, but in the authors' experience, players tend to quickly eliminate instruments they find unsuitable, then spend more time on those that seem a better fit. We polled nine soloists (by means of a questionnaire sent prior to the experiment) about the time needed to comfortably evaluate instruments within the context of the experiment (i.e., choosing from among 12 violins a replacement for their own for an upcoming tour). Their average estimate was 50 minutes, with a standard deviation of 30 minutes.

In light of this, each soloist was scheduled for a pair of 1:15 hour sessions, each held on a different day in a different venue (see section 2.4). Before each session they were given written instructions. After their first session they were interviewed; after the second they answered a brief questionnaire.

When testing violins in real life, players typically use their own bows, which through constant use have become, in effect, extensions of their right arms [5]. We therefore asked the soloists to use the bow they normally played, and to use that same bow throughout the study. We are aware that the choice of bow may affect the perceived quality of a violin, and so introduce an unconstrained variable - but so

too would asking all players to use a single, unfamiliar bow. To facilitate testing, we provided players who used shoulder rests with additional ones of the same model.

During both sessions, soloists wore modified welders' goggles, which together with much-reduced ambient lighting made it impossible to identify instruments by eye. The fact that the new violins had been antiqued helped eliminate any tactile clues to age, such as unworn corners and edges. It was proposed that a dab of scent be placed under the chinrest of each violin in order to mask any distinctive smells. This idea was, however, deemed unacceptable by those responsible for the condition of the old violins, who felt the essential oil might possibly infiltrate the varnish. However, no distinctive smells were detected by the authors, nor were any reported by participants.

Two of the authors (CF, IW) were present during the sessions; they made notes of the subjects' comments, but responded only to confirm what had been said, and to move players from one task to the next. The researchers were seated behind the players, and in any case were scarcely visible to subjects, given the dim light and goggles. A large, back-lit timer helped participants keep track of the time.

2.3   Tests instruments

A pool of 15 new and 9 Old Italian violins was assembled by the authors. The new violins (none of which were used in the Indianapolois experiment) were built by professional makers in Europe and North America, and were between several days and two decades old.

Old violins in the pool included two by Guarneri 'del Gesu' (both made after 1740), six by Stradivari, and one by another well-known 18th century Italian master. None of these violins belonged to or were played by the invited soloists. All were loaned on condition that their identity remain confidential, hence the very general descriptions used throughout this paper. It was assumed that the parties who loaned instruments had an interest in them sounding their best, and so had them set up and adjusted accordingly. All violins were therefore kept in the exact condition in which they were received. This condition was monitored throughout the study by separate "guardians" – JC for new violins, and TG for old.

Before the actual experiment, xix old and six new violins were selected from the pool by means of informal blind tests designed to eliminate instruments with the least impressive playing qualities. Just which instruments were included in the final twelve was not revealed to the makers, dealers, collectors, and players who submitted them. None of the test instruments were unusual in terms of size, proportions, or set-up. While not all had the same strings, all had very typical combinations of a steel E-string and metal-wound synthetic-core lower strings.

2.4   Venues

The experiment took place at two locations, both on the outskirts of Paris, France. The first was the home of a family of professional string players. The room used was one favored for rehearsals and individual practice. The second was a 300 seat concert hall (Auditorium Coeur de Ville, Vincennes), well-regarded for its acoustics. An acoustically transparent screen was installed between the stage and the seats, where a small, varying audience included at times soloists not currently involved in a test, authors other than CF and IW, and a few interested outsiders.

2.5   Violinists

Where the Indianapolis study involved players of varying levels, including soloists, orchestral players, and amateurs, this study involved only soloists. Though the preferences of players at all levels is potentially interesting, those of soloists were felt to be most important for our purposes due to their high playing standards under widely varying conditions, and their (typically) broad experience playing top-quality violins. We also considered the common belief that it takes a top player to "get the most" out of an instrument, especially in terms of projection. And there is the fact that the real-life choices of soloists have been very important in forming the reputation of individual violin-makers, past and present. To give the experiment maximum credibility, we tried to choose internationally known soloists and/or those who had won major international competitions.

Time constraints limited the number of players we could work with. The old instruments were available for just a few days, and the auditorium for a day and a half. Considering the estimated time (50 minutes on average: see section 2.2) required by soloists to choose a single favorite violin from a set of twelve, we judged that giving more time to fewer players would lead to more reliable judgments than would the converse.

In the end, ten soloists were invited. Ranging in age from 20 to 62, they were awarded major prizes at different international competitions. While ten soloists may seem a relatively small number, it should be remembered that the world population of players at this level is not large – indeed the combined number of first-prizes awarded in the above competitions in the past 50 years is about 90. Given our selection process, however, the ten soloists can hardly be regarded as a random sampling of this population, and we have no information on how and to what extent they might differ from it. Consequently, in this paper we consider those ten individuals as our population of interest, and limit ourselves to descriptive statistics (i.e. avoiding confidence intervals and significance tests). Two of the soloists regularly play new instruments, but have in the past played extensively on violins by Stradivari and/or Guarneri 'del Gesu.' A third soloist, who owns and performs on both a Guarneri 'del Gesu' and new violins, came to the experiment with a new instrument. The other seven soloists play old violins – including instruments by Carlo Bergonzi, Gagliano, Gobetti, Guarneri 'del Gesu', Storioni, and Vuillaume.

Soloists were given no information about the test instruments, though the publicity generated by the Indianapolis study [4] may well have led them to expect a comparison between new and old.

2.6   Detailed procedure

In Session 1, all twelve instruments were laid out in random order on a table. In the authors' experience, when players test violins they tend to quickly eliminate those they find unsuitable, and then spend more time with those that seem a better fit. Soloists were therefore given 50 minutes to test the instruments as they wished, with the goal of

(1) removing any violins that seemed unsuitable; and (2) choosing the four they liked most, and then arranging these in order of preference. As a reference, and to get a sense of the space, they were instructed to play their own violins first, and then anytime it seemed useful thereafter.

For the last 12 minutes of the session, they were presented with three violins. One was their own. One was their chosen favorite. The other was (unbeknownst to them) their most-favored of the opposite new/old category to their favorite. As one player's top-four were all from the same category, he was given his two most-favored violins. The soloists were then given 30 seconds to rate each instrument (beginning with their own) on a (continuous) scale from 0 to10 for (1) loudness under the ear; (2) estimated projection; (3) playability; (4) tone quality; (5) articulation/clarity, and (6) overall preference/quality.

These terms, all commonly used by players when evaluating instruments, were left undefined. Note that unlike the other criteria, loudness under the ear is not necessarily a positive attribute for all players. Note too that while projection can by definition be judged only by a distant listener, players routinely estimate projection when testing a violin – and typically acknowledge (as did many of our subjects) the provisional nature of such estimates, and the need to retest in a large hall with trusted listeners. However, this portion of the study was designed to test the subjective preferences of the subjects under a specific set of conditions, rather than objective qualities of the instruments themselves.

We were interested in how choices made in the rehearsal room carried through into the concert hall, and so all violins (including those rejected in Session 1) were presented again in Session 2, though now divided into three groups: the four favorites (in random order); those rejected during Session 1; and any remaining instruments. It was hoped this would best enable soloists to build upon earlier impressions, as they would in real-life tests. While their first task was identical to that in the previous session, they had 45 minutes this time, and the option to: i) ask for feedback from a designated listener chosen before the session – for example, a friend or colleague, HB, another soloist who had already taken the test, or somebody else from the audience; ii) ask HB (who wore goggles) to play a violin for them, while they listened from anywhere in the hall; iii) ask the professional pianist (available at all times) to accompany them or HB for any of the violin/piano excerpts in the portfolio (Franck Sonata: 2nd Mvt, Beethoven Kreutzer Sonata: 3rd Mvt and Brahms Sonata 1:1st Mvt).

During the course of the experiment, nine participants used the piano accompaniment, five asked for listener feedback, and three asked HB to play for them. As in the previous session, soloists were then given 12 minutes to evaluate their favorite violin, their most-favored of the opposite new/old category, and their own instrument, using the same six criteria. Next they were presented with a series of violins (one at a time, in random order), and given 30 seconds to play each one before guessing what kind of instrument it was. If a soloist was unclear about the meaning of the question, he/she was prompted to guess whether the violin was new or old. The series consisted of: i) that player's favorite old violin; ii) the player's favorite new violin; iii)An old and a new violin the player found unsuitable; iv) the old violin and the new violin that on Day 1 were most often included in top-four lists, and that were on

average most highly ranked within those lists; v) the old and the new violin that were most often rejected as unsuitable on Day 1. If it happened that two of the above criteria described the same instrument, the player was simply given one less instrument to judge.

3 Results and discussion

3.1 Favorite and rejected violins

Soloists are (almost by definition) individualists, so it is hardly surprising they do not all have the same taste in violins. In this study a large inter-individual variability in preferences was indeed observed, and this is consistent with the results of previous studies [4, 5, 6].

Figure 1 shows how often each violin appeared on a soloist's top-four list, where on that list it appeared, and how often it was rejected as unsuitable. Five of the 12 test instruments were the top-choice for at least one player; 10 were included in at least one top-four list, and all 12 violins were rejected by at least two players. It should be borne in mind that soloists spent very little time with rejected instruments, instead focusing on their favorites. About all that can be said of the least-preferred instruments is that they made a poor first impression on the majority of players.
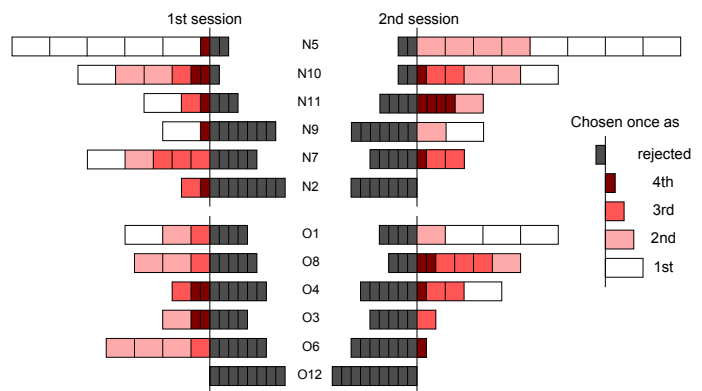

Figure 1: For each session, the number of times each violin was chosen as 1st, 2nd, 3rd and 4th on a soloists top-four list, and the number of times it was rejected.

Preference scores were assigned to each instrument as follows: four points each time it was first on a top-four list, three points for 2nd, two points for 3rd, and one for 4th. A point was subtracted each time it was rejected. No point was assigned if it was an intermediate violin, i.e. neither rejected nor in the top-four list. By design, the soloists built on experience gained during Session 1 to arrive at their final choices in Session 2. Here a single new instrument, N5, was easily the most-preferred. It was the top-choice for four soloists, 2nd-choice for another four, and rejected just twice, garnering a total of 26 points. Next came N10, the top-choice for just one soloist. Third was O1, a Golden Period Stradivari. Though it was top-choice for three soloists and 2nd-choice for one, it was also rejected four times. At the other end of the scale we see N2 and O12, a new violin and a Stradivari.

Other scoring systems produce slightly different rankings. For example, if rejections are ignored, or if top-choice instruments alone are considered, O1 moves up to second place, and N10 (which is on average more

popular) moves down to third. O8 seems to appeal to many players, but is never a top-choice. By contrast, O4 and N9 are the top-choice of one soloist each, but are also rather frequently rejected. Still, if a "successful" violin is defined as one that a soloist would use on a concert tour, both O4 and N9 are successful instruments. Their appeal, however, seems rather narrower than that of N5 and O1.

Summing the scores for new and old separately, we get 35 and 4 respectively – almost 6:1 in favor of the new. If rejections are ignored, this changes to 62 and 38, or about 3:2 in favor of the new. Ignoring all but the four top-choice violins, it is 24 and 16 – again 3:2 in favor of the new. We can find no plausible scoring system by which the old fare any better than this.

3.2   Evaluation by specific criteria

Figure 2 shows the ratings (on a 0-10 scale, averaged over 10 soloists) for each of six criteria: overall quality, articulation, timbre, playability, projection, and loudness under the ear. Each soloist rated their own instrument, their chosen-favorite, and their favorite of the opposite new/old category. In Session 1, 11 ratings are for new violins, and 9 for old, since one player's top-four list contained only new violins. In Session 2, 10 ratings are for new, and 10 for old. On average, the ratings given to test violins are similar
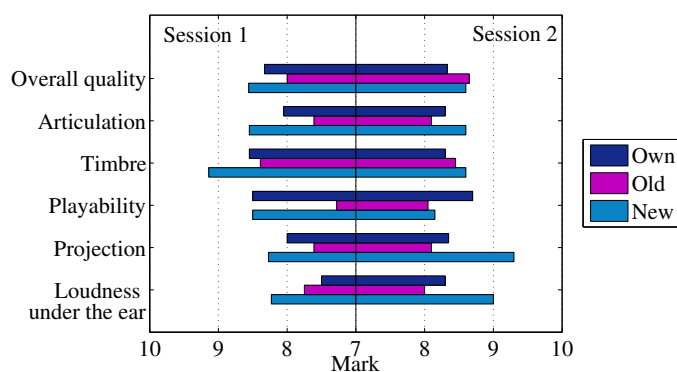

Figure 2: Averaged ratings for each criterion for each
category of violin (new, old, own).

to those given to the soloists' own, suggesting the two groups are similar in terms of their playing qualities. In both sessions the soloists rate new violins more highly than their own for all criteria except playability. While old violins are rated much lower than both new and soloists-own in Session 1, they almost catch up to the soloists-own in Session 2. Keep in mind, however, that for these averaged ratings, (1) each violin was evaluated by a somewhat different group of soloists in Sessions 1 & 2, and (2) inter-session differences may also be attributable to one or more of the factors mentioned in the previous section.

That said, the improved ratings, in particular for playability, for old violins in Session 2 could be taken as support for a commonly-held belief that it takes more time to learn to play an old violin than a new one, or it may be that player judgments are affected by the change from rehearsal room to concert hall – positively for old violins and negatively for new. More evidence would be needed to make a case for either of the above explanations. Easier to understand are the higher playability ratings soloists give

their own violins in both sessions: they have played these instruments for years, and the test violins for some fraction of two hours. Old Italian violins are commonly believed to project better in a hall than new ones, despite seeming less loud under the ear. Figure 2 shows that the soloists do indeed rate the old lower than the new for loudness-under-the-ear, but they also rate them lower for projection.   (This of course says nothing about actual projection, as evaluated by listeners).

It is widely believed that new violins may be louder than old ones, but at the expense of tone quality. Our data shows that while the new violins are indeed more highly rated for loudness-under-the-ear and projection, they are also rated equal to or better than the old for timbre. Their perceived advantage in the former two criteria seems to account for the overall preference for new violins, as both categories are rated quite equally on the other criteria.

Critics of the Indianapolis experiment voiced the importance of testing violins in a large space, where the (supposedly) superior projection of Old Italian violins would become evident.   While these old and new violins (all of which are favorites) are generally rated more highly for individual criteria during Session 2, the effect is slightly greater for the old violins, but the difference is too small to make a convincing case that Old Italians have any special advantage in the hall, especially since their averaged ratings were lower than new violins (see section 3.1).   Remember too that differences could be related to the other factors listed above.

A surprising result is that while old and new violins have similar ratings for overall quality, the old are on average lower for the other five criteria.   Looking at individual results, this can be explained by a single outlier: One soloist gave very high scores to his second-favourite violin (new) for all criteria except overall quality, which received a surprisingly low rating. We have no way knowing why, since a player's estimate of overall quality is not necessarily the simple average of our five criteria. For example, timbre may be especially important, or loudness under the ear may be a negative criteria.   There are also numerous factors outside our criteria that may affect a sense of overall quality, such as neck-thickness, bridge curvature, string heights, type of strings, or wolf notes. Still, if we ignore this player's data, the overall quality becomes higher for new violins (8.9) than for old (8.5), in total agreement with the averaged marks over the four positive criteria projection, playability, timbre and articulation (loudness-under-the-ear being potentially negative for some players) – 8.7 and 8.1 for new and old respectively.

It is interesting to put these results into perspective with responses to the question asked at the end of session 1: "In your experience, are there general differences in playing qualities between new and old violins?"Seven soloists responded that there are general differences; six of them believe that (in summary): i) New violins are easier to play, speak more easily or more immediately, and are more powerful and "direct" than old ones; ii) Old violins may not be powerful enough to play with a modern orchestra; iii) Old violins have more colors, personality, character, refinement, and are sweeter and mellower than new ones. The soloists' responses are in agreement with the averaged ratings for (i) and (ii), but not for (iii), at least not if the characteristics listed in (iii) can be considered aspects of timbre.

3.3 Old or new?

Each soloist was presented with a series of violins and, after playing each of them for 30 seconds, was asked to guess what kind of instrument it was. If the instrument was new, a correct guess was "modern," "new," or some similarly unambivalent attribution. If old, a correct answer was any that suggested the instrument was an Old Italian, regardless of whether it was attributed to the right maker (thus "Guarneri del Gesu" was considered correct for a Stradivari). Five answers (e.g. "19th Century French") were considered indeterminate.

The soloists played between 6 and 8 violins each, and made a total of 69 guesses – 33 of them about new violins, and 36 about old. Guesses are compiled in Figure 3 and summarized by category of instrument in Table 2. Considering all guesses about all instruments, 33 were wrong, 31 right, and 5 indeterminate. These guesses were rather evenly divided between old and new violins (36 and 33 respectively), so the data rather clearly demonstrate the inability of the players to reliably guess an instrument's age, whether the instrument is in fact new or old.
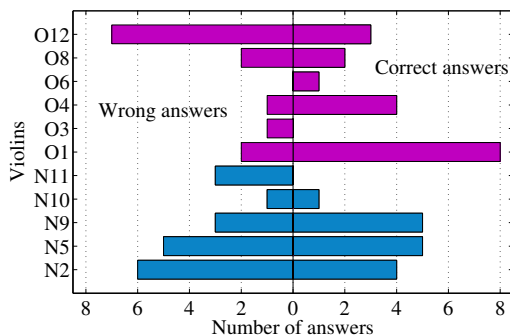

Figure 3: Soloists' guesses about the age of each test instrument. Five indeterminate guesses about old instruments are not represented here.

Table 1: Soloists' guesses about the age of old and new test instruments.

	Correct	Wrong	Indeterminate
New violins	15	18	
Old violins	18	13	5

4 Conclusions

The nominal premise of this study was that soloists choose from among six new and six Old Italian violins one that might plausibly replace their own violin for an upcoming tour. After evaluating the instruments first in a rehearsal room and then in a concert hall, six soloists chose new violins and four chose Stradivaris. A single new violin was chosen four times, a single Stradivari three times, and two new violins and a Stradivari once each.

Preference scores were assigned to each instrument based on its placement in top-four lists compiled by each soloist, and by how often the instrument was rejected as unsuitable. By this measure, new violins out-scored old by almost 6:1. If rejections are ignored, or if only the five violins that were

the favorite of at least one soloist are considered, the ratio drops to about 3:2. But no matter how results are tallied, it is clear that among these players (seven of whom regularly play Old Italian violins) and these instruments (five of which were made by Stradivari), there is an overall preference for the new.

Ratings for individual quality criteria suggest this preference is related mainly to better articulation, playability, and estimated projection – but without trade-offs in timbre. New violins were on average more highly rated for loudness-under-the-ear, and while this is not necessarily a positive attribute for all players, instruments more highly rated for loudness-under-the-ear were also more highly rated for (estimated) projection – an unquestionably positive criterion for soloists.

Soloists readily distinguished instruments they liked from those they did not, but were unable to tell old from new at better than chance levels. This emphatically confirms the findings of the Indianapolis experiment – and indeed many informal listening tests conducted over the years. There is no way of knowing the extent to which our test instruments (old or new) are representative of their kind, so results cannot be projected to the larger population of fine violins. But given the stature and experience of our soloists, continuing claims for the existence of playing qualities unique to Old Italian violins are strongly in need of empirical support.

Acknowledgments

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