



The effect of ear-training with viola on instrument intonation

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Abstract

This research was carried out to reveal the reflections of the ear training performed with viola on instrument deciphering in terms of intonation. The research was conducted with viola students at Afyon Kocatepe University State Conservatory. The research was planned as a semi-trial model and a single group pattern. The data were collected through the pre-test and post-test developed by the researcher. A training plan was developed and applied to the study group for a period of eight weeks, one hour per week. Quantitative data obtained from the pre-test and post-test were tabulated and interpreted descriptively. In addition to the experimental process in the research, the participating students' views on their intonation status were taken with an open-ended question form and analyzed descriptively. As a result of the research, it was determined that the students successfully identified the sounds they heard from the viola and played sight-reading with the viola. In addition, it was determined that the training contributed to the students' motivation to study, development of their intonation awareness, their listening and auditory skills.

Keywords: Ear-training; intonation; string intonation; viola intonation; viola education

1. Introduction

Instrument education aims to bring individuals to the best level technically and musically. In this process, along with learning wide-ranging technical subjects, the student develops musically by studying large repertoires. Regardless of the subject studied in string instrument education, the intonation must be correct. Intonation, which means the correct resonance of the sound (Say, 2012: 180), is a subject that requires attention and continuous improvement in string instrument playing. From the first day of training, intonation studies at all levels are at the forefront of daily studies in string instruments.

As they are fretless instruments, developing awareness of intonation in string instruments is a process that requires detailed studies. Good hearing is an essential requirement for the development of intonation. Studies on the development of hearing in vocational education are carried out in courses such as solfeggio or musical hearing. With

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the reflection of the acquired auditory knowledge on instrument lessons and ensemble activities, students develop as a whole.

In string instrument education, students should internalize the correct intonation of sounds by hearing them in the instrument body. They should determine the places of the sounds in the instrument themselves, depending on the need for tonal, modal, maqam, double stop, chord playing, or playing with the piano. There are differences between the sounds of string instruments, which are not limited to the Tampere system (dividing an octave into 12 equal parts), and the sounds of fixed-tuned instruments such as the piano. While the works played with fretless instruments show a natural timbre, the works performed with the piano, a fixed tuned instrument, sound cruder (Yarman, 2003: 2-3). For this, being in high intonation awareness is a compulsory requirement in string instrument education.

1.1. Intonation in string instruments

In order to have good intonation and development, it is necessary to have a good hearing ability. Since the left hand's fingers cannot detect the clear sound directly, directing the finger to the right place can only be achieved with good hearing. Touch and feel also play a significant role in precise intonation. As a result of the correct guidance of the ear, the fingers will learn to find the right place in time and gain the sense of interval and distance. Correct posture and holding will speed up this process. The pressure of the left hand on the handle and the correctness of the posture will facilitate intonation. The ear must constantly control and direct intonation (Aydar, 2002: 41, 42). Technical factors affecting the accuracy of intonation can be counted as holding the instrument correctly, the position of the bow on the string, and the correct position of the left hand and fingers. The habits developed concerning these directly affect the quality of intonation.

The accuracy of intonation in string instrument playing can be explained as the clear resonance of the sounds in the instrument's body. The intonation of these instruments is different in melodic (monophonic) playing, vocalization of double stops, chamber music, and piano accompaniment disciplines (Sassmannshaus, 2012c). Sound systems often explain these differences. The Pythagorean system adopts the method of reaching different sounds by dividing the sound source at a specific fixed rate and thus obtaining a series. Just intonation, which attempts to eliminate the problems arising from the Pythagorean order, is a system in which *intervals* are defined as smooth and pure (Şenel, 2021: 354-357). While the Pythagorean system is mainly preferred for vocalizing scales and monophonic musical passages, just intonation is used in the playing of thirds and sixths, unlike perfect intervals. In the field of string instruments, it is known that these sound systems alone are not sufficient in different situations. As stated above, it is necessary to choose between these sound systems in various situations (Sassmannshaus ,

2012c). It is helpful to make this choice with a particular theoretical awareness, but the player must be auditory aware of what he is playing and how he is playing. Sassmannshaus (2012a) explains which sound system is used and when in string instruments, on the example of the violin: It will sound clean when the first octave "E" (1st finger on the "D" string) is played immediately after the "D, A and E" strings are played. The fourth will sound clear when the same "E" is played as a double stop with the open string "A." However, when the same "E" (1st finger on "D") is played as a double stop with the string "G," major sixth will not be clear. In order to be heard the interval clearly, the "E" must be arranged according to just intonation. When F# is played after the open string "D," a major third consists in D major. While "F#" is evident in melodic playing as a double stop with the string "A," a minor third will not be heard clean. Because while Pythagorean intonation gives correct results in melodic playing, just intonation should be considered in double stops that are outside of perfect intervals. Because while Pythagorean intonation gives correct results in melodic playing, just intonation should be considered in double stops that are outside of perfect intervals.

In solfeggio and musical hearing lessons, education is generally carried out using the piano. Training the ear to a fixed chord is acceptable. The student will learn the polyphonic sensation with the piano in the most risk-free way. In addition to the studies based on the fixed intonation of the piano, the hearing studies of the string instrument students should also be supported with their instruments because the first basis of string instrument education is based on learning intervals and studying melodic sequential sounds. A beginner student may not play double stops, sequential sounds, and melodic textures well. At this stage, the instrument teacher should step in and guide the student. This orientation should not only be based on the etudes, works, or exercises in the lesson but also should relate the intonation studies with the hearing lesson. It is seen that beginner-level students are sometimes unable to make this association. The student should be guided in cooperation with the instrument teacher and the hearing educator. Sometimes in string instrument studies, it is seen that students control the sounds by comparing them with the piano.

In such controls, the harmony of individual sounds with the piano can be achieved, but it may cause incorrect results in double stops, melodic playing, and tonal, maqam, or modal integrity. In the intonation studies of melodic structures and scales, the control of sounds with open strings can only be done when perfect intervals (unisons, fourths, fifths, and octaves) are played. Thirds and sixths cannot be controlled with open strings (Sassmannshaus, 2012a). Controlling the intonation with the piano can only be performed when it is going to be played unisons with the piano. When playing the piano accompaniment, Pythagorean intonation should be used mainly. While playing the unison with the piano in long notes, the equal tempering system should adhere. Abiding by this rule will bring the correct intonation.

Individuals who play a string instrument should have multidimensional awareness of intonation. The development of this consciousness spreads over time and is achieved through experience. However, students should be made aware of the special situations of string instrument intonation at an early stage. For this, it is thought that in addition to the ear training applied with the piano in traditional education, applications with a string instrument will be beneficial. Based on this, the research; It was questioned how the effect of hearing training performed with viola on viola intonation. In this direction, answers to the following questions were sought.

1. What are the students' hearing levels in the pretest?
2. What are the viola intonation levels of the students before the sight-reading training?
3. What are the students' hearing levels in the posttest?
4. What are the viola intonation levels of the students after the sight-reading training?
5. What are the students' views on the effects of training on intonation?

2. Method

2.1. Research design

This research is a semi-experimental and single-group study. With the pretest, the hearing levels of the students were determined, and then an eight-week training was given. Finally, the final test was carried out. The quantitative data obtained in the study were interpreted descriptively.

In many cases where experimental models cannot be applied, quasi-experimental models are used. Quasi-experimental models should be viewed as the best that can be in the current environment. It is helpful to prefer semi-experimental models with well-defined boundaries in cases where real experimental models cannot be applied (Karasar, 2016: 134). In this study, a trial environment was created because the viola hearing practices could not be placed in the ear training that the students received. Because the basic instrument used in ear-training that students are taking is the piano, and the groups are mixed. In the data collection part of this study (pretest-training-posttest), the viola was played by professionals. In addition, the participants of the study are only viola students.

In the single group-patterned studies, the subjects are taken from the working environment. They are naturally observed for a while, and they are tested. Then the experiment is carried out. Afterward, the procedure is repeated, and the test is applied once again. Single group patterned studies reveal the differences between the data obtained from the tests before and after the experimental process (Sönmez ve Alacapınar, 2011: 65). In this study, the viola intonation of participants was observed then the

pretest was carried out. After the pretest, the students were given training related to the subject, and the final test was applied.

In the research, a questionnaire was also used to get the opinions of the students about their intonation status. In this form, there are eight open-ended questions. Open-ended questions; It is a type of question that is used for situations where the answer cannot be predicted beforehand, where there is a high probability of getting very different answers, or when the answer is desired to be formed freely (Gökçe, 2004: 95). These questions are important in that they allow research participants to present their explanations and unique perspectives on the subject (Cohen, Manion, & Morrison, 2007: 151). If a field-specific case study is conducted, the research can be structured on a verbal basis with less structured open-ended questions. In cases where personal data is desired to be obtained, this type of approach may be appropriate for research (Cohen et al., 2007: 321).

2.2. *Participants*

The study group of this research consists of two viola students studying at Afyon Kocatepe University State Conservatory String Instruments Department and participating in the study voluntarily. Both students are graduates of Fine Arts High School.

2.3. *Data collection instruments*

2.3.1. *Pretest and post-test*

In the research, pretest and posttest were developed to measure the hearing status of the students. The instrument used in their implementation is the viola. The pretest and posttest questions were prepared to understand students' musical hearing and sight-reading skills. The questions were determined as writing dictation, writing single sounds, writing the sounds and qualities of intervals, identifying the notes played differently, and sight-playing. The prepared questions were presented to three specialists. Two of them work in the fields of theory-solfeggio and violin education, and one of them works in the field of violin education. Necessary corrections were made in the light of specialists' opinions, and then necessary corrections were made.

Table 1 Pre-test steps and scores

Question Type	Number of Questions	Score	Total
Dictation	8 measures	2	16
Single Sounds	12	1	12
Intervals	8	1	8
Identifying different notes	8 notes	2	16
Sight-playing	24 measures	2	48
Total			100

Table 2 Post-test steps and scores

Question Type	Number of Questions	Score	Total
Dictation	8 measures	2	16
Single Sounds	12	1	12
Intervals	12	1	12
Identifying different notes	6 notes	2	12
Sight-playing	24 measures	2	48
Total			100

2.3.2. Questionnaire of interview

A questionnaire was prepared by the researcher in order to get the opinions of the students on their intonation status after the training in a face to face session. The draft of the questionnaire was submitted to the opinion of two specialists, one of whom is a violist and the other is a violinist, and the questionnaire was given its final shape in line with the opinions of the experts.

In the questionnaire, it was aimed to analyze the benefits of the training in general, its effects on instrument timbre, and its contribution to listening and auditory skills.

2.4. Data collection processes and training

2.4.1. Tests

The questions in the pretest (Usluer, 2021: 49-53) and the posttest (Usluer, 2021: 68-72) were sung by a viola instructor working at Afyon Kocatepe University State Conservatory.

- The dictation: The whole piece was played first, then the students were asked to write it in two-by-two measures.
- Single sounds: All of the sounds were played once, and then they were played one by one, and the students were asked to write them.
- Intervals: They were played once from the beginning to the end, then each interval was repeated two times, and the students were asked to write them qualitatively.
- Identifying the different notes: The notes of four different melodies were given to the students. After the melodies were played once with the viola, the two notes in each of the melodies played by changing. Students were asked to identify these changing notes.

- Sight-reading: The students were asked to play the selected piece with the viola
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2.4.2. Evaluation of tests

- Hearing subtests were evaluated according to the answer key created, and their total scores were calculated.
- The sight-playing subtest was evaluated by three educators working at AKU State Conservatory, who are experts in viola, cello, and violin branches. The result was obtained by taking the average of the scores given by the educators.
- The pretest and posttest scores for each student were determined by summing the hearing subtest scores and sight-reading scores.

2.4.3. Training

- The training carried out after the pretest is planned as one hour per week, for eight weeks.
- Materials (Usluer, 2021: 49-72) were prepared by considering the developmental needs of the students.
- Dictation, a single voice, interval hearing (quality), detecting changing notes, and deciphering exercises were carried out during the one-hour training sessions.
- Report was created at the end of each training (Usluer, 2021: 54-67).

2.4.4. Interview

- Six months after the training, interviews with the students were conducted face-to-face via the questionnaire developed by the researcher.

2.5. Data Analysis

In the research, the quantitative data obtained from the pretest and posttest were tabulated and processed descriptively. In the descriptive analysis, data are summarized under predetermined titles. The data can be classified according to the research questions or can be arranged in light of the preliminary information obtained during the data collection stages. The purpose of this analysis is to put the raw data in a form that can be understood by the readers. The data obtained for this purpose are first put in a logical order, then these descriptions (classifications) are interpreted, and the results are reached. In this type of analysis, it is helpful to cite some data sources for the reliability of the study. Thus, striking views will be reflected (Altunışık, Coşkun, Bayraktaroğlu, & Yıldırım, 2004: 234). In this study, meaningful and interrelated classifications were made and systematically explained in the findings section. In addition, the data obtained from

the interviews with the students after the training were interpreted descriptively. While presenting the findings, direct quotations were made from the statements of the students.

3. Results

3.1. *Hearing and sight-playing skills of students before training*

Table 3. Pretest-Subtests and Total Scores

Student	Dictation	Single Sounds	Intervals	Different notes	Sight-Playing	Total
Student 1	10	0	6	10	31	57
Student 2	2	6	2	12	35	57

According to the data obtained, the first student correctly wrote five measures in an 8-measure dictation in the pretest before the training. However, there is no correct answer in single sounds. In the intervals, he answered 6 out of 8 intervals correctly. In the question of determining the notes played differently, she answered 5 out of 8 notes correctly. As a result, the first student got a total of 26 points from the pretest subtests measuring hearing skills and 31 points from the sight-reading subtest. When the scores of all subtests are added, it is seen that the first student got 57 points out of 100 points from the pretest (Table 3).

The second student correctly wrote only one measure in an 8-measure dictation in the pretest. She correctly answered six sounds in single sounds and 2 out of 8 in intervals. In the question of identifying different notes, she made 6 out of 8 notes correctly. As a result, the second student got 21 points from the pretest subtests measuring hearing skills and 36 points from the sight-playing subtest. When the scores of all subtests were added, it was concluded that the second student got 57 points out of 100 points from the pretest (Table 3).

3.2. *Hearing and sight-playing skills of students after training*

Table 4. Posttest-Subtest and Total Scores

Student	Dictation	Single Sounds	Intervals	Different notes	Sight-Playing	Total
Student 1	16	10	12	12	42	92
Student 2	8	11	9	10	40	78

In the data obtained, the first student wrote an entire 8-measure dictation correctly in the posttest. She answered 10 out of 12 questions correctly in the single sounds subtest of

the posttest. Additionally, the student correctly answered all interval subtests and the question of identifying different notes. The first student, who got 50 points from the posttest questions measuring his hearing skills, got 42 points from the sight-reading subtest. When the scores of all subtests were added, it was concluded that the first student got 92 points out of 100 points (Table 4).

The second student correctly wrote four measures of 8-measure dictation in the posttest. The student who correctly identified 11 sounds in the single sound writing subtest answered 9 out of 12 correctly in the interval question. In the question of identifying the notes played differently, the student made 5 of 6 notes correctly. The student, who got 38 points from the posttest's subtest measuring hearing skills, got 40 points from the sight-reading subtest. When the scores obtained from all subtests were added, it was concluded that the second student got 78 points out of 100 points (Table 4).

3.3. Comparison of test results before and after training

Table 5. Pre-Test and Post-Test Hearing Skill Scores

Student	Pre-test score	Post-test score
Student 1	26	50
Student 2	22	38

Table 6. Pre-Test and Post-Test Sight Reading Scores

Student	Pre-test score	Post-test score
Student 1	31	42
Student 2	36	40

Although the total score obtained by both students before the training seems to be equal, it was determined that the students got different results from the subtests of the pretest (Table 3). The first of this difference is that the first student achieved a clearly higher result in the post-test in dictation and interval sense compared to the pre-test (Table 3-4). The second difference is; the first student achieved a higher result in the post-test than the pre-test in sight-reading (Table 6).

The first student got a higher result in all subtests of the posttest compared to the pretest (Table 3). It was determined that the first student, who got a very low score in the sight-reading subtest of pretest, got a higher sight-reading score in the posttest compared to the pretest (Table 6). In other words, it can be said that the first student succeeded in playing sight-reading by listening to the viola intonation better at the end of the training.

On the other hand, the second student got slightly better results in the post-test hearing skills than the pre-test (Table 5). In addition, a slight positive difference was observed between the pretest and posttest in the second student's sight-reading (Table 6).

3.4. Student opinions on the benefits of training

Both students state that they started playing with a cleaner intonation after this training. In addition, the students stated that such a study increased the motivation and that they began to understand the viola timbre better with the application of a method other than the traditional study method. In addition, it is remarkable that a student who uses the piano in his intonation studies can continue his studies only with the viola without being dependent on the piano anymore.

Student 1: I had a lot of trouble with intonation. Through this training, my intonation began to improve. I became more motivated and liked my instrument because I was personally taken care of. Over time, I started to play sounds more clearly during the working process.

Student 2: Sight readings started to get better. Ear-training with a method (by using the viola instead of the piano) other than the traditional one that is made me more aware of the timbre of the instrument. After training, I stopped studying intonation with the piano in my viola life and started to do my intonation studies on the viola itself.

3.5. Contribution of training to auditory skills

Regarding recognizing intervals as qualities and naming sounds, the first student stated that she could easily distinguish intervals when she heard them from the viola before the training, adding that he reinforced this through education and made fewer mistakes in this regard. On the other hand, the second student said that he had difficulty describing these intervals auditory before the training and that he could hear better as he practiced.

Student 1: I could hear intervals and sounds beforehand. I could hear them on both the viola and the piano before. Training helped, of course. I reinforced it.

Student 2: When I wanted to name the sounds, I could not hear much from the viola; training made a great contribution. At first, the piano was descriptive. Before, I could not describe the quality of the intervals I heard on the viola, and I could not name the sounds. I was feeling unfamiliar with the timbre of my own instrument. When I forced hearing to work on the viola, I realized that I started hearing better.

4. Discussion

When the pretest and posttest results of this study were compared, it was determined that both students successfully identified the sounds they heard from the viola and successfully played sight-reading with the viola. Angı, Albuz, and Birer (2013: 67) state that the most influential factor in instrument teaching is intonation, and it is crucial to have auditory perception as much as technical competencies. Similar to the results of this study, Şendurur (2017) determined the positive effects of a musical hearing lesson on intonation and sight-reading on violin. In addition, Denizler (2008) states that there is an interaction between individual instrument training and hearing lessons and that students who are successful in sight-reading and dictation show more success in instrument lessons. Tarkum (2006: 122) says that the position of both hands and the development of the ear should be carried out in parallel in string instruments and adds that intonation studies can be started after the ear develops. Contrary to the idea that after the ear has developed, intonation studies can be started, in this study, the idea that a string instrument intonation awareness can be awakened simultaneously with ear training emerges.

After this study, the students stated that they started to understand the viola timbre better and to play it with a clearer intonation. Accordingly, it can be said that the hearing training with the viola provides benefits for perceiving the tone of the instrument and hearing. Therefore it has a positive effect on intonation. Whitcomb (2007: 44) states that some technical tips can be helpful in improving intonation. One of them is to listen to the extra cymbal obtained from the sympathetic vibrations of the other strings during playing. He says that this works much better for some notes than others but works to some extent for all pitches. However, he adds that over time, the player began to be able to distinguish each sound in terms of intonation in this way. It is thought that the contribution of this study to the students in the timbre dimension may be due to the fact that the students constantly listen to the clean sounds throughout the training and the extra cymbal obtained from the vibration of the other strings behind and understand this.

In this study, students stated that they were able to distinguish intonation in more detail when listening to someone else. Whitcomb (2007: 44) suggests recording in intonation studies and then listening to this recording. He adds that most of the time when individuals are not playing, they can listen to the other person much better and objectively. It can be said that this study developed students' listening skills by listening to the other person and participating in the practices during the training process.

In this study, students were trained by adapting ear-training practices, which are usually performed with piano, to their own instruments. It is seen in the study findings that training increases the general motivation about the instrument and student awareness of the subject. Helping students realize what they can do by supporting them

in a challenging subject will positively affect their motivation and success. Özmentiş (2013: 328) states that students ascribing failures in their performance to their abilities may negatively affect their motivation towards the instrument and that teachers should take measures to prevent their students from having wrong and negative thoughts. In instrument education, when students cannot solve their intonation problems most of the time, they can question their hearing abilities and get into a dead end. It is thought that the training application of this research can be used as an exemplary model for effective studies on intonation. In this study, in which students developed especially in intonation awareness, it was aimed to try typical applications in hearing from a different perspective. According to the results of this study, it can be said that different practices-methods-seeks can support the development of string instrument intonation. For example, it is known that various approaches to accompaniment improve students' intonation and have an effect on string instrument intonation (Taş, 2020: 1817, 1818; Sonsel & Tanrıverdi, 2019: 591; Topoğlu, 2010; Ergen & Bilen, 2010;). It is thought that the diversification of such studies will contribute to the field.

5. Conclusions

According to the results of this study, it was determined that the students successfully identified the sounds they heard from the viola and played sight-reading with the viola. Besides, they began to understand the viola timbre better and played it with a cleaner intonation. In addition, the ear training practices used in the research increased the students' general motivation about the instrument and their awareness of the subject.

According to this research, it is crucial to conduct studies that will try different education methods and develop new plans to make intonation studies more efficient. Additionally, it is suggested that studies that will improve the perception of intonation in the field of string instruments should be implemented as of the early stages of education. It is considered essential to support the research on this field by institutions and area educators and carry out similar studies with larger groups. In addition, it will be beneficial to have close communication between solfeggio and theory educators and string instrument educators in terms of monitoring students' auditory development and highlighting the studies on performing various sensation practices with string instruments in assignments.

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