An Analysis-Synthesis of the Pedagogical Literature on Intonation in Initial Learning of Violin and Viola: Pitch Contents, Teaching Approaches, and Auxiliary Resources

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Abstract

This work presents an analysis of the didactic literature for the initial learning of intonation on violin and viola. Analysis has been conducted through a document-analysis design of 86 methods. The chosen analytic categories were: (1) contents [number of pitches; sequence of pitches presentation]; (2) pedagogy [teaching approach; use of pizzicato]; and (3) auxiliary learning resources [written accompaniments; audio resources]. The results of the analysis allowed us to conclude that there is a great disparity in the number of pitches, which is reduced with the passage of time. Different sequences coexist in practically all the materials, and the traditional teaching approach occurs the most frequently in the documents analyzed. A homogeneous teaching approach is adopted in most of the documents, especially with the violin. Pizzicato is scarcely used as a didactic resource. There is a wide inclusion of written (accompaniments) and recorded (minus-one) auxiliary resources in the most modern documents. Based on these results, a methodological proposal for the initial learning of intonation on these instruments is presented.

Keywords: instrumental intonation, viola methods, violin methods, instrumental teaching, music education

Students beginning to learn the violin and viola must pay attention to many factors during their practice, especially in the first year of study, such as grasping and holding the instrument; holding and moving the bow; finger spacing and intonation (Macián-González & Tejada, 2018); and reading the score and associating it with motor movements. However, of all these skills, and together with rhythm and tone production, intonation is probably the most important factor when learning these instruments (Galamian, 2013). That is because intonation is a complex skill that encompasses perceptual aspects (such as pitch discrimination, or the ability to distinguish between two different sounds) and production aspects (such as pitch matching or the ability to reproduce a given pitch) (Morrison & Fyk, 2002). This imposes certain limitations on the aspects that can be dealt with in the first year of study, such as the number of pitches to be studied, derived from the scales suitable for starting out on the instrument (Hamann & Gillespie, 2004; Tasgal, 2004, Yampolsky, 1967).

The order of presentation of pitches is another important factor in the teaching of intonation on these instruments, which also involves the order of the strings to be studied. Other factors, such as the teaching approach (Mishra, 2000), the use of written accompaniment or the usefulness of including audio materials in the form of accompaniment (Laux, 2015; Springer et al., 2021; Zabanal, 2019), are often significant for teachers. This is the reason why the choice of a specific learning method is an important decision that has consequences when learning an instrument.The analysis of learning methods is a powerful guide for teaching, as they contain the praxis of important pedagogues of the instrument. The analysis carried out in this study may be of interest to researchers in these aspects, since there are few prior investigations concerned with these questions. This has been a conditioning factor that has limited the link between the bibliographic review of this study and the categories of analysis investigated. In this case, a review focused on aspects to be considered in teaching at initial levels has been carried out.

Considering all of this, the current study has three objectives: (1) to review some of the main contributions to the initial learning of the violin and viola through

an analysis of the related scientific and didactic literature; (2) to analyze the intonation-related contents, of the selected documents, including the sequence of sound presentation; and (3) to suggest a didactic proposal for intonation in the initial learning of these instruments.

Conceptions in Violin and Viola Learning

Shin'ichi Suzuki and Paul Rolland are two of the most renowned pedagogues of the 20th century in violin and viola teaching thanks to their transformation of teaching through their initiation methods, and their great influence can still be felt today (Sarch, 1996; Ships, 2014). Some of the most consequential contributions of the Suzuki method include the repetition of musical content for learning to occur (as occurs with the mother tongue), extrinsic motivation through parental accompaniment during learning, and the use of recordings of sound material for educational purposes (Thibeault, 2018). For his part, Rolland's method, perhaps influenced by the Gestalt principle that "the whole is more than the sum of its parts," sought to avoid tensions in movements through a conceptualization of practice and technique from a holistic body-instrument perspective (Fanelli, 2011; Kovacs, 2011; Meyer et al., 1983; Rolland, 1979).

Other well-accepted and established methods in current violin and viola didactics are those of Paul Herfurth, Samuel Appelbaum, and Müller-Rusch (see Appendices). However, their teaching approach has been described as atomistic (Kovacs, 2011), where each musical exercise addresses a specific technical element that does not comprise an integrative approach. Those approaches are similar to Rolland's method. A further difference with respect to Rolland's is the way the fingers are placed on the fingerboard. Even despite their differences (Cary, 2011), there are curricula where an atomistic and integrative approach has been combined (Meyer et al., 1983). What seems evident is that, whatever the methodology used in initiation, intonation is a fundamental content in any method and constitutes one of the main milestones in initial learning, a subject that we will address in greater depth.

Learning Intonation on Violin and Viola

One of the main dilemmas of violin and viola teachers is to determine the presentation order of pitches during initial learning, an important factor when teaching intonation because it conditions the type of scales that can be played with the instrument and, therefore, conditions the spacing of the fingers of the left hand. For example, the use of popular tunes at the beginning of violin practice seems very useful. This is because many of the sound patterns of this type of simpler and more applicable violin repertoire coincide with descending scales on the D and A strings. These scales using above all the patterns with pitches D-E-F#-G-A-B-C#-D-E at the beginning (Tasgal, 2004).This pattern coincides with the D major scale, which has been considered by pedagogue and violinist Joseph Joachim to encourage the natural position of the left-hand fingers on the violin fingerboard (Yampolsky, 1967). As previously stated, this spacing is very relevant in violin initiation, since it represents one of the typical problems of the left hand (Hamann & Gillespie, 2004; Macián-González & Tejada, 2018). However, the order of pitches presentation can be different in the same teaching approach (Macián-González & Tejada, 2020).

The position of the hand on the fingerboard is another relevant factor in intonation. Cowden (1972) investigated whether there was an effect between initially learning in first or third position (N = 37), using several groups with different exposure times to each method. Results indicated that there were no differences in intonation due to the exposure time to first or third position nor in the number of changes from one to the other. However, in a recent survey of violin and viola teachers (N = 160), more than half believed the LH is better placed in the third position than in the first position, and that starting in third position can benefit students (Arica, 2021). Also, participants highlight that there are few methods that initiate learning in the third position. An increase in these could improve teaching approaches using this position Aural discrimination is a critical ability in the development of intonation (Hallam, 2001). The results of prior researchers that investigated the effect of auditory training are inconclusive. In a study by Smith (1995), students completed a course of auditory-vocal reinforcement, showing gains in auditory and intonation discrimination with the

instrument versus a control group. However, Jacobs' (1969) found that no relationship between these variables. Jacobs' auditory training group made a greater number of errors in the movement and placement of the left-hand fingers than the control group. Despite these discrepancies, the most important contribution of Smith's (1995) study was revealed in the potential benefit that technology (recorded materials) can bring to string instrument classes. She observed that there was an improvement in intonation when participants practiced with recorded materials.

Various methods are often accompanied by audio materials with recordings made by experts (Geringer et al., 2013). In other cases, they contain the harmonic accompaniment (minus-one) for the musician to play with, which provides trainees with an intonation model for out-of-class practice exercises. In relation to this factor, results from Laux's (2015) study with second-year students suggests that accompanying the performance with (1) a harmonic pedal, (2) the same musical content to be performed, or (3) a combination of both proposals, has no effect on intonation. The results of a similar study (accompaniment in charge of the E4 sound only) involving more experienced students (2-11 years) support these negative results (Zabanal, 2019). In a recent examination of college wind instrumentalists' intonation (Springer et al., 2021), a single group of students (repeated measures) played a familiar melody with three types of accompaniment: (1) a single C3 sound, (2) a harmonic interval: C3-G3, and (3) no accompaniment. Results revealed that the use of accompaniments had no effect on intonation accuracy, but advanced students perceived their use of accompaniments improved the results of their scale and arpeggio practice (Zabanal, 2020a). However, it has been suggested that the ability to tune open strings in unison may be a prerequisite for the use of accompaniments to be effective in learning (Zabanal, 2020b).

The use of markers or "frets"[1] on the fingerboard is a widespread practice to facilitate intonation and fingering on the violin and viola. Although it has been a

[1] The markers or "frets" are visual guides on the fingerboard that indicate where the fingers of the left hand should be placed.

controversial practice since the treatises of Geminiani and Leopold Mozart (Novillo-Fertrell, 1998), in recent decades it has been widely used or recommended in some methods. In an attempt to clarify its relevance, a number of papers have investigated its effect on students' intonation without conclusive results. Some show improvements in intonation (Bergonzi, 1997; Knots, 2018; Miles, 2010), while others do not (Núñez, 2002; Smith, 1985). However, Smith (1987) found mixed results depending on the conditions under which she applied the use of marks.

The posture of the left hand on the instrument's fingerboard is another significant factor when it comes to intonation. Feedback to rectify left hand postural patterns has been studied by Salzberg & Salzberg (1981). It appears that positive verbal feedback has the greatest positive effect. Another study (Ha, 2015) has highlighted that teachers of advanced students consider three aspects relevant for the development of intonation: (1) a good position of the left hand, (2) the technical improvement of this hand, and (3) the improvement of listening skills. Related to the left hand, holding the instrument in a conventional way under the chin or with the arm (banjo type) could also influence violin and viola learning. However, beyond knowing these strategies exist (Edmonson, 2005), there seems to be no published research in scientific journals on this type of holding.

Finally, the effects of the teaching approach in initial violin lessons were addressed by Macián-González & Tejada (2018) in an intervention-based study involving 11 preschoolers aged 4-5 years in two different groups. One group started studying with the right hand (RH) and then included the left hand (LH). The other group began by using both hands (BH) at the same time. The results showed that there were no differences in the postural hygiene of the participants in relation to the approaches, nor in the coordination of both hands. However, the BH group showed a greater development of the left hand and right hand than the RH group. This led the authors to propose that the BH approach might have greater technical advantages for the initial students than the RH approach. In addition, the type of class organization should be considered. Some prefer a homogeneous class (only for one type of instrument) and others a heterogeneous class (for several instruments in a class that is

similar to a group/orchestral formation). In the former, priority is given to technical learning, while in the latter, focus is placed on the group's experience (Mishra, 2000).

Learning Methodologies

A widely used methodology in instrumental teaching consists of the student's understanding of intonation from a theoretical point of view and implementing the teacher's input through verbal instructions, as Springer (2020) does with a group of wind instrumentalists. However, the use of this method can produce problems arising from the semantic load of the instructions themselves, which are mostly metaphors of movement and space [e.g., terms such as "high" or "low", "up" or "down"](Johnson & Larson, 2003). These terms, which are often widely used in instrumental training, may not be effective on string instruments because of the contradictions arising from the teacher's verbal instructions and the spatial orientation of the student's hand on the instrument. Thus, a teacher could verbally say "lower" to indicate a lower intonation and the student could move to a lower position on the strings of the instrument, corresponding to the sharp range of the instrument, favoring with this ambiguity a false association in the cognitive schemas of the student.

The different types of cognitive styles (personal preferences in the mode of information presentation) may also play a key role in coping with intonation practice and improvement. It appears that learners who use a style preferably based on auditory strategies (as opposed to visual or kinesthetic) are more comfortable listening to both the teacher and the recordings (Beheshti, 2009). This means they are more sensitive to auditory stimuli and thus use them more frequently, which may result in improved aural and intonation ability.

Finally, the feedback provided to the student does not always have an effect on intonation, particularly visual feedback, which shows inconclusive results (Blanco & Ramirez, 2019; Blanco et al., 2021; Lim & Raphael, 2010; Owens & Sweller, 2008; Pardue & McPherson, 2019; Springer, 2020). The combined presentation of information of different perceptual natures in instrumental or vocal training, even having been objectified in the aforementioned studies, shows inconsistent results that

could occur due to the division of attention, to an inadequate integration of different modes of information presentation, or both. These factors are addressed in Multimedia Learning Theory (Ayres & Cierniak, 2012) and Cognitive Load Theory (Low & Sweller, 2014). The conclusion is that not all audiovisual learning materials could be effective in intonation, being dependent on the aforementioned aspects, which can generate additional (extrinsic) cognitive load. Teachers should assess these factors of influence on intonation and their relevance in the choice of didactic materials.

Method

Design

The research team carried out a documentary study based on content analysis of 86 documents on the initial learning sequences for violinists and violists. When it came to selecting a model for analysis, a literature search was carried out. Research on contrasting methods is limited and also revealed problems for using them as models for analysis. Perhaps, this is because they are academic exercises (e.g., doctoral theses). The purpose of some prior studies was to show the philosophy of different violin pedagogues and make a subsequent narrative comparison without support in any pre-established scheme or scientific recommendation (Bujes, 2013; Croft, 1987). Another study carried out an analysis based on its own pre-established scheme, which was based on a literature review lacking in empirical work (Buckles, 2003). Finally, another study based the analysis on a pre-established method that the author considered relevant for the violin teaching community (Moya, 2018).

Sample

To collect the sample documents, a search was conducted in Journal Citation Report, SCImago Journal Rank, JSTOR, Google Scholar and ERIC, using the following terms: *violin method, viola method, beginning to play a violin, beginning to play a viola, learning to play a violin, learning to play a viola, violin pedagogy, viola pedagogy, starting to play a musical instrument, learning a musical instrument,* and their corresponding terms in other languages. Likewise, a search of the syllabi

references of violin and viola disciplines in the studies of conservatories and music schools in the country where this study was conducted.

One hundred valid references were obtained and revised. Some inconsistencies were detected, and according to the research objectives and the inclusion-exclusion criteria suggested by Meline (2006), researchers adopted, by consensus, the following set of inclusion-exclusion criteria: (1) include documents of initial study regardless of the date of publication and language; (2) exclude documents corresponding to collections of songs that do not include a logical learning progression[2] or exercises that cannot be assigned a clear progression in the learning of pitches; (3) exclude documents that do not offer exercises to practice[3] in the form of Western music notation; (4) exclude documents whose limits between theory and practice are not well defined, making a coherent contrast with the rest of the documents impossible; and (5) exclude documents with teaching approaches that do not allow a contrast with the rest of the documents, such as the use of harmonic sounds during the didactic sequence or sounds out of first position. Having these criteria in mind, the researchers could also replicate the method in order to include the documents based on their teaching experience. However, during the design process, there were some criteria on which the researchers disagreed, which were finally accepted by all after contrasting them with other direct sources, such as teachers' opinions. For example, one of the authors did not believe it was appropriate to include methods dealing with fewer than 24 pitches. However, the research team finally agreed to include materials with any number of pitches in an attempt to not restrict the sample too much and to be faithful to the reality a teacher might encounter when looking for materials. After the application of these criteria, the final sample of documents was 86: sixty-one of violin

[2] When speaking of a logical learning progression, we have taken into account the use of defined patterns (such as 1-23-4, 12-3-4, 1-2-34, or in the form of scales), avoiding mixtures and constant jumps between patterns that could make it difficult for students to fully understand the spacing of the fingers.

[3] This term refers to exercises for learners to practice and which are not limited to mere theoretical examples.

(70.9%) (see Supplementary Appendix A), and twenty-five of viola (29.1%) (see Supplementary Appendix B).

Data Collect and Categories of Analysis

A table of categories gathered six constructs (see section 3) belonging to initial violin-viola learning that were determined as essential by the researchers, in a similar way to Buckles (2003) and with the conviction that it is useful for other teachers (Moya, 2018). This table was validated by two experts in teaching viola and violin in the initial stage with an experience of 24 and 27 years. By means of a questionnaire, the experts gave dichotomous responses (YES or NO) on the appropriateness of each item of the table to the research objective. In addition, open response spaces were provided for comments on each item. After the first evaluation, the researchers modified some of the questionnaire items according to the experts' observations and submitted it again to them for reevaluation, which resulted in a Cohen's kappa value of k=1.

a) Contents

a.1) Number of included pitches in the first level of teaching of the document in question. This category intends to inquire about the number of pitches that are considered adequate to get started on the instrument.

a.2) Sequence of presentation of pitches. In addition to the number of pitches, it is intended to determine the sequences used in the initiation to the violin and viola, looking for similarities in the different documents.

b) Pedagogy

b.1) Teaching approach. This category aims to differentiate the documents according to their design: traditional (based on the execution of more or less progressive exercises), improvisational (uses improvisation as a vehicle for learning to play the instrument), intervallic (uses the different intervals to work on the other technical issues of the instrument), homogeneous, or heterogeneous. These differences can provide information about educational intentions in terms of intonation.

b.2) Use of pizzicato: how many documents include this resource.

c) Auxiliary Learning Resources

c.1) Use of musical accompaniment: how many documents include written musical accompaniments (either violin or viola, or piano) that can serve as harmonic and/or melodic support in the learning of intonation.

c.2) Use of audio materials (companion): how many documents include auxiliary learning materials on CD, DVD, or cassette that can serve as harmonic and/or melodic support in the learning of intonation.

Procedure

The documentary analysis was carried out in five phases: (1) selection and recovery of sources, (2) classification, (3) review and extraction, (4) codification and categorization, and (5) relational analysis of categories to obtain results and produce the synthesis or final proposal (Creswell & Creswell, 2017).

Results and Discussion

Number of Pitches[4]

Our analysis revealed that there are significant differences in the number of pitches included in the violin (range = 8-52; M = 28.1) (Supplementary Appendix C) and viola (range = 8-63; M = 23.6) documents (Supplementary Appendix D).4 It is pos- sible that this disparity in the number of pitches occurred because some are dedicated exclusively to the first year of the initial level of learning, while others also address other subsequent years of the initial and intermediate levels. Nevertheless, the entire sample of documents analyzed includes the first year of the initial level. When com- paring the number of pitches included in the violin documents, the most used number of them is 20 pitches (16.4% of documents), followed far behind by documents that include 22 (6.6%), 35 (6.6%), and 43 pitches (6.6%). In viola

[4] It has been considered that the pitches produced with open strings and those same pitches produced with the fourth finger are different. This is justified by understanding the great technical difference between the execution of one and the other.

documents, most of them have 20 pitches (24% of documents), followed by documents that have 18 and 22 pitches (16%), and 19 pitches (12%). In violin and viola, the most used number of pitches is 20 (24%). It is followed, in order of use, by 18 (16%) and 22 (16%). The use of 20 pitches could be due to the sum of sounds per string and one sound per finger in first position: five pitches on each of the four strings.It is noteworthy that for both instruments there is a certain downward trend between the number of pitches and the year of publication (shown in Figure 1). This may be due to the fact that with the passage of time there has been a tendency towards a greater degree of teaching specialization at the initial level and, therefore, a better adaptation to the learning pace of young students, limiting the number of pitches covered. Moreover, in the case of the violin, the tendency is more pronounced than in the case of the viola. This may be related to the fact that the first violin document dates from 1791 and the first viola document from 1881, which could suggest that the viola authors implemented the knowledge derived from the violin and, therefore, developed their methods including a number of pitches achievable in initiation.

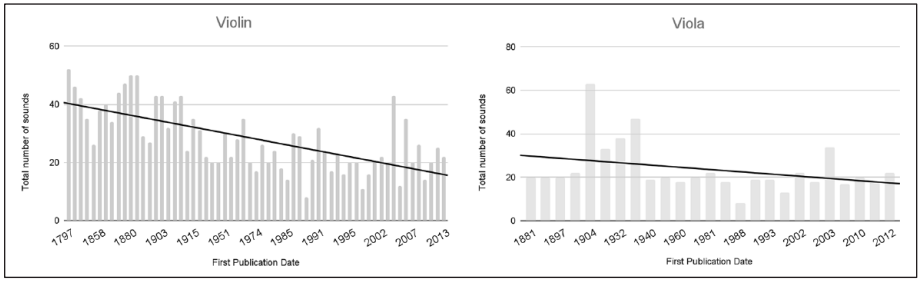

Figure 1. Trend in the number of pitches related to the year of first publication.

Pitches Presentation Sequence

The most remarkable fact regarding the didactic sequence of sounds in the analyzed documents is that no coincidence has been found. Each one uses its own sequence of sounds in the initiation to the instrument. In view of this fact and trying to find coincidences, the frequencies of use of the first eight sounds, the minimum number found in the sample, were analyzed. Thus, four publications (*Schule für die*

violine teil 1 [Violin School, 1st. part] [Bagantz, 1885]; *Méthode de violon elementaire et progressive* [Elementary and progressive violin method] [Conte, 1805]; Complete method for the violin [1st. part] [Eichberg, 1879]; and *Szkola Na Skrzypce* [Violin school] [Górskiego, 1883]) were found to coincide in this sequence for violin: G2-D3-A3-E4-A2-B2-C3-D3p[5] (6.6%). A more in-depth analysis of the documents that use this majority sequence shows that all of them were published at the end of the 19th century. Other frequencies also used on more than one occasion for violin have been the following: A3-E4-D3-G2-B3-F#4-E3-A2 (4.9%); D3-A3-G2-E4-E3-F#3-G3-B3 (4.9%); D3-A3-E4-G2-E3-F#3-G3-A3p (3.3%); E4-A3-D3-G2-A2-B2-C3-E3 (3.3%); E4-A3-D3-G2-B3-C#4-D4-F#4 (3.3%); G2-D3-A3-E4-A2-E3-B3-F#4 (3.3%); and G2-D3-A3-E4-F4-B3-E3-A2 (3.3%)

From the sequence with the highest frequency, it has been possible to extend the range of coincidences of the four materials that include it, finding that they coincide fully up to the ninth sound. From there, two sequences arise in parallel, changing only some pitches in a semitone depending on the document. The first of them comprises 20 sounds (G2-D3-A3-E4-A2-B2-C3-D3p-E3-F#3-G3-A3p-B3-C4-D4-E4p-F#4-G4-A4-B4), while the second is of 16 (G2-D3-A3-E4-A2-B2-C3-D3p-E3-F3-G3-A3p-B3-C4-D4-E4p) These are shown in Figure 2.

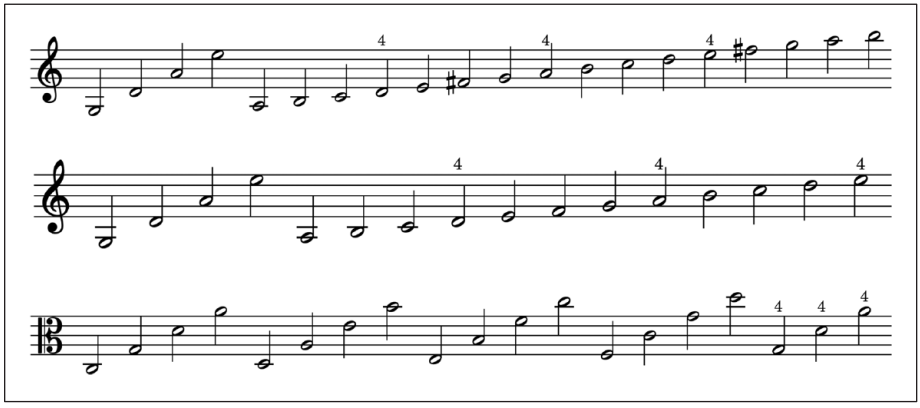

Figure 2. Main sequences of sounds for violin (top and center) and viola (bottom).

[5]The "p" indicates that this sound should be made with the fourth finger.

For the viola, one sequence (C2-G2-D3-A3-D2-A2-E3-B3; 12%) was used by three documents: *Viola school: Preliminary Exercises* (Carse, 1932); *Excelsior Method for the Viola* (Prendiville, 1881); and *The Premier Method for Viola* (Weber, 1897). In this case, as in violin, two of the documents that include it were also created in the 19th century and the other was published in the early 20th century. Once this initial sequence was detected, the complete sequences for these three documents were studied and all three coincided in 19 sounds (shown in Figure 2), which resulted in the sequence: C2-G2-D3-A3-D2-A2-E3-B3-E2-B2-F3-C4-F2-C3-G3-D4-G2p-D3p-A3p.

Likewise, a fundamental aspect in initiation was investigated: the learning order of the different strings. In the case of the violin, the most common string for initiation to the instrument is A3 with 19 documents (31.1%), followed in descending order by G2 with 15 (24.6%), D3 with 14 (22.9%) and E4 with 12 (19.9%). There is one material that did not start on an open string. For the viola, the majority string in initiation is D3, present in 10 materials (40%). It is followed in descending order by A3 with 7 (28%), C2 with 5 (20%) and G2 with 3 (12%). It is noteworthy that both instruments start, preferably, on the second string. However, when analyzing the two majority sequences, it is observed that they follow the same pattern of open strings: 4th, 3rd, 2nd, 1st. Given the range of dates and the fact that this order is no longer used later, this could be the majority option at the time and the reason for including it in these documents.

Teaching Approach

This section deals with the didactic design on which the methods are based, and almost all of the documents follow a traditional approach (97.7%). Indeed, only two violin documents completely approach the practice of the instrument in a different way, while none do so for the viola. In the case of the violin, 10 documents combine two teaching approaches: traditional and intervallic. The intervallic approach is used only by violinists in 12.8% of cases (shown in Figure 3), as is the improvisation-based approach, which accounts for 1.2%. Except for a few more recent cases, the majority

that address the intervallic approach predate the 20th century, while the improvisatory approach is a 21st century material, following newer pedagogical currents.

Most of the documents are homogeneous (86.05%) as opposed to heterogeneous (13.95%). By instrument (shown in Figure 3), the violin has 88.5% homogeneous and 11.5% heterogeneous documents. The viola has 80% homogeneous and 20% heterogeneous. It is remarkable that, in the case of the violin, the heterogeneous documents are mostly concentrated around the years 1980-1990, which seems to indicate that it was an almost exclusive trend of the 20th century. Also note that one violin document specifies that it can be used with both approaches.

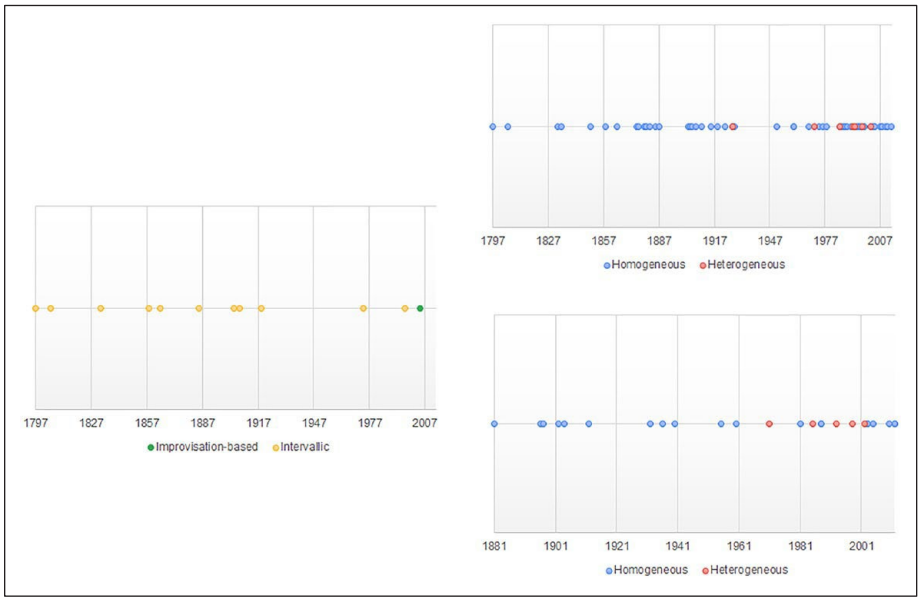

Figure 3. Trend toward intervallic/improvisatory (left graphic for violin) and homogeneous/ heterogeneous (right-up graphic for violin and right-down for viola) approximation according to the date of first publication of violin materials.

Use of Pizzicato

One way to divide didactic documents is according to their approach to the instrument, whether RH, LH, or BH (Edmondson, 2005). In this study, only those that have similarities with LH have been discussed. According to Edmondson, the LH

approach starts with pizzicati to get to know the different sounds. Since the bow is omitted at the initial learning stages, the student can pay more attention to the spacing of the fingers and, consequently, pay more attention to the intonation. For this reason, the use of pizzicati (both as a pedagogical conception and as a one-off resource) is a useful element in the study of intonation. This being so, an analysis of the sample shows that 33.7% employ pizzicato as an explicit teaching resource. That is, documents indicate it on the staff. This figure, although slightly higher than the results of previous studies, points in the direction indicated by Macián-González & Tejada (2020) on the prevalence of some teaching approaches as opposed to others, where LH is the minority.

Inclusion of Musical Accompaniment

Most of the sources analyzed include written accompaniments (violin = 80.3%; viola = 72%) to be performed by the teacher or other students with the function of serving as an aural reference for the novice student. This seems to be a constant over time, regardless of the era in which the documents were created. Although there are reputable teachers who discourage this practice, especially unison practice (Auer, 1980), others find this type of accompaniment appropriate in the early stages of learning (Flesch, 2008). According to the data collected, the tendency is to include written accompaniments, being aware of the pedagogic role this practice can play with novice learners. In this category, no remarkable differences are found according to the date of first publication, as this practice is evenly distributed over time in both instruments.

Inclusion of Audio Resources

The use of CD, DVD, cassettes, downloads, or online streaming of audios or audio companion is determined by the date of publication of the document. In fact, only 22.1% of the sample (violin = 19.7%; viola = 28%) has these supports. In some cases, these are recordings made by experts (Geringer et al., 2013).[6] With the invention

[6] Although, recordings with sound emulating synthesizers or MIDI files are also found in the documents.

and commercialization of such resources, from 1960 (violin) and 1980 (viola), some kind of audio accompaniment is provided (shown in Figure 4). Studies on this subject have not found effects of these resources on the instrumental intonation (Laux, 2015; Zabanal, 2019, 2020a). Perhaps, the aim of authors or publishers including these resources is to provide greater learner enjoyment and perhaps a motivational element. In other cases, it may be related to the philosophy of the Suzuki method (Thibeault, 2018).

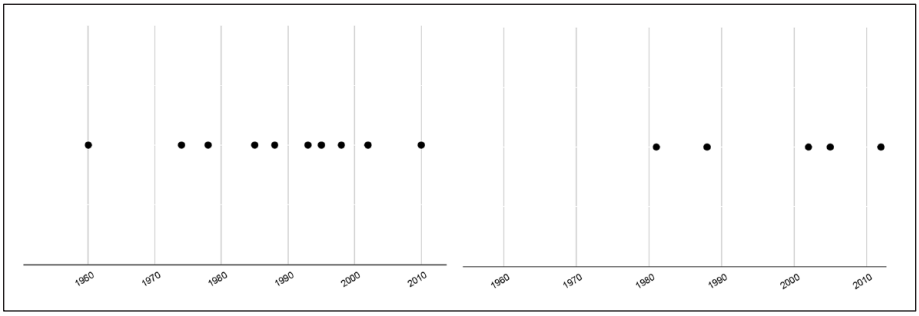

Figure 4. Use of audio resources in the materials by first date of publication for violin (left) and viola (right).

Synthesis of Results: A Pedagogical Proposal

Based on the results of the analysis of the documents included in this article, teaching materials for violin and viola should take into consideration the following items:

1. *Number of pitches advised for first school year.* According to the data analyzed, the appropriate number of pitches should be set at around 20. Although the average of the analyzed materials is 26 pitches, several reasons make it advisable to reduce this number to around 20. On the one hand, as time goes by, the tendency (and therefore specialization) observed in the graphs is closer to 20. On the other hand, this number is most prevalent across the materials of both instruments. A plausible explanation for this number may result from the sum of sounds on open strings and one sound for each finger on each string. Finally, the two majority sequences coincide or are very close

to this number. However, this number cannot be contrasted with empirical results, as it has not been studied for either instrument.

2. *Pitches sequence.* According to the results of the analysis, this section is complex to approach. First, no complete identical sequences have been found for either instrument. Second, the majority of the sequences are found in very old materials, which are possibly out of use in both cases. Moreover, the frequency of use is not at all significant (6.6% and 12%). Finally, the string that is usually used to start in both instruments (2nd) does not coincide with the one used in the majority sequences, but it is one of the most useful strings when starting on the instrument in the case of using popular melodies as a form of initiation (Tasgal, 2004). However, most of the sequences do not follow a linear learning process that enhances natural hand position (Yampolsky, 1967). For all these reasons, it is pertinent to propose a sequence based on expert opinions.
3. *Teaching approach.* Since the traditional approach is the majority one, the materials should adopt this form, even if only partially. Thus, the student would have the possibility of exercising the technique logically, in line with the knowledge accumulated over the centuries. However, the use of the interval as a means of improving intonation with the instrument cannot be ignored and may contain this type of exercise interspersed with other more traditional ones. Furthermore, it is the context that will determine whether homogeneous (more suitable for scenarios such as music schools and conservatories) or heterogeneous materials (more suitable for orchestral formations in which social interactions predominate over instrumental technical results) should be treated (Mishra, 2000).
4. *Auxiliary audio materials.* The current media allow publishers to offer a wide variety of accompaniments to the student. According to results of some prior research, there is disagreement about the way audio materials help in the development of intonation. Some studies consider this material useless for developing intonation (Laux, 2015; Springer et al., 2021; Zabanal, 2019,

2020a). Others concluded it can have other valuable benefits, for example gaining pitch performance accuracy, but when used alongside other kinds of exercises not only as accompaniment but also for other intonation practice (e.g., singing) (Smith, 1995). Apart from research results, motivation may be one reason why many materials have included in some form of audio accompaniment since the 1960s. Another reason may be because of Suzuki's influence (Thibeault, 2018). Therefore, its inclusion seems reasonable in any didactic text to be made in the future. Likewise, including written accompanying materials seems necessary in the early stages of learning, as shown by the results of the analysis performed.

Conclusions

This research has attempted to achieve three objectives: (1) to review the main contributions to the teaching of intonation in initial violin and viola training through an analysis of the related literature; (2) to analyze the sequence of sound presentation, teaching approaches, and auxiliary resources in the pedagogical literature for these instruments; and (3) to present pedagogical guidelines for teaching intonation based on the above analysis.

Regarding the first objective, the limited scientific works found on intonation have made clear the need for additional research that can expand the knowledge of the teaching intonation in initial learning, as this work has sought to do. Additionally, the research literature lacked consensus. For example, several works achieved opposing results, such as those that have studied which is the best left-hand position for learning (Arica, 2021; Cowden, 1972), those that have analyzed the effect of auditory training (Jacobs, 1969; Smith, 1995), or those that investigated the use of markers on the fingerboard (Bergonzi, 1997; Knots, 2018; Miles, 2010; Núñez, 2002; Smith, 1985, 1987). In other cases, various issues, such as the appropriate number of pitches and their order of presentation, the use of pizzicato, the use of written accompaniment, or the effectiveness of the audiovisual materials included with the methods, have not aroused the interest of researchers.

The review has shown different ways of how pedagogues understand the learning sequences of the instrument, such as a holistic vision of Paul Rolland (Fanelli, 2011; Kovacs, 2011; Meyer et al., 1983; Rolland, 1979) versus an atomistic one of compos- ers, such as Paul Herfurth, Samuel Appelbaum, and J. Frederick Müller & Harold W. Rusch (Kovacs, 2011). There has also been a lack of consensus in the scientific litera- ture that has not found a benefit from the use of accompaniment (Laux, 2015; Zabanal, 2019, 2020a). However, methods that include accompaniments as additional material are still published (e.g., Alfaras, 2010, 2012; Allen et al., 2002, 2004; Blackwell & Blackwell, 2005; Bull et al., 2008).The second objective has been accomplished, showing some interesting results. One of the most important facts that can be seen after the analysis of the results, the pedagogical proposal, and its discussion, is that there is a significant lack of consensus among the authors of manuals and pedagogical materials, which makes it necessary to reflect on this problem. In this work, only materials in the first position have been included, which could be another limitation. However, no evidence has been found on the efficacy of starting in first or third position (Cowden, 1972). Perhaps if materials in third position had been included in the review, as claimed by a recent survey (Arica, 2021), different results would have been obtained. However, the number of available methods that initiate learning in third position is small. Finally, the analyzed documents show an evolution of strategies over time, but there is a lack of systematization in the teaching of intonation. This seems to be far from being achieved if one pays attention to the order of presentation of pitches, as the matches found are from very old texts.

The third objective has been a pedagogic proposal as a synthesis and main implication of this study. Some of the items are only based on the results of the analysis due to the lack of previous research done in this field. In any case, the data yielded by this study should be taken with caution due to its exploratory nature, since there is a very limited literature in this field. Furthermore, although the sample of documents was large, its representativeness cannot be asserted. In order to improve the understanding of intonation teaching in the initial learning of violin and viola, it would be prudent to carry out studies with mixed designs that would allow future researchers

to know the praxis of the initial level teachers: How many pitches do they use during initiation? What sequence of pitches do they consider most appropriate according to the personal characteristics of the students? What benefits do they think the use of one or another approach brings for the development of intonation? What role do they consider that accompaniments play in class with the teacher and with peers and during personal study? And how do they value working on intonation from homogeneous or heterogeneous groupings?

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Notes

1. The markers or "frets" are visual guides on the fingerboard that indicate where the fingers of the LH should be placed.
2. When speaking of a logical learning progression, we have taken into account the use of defined patterns (such as 1-23-4, 12-3-4, 1-2-34, or in the form of scales), avoiding mix- tures and constant jumps between patterns that could make it difficult for students to fully understand the spacing of the fingers.
3. This term refers to exercises for learners to practice and which are not limited to mere theoretical examples.
4. It has been considered that the pitches produced with open strings and those same pitches produced with the fourth finger are different. This is justified by understanding the great technical difference between the execution of one and the other.
5. The "p" indicates that this sound should be made with the fourth finger.
6. Although, recordings with sound emulating synthesizers or MIDI files are also found in the documents.

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Supplemental Material

Supplemental material for this article is available online.

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