PREDICTORS OF SIGHT-SINGING SKILLS: AN INVESTIGATION WITH PRESERVICE MUSIC TEACHERS

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ABSTRACT

This study aims to reveal the factors associated with sight-singing skills. A correlational research model was used in this research. The sample of the research consists of 41 music teacher candidates. The second- and third-grade students were given 30 seconds before tonal and rhythm sight-singing tests and then asked to do the first performances. Immediately after the first attempt, students were given another 10 seconds and then asked to do their second trial. The behaviors and performances of the students before and during singing were evaluated with the obtained video recordings by experts. As a result of the Kolmogorov-Smirnov test performed on performance scores, it was seen that group distribution was not normal. Since the distribution was not normal, the nonparametric tests—Spearman's rank correlation and Wilcoxon signed-rank test—were preferred in this study. The results from the study show that the greatest predictor of pitch and rhythm sight-singing skill was the piano education experience. In addition, it was discovered that there is a moderate relationship between pitch sight-singing skill and rhythm sight-singing. Academic success, piano education, instrument education, music education, choir, orchestra, and voice education experience are also associated with pitch-rhythm sight-singing. In addition, the variable of age is not related to sight-singing skills. While there was no significant difference in the second trial performance scores compared to the first one in the study, the students with high scores were able to evaluate the 10-second period given more effectively than others when the students were divided into low, medium, and high scores. In the preparation section, the students who could examine the full melody were successful in pitch sight-singing, and there was a significant relationship between the ability to hit the beat and the success of rhythm sight-singing.

INTRODUCTION

Although sight-singing is not enough for a musician, deficiencies in sight-singing skills limit one's ability to scrutinize unfamiliar repertoires alone (Amkraut, 2004). A person who cannot understand an unfamiliar notation will always need others during analysis (Lucas, 1994). Therefore, sight-singing skills are required to analyze unfamiliar notations. Killian (1991) and Pollock (2017) stated that sight-singing is an important predictor that allows one to read a previously unknown melody without any instrument assistance and to measure musical independence. Sight-singing skills are also important for teachers and students in any grade level of education. Throughout the education period, a student encounters new repertoire in many lessons. Sight-singing skill levels of students also determine how fast they can analyze these repertoires. Practicing with students who have this skill allows music educators to allocate more time for non-sight-singing

activities in their classes. A choir lesson is a good example of this situation. When students start to practice a new repertoire in a beginner choir lesson, parts are usually drilled separately, and then polyphonic work can be conducted. Practicing with students with high sight-singing skills will allow educators to allocate more time for making music in choir lessons. However, leaving sight-singing practices aside and allocating an entire lesson for performance can also risk the development of sight-singing skills. For this reason, educators should manage time well to teach the lesson content effectively (Galyen, 2005). Because it has great importance in the education and music life of students, sight-singing skill has become one of the priorities of educators.

Sight-singing skill is relatively easier to measure compared to other musical skills. For the measurement process, a melody the student has not heard before, and any musical instrument that can provide the starting pitch is sufficient. Although the measurement process is easy for educators, this is not true for students. Before the sight-singing process, students usually examine tone, measure, starting pitch, rhythmic structure, the hierarchy between notes, and altered notes in a limited time (Darrow & Marsh, 2006). Vujović & Bogunović (2012) defined paying attention to these features in the preparation part as a cognitive strategy while preparing without paying much attention to these features as an intuitive strategy. In the same study, students in the non-strategy group switched to the performance part without using the preparation time. In this limited time given for preparation, students should learn about tone as much as possible by doing singing trials. During the sight-singing trials, students also conduct an internal evaluation and error detection process. Darrow & Marsh (2006) stated that successful students can evaluate themselves correctly. Killian & Henry (2005) noted that it is beneficial for students not to spend unnecessary time on easy parts by distinguishing difficult parts in the preparation part. Studies indicate that students who can effectively evaluate this part are also successful in sight-singing (Furby, 2008; Henry, 2008; Killian & Henry, 2005; Vujović & Bogunović, 2012). The student who acquires basic information about the melody in the preparation part tries to sing the notes in the melody with the right pitch and time and by making proper hand signs matching the measure. Being able to sing in the right pitch undoubtedly challenges students much more than others. Students stated that the biggest challenge for them in sight-singing is large intervals, and the second one is altered notes (Henry, 2008; Vujović & Bogunović, 2012;). Allocating considerable time for the concept of intervallic thinking in the early practice period will enable students to understand better the relationship between intervals (Foltz, 1976). For this reason, educators (Barnes, 1960; Tucker, 1969) carried out sight-singing practices with students by isolating the pitch and rhythm elements from each other. In addition, an educator who wants to measure the pitch sight-singing may also cause the students to have erroneous results because they include rhythmic difficulties in the melody they will use.

Developing students' sight-singing skills depends on many gains in the background (Hutton, 1953), and many activities in music education support these gains. Galyen (2005) pointed out that students' success in sight-singing and music experience are related to each other. For example, there is a high relationship between dictation skills and sight-singing skills (Norris, 2003; Rogers, 2013). Studies also show that many activities that confront students with any unfamiliar melody, such as dictation, are associated with sight-singing success (Demorest & May, 1995; Elliott, 1982; Furby, 2008; Galyen, 2005; Henry & Demorest, 1994; Killian & Henry, 2005; McClung, 2008; Read, 1968; Reifinger, 2018; Tanner, 1985).

This study aimed to examine the factors related to sight-singing skills. The study sought to answer the questions given below:

1. Is there a significant difference between the students' sight-singing first trial and last trial scores?
2. Is there a relationship between the behaviors exhibited during the preparation-performance

process and sight-singing skills?

3. Is there a relationship between sight-singing skills and musical experience?
4. Is there a relationship between sight-singing skills and academic success?

METHOD

Research Model

A correlational research model was used in this research. Correlational research aims to verify the hunches a researcher has about a presumed relationship between characteristics or variables (Cohen et al., 2005). This study aimed to reveal the factors related to sight-singing skills, which have been the subject of various previous studies.

Participants

A convenience sampling method was used to determine the participants of the research. A convenience sample is a group of individuals available for study (Fraenkel et al., 2018). Forty-one music teacher candidates studying at a university in the Central Anatolia of Turkey participated in the research during the fall semester of the 2019-2020 academic year. The student participants consisted of 23 second graders and 18 third graders. The reason for preferring second- and third-graders in the study was that these grades were easily accessible to the researcher. In addition, the participant group of the study voluntarily took part in the data collection process.

Data Collection Tools

Two different melodies (Appendix A) were composed in F major and E minor keys to measure the pitch sight-singing skills of the students. While composing the melodies, the students' voice range was considered, and no rhythmic difficulties were included. Similarly, two rhythm phrases were created in 2/4- and 6/8- time signatures (Appendix A) to measure the rhythm sight-singing skills. Later, melodies and rhythm phrases were sent to two experts for evaluation. As a result of the evaluation, the experts stated that melodies and rhythm phrases were appropriate for the participants' level. In addition, a semi-structured observation form (Appendix B) was created to evaluate the students' behaviors before and during sight-singing. An interview form (Appendix C) was also created to obtain the students' personal information, such as age and academic success. Further, I created an unstructured observation form to record my own observations through video recordings.

Data Collection Procedures

First, students were asked to fill out the interview form (Appendix C) to obtain their personal information, such as age and academic success. Then, individual sight-singing practices were made with the students. The sight-singing practices were conducted in a studio environment under my control, and all the student behaviors were recorded with a camera. The studio provided the students with a convenient setting that was isolated from any kind of distracting sounds.

The sight-singing practice first started with the rhythm sight-singing activity (Figure 1). Students were given 30 seconds of scrutiny time before the sight-singing. After the preparation process, students were asked to begin the first sight-singing trials, and no guiding metronome beat was given during the sight-singing. After the first trials, an additional 10 seconds were given to scrutinize the rhythm phrases. When the 10 seconds ended, students were asked to conduct the second sight-singing trial, and the rhythm sight-singing activity finished. This process was repeated in the same way for both rhythm phrases (Appendix A). Just after the rhythm sight-singing, the pitch sight-singing process started.

Before pitch sight-singing, Figure 1 indicates that the melody's key was sung to the students

Figure 1
Rhythm Sight-singing Process

Figure 2
Pitch Sight-singing Process

accompanied by myself. After the scale was sung, the students were shown the melody and asked to scrutinize it for 30 seconds. During the scrutiny process, the students could only get a tonic pitch from the piano. At the end of the preparation process, the starting pitch of the melody was played, and the student was asked to make the first sight-singing trial. After the first trial, an additional 10 seconds of scrutiny time was given as with the rhythm sight-singing activity, and immediately after this, the student conducted the last singing activity. No guiding metronome beat was given, just as in the sight-singing and rhythm sight-singing activities. This process was repeated in the same way for both melodies (Appendix A).

DATA ANALYSIS

Pitch and rhythm sight-singing performance scores of the students were the study's dependent variables, as follows:

- Pitch sight-singing first trial score (average of two melodies' first trial scores)
- Pitch sight-singing last trial score (average of two melodies' last trial scores)
- Rhythm sight-singing first trial score (average of two rhythm phrases' first trial scores)
- Rhythm sight-singing last trial score (average of two rhythm phrases' last trial scores)

The dependent and independent variables whose relationships were investigated are as follows:

- Student behaviors examined during the 30-second of preparation time before pitch sight-singing:
  - *Singing out loud during practice*
  - *Scrutinizing the entire melody*
- Student behaviors examined during pitch sight-singing:
  - *Starting to sing in tune*
  - *Keeping a steady tempo*
  - *Singing confidently*
  - *Staying in tune*
  - *Singing without stopping in the beginning*
- Student behaviors examined during rhythm sight-singing:
  - *Keeping the beat in the body*
  - *Using hand signs*
- The demographic information of the students:
  - *Orchestra experience (as the number of years)*
  - *Age*
  - *Piano education experience (as the number of years)*
  - *Choir experience (as the number of years)*
  - *Musical education experience (as the number of years)*
  - *Voice education experience (as the number of years)*
  - *Academic success (as score point)*
  - *Instrument education experience (as the number of years)*

For the evaluation, video recordings of student performances were uploaded to the cloud and sent to the two experts. The data were evaluated by three experts total, including myself. I developed a form (Appendix B) for the evaluation. When the evaluation form was examined, it was seen that it was built on two bases, performance (pitch and

Table 1
Kolmogorov-Smirnov, Skewness and Kurtosis Tests on Performance Scores

	Kurtosis	Kurtosis SD	Skewness	Skewness SD	Kolmogorov-Smirnov (p)
Pitch sight-singing first trial score	-1.301	.724	-.155	.369	.007
Pitch sight-singing last trial score	-1.513	.724	-.031	.369	.006
Rhythm sight-singing first trial score	-1.579	.724	.141	.369	.005
Rhythm sight-singing last trial score	-1.530	.724	.059	.369	.026

rhythm sight-singing) and behaviors. In the performance section, each note in the melodies used in pitch sight-singing was accepted as one point (one point for each pitch), and rhythmic patterns in these melodies were excluded from the evaluation (Boyle & Lucas, 1990; Holmes, 2009; Lucas, 1994; Scofield, 1979). Then, the scores obtained from each melody were converted into the 100-point scale. In the rhythm sight-singing, each beat (quarter length for 2/4, dotted quarter length for 6/8) in the phrase was accepted as one point, and the scores obtained from each rhythm phrase were converted into the 100-point scale. As a result, the average of the data obtained from three experts was taken, and four different final performance scores (pitch-rhythm, first and last sight-singing trial scores) of the students were calculated.

The experts also examined students' behavior through video recordings. Each behavior was coded as "yes" or "no" by experts regarding whether or not the students were performing the behavior. The data obtained from experts were analyzed, and the "yes" answer for a student was coded as one point, and the "no" answer as zero points. (In a situation where two experts say *yes* and one expert says *no*, the final point of the student would be two).

The Kolmogorov-Smirnov and skewness and kurtosis test were applied to the performance scores to reveal whether the group showed normal distribution (Table 1). The Kolmogorov-Smirnov test is recommended when the number of participants is 30 or more (Can, 2014).

For normal distribution, the kurtosis-skewness coefficients of the performance scores must be between -1 and +1, and the ratio of these coefficients to standard error must be between -2 and +2 (Tabachnick & Fidell, 2013). As shown in Table 1, the kurtosis-skewness coefficients of the performance scores were not between -1 and +1, and the ratio of these coefficients to standard error was not between -2 and +2. As a result of the Kolmogorov-Smirnov test performed on performance scores, it was seen that p values were less than 0.05. In this case, it can be considered that the group distribution was not normal. Since the distribution was not normal, nonparametric tests—Spearman's rank correlation and Wilcoxon signed-rank test—were preferred in this study.

First trial and last trial scores were used to determine whether the 10 seconds of the scrutiny period given to the students between the two trials (both pitch and rhythm) made a significant difference in success by carrying out a Wilcoxon signed-rank test. This test is preferred over the t-test in cases where the scores obtained from the subjects do not show normal distribution (Büyüköztürk, 2013). In addition, to understand whether the student level had an effect on using the

Table 2
Distribution of Students When Rhythm and Sight-singing Scores Are Grouped as Low, Medium, and High

Pitch sight-singing scores	N	Rhythm sight-singing scores	N
Pitch sight-singing low scorers	14	Rhythm sight-singing low scorers	20
Pitch sight-singing medium scorers	12	Rhythm sight-singing medium scorers	9
Pitch sight-singing high scorers	15	Rhythm sight-singing high scorers	12
Total	41	Total	41

Table 3

The Results of Wilcoxon Signed-rank Test Applied on Rhythm Sight-singing First Trial and Last Trial Scores

Rhythm sight singing last trial - first trial scores	N	Mean Rank	Sum of Ranks	*z*	*p*
Negative Ranks	12	16.17	194	-1.76	.07
Positive Ranks	22	18.23	401		
Ties	7	-	-		

Table 4

The Results of Wilcoxon Signed-rank Test on Pitch Sight-singing First Trial and Last Trial Scores

Pitch sight singing last trial - first trial scores	N	Mean Rank	Sum of Ranks	*z*	*p*
Negative Ranks	17	16.50	280.5	.00	0.99
Positive Ranks	16	17.53	280.5		
Ties	8	-	-		

10-second scrutiny period effectively, this test was re-conducted by grouping the students according to their scores (low "0-39", medium "40-79", and high "80-100"). Table 2 shows the distribution of students when they were grouped as low, medium, and high scores.

Lastly, the Spearman correlation test was applied to examine the relationships between the study's dependent (performance scores of last trials) and independent variables (behaviors and demographics). The correlation coefficients obtained from correlation tests are categorized as low (<.30), medium (.30-.70), and high (>.70) (Büyüköztürk et al., 2015).

RESULTS

Table 3 shows the Wilcoxon signed-rank test results, revealing whether there was a significant difference between the students' rhythm sight-singing first and last trial scores.

The results of the analysis show that there was no significant difference between the students' rhythm sight-singing first trial and last trial scores, $z = -1.76$, $p > .05$. It was observed that the students could not use the 10-second time between two rhythm sight-singing trials effectively.

Table 4 shows the Wilcoxon signed-rank test results, indicating whether there was a significant difference between the students' pitch sight-singing first and last trial scores.

The results of the analysis show that there was no significant difference between the students' pitch sight-singing first trial and last trial scores, $z = -.00$, $p > .05$. The students could not use the 10-second time between two pitch sight-singing trials effectively.

However, when the pitch and rhythm scores were grouped as low, medium, and high levels, as a result of the Wilcoxon signed-rank test, it showed

Table 5

The Results of Wilcoxon Signed-rank Test Applied on Rhythm Sight-singing First Trial and Last Trial Scores of High Scores Students

Rhythm sight singing last trial - first trial scores	N	Mean Rank	Sum of Ranks	*z*	*p*
Negative Ranks	0a	.00	.00	-2.66a	.00
Positive Ranks	9b	5.00	45.00		
Ties	3c	-	-		

[a] Rhythm last trial < Rhythm first trial

[b] Rhythm last trial > Rhythm first trial

[c] Rhythm last trial = Rhythm first trial

Table 6

The Results of Wilcoxon Signed-rank Test on Pitch Sight-singing First Trial and Last Trial Scores of High Scores Students

Pitch sight singing last trial - first trial scores	N	Mean Rank	Sum of Ranks	z	p
Negative Ranks	1a	5.00	5.00	-2.66a	.00
Positive Ranks	11b	6.64	73.00		
Ties	3c	-	-		

[a] Pitch last trial < Pitch first trial

[b] Pitch last trial > Pitch first trial

[c] Pitch last trial = Pitch first trial

Table 7

The Correlation Levels Between the Behaviors Performed During the 30 Seconds of Preparation Time and Pitch Sight-singing Skills

Behavior	Correlation Coefficient
Scrutinizing the entire melody	.71*
Singing out loud during practice	.53*

*p < .05

that the students with high scores could effectively use the additional 10 seconds of time (Tables 5, 6). In contrast, the students with low and medium scores could not effectively use the time ($p > 0.05$).

Table 5 shows the Wilcoxon signed-rank test results, revealing whether there was a significant difference between the high scorer students' rhythm sight-singing first trial and last trial scores.

The negative ranks in Table 5 show $N = 0$, which means no students had a lower rhythm last trial score than the rhythm first trial score. The positive rank shows $N = 9$, meaning nine students had higher rhythm last trial scores than their rhythm first trial scores. The average increased score was 5.00, while the sum of rank was 45.00. The ties category shows $N = 3$, meaning three students had the same rhythm first trial score as the last trial score. The results show that rhythm sight-singing last trial scores of the students with high scores were significantly higher than their first trial scores ($p < 0.05$).

Table 6 shows the Wilcoxon signed-rank test results, revealing whether there was a significant difference between the high scorer students' pitch sight-singing first trial and last trial scores.

The negative ranks in Table 6 display $N = 1$, showing one student had a lower pitch last trial score than a pitch first trial score. The average of the same score was 5.00, while the sum of rank was 5.00. The positive rank shows $N = 11$, meaning 11 students had a higher pitch last trial score than their pitch first trial score. The average increased score was 6.64, while the sum of rank was 73.00. The ties category shows $N = 3$, meaning three students had the same pitch last trial score as the pitch first trial score. The results show that the pitch sight-singing last trial scores of the students with high scores were significantly higher than their first trial scores ($p < 0.05$). Both rhythm and pitch sight-singing last trial scores of the students with high scores were significantly higher than their first trial scores. Thus, it can be inferred that as the students' success increased, their ability to use the time given increased accordingly.

Table 7 shows that the Spearmen test results indicate the correlation levels between the behaviors performed during the 30 seconds of preparation time and pitch sight-singing skills.

Table 7 shows that scrutinizing the entire melody during the preparation time was highly related to pitch sight-singing skill, and singing out loud during practice was moderately related to pitch sight-singing skill.

As a result of the unstructured observation form, some students tried to get other pitches in the melody from the piano unconsciously, even though they were limited to getting the tonic pitch in the 30 seconds of preparation time. The students who

tried to play and sing the restricted pitches during the preparation process were warned by myself. In addition, I observed that some students could detect the target note's pitch by singing the other notes between the two notes as a scale instead of calculating the interval in the note transitions that were larger than the second interval. Some students did determine the difficult parts in the melody during the preparation and concentrated on those parts without the need to start over singing the melody. At the same time, some students stated that they wanted to proceed to the performance part without using the given time entirely. These demands were accepted, and they were asked to make their first trials. At the beginning of the preparation time, some students sang III. and V. scales on the tonic pitch they found before trying to sight-sing to have an idea about the other pitches. On the other hand, some students uttered various voices with "um" syllables without singing the solfege syllables in the preparation part.

Table 8 shows the Spearmen test results with correlation levels between the student's behaviors during sight-singing and success.

Table 8 indicates that the behavior of staying in tune and singing confidently were highly related to pitch sight-singing success; however, the behaviors of singing without stopping in the beginning and keeping a steady tempo were moderately related to pitch sight-singing skills. The behavior of starting to sing in tune was not significantly related to the success of pitch sight-singing skills.

When the unstructured observation form was examined, it was observed that some unsuccessful students sang in a constant pitch (like humming) instead of singing in a different pitch, and some of them mispronounced the solfege syllables. Some students also sang the remainder of the melody in the wrong pitch by singing the notes larger than the second interval as second interval. Further, in

Table 8

The Correlation Levels Between the Behaviors of the Students During Sight-singing and Success

Behavior	Correlation Coefficient
Staying in tune	.706*
Singing confidently	.700*
Singing without stopping in the beginning	.653*
Keeping a steady tempo	.597*
Starting to sing in tune	.270**

*p < .05 **p > .05

Table 9

The Correlation Levels Between the Student's Demographic Information and the Success of Pitch Sight-singing

Demographics	Correlation Coefficient
Piano education experience	.80*
Academic success	.76*
Musical education experience	.70*
Instrument education experience	.68*
Rhythm sight-singing success	.67*
Voice education experience	.59*
Choir experience	.56*
Orchestra experience	.52*
Age	.05**

*p < .05 **p > .05*p < .05 **p > .05

the additional 10 seconds between two trials, some students constantly tried to sing the melody from the beginning to the end, while the other students scrutinized the parts they thought they did not sing correctly at their first trials.

Table 9 shows the Spearmen test results, revealing the correlation levels between the student's demographic information and the success of pitch sight-singing.

According to Table 9, piano education experience, academic success, and musical education experience were highly correlated with pitch sight-singing success. The variables of instrument education experience, rhythm sight-singing success, voice education experience, choir experience, and orchestra experience were moderately correlated to pitch sight-singing skill. There was no significant relationship between the age variable and pitch sight-singing skill

Table 10 displays the Spearmen test results, showing the correlation between the behaviors during rhythm sight-singing and the success of rhythm sight-singing.

According to Table 10, there was a high relationship between the behavior of keeping the beat in the body and rhythm sight-singing skill, and the behavior of using hand signs was moderately correlated with rhythm sight-singing.

As a result of the unstructured observation form, some students made unsteady metronome beats instead of steady ones during the rhythm sight-singing process. At the same time, some students tried to sing the repeating 16th notes by counting one by one how many beats there were instead of fitting them into the beat. These students sang extra 16th notes not in the context. This type of problem was not encountered by the students who kept a steady tempo.

Table 11 shows the Spearmen test results, revealing the correlation levels between the student's demographic information and the success of rhythm sight-singing.

Table 11 shows that piano education experience, musical education experience, instrument education experience, academic success, orchestra experience, choir experience, and voice education experience were moderately correlated with rhythm sight-singing skill, and there was no significant relationship between the age variable and rhythm sight-singing skill.

DISCUSSION AND CONCLUSION

In this study, sight-singing skills were examined in two separate parts: rhythm and pitch. The biggest predictor of both pitch and rhythm

Table 10

The Correlation Levels Between the Behaviors During Rhythm Sight-singing and the Success of Rhythm Sight-singing

Behavior	Correlation Coefficient
Keeping the beat in the body	.80*
Using hand signs	.65*

*p < .05

Table 11

The Correlation Levels Between the Student's Demographic Information and the Success of Rhythm Sight-singing

Behavior	Correlation Coefficient
Piano education experience	.69*
Musical education experience	.66*
Instrument education experience	.65*
Academic success	.60*
Orchestra experience	.48*
Choir experience	.45*
Voice education experience	.49*
Age	.00**

*p < .05 **p > .05

sight-singing skills is piano education experience. However, unlike this finding, some studies indicate that choir experience (Demorest & May, 1995; Furby, 2008) and instrument education experience (Tanner, 1985) might also be a predictor of sight-singing skill. The data obtained from this study indicate that choir and instrument experience is moderately related to pitch and rhythm sight-singing skills. It has been thought that this difference in results may be due to the differences in the teaching process of lessons. Allocating little time for sight-singing practices in choir lessons may yield positive results (Cutietta, 1979). Henry (2008) also stated that sight-singing activities in choir lessons are carried out collectively like other activities, and therefore individual developments are often overlooked.

Students' academic success has been an important predictor of pitch and rhythm sight-singing skills, as in other studies (Galyen, 2005; Read, 1968; Reifinger, 2018). The results have suggested that the students' piano, instrument, and voice education experiences also predict pitch and rhythm sight-singing skills. Further literature supports this finding (Demorest & May, 1995; Henry & Demorest, 1994; Killian & Henry, 2005; McClung, 2008; Read, 1968; Tanner, 1985). Although it is difficult to conclude sight-singing skills based on a student's performance in the lessons, the results obtained from the study indicate that musical education experience is also related to the sight-singing skill. It has been observed that the sooner music education starts, the more sight-singing skills increase accordingly (Galyen, 2005; McCoy, 1997).

The results also showed no relationship between pitch-rhythm sight-singing skills and age variable, which contradicts the findings of Read (1968). Although both studies were conducted with university students, the difference in years when the studies were conducted may lead to such a result because technological developments have made access to information much easier and cheaper. The results also showed that pitch sight-singing and rhythm sight-singing skills are related. The results from Henry (2011) support this finding.

The students were given 30 seconds of preparation time before pitch sight-singing the melody. During this time, the student's behavior to "scrutinize the entire melody" has been the biggest predictor of pitch sight-singing skill. In other words, students who can scrutinize all the melody in the preparatory part also have higher pitch sight-singing skills (Killian & Henry, 2005). Furby (2008) stated that students developing different strategies in the preparatory part are more successful than the other students who do not. Some students develop different strategies from others. For example, it was observed that some students sang the I, III, and V pitch of the tonal scale to estimate the right pitch in the preparatory part. Thanks to this method, students were able to predict the other pitches close to the I, III, and V. It was not difficult for students who grasped the subject to sing the pitches III and V on the tonic pitch played on the piano. Some students scrutinized the difficult parts in the preparation part instead of trying to start over singing the melody. Killian and Henry (2005) stated that this is a desired type of behavior. While the students made singing trials in the preparation part, they simultaneously checked for a difference between the pitch they were singing and the pitch written on the sheet of paper. Darrow and Marsh (2006) stated that students with high sight-singing skills are also successful in evaluating their performances. In this case, it was considered normal for students with high sight-singing skills to identify the mistakes they made during the preparation process, to focus on these sections, and to evaluate within the given time effectively. This situation was slightly different for students with low sight-singing skills. The same study (Darrow & Marsh, 2006) stated that students with low sight-singing skills are not successful in evaluating their performance. Therefore, the students who do not realize their mistakes constantly try to sing the melody over again. It has been argued that another reason that students with low sight-singing skills are constantly singing the melody all over is the fear of starting to sing in any other note than a tonic pitch. The students who are free to get tonic-starting pitch in the preparation part ensure they will start the right pitch every time they sing the melody. Hence, starting to sing from any part of the melody with an unknown pitch other than tonic may be challenging for low-level students.

There is a general view that the students do not have any problems while singing the sequential diatonic note scales. During the preparation

process, it was seen that some students reached the target by singing the other notes between the two notes as a series instead of singing by calculating the note transitions that were not larger than the second interval and the non-sequential.

Figure 3
Student Strategy Example

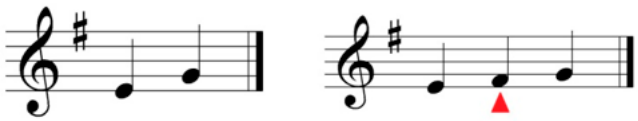


Figure 3 shows that the student who wanted to sing the E-G transition predicted how the G note should sound by singing the F note in between. Even if this strategy is assumed to work in larger interval note transitions, students should be careful not to waste time singing other notes between the two notes.

In the preparatory part, students were limited to getting only the tonic pitch on the piano. Despite this limitation, some students were observed getting help by playing the other notes even though they were warned. It has been thought that students broke the rules due to their habits rather than consciously doing this behavior. The level of this habit can be directly associated with the personal time spent with the piano. Vujović & Bogunović (2012) stated that using an instrument in the sight-singing process is not a part of the strategies of successful students. The results also show that students who sing out loud during the practice are also successful. This behavior can provide a kind of memorization for the performance part because the pitches are better committed in the brain during practice.

Pherson (1994) stated that students with good sight-singing skills can sing confidently in the performance part. In this study, the biggest predictor of success in pitch sight-singing was the behavior of singing confidently. In the performance part, self-confident students used their voices loudly to make sure of what they were doing, while unconfident students used their voices soft or made humming sounds. McCoy (1997) reached a similar conclusion in her study. In addition, some students who were not self-confident apologized to the educator in advance for the mistakes they would make before the pre-singing education. It is estimated that the students' urge to compare themselves with their classmates may have caused this insecurity. Some students who were not self-confident stated how low their pre-singing levels were compared to their friends. These students were told that the data would not be shared with anyone and that they should feel comfortable.

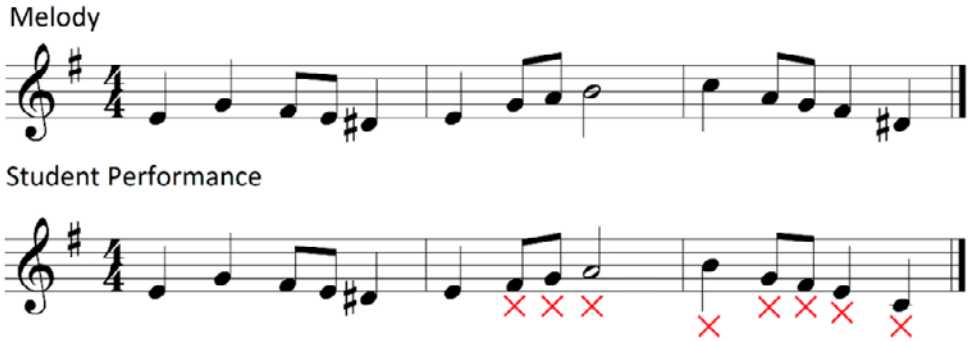
Another predictor of pitch sight-singing performance is the behavior of staying in tune. McCoy (1997) stated that staying in tune is the biggest predictor of pitch sight-singing. A student who sings out of tune during sight-singing no longer has a way to sing the notes on the right pitch. During my study, when experienced students realized this situation, they corrected their mistakes when they sang out of tune. On the other hand, inexperienced students sang out of tune and all the remaining pitch incorrectly. Singing out of tune in pitch sight-singing may also predict musical deficiencies other than sight-singing. For this reason, staying in tune should be an important behavior that educators should consider.

Stopping just after starting to pitch sight-singing and not keeping a steady tempo were defined as undesired behaviors (Killian & Henry, 2005). In my study, I observed a moderate relationship between the behaviors of singing without stopping after the beginning, keeping a steady tempo, and the success of pitch sight-singing. Failure to keep the tempo steady also indicated insecurity among the students. The non-self-confident student thought that s/he made mistakes and got stuck during singing. The literature indicates that continuously taking a break in the singing process distracts attention and causes students to sing out of tune. As a result, it may be beneficial for educators to encourage students not to stop when they make mistakes.

In my study, no significant relationship existed between the behavior of starting to sing in tune and the success of pitch sight-singing. The scale sung before the performance was effective in leading to this result. Giving the first pitch of the melody to the students without any preparation before singing—or singing the scale indicating the key—may make a difference in the success of starting to sing in tune.

When the performances were analyzed, it was observed that some students kept singing the rest of the melody in the wrong pitch by singing the

Figure 4
An Example of the Student Mistake



second intervals while singing the intervals larger than the second interval.

Figure 4 shows that the student sang the second interval instead of making a third interval transition in the E-G transition, thus incorrectly singing the rest of the melody. Singing the large intervals can often discourage students; therefore, students must have an idea in a limited time by detecting such intervals during the preparation process.

During my study, the students sang the melody twice, and their performance scores were obtained from their second trials. They were given 10 seconds between these two trials. While most students spent this time trying to sing the melody over again, some students spent their time scrutinizing the difficult parts. Not wasting time on easy parts during the preparation process was defined as a useful strategy (Henry, 2008). No significant difference was found between the student's first and last trial scores. However, when the students were divided into low, medium, and high groups, both rhythm and pitch sight-singing last trial scores of the students with high scores were significantly higher than their first trial scores. This result showed that high-scoring students could effectively use the 10-second time given to them between two trials (Killian & Henry, 2005).

According to the rhythm sight-singing results of the students, it was found that keeping the beat in the body was the biggest predictor of success. However, some students were also found to use hand signs. The students who did not keep the beat in their bodies usually sang in an unsteady and unstable tempo without matching fixed metronome beats. Rhythmic patterns are sung using previous musical experiences, just like tonal patterns. Singing without feeling/determining the beat made it difficult to evaluate the rhythmic patterns separately. For example, some students who did not feel the beat tried to sing by counting 16th notes fitting within the dotted quarter note in a 6/8 melody. On the other hand, the students who could feel the beat completed the task successfully without the need of counting by singing the two pieces of 16th notes in each 8th beat. In rhythm and pitch sight-singing, it has been thought that educators should encourage students to keep the beat in the body. It is sufficient for the student to physically show the beat. A student who keeps the beat in the body correctly is likely to know what notes fit into each beat. Therefore, it contributes to fluency and accuracy in singing.

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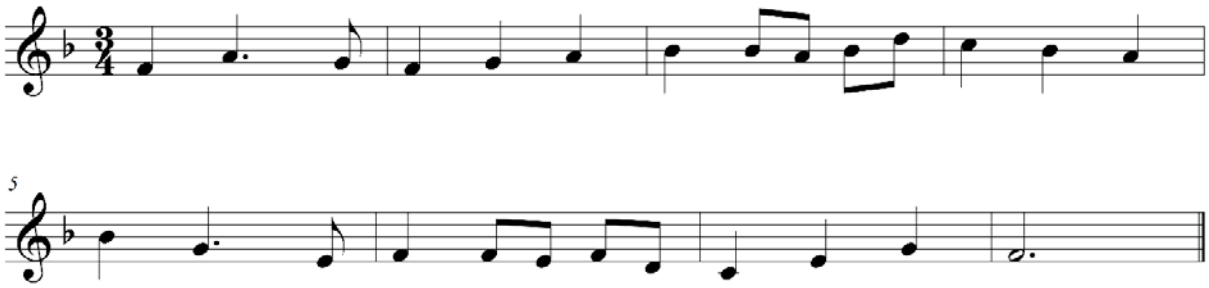
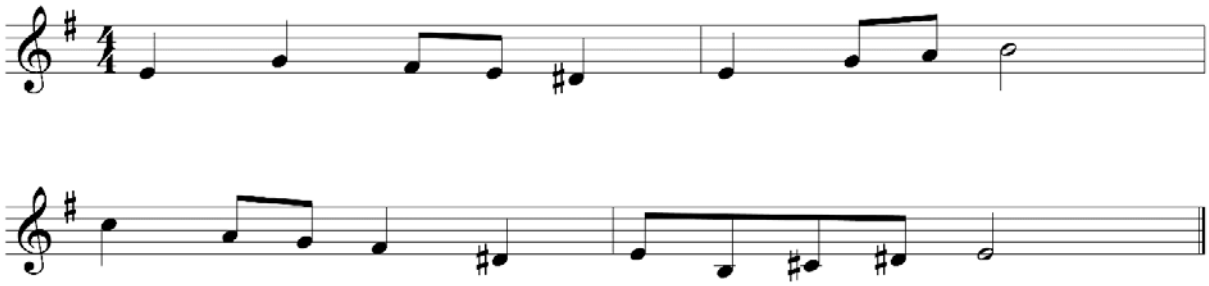
Appendix A

Melodies

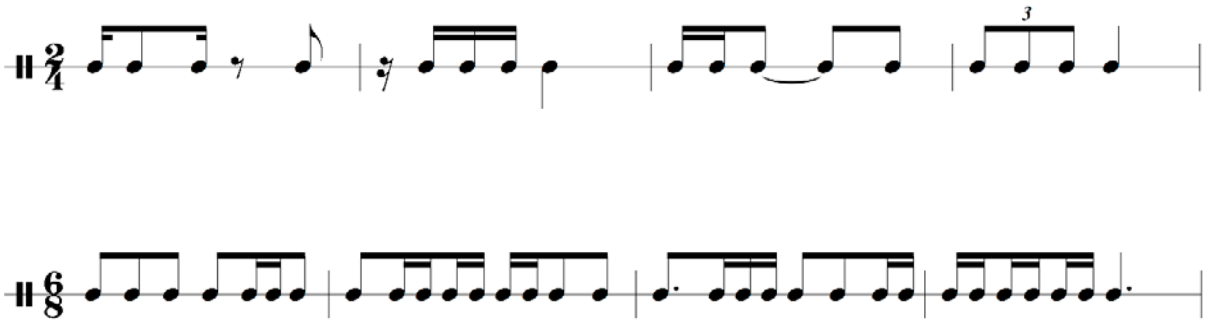
F major melody



E minor melody



Rhythm phrases

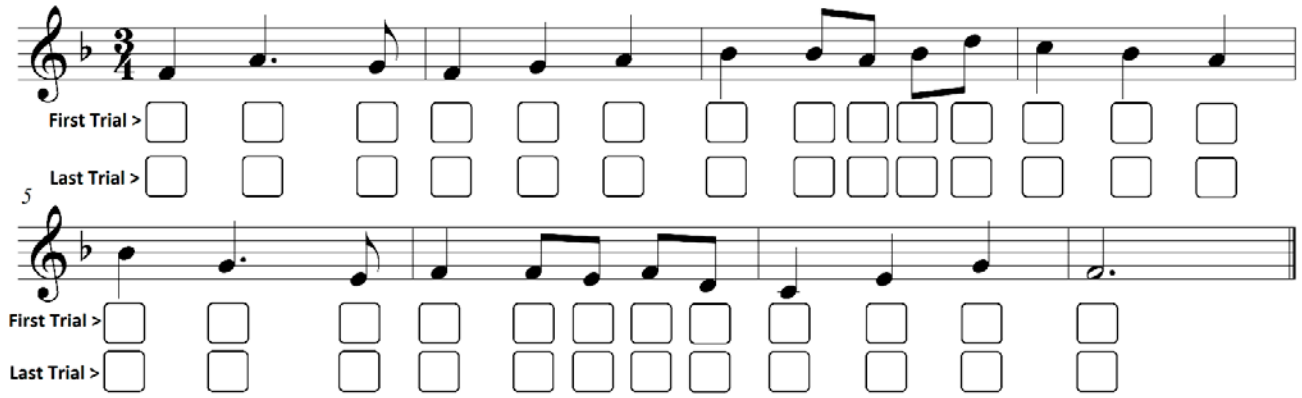


Appendix B

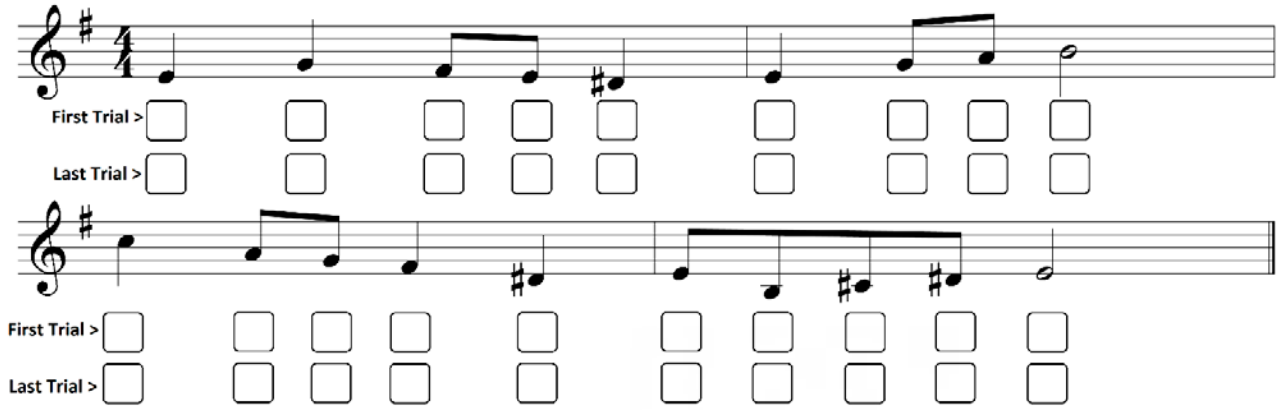
Participant Evaluation Form

Student No:

Fa major melody (One point for each pitch)



Mi minor melody (One point for each pitch)



During 30-second preparation before pitch sight-singing

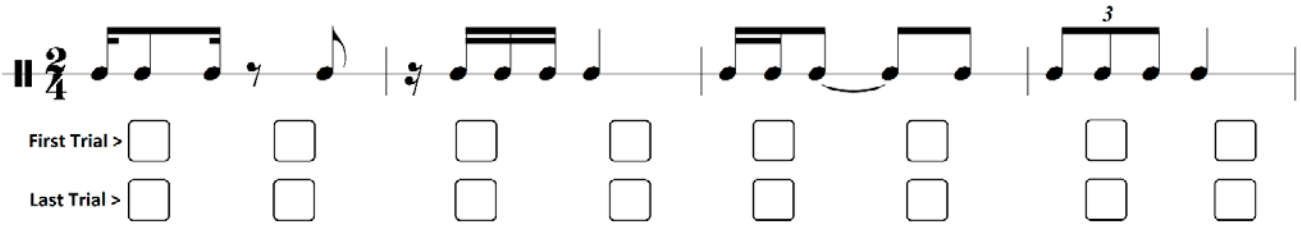
Behavior	Yes	No
Singing out loud during practice		
Scrutinizing the entire melody		

During pitch sight-singing

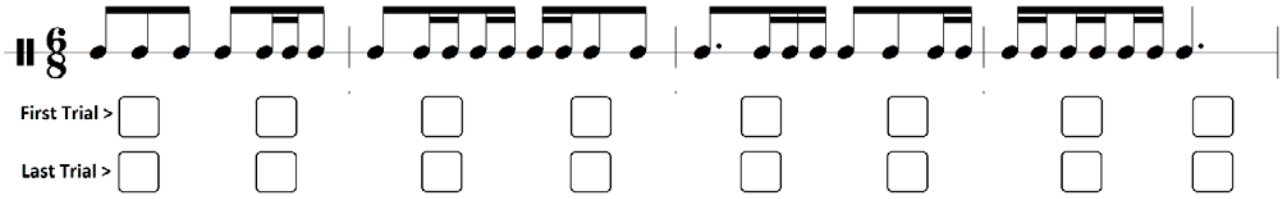
Behavior	Yes	No
Starting to sing in tune		
Keeping a steady tempo		
Singing confidently		
Staying in tune		
Singing without stopping in the beginning		

Student No:

Rhythm phrase - 1 (One point for each)



Rhythm phrase - 2 (One point for each)



During rhythm sight-singing

Behavior	Yes	No
Keeping the beat in the body		
Using hand signs		

Appendix C

Personal Information Form

Name:

1- How old are you?

2- What is your grade point average?

3- How many years have you been studying music?

4- How many years have you been studying instruments?

5- How many years have you been singing in choirs?

6- How many years have you been studying piano?

7- How many years have you been playing in orchestras?

8- How many years have you been taking individual vocal training?