

# Singing abilities of kindergarten and elementary school children: Assessment of the vocal pitch matching abilities

**Mayumi Mimura, Sachiko Kitano,  
Katsunobu Yoshitomi, Hiroaki Takeuchi\***

Hiroshima University, Fukuoka University of Education,  
International Pacific University, Hiroshima University

## Abstract

The vocal pitch matching ability is one of the most important abilities in music education. This study focuses on children's development of the vocal pitch matching ability. Children of 4- and 5-year-olds in two kindergartens, and one class of the first 3 grades of the elementary school listened to musical tones and were asked to reproduce by singing what they had heard. The types of musical inputs were (1) piano sounds; (2) female singing voice sounds; and (3) chants with female singing voice sounds. As for the results, (3) input led to the best answer and the second best was (2). It was easier for children to match the pitch with voice sounds inputs with meaning. Children's pitch matching ability was higher in the kindergarten offering music activities intentionally. From the study, the importance of developing a systematic music transition program for children to improve their music ability is suggested.

**Key words:** *kindergarten, elementary school, music education, vocal pitch matching ability*

---

\* mimuram@hiroshima-u.ac.jp, s-kitano@fukuoka-edu.ac.jp,  
k.yoshitomi@ipu-japan.ac.jp, hiloakit@hiroshima-u.ac.jp

## Introduction

More than 96.7% of 5-year-olds attend kindergarten or day care centre, in Japan (Meeting of Education Rebuilding, 2008). However, not until recently has the lack of smooth transition from kindergarten education to elementary school been criticized in Japan. The elementary 1st grade education starts with the so called “Zero Start”, and elementary school teachers have to build their curriculum without any information about children’s experience during the preschool years. In 2008, Ministry of Education, Culture, Sports, Science, and Technology mentioned that professional knowledge and skills to collaborate with elementary school teachers and early childhood teachers is one of the very important current professional needs for both preschool and elementary school teachers in revised national curriculum guidelines (Ministry of Education, Culture, Sports, Science, and Technology, 2008a; 2008b). Though some school districts started transition activities, such as visiting each other’s institution and sharing experiences, transition programs in certain subjects have not been developed, in general. The importance of building a transition curriculum in music education has been pointed out, however, more research is needed in this field in Japan.

The purpose of this study is to reveal children’s development of pitch matching ability. The vocal pitch matching ability is the one of the most important abilities in music education. Though Atterbury & Silcox (1993) found that there are no difference between children’s singing ability between with piano accompaniment and without piano accompaniment, however, children in Japan are most likely to sing with the teachers’ piano accompaniment, during music education activity periods in kindergarten and in the early years of elementary school, in Japan. At some kindergartens, children are also singing with imitating teachers’ singing, or listening to CDs. In addition, children in Japan are expected to sing together with their classmate during their music activities. As for these, children in Japan are expected to develop singing abilities to match the pitch of what they listened. Developing pitch matching abilities are very important abilities for children, however, Japanese kindergarten music education does not seem to focus on the vocal range of young children. Yoshitomi (1983) has examined singing vocal range of Japanese preschool children, however only a

few songs in songbooks are suitable for young children's vocal range, as for example Mizusaki (2008) found that 7/13 books have no songs that are suitable for 4-year-olds, and none of the books have more than 30% suitable songs for 5-year-olds. Pitch matching ability is not emphasized in early childhood education in Japan. In the contrast, pitch matching ability is much emphasized in elementary school music education, in Japan. The knowledge of children's development of pitch matching ability is very important for the creation of an elementary transition program in music education. In this research we examine the pitch matching abilities of both kindergarten and early elementary school children in different inputs and also the music education activities in kindergartens. The data will help to reconsider the kindergarten music education in kindergartens, in Japan.

In this research, the subjects for the experiment about the development of pitch matching abilities in different sound sources were 4-year-olds and 5-year-olds children in two kindergartens, and 1st, 2nd and 3rd grades of the elementary school children. This research also compared the young children's abilities with two types of education styles: one kindergarten was offering play based activities, and the other one was offering music activities explicitly.

There are researches on the pitch matching abilities for young children (Flowers & Dunne-Souza, 1990; Geinger, 1983; Trollinger, 2003; Welch 1985; Yarbrough, Bowers, & Benson, 1992; Yarbrough, Green, Benson, & Bowers, 1991). There is also research on the effect of the educational instruction for the development of pitch matching abilities in early childhood education (Kim, 2000). There are some researches with the experiment about the development of pitch matching abilities of young children in different sound sources. Buckton (1977) made clear that both vocal and instrumental programmes improved pitch discrimination and tonal memory; the vocal programme improving the vocal accuracy of the children; and children with high vocal accuracy levels and children with low vocal accuracy levels showed more improvement in melodic and vocal abilities than children with medium vocal accuracy. Green (1989) found that 9-year-olds singing voice was the best sound sources than female or male singing voices, for elementary school children. Sims, Moore & Kuhn (1982) examined 5- and 6-year-olds children and found that the female voice

was the better sound source for children's pitch matching test. However, there are no such researches in Japan. There are no research comparing the children's pitch matching abilities with different types of education styles, such as play centered activities and curriculum based structured activities, in Japan, too.

## Procedure

The experiment took place from September to December in 2004, involving two classes of 4-year-olds and 5-year-olds in two kindergartens, and one class of the first 3 grades of the elementary school. In addition to the tests, a questionnaire asked parents about the music environment of children at home.

### *Research Subjects*

Elementary school A: one class of the 1st, 2nd and 3rd grades.

In the 1st grade class, there are 39 children (19 boys & 20 girls) with 19 children (7 boys & 12 girls) who are taking out of the school music lessons. In the 2nd grade class, there are 29 children (10 boys & 19 girls) with 19 children (4 boys & 15 girls) who are taking out of the school music lessons. In the 3rd grade class, there are 39 children (19 boys & 20 girls) with 26 children (9 boys & 17 girls) who are taking out of the school music lessons.

Kindergarten B: one class of 4-year-olds, and one class of 5-year-olds.

In 4-year-olds class, there are 30 children (16 boys & 14 girls) with 11 children (5 boys and 6 girls) who are taking out of the school music lessons. In 5-year-olds class, there are 31 children (16 boys & 15 girls) with 14 children (6 boys and 8 girls) who are taking out of the school music lessons.

Kindergarten C: one class of 4-year-olds, and one class of 5-year-olds.

In 4-year-olds class, there are 16 children (5 boys & 11 girls) with 5 children (2 boys and 3 girls) who are taking out of the school music lessons. In 5-year-olds class, there are 9 children (4 boys & 5 girls) with 3 children (1 boy and 2 girls) who are

taking out of the school music lessons.

Elementary school A and kindergarten B are in the same school district hence most children from kindergarten B go to elementary school A.

### ***Method***

Types of musical inputs were (1) piano sounds; (2) female singing voice sounds “Aaa”; and (3) chants with female singing voice sounds “Kon-nichi-wha” which means Hello in Japanese (see Table 1). Children were asked to reproduce these 3 types of input sounds, each of them five times. 3 types of the sources are played in different order for different subjects. One person presented the task, and the other one recorded the children’s performances. Data was recorded by microphone (SONY F=V620) and a portable DAT recorder (SONY TCD-D100). The pre-recorded musical input sources were on a mini disc. As for the musical input sources, (1) piano sounds were played on a keyboard, (2) the female singing voice sounds and (3) the chants with female singing voice sounds were real voices without vibrato. 5 graduate students majoring in music education rated the children’s performances on a 5-point scale. 5 points for “match”; 4 points for “match partly or match within quarter tone”; 3 points for “match almost within half tone or absolutely one octave above or below”; 2 points for “singing around tone but without half tone”; and 1 point for “entirely off pitch” (see Table 2).

Table 1. *The Tasks of the Pitch Matching Test*

| The tasks             | Piano sounds | Female singing Voice sounds | Chants with female singing voice sounds |
|-----------------------|--------------|-----------------------------|-----------------------------------------|
| Demonstration example | C4           | B3                          | C4 – B ♭ 3 – C4                         |
| 1                     | E ♭ 3        | E4                          | D4 – C4 – D4                            |
| 2                     | C # 4        | A4                          | F # 4 – E4 – F # 4                      |
| 3                     | A4           | C # 4                       | A4 – G4 – A4                            |
| 4                     | G4           | A3                          | E4 – D4 – E4                            |
| 5                     | A3           | F # 4                       | B3 – A3 – B3                            |

Table 2. *Standards for Rating*

| Rating | Standards                                                             |
|--------|-----------------------------------------------------------------------|
| 5      | Match                                                                 |
| 4      | Match partly or match within quarter tone                             |
| 3      | Match almost within half tone or absolutely one octave above or below |
| 2      | Singing around tone but without half tone                             |
| 1      | Entirely off pitch                                                    |

## Results, Analysis and Findings

### *Comparison of Score According to Sound Types and Comparison According to Children's Experience of Private Music Lessons*

The average score of vocal pitch matching ability of elementary school A, kindergarten B and kindergarten C are presented in three figures (see Figure 1 to Figure 3). Except for (3) chants with female singing voice sounds like “Kon-nichi-wha”, in the case of the pitch matching score of elementary school A, all the scores increase with age. Especially kindergarten B shows a remarkable increase of scores from 4-year-olds to 5-year-olds.

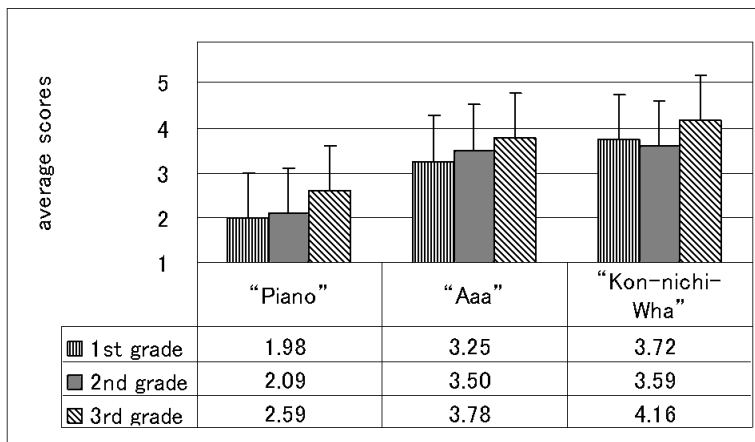


Figure 1. The average score of vocal pitch matching ability of elementary school A.

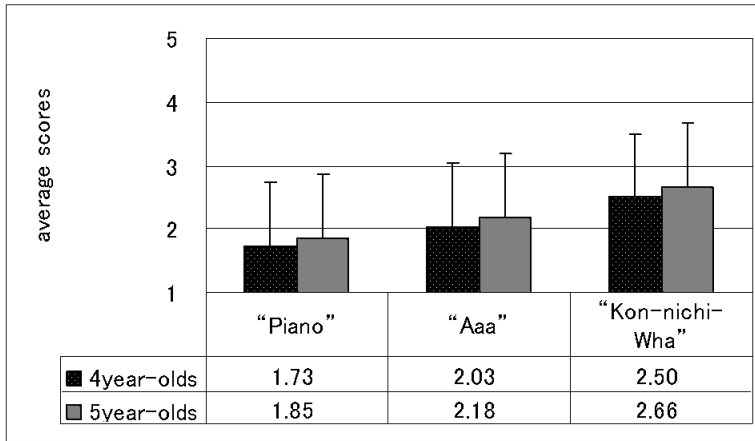


Figure 2. The average score of vocal pitch matching ability of kindergarten B.

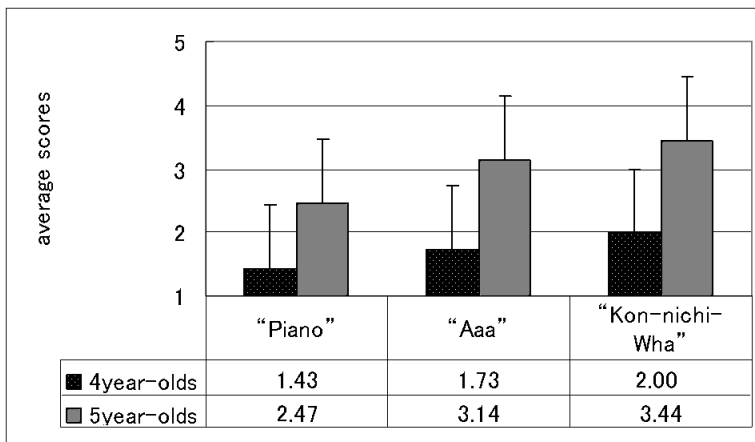


Figure 3. The average score of vocal pitch matching ability of kindergarten C.

In the questionnaire about children's home environment in music education, parents gave information about children's experiences regarding private music lessons. Based on this data, scores of children taking private music lesson are compared to scores of those who do not take (see Figure 4 to Figure 10). Children without the experience of private music lessons obtained slightly higher scores for (1) piano sounds score of kindergarten B, and (2) female singing voice sounds "Aaa" of kindergarten B and C in the classes of 4-year-olds. These results show that private music

lessons do not necessarily affect the vocal pitch matching ability of children in 4-year-olds. Children older than four, however, scored higher if they were taking private music lessons. This reveals that the experience of private music lessons improves children's vocal pitch matching ability, but not the experience of kindergartens.

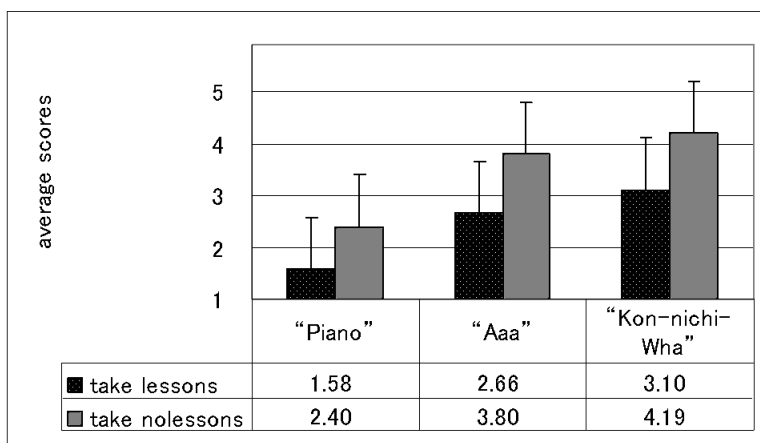


Figure 4. The average score of vocal pitch matching ability of grade one, elementary school A classified groups based on taking private music lessons or not.

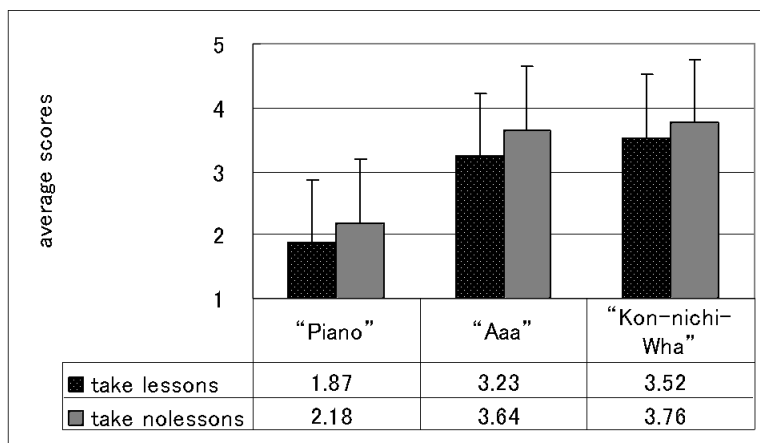


Figure 5. The average score of vocal pitch matching ability of grade two, elementary school A classified groups based on taking private music lessons or not.

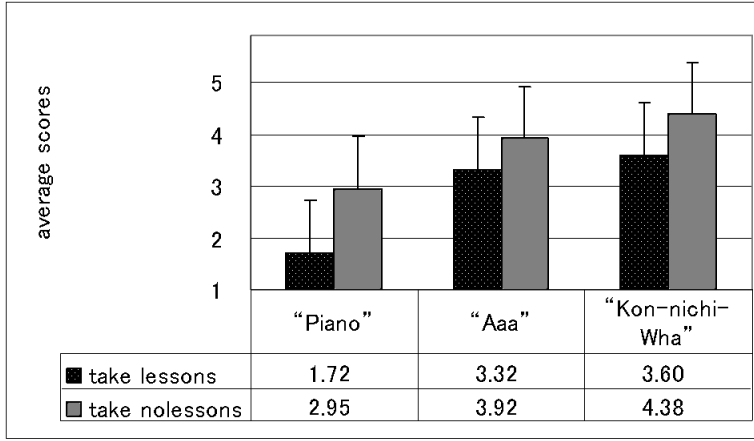


Figure 6. The average score of vocal pitch matching ability of grade three, elementary school A classified groups based on taking private music lessons or not.

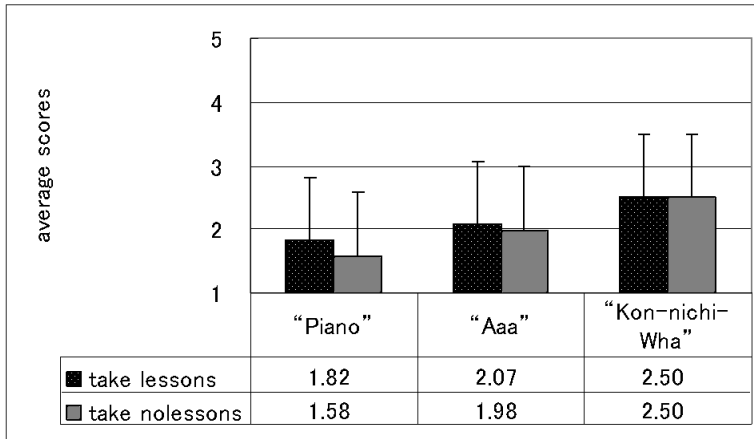


Figure 7. The average score of vocal pitch matching ability of four-year-olds, kindergarten B classified groups based on taking private music lessons or not.

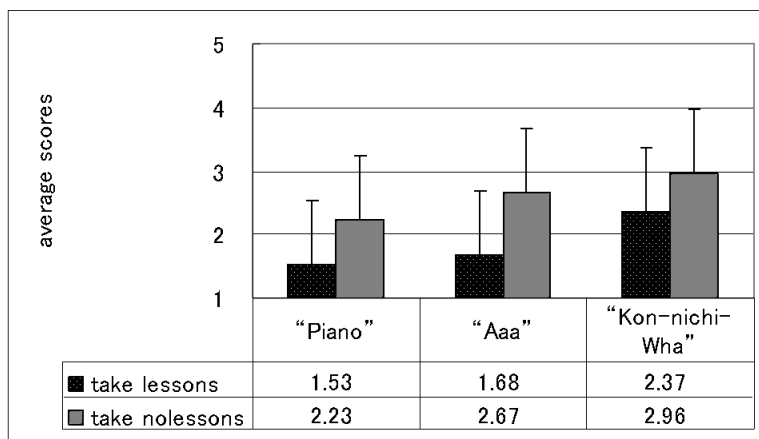


Figure 8. The average score of vocal pitch matching ability of Five-year-olds, kindergarten B classified groups based on taking private music lessons or not.

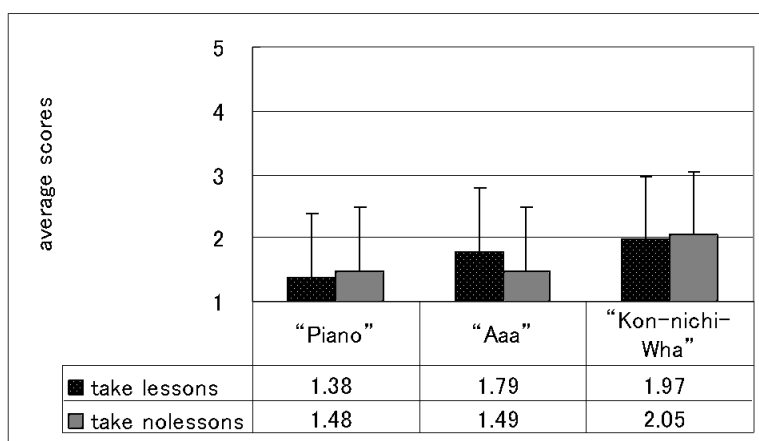


Figure 9. The average score of vocal pitch matching ability of four-year-olds, kindergarten C classified groups based on taking private music lessons or not.

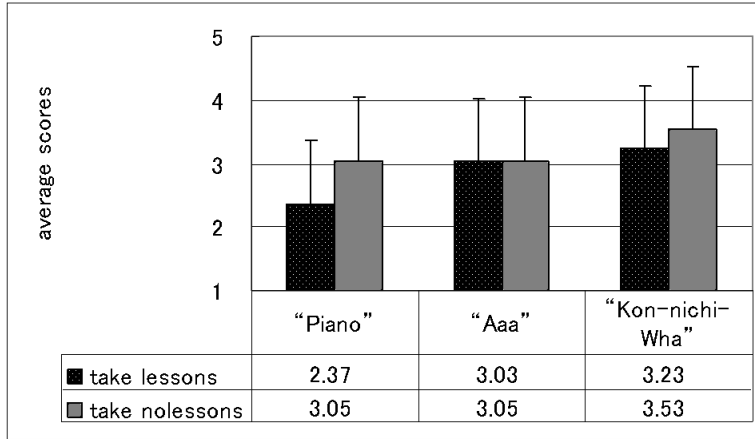


*Figure 10.* The average score of vocal pitch matching ability of five-year-olds, kindergarten C classified groups based on taking private music lessons or not.

Figure 11. to Figure 13 show the scores of children without the experience of private music lessons. Musical activities in the kindergarten and music lessons together with musical activities in the elementary school have an obvious effect on the musical development of children who have not taken private music lessons.

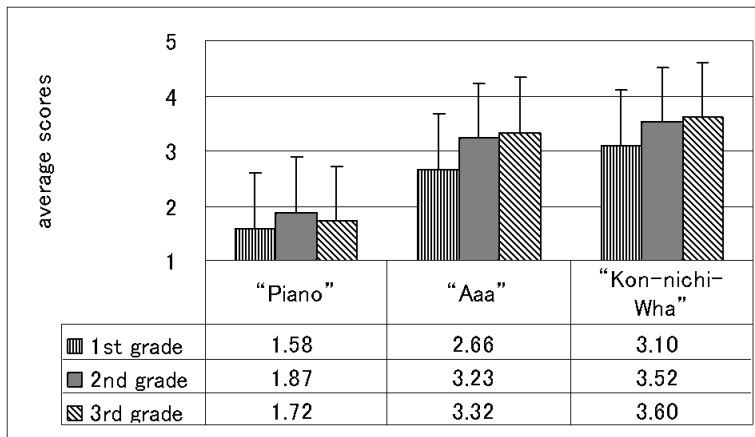


*Figure 11.* The average score of vocal pitch matching ability of children who have not taken private music lessons, all grades, elementary school A.

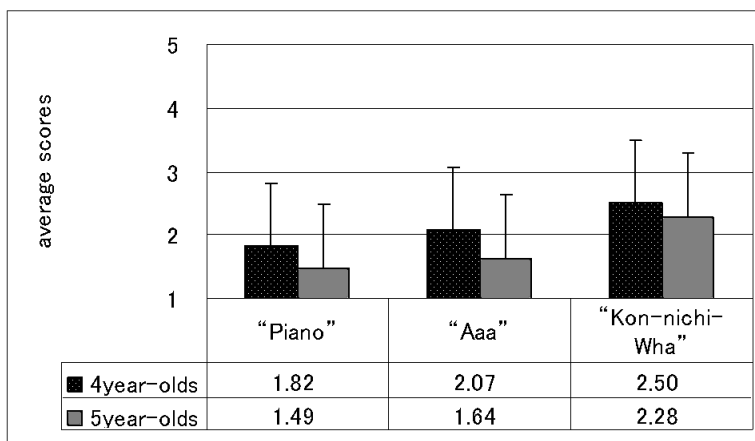


Figure 12. The average score of vocal pitch matching ability of children who have not taken private music lessons, four-year-olds and five-year-olds, kindergarten B.

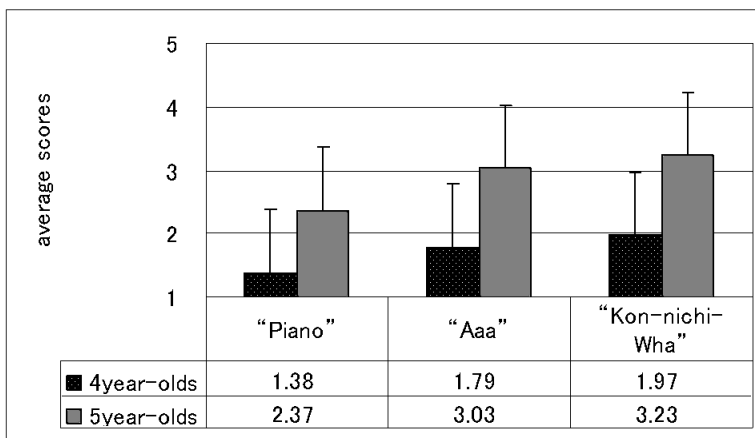


Figure 13. The average score of vocal pitch matching ability of children who have not taken private music lessons, four-year-olds and five-year-olds, kindergarten C.

In the case of elementary school A, the 3rd grader's (1) piano sounds pitch matching scores decrease, however, all other scores increase by grade. In the case of kindergarten B, all the scores of 5-year-olds are lower than those of 4-year-olds. However, all the scores of 5-year-olds in kindergarten C are remarkably higher than those of the 4-year-olds. In kindergarten C, there was not big difference between the scores of 5-year-olds taking private music lessons and of the ones that were not

taking any (See Figure 10). This suggests that musical activities of kindergarten C were effective in developing the vocal pitch matching ability.

Figure 1 to Figure 13 present all the pitch matching scores examined. These data show that the input of type (3) chants with female singing voice sounds “Kon-nichi-wha” resulted in the highest scores for all age groups. The second best scores were for the input of type (2) female singing voice sounds “Aaa”. It became clear that it was easier for children to match the pitch with voice sounds inputs, and it was much easier with inputs with meaning.

### ***Developmental Transition of Vocal Pitch Matching Ability***

In the case of (1) piano sounds, scores slightly decrease. In Figure 14, the average scores of all children show an increase of scores in the 3rd grade. In Figure 15, however, the average of pitch matching scores of (1) piano sounds decreases in the 3rd grade. A closer look at the results reveals that higher scores of (1) piano sounds in the 3rd grade were given to children who took private music lessons. Most of the children who took private music lessons were taking piano or electric piano lessons. Therefore, this increase indicates that piano or electric piano lesson may affect the vocal pitch matching ability for (1) piano sounds. On the other hand, the average scores of (2) female singing voice sounds “Aaa”, and (3) chants with female singing

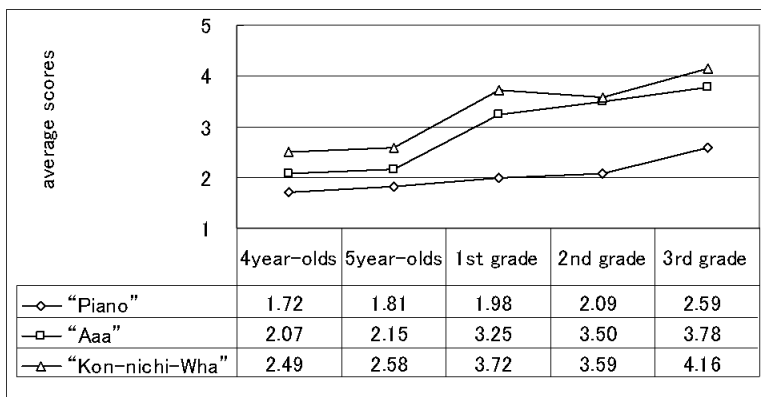


*Figure 14.* Transition of the average score of vocal pitch matching ability of four-year-olds to eight-year-olds, kindergarten B and elementary school A

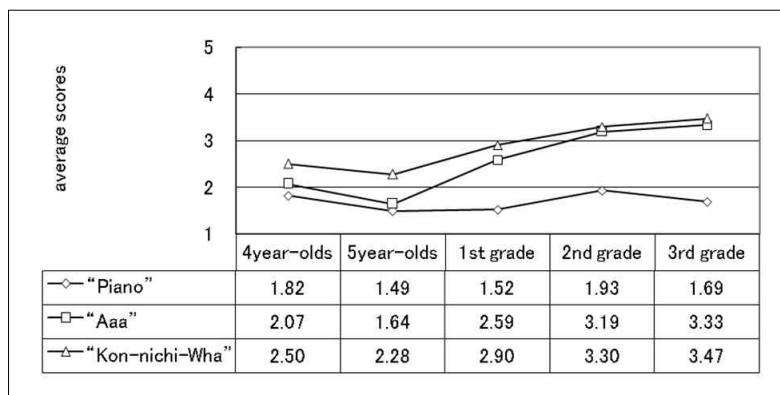


Figure 15. Transition of the average score of vocal pitch matching ability of four-year-olds to eight-year-olds who have not taken private music lessons, kindergarten B and elementary school A.

voice sounds “Kon-nichi-wha” remarkably increased in the case of 5-year-olds children in both groups. This fact shows that the outcome of music instruction becomes tangible in the elementary school.

### ***Comparison of Vocal Pitch Matching Ability between Two Educational Styles in the Kindergarten***

In this section, two things have been considered. One is why the score of children without the experience of private music lessons decreased in 5-year-olds in kindergarten B. The other one is why the score of children who have not taken private music lesson increased remarkably in 5-year-olds in kindergarten C. This consideration focuses on the musical activities of each kindergarten. Musical activities of kindergarten B and Kindergarten C are shown in Table 3. The data presented were based on the questionnaire answered by the staff in both Kindergartens.

Table 3. *Comparison of Musical Activities between Kindergarten B and Kindergarten C*

| Item                                         | Kindergarten B                                                                                          | Kindergarten C                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type of nursing                              | Largely favorite play except closing convention                                                         | Approximately amount of favorite play and setting nursing are the same                                                                                                                                                                                                                                                   |
| Morning convention                           | None                                                                                                    | Including musical activities (30 min./day)                                                                                                                                                                                                                                                                               |
| Closing convention                           | Including musical activities (5 to 15 min./day)                                                         | Including musical activities (15 min./day)                                                                                                                                                                                                                                                                               |
| Setting nursing including musical activities | 15 to 30 min.<br>(four to six times per month)                                                          | Over 30 min.<br>(5 times per week)                                                                                                                                                                                                                                                                                       |
| Musical environment                          | Setting the opportunity of listening to music<br>Playing music as a back ground music at the lunch time | Setting the period of audition of listening recorded music and music videos<br>Playing back ground music<br>Singing symbolic songs of morning, leaving and lunch time<br>Playing music as a sign of changing living hours<br>Using chords and sounds for the purpose of acquiring manners as getting, keeping quiet etc. |

The amount of musical activity periods of kindergarten C is evidently higher than that of kindergarten B. Figure 16 to Figure 21 show the transition from 4-year-olds to 5-year-olds. From these figures, the developmental difference of kindergarten B and kindergarten C by sound sources can be detected. The average scores of all children of 4-year-olds to 5-year-olds are shown in 3 figures (see Figure 16 to Figure 18). The average scores of children who have not taken private music lessons are shown in Figure 19, 20 and 21.

The data from Figure 16 to 18 were analyzed by two-way analyses of variance with two between subject factors, kindergarten and age. On the data of Figure 16, all members and piano, significant main effects of kindergarten [ $F(1, 82)=4.788, p=0.0315$ ] and age [ $F(1, 82)=15.940, p=0.0001$ ] were found, and an interaction between the two factors was also significant, [ $F(1, 82)=12.309, p=0.0007$ ]. The simple main effect of kindergarten was significant at 5-years-old, [ $F(1, 82)=16.225, p=0.0001$ ], and the simple main effect of age was significant at kindergarten C [ $F(1, 82)=$

28.132,  $p=0.0000$ ]. On the data of Figure 17, all members and female-voice, a significant main effect of age [ $F(1, 82)=11.305$   $p=0.0012$ ] was found, and an interaction between two factors was significant, [ $F(1, 82)=7.682$ ,  $p=0.0069$ ]. The simple main effect of kindergarten was significant at 5-years-old, [ $F(1, 82)=8.905$ ,  $p=0.0037$ ], and the simple main effect of age was significant at kindergarten C, [ $F(1, 82)=18.813$ ,  $p=0.0000$ ]. On the data of Figure 18, all members and “Kon-nichi-wha”, a significant main effect of age [ $F(1, 82)=11.002$   $p=0.0014$ ] was found, and an interaction between two factors was significant, [ $F(1, 82)=6.689$ ,  $p=0.0115$ ]. The simple main effect of kindergarten was significant at 5-years-old, [ $F(1, 82)=4.815$ ,  $p=0.0311$ ], and the simple main effect of age was significant at kindergarten C, [ $F(1, 82)=17.424$ ,  $p=0.0001$ ].

Furthermore, similar analyses were undertaken for the data from Figure 19 to 21. On the data of Figure 19, without private lesson and piano, a significant interaction between two factors was found [ $F(1, 48)=6.150$ ,  $p=0.0167$ ]. The simple main effect of kindergarten was significant at 5-years-old, [ $F(1, 48)=5.346$ ,  $p=0.0251$ ], and the simple main effect of age was significant at kindergarten C, [ $F(1, 48)=7.330$ ,  $p=0.0094$ ]. On the data of Figure 20, without private lesson and female-voice, a significant main effect of kindergarten was found [ $F(1, 48)=5.183$ ,  $p=0.0273$ ], and an interaction between two factors was found [ $F(1, 48)=11.982$ ,  $p=0.0011$ ]. The simple main effect of kindergarten was significant at 5-years-old, [ $F(1, 48)=16.463$ ,  $p=0.0002$ ], and the simple main effect of age was significant at kindergarten C, [ $F(1, 48)=14.026$ ,  $p=0.0005$ ]. On the data of Figure 21, without private lesson and “Kon-nichi-wha”, a significant interaction was found between two factors [ $F(1, 48)=5.713$ ,  $p=0.0208$ ]. The simple main effect of kindergarten was significant at 5-years-old, [ $F(1, 48)=4.334$ ,  $p=0.0427$ ], and the simple main effect of age was significant at kindergarten C, [ $F(1, 48)=9.564$ ,  $p=0.0033$ ].

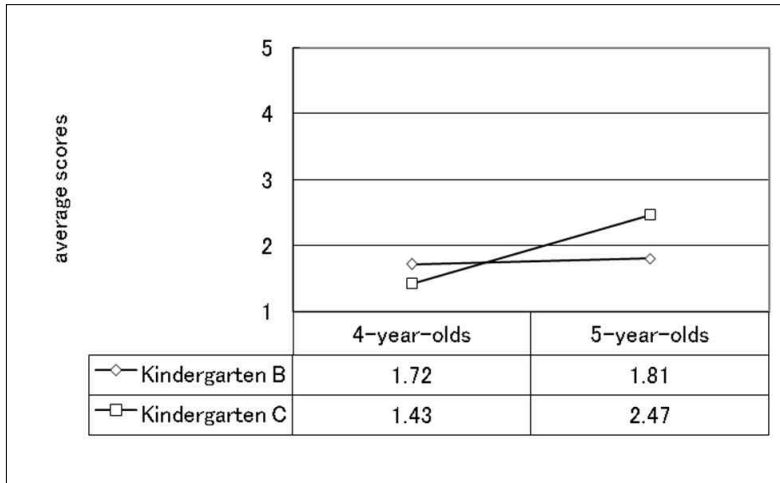


Figure 16. Comparison of the average score of piano sounds with all children of kindergarten B and kindergarten C

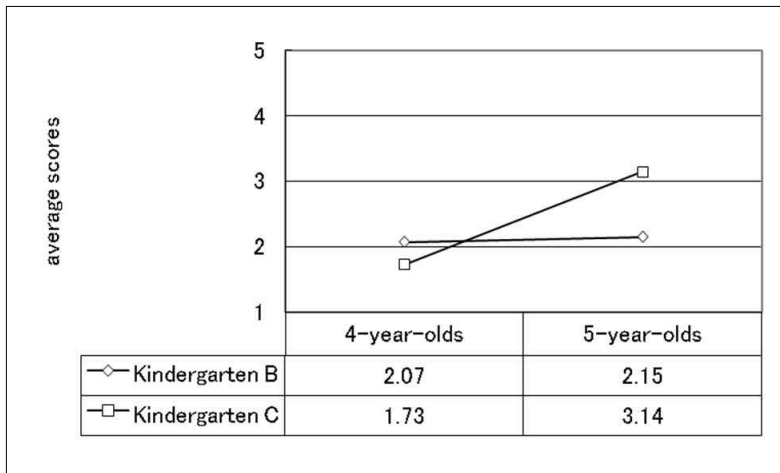


Figure 17. Comparison of the average score of female singing voice sounds with all children of kindergarten B and kindergarten C.

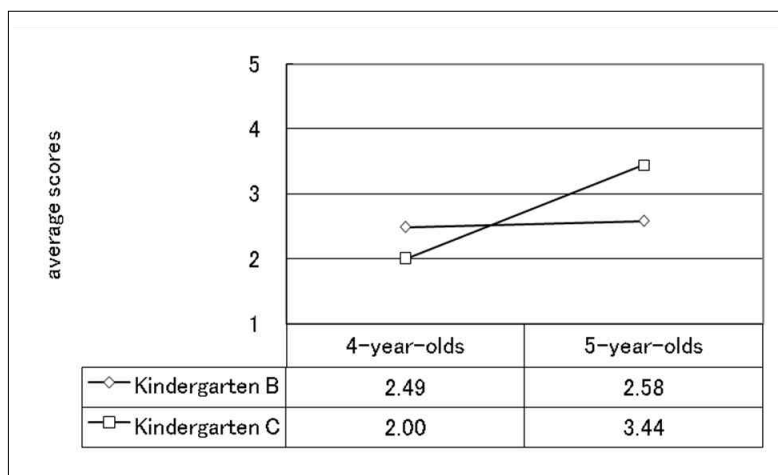


Figure 18. Comparison of the average score of chants with female singing voice sounds with all children of kindergarten B and kindergarten C.

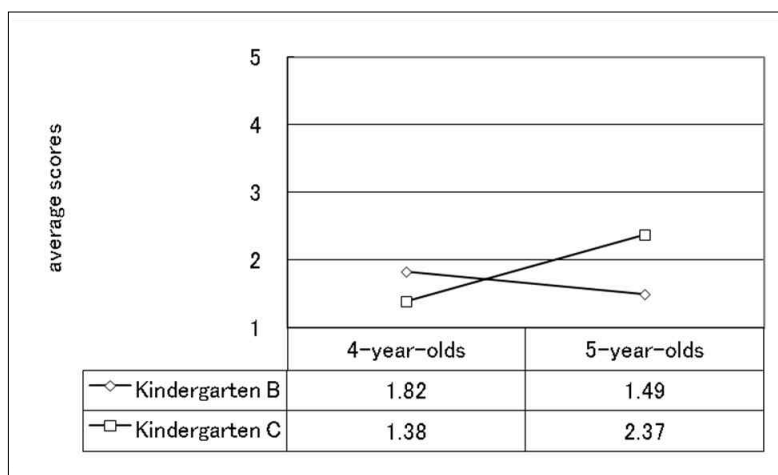


Figure 19. Comparison of the average score of piano sounds with all children who have not taken private music lessons of kindergarten B and kindergarten C.

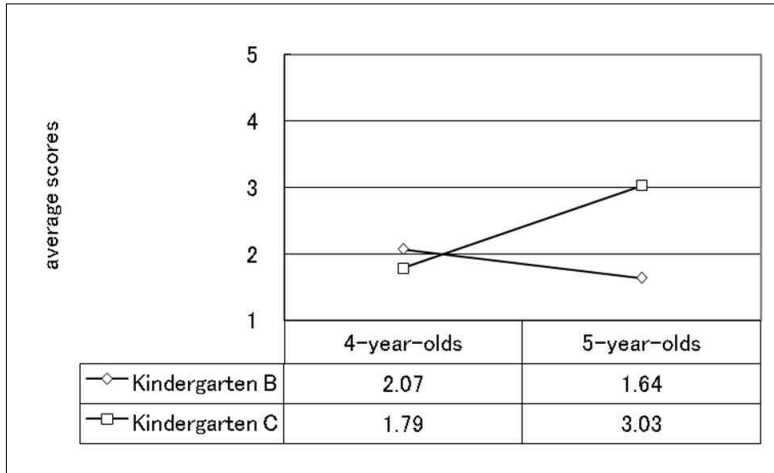


Figure 20. Comparison of the average score of female singing voice sounds with all children who have not taken private music lessons of kindergarten B and kindergarten C.

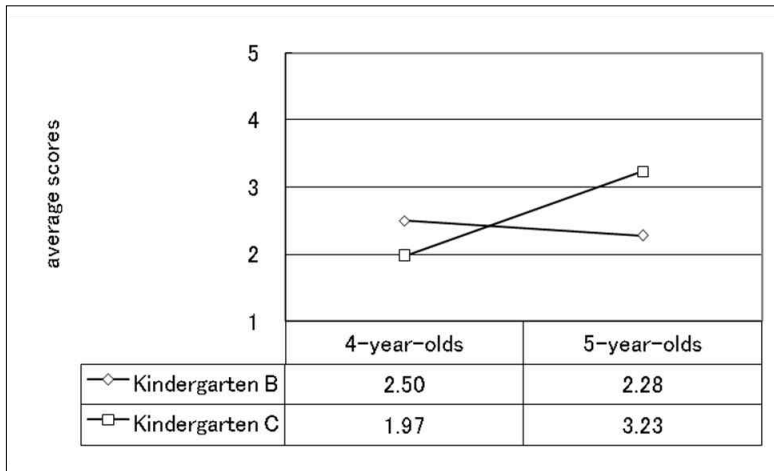


Figure 21. Comparison of the average score of chants with female singing voice sounds with all children who have not taken private music lessons of kindergarten B and kindergarten C.

All the average scores of 4-year-olds of kindergarten B are superior to those of kindergarten C. The average scores of 5-year-olds of kindergarten B remain approximately the same as those of 4-year-olds. All the scores of 5-year-olds who have not

taken private music lessons in kindergarten B, however, remain the same as those of 4-year-olds. The results of variants analysis show a significant correlation in Figures 16 to 21. Therefore it is natural to assume that a substantial increase of the scores in the case of 5-year-olds in kindergarten C results from the difference between musical activities shown in Table 3.

## Conclusion

This paper has provided the characteristics of the pitch matching abilities of young children, namely that type (3) chants with female singing voice sounds “Kon-nichi-wha” input resulted in the right answer in all age groups of children. The second best scores were achieved in the case of input (2) female singing voice sounds “Aaa”. (1) piano sounds inputs were the hardest for children to reproduce. It became clear that it was easier for children to match the pitch with voice sounds inputs, and it was much easier for children to match with input with meaning. From our study, it is suggested that playing the piano in early childhood music education is not always necessary for singing instruction but showing a model for singing is more effective in improving the children’s singing abilities.

A big progress could be detected in the case of 5-year-olds of the kindergartens and the elementary school 1st grade children. The probable reason for this is that music education in the elementary school is much more structured and has a clear educational aim for music experience. When the two kindergartens were compared, children’s pitch matching ability was higher in the kindergarten offering explicit music activities. In addition, in children’s vocal pitch matching ability, there was a big difference between the scores of 5-year-olds in kindergarten B and kindergarten C. These kindergartens have different educational policies and styles, and both the quality and the quantity of music educational activities are different. These facts indicate that there was a correlation between musical experiences and vocal pitch matching ability.

There were more play activities at kindergarten B and less music education activities. The objectives are to foster musical sensibility, to expose children to ex-

periencing tone colors, rhythms and music as an important part of their daily lives and plays. Unfortunately, in general, there are very few kindergartens with a clear educational curriculum including goals in music education, in Japan.

In contrast, in our interview, the director of kindergarten C said that “daily live actually is rhythm itself, and live full of music is a vital element of children’s physical and mental development in early childhood care and education”. Under the direction of the director, the staff uses music in children’s daily lives in kindergarten C. The director himself is an accomplished musician, furthermore the wife of the director, who is a specialist in music, plays an important role in the music activities of the kindergarten, and both of them graduated from a music college. As a result, music activities in kindergarten C are satisfactory. There are no visiting instructors of music in kindergarten C, and no musical outsourcing activities by music education companies. Consequently, acquiring the habit of listening to speech is emphasized. In other words “hearing” is emphasized. It can be assumed that musical activities and musical play are joyful.

The principle of kindergarten B is common in the field of early childhood education. Children must play spontaneously, learn by trial and error. Children are growing through those processes. However, it is difficult to nurture children’s musical sensibility only through free play. Kindergarten teachers who understand what musical sensibility is and how to nurture that sensibility may be scarce. Those who can detect the musical sensibility of children in their activities, and who can develop that sensibility may also be scarce. It is clear that play based musical experience is very important in kindergarten education. However, it is also important to design a more structured, goal-oriented program especially in music education in the kindergarten.

Vocal pitch matching ability, which the study deals with, is not necessarily directly associated with musical sensibility. Nonetheless, musical sensibility is not expressed suddenly and cannot be fostered in a day. Consequently, children’s musical sensibility may be fostered through their daily musical activities. In order to do that, Kindergarten teachers have to build in as many enjoyable musical activities for the children as possible in their everyday lives. No one should expect a sudden leap in the

musical sensibility of children. The vocal pitch matching ability involves fundamental abilities to listen to music, to listen to singing voices of the teacher, friends and their own. Therefore it can be assumed that the vocal pitch matching ability is an essential ability for musical activities of children. Probably no special training is required for fostering this ability. Some kindergartens teach singing with the help of special visiting instructors of music, although much of their instruction is not appropriate for the feelings and the development of children.

The authors believe that by providing satisfying musical activities closely related to the children's daily lives, such as in the case of kindergarten C, where there are no strict musical activities in preparation for a show, children develop their musical ability naturally, and thus their musical sensibility improves. The kind of music education that is needed is evidence based developmentally and culturally appropriate practice for young children. In order to developing kindergarten to elementary school music transition curriculum, more quantitative and qualitative expansion of musical activities in kindergarten should be considered. In the curriculum, the music activities should be the one that children can learn in an enjoyable way, and that develop children's aural abilities and singing abilities to sing in accurate pitch. Based on the data of this research, developing the music transition curriculum is the subject for a further study.

## References

- Atterbury, B. W., & Silcox, L. (1993). The effect of piano accompaniment on kindergartners' developmental singing ability. *Journal of Research in Music Education*, 41 (1), 40-47.
- Buckton, R. (1977). A comparison of the effects of vocal and instrumental instruction on the development of melodic and vocal abilities in young children. *Psychology of Music*, 5 (1), 36-47.
- Flowers, P. J., & Dunne-Souza, D. (1990). Pitch-pattern accuracy, tonality, and vocal range in preschool children's singing. *Journal of Research in Music Education*, 38 (2), 102-114.

- Geringer, J. M. (1983). The relationship of pitch-matching and pitch-discrimination abilities of preschool and fourth-grade students. *Journal of Research in Music Education*, 31 (2), 93-99.
- Green, G. A. (1989). The effect of vocal modeling on pitch-matching accuracy of elementary school children. *Journal of Research in Music Education*, 38 (3), 225-231.
- Kim, J. (2000). Children's pitch matching, vocal range, and developmentally appropriate practice. *Journal of Research in Childhood Education*, 14 (2), 152-160.
- Meeting of Education Rebuilding (2008). *State of Early Childhood Education and Family Education*.
- Ministry of Education, Culture, Sports, Science, and Technology (2008a). *National elementary school curriculum guideline*. Tokyo: Ministry of Education, Culture, Sports, Science, and Technology.
- Ministry of Education, Culture, Sports, Science, and Technology (2008b). *National kindergarten curriculum guideline*. Tokyo: Ministry of Education, Culture, Sports, Science, and Technology.
- Mizusaki, M. (2008). Investigating song books for early childhood education in Japan. *International Journal of Early Childhood Education*, 15, 13-20.
- Sims, W. L., Moore, R. S., & Kuhn, T. L. (1982). Effects of female and male vocal stimuli, tonal pattern length, and age on vocal pitch-matching abilities of young children from England and the United States. *Psychology of Music*, 10, 104-108.
- Trollinger, V. L. (2003). Relationships between pitch-matching accuracy, speech fundamental frequency, speech range, age, and gender in American English-speaking preschool children. *Journal of Research in Music Education*, 51 (1), 78-94.
- Welch, G. F. (1985). Variability of practice and knowledge of results as factors in learning to sing in tune. *Bulletin of the Council for Research in Music Education*, 85, 238-247.
- Yarbrough, C., Bowers, B., & Benson, W. (1992). The effect of vibrato on the pitch-matching accuracy of certain and uncertain singers. *Journal of Research in*

*Music Education*, 40 (1), 30-38.

Yarbrough, C., Green, G., Benson, W., & Bowers, J. (1991). Inaccurate singers: An exploratory study of variables affecting pitch-matching. *Bulletin of the Council for Research in Music Education*, 107, 23-34.

Yoshitomi, K. (1983). A study of singing able vocal ranges in infants. *Bulletin of the Faculty of Education Ehime University*, 1 (29), 257-265.