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The purpose of this study was to determine the relationship between singing achievement and developmental tonal aptitude for students in kindergarten through third grade. In addition, we investigated whether singing achievement differs according to grade level or school setting. Subjects (N = 162) were randomly selected kindergarten, first-, second-, and third-grade children from schools in two different school districts. Correlations between composite singing achievement scores and scores on the Primary Measures of Music Audiation-Tonal reflected no meaningful relationships between singing achievement and developmental tonal aptitude. Two-way analysis of variance revealed no significant interaction between school and grade. However, there were significant main effects for school and grade ($p < .001$). With the exception of third-grade students, older students demonstrated greater singing achievement than younger students.

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The Relationship between Developmental Tonal Aptitude and Singing Achievement among Kindergarten, First-, Second-, and Third-Grade Students

Singing is an important component of elementary general music instruction (Atterbury & Silcox, 1993; Cooper, 1995; Goetze, Cooper, & Brown, 1990; Guerrini, 2002; Kim, 2000; Levinowitz et al., 1998). However, music teachers continue to be concerned about the singing achievement of their students (Phillips, 1985), with some studies

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pointing to a recent decline in the number of elementary children who are able to use their singing voices (Levinowitz et al., 1998). Children develop singing habits as early as age 8 (McGraw, 1996). Therefore, if music educators are to improve singing in the elementary school, they must have as much information as possible about developing singing skills in elementary-age children.

Many factors affect singing achievement in children. Some researchers have found that singing accuracy is related to age, regardless of instruction (Geringer, 1983; Goetze & Horii, 1989; Gould, 1969; Green, 1989). Others, however, believe that singing is a learned behavior and support the need for vocal instruction to develop singing skills in children (Aaron, 1993; Apfelstadt, 1984, 1986; Cooper, 1995; Goetze & Horii, 1989; Green, 1989; Klinger et al., 1998; Levinowitz et al., 1998; McGraw, 1996; Muse, 1994; Phillips, 1985; Phillips & Aitchison, 1997a; Phillips & Vispoel, 1990). Other factors that affect singing achievement are type of model, singing context, and use of accompaniment. A child vocal model results in the best singing accuracy from children, followed by an adult female model and then an adult male model (Green, 1989; Sims, Moore, & Kuhn, 1982; Small & McCachern, 1983). An adult female without vibrato model elicits more singing accuracy from children than does an adult female model with vibrato (Yarbrough, Bowers, & Benson, 1992). Also, singing accuracy is greater when children sing individually rather than in a group (Goetze & Horii, 1989), and several researchers recommend the use of individual and small-group singing activities to improve singing accuracy (Rutkowski, 1996; Rutkowski & Snell Miller, 2003). Petzold (1969) and Stauffer (1985) have found that children sing more accurately without than with accompaniment.

Music Aptitude

Because music aptitude is defined as the potential for one to achieve in music, it, too, may be one of the factors affecting singing achievement. With appropriate instruction, children with high tonal aptitudes should tend to demonstrate higher singing achievement than do those with low tonal aptitudes. However, there is conflicting evidence of the strength of the relationship between developmental tonal aptitude and singing achievement. Mota (1997) reported a significant relationship between ratings on singing a familiar song and scores on the Primary Measures of Music Audiation (PMMA); however, some subjects were able to sing a song accurately, but performed poorly on the Tonal subtest of the PMMA. Phillips and Aitchison (1997b) found that third-grade accurate singers performed significantly higher on the Tonal subtest of the PMMA than nonaccurate singers, and Guerrini (2002) found that the high- and moderate-aptitude children are significantly more accurate in their singing than are low-aptitude children. Jaffurs (2000) found a moderate relationship between developmental tonal aptitude and

singing achievement. However, other researchers have found that there is little relationship between developmental tonal aptitude and singing achievement (Atterbury & Silcox, 1993; Mota, 1997; Phillips, Aitchison, & Nompula, 2002; Rutkowski, 1986, 1996; Rutkowski & Snell Miller, 2003).

Purpose and Problems

Continued study of the relationship between tonal music aptitude and singing achievement with a variety of ages of children and in a variety of settings may provide more insight into the development of the singing voice. Therefore, with the intent of improving singing instruction in elementary general music, the purpose of this research was to investigate the nature of the relationship between developmental tonal aptitude and singing achievement. The specific goals of this study were (1) to determine the relationship between developmental tonal music aptitude and singing achievement among kindergarten, first-, second-, and third-grade children, (2) to determine whether the relationship between developmental tonal music aptitude and singing achievement changes with age, and (3) to determine whether school setting or age affects singing achievement.

METHOD

Participants

Subjects ($N = 162$) were randomly selected students from the kindergarten, first, second, and third grades of two elementary public schools from separate districts in Michigan. We chose these specific schools because we knew, through observation, that the schools had strong elementary general music programs. School 1 was in a rural/suburban district, and School 2 was in a suburban/urban district. Both schools had diverse socioeconomic compositions. Students in both schools received music instruction twice a week for approximately 30 minutes. Curricula in the two schools were similar, but the teacher in School 2 placed more emphasis on solo singing than did the teacher in School 1.

Design and Procedures

Two criterion measures were used in this study. Both were administered within a three-week period in the spring of the academic year. First, during regular general music instructional time, the general music teachers administered the Tonal subtest of the Primary Measures of Music Audiation (Gordon, 1986) to measure their students' tonal developmental musical aptitudes.

The second measure was a test of singing achievement. We designed a singing achievement rating scale (see Figure 1) that describes use of the singing voice in the context of melodic contour and key stability.

Rating	Behavioral Description
5	Child is nearly or totally accurate singer.
4	Child sings with some accuracy, beginning in the established key.
3	Child sings song with some accuracy, starting in a different key than established or modulates within the song.
2	Child sings/chants melodic shape at significantly different pitch.
1	Child sings/chants song with a different melodic contour than the song.

Figure 1. Singing Achievement Measure.

The music teachers in both schools taught the traditional song "Bow Belinda" (see Figure 2) to each class (K-3) for four class periods prior to testing. After four class periods of instruction, we brought students to separate rooms in groups of three to five. First, we reviewed the song "Bow Belinda" with the students in each group by singing the song two times with them. Then, each student was asked to sing the song individually. Before each performance, we played the tonic pitch [G] using a soprano recorder. Then, one of us established tonality by singing (*sol-la-sol-fa-mi-re-ti-do*) using a neutral syllable. If a child preferred not to sing with his or her peers present, the other children in the group were asked to wait outside the room until the individual had performed the song. Most children willingly performed in front of their peers.

BOW, BELINDA

Traditional

Bow, bow, bow, Be - lin-da, Bow, bow, bow, Be - lin-da,

Bow, bow, bow, Be - lin-da, Won't you be my part - ner?

Figure 2.

Table 1
Composite Singing Achievement Means and Standard Deviations for Separate and Combined Schools

Grade	<i>N</i>	<i>M</i>	<i>SD</i>
School 1			
K	22	5.64	2.54
1	16	5.69	2.33
2	18	8.11	3.45
3	20	6.75	3.85
Total	76	6.53	3.21

School 2			
K	18	8.28	2.85
1	20	9.75	3.95
2	16	11.50	3.92
3	32	10.16	3.13
Total	86	9.92	3.53

The students' performances were audiotaped for subsequent rating. Along with an independent judge, we rated the song performances using a researcher-developed, 5-point rating scale. All three judges were experienced music educators who worked regularly with elementary-age children. Tonal aptitude tests were scored according to the instructions in the test manual.

RESULTS

Pearson's r was used to determine interjudge reliabilities. The interjudge reliabilities were high, positive, and significant ($p < .05$). They ranged from .76 to .97. The composite singing achievement means and standard deviations for separate schools are shown in Table 1. The composite scores were calculated by adding the three judges' scores; therefore, the possible scores range from 3 to 15. The trend was for means to increase with grade level; however, in both schools, third-grade students tended to demonstrate less singing achievement than did second-grade students.

Means and standard deviations for tonal aptitude subtests are shown in Table 2. The means all increase with grade level with the exception of the third-grade mean from School 1, which is slightly lower than that of the second grade.

As can be seen in Table 3, Pearson's r coefficients between composite singing achievement scores and developmental tonal aptitude scores were low and not significant ($p > .05$), regardless of grade level

Table 2
PMMA Means and Standard Deviations for Separate and Combined Schools

Grade	<i>N</i>	<i>M</i>	<i>SD</i>
School 1			
K	22	29.18	5.49
1	16	32.75	2.26
2	18	35.89	8.51
3	20	35.25	1.94

School 2			
K	18	27.00	8.47
1	20	32.70	4.64
2	16	34.19	5.88
3	32	35.28	2.89

or school. Most were positive, with the exception of two weak correlations, which were negative.

When we compared the singing achievement scores between schools and grade levels statistically, there was no significant interaction between school and grade [$F(3, 154) = .293, p = .83$]. Results of a two-way ANOVA demonstrated that there was a significant main effect for school [$F(1, 154) = 40.76, p < .001$]. Students from School 2 ($M = 9.92, SD = 3.53$) scored significantly higher on singing achievement than did students from School 1 ($M = 6.53, SD = 3.21$), regardless of grade level. There also was a significant main effect for grade [$F(3, 154) = 4.92, p < .01$]. Fisher's PLSD revealed that students in second grade ($M = 9.71, SD = 2.96$) performed better than did first-grade students ($M = 4.00, SD = 3.87, p < .05$) and better than kindergarten students ($M = 6.82, SD = 2.96, p < .01$); also, third-grade students ($M = 8.85, SD = 3.78$) performed better than kindergarten students ($M = 6.82, SD = 2.96, p < .05$). There were no other significant differences. Results suggest that singing achievement may be, in part, developmental.

DISCUSSION AND CONCLUSIONS

Singing achievement does not seem to have a meaningful relationship to tonal music aptitude, regardless of age or school setting, which supports the findings of Atterbury and Silcox (1993), Mota (1997), Phillips, Aitchison, and Nompula (2002), Rutkowski (1986, 1996), and Rutkowski and Snell Miller (2003). Singing voice use and tonal aptitude are apparently separate constructs and develop independent of one another. However, the results of this study suggest

Table 3

Correlation Coefficients of Composite Singing Achievement and PMMA Scores

Grade	School 1	School 2	Combined
K	.01	.11	-.01
1	.01	.22	.15
2	.04	.24	.06
3	.40	-.02	.11

Total correlation coefficient for School 1 is .184.

Total correlation coefficient for School 2 is .229.

$p > .05$ for all correlations.

that if singing is taught, students' singing achievement may improve. This study was not designed to determine the specific causes of the differences in achievement between the two schools or between grade levels, as it was an investigative study. However, future researchers will want to continue to investigate factors of causation in the development of singing achievement.

Surprisingly, in both schools, second-grade students tended to demonstrate more achievement in singing than did third-grade students, although this difference was not significant. While this decrease may just be an anomaly in the data, the tendency toward decline of singing achievement in third grade in this study may be the result of issues relating to social rather than musical development. Peer-group values in recent years or in these specific schools may have resulted in the third-grade students' choosing not to use their singing voices, even if they were capable. Third-grade students seemed less at ease in the testing situation than did younger children. This was illustrated by a third-grade boy, who commented in an embarrassed tone, "That was my 'girl' voice," after singing accurately in a pure, boy-soprano singing voice. Teachers and parents may need to find ways to encourage the valuing of singing voice use by children in the upper grade levels in elementary school, as it may be that peer pressure results in less singing achievement in older children.

The difference between the singing performances of the students in the two schools also may have practical significance for the elementary music teacher. Teachers should specifically address the skill of singing, especially in head voice, in their teaching. Levinowitz et al. (1998) noted that children "vacillate between the speaking voice and the singing voice" and that this does not seem to be a product of maturation, as is range, but that the use of the singing voice is a "learned" skill (p. 41). Though the range and tessitura of "Bow Belinda" is developmentally appropriate for early-elementary children, it does require two short transitions over the break. To sing this

song, students must be using their head voice and not their chest voice. Perhaps the better singing from students in School 2 was a result of these students receiving more instruction in the use of head voice. These students also may have had richer music environments at home.

Researchers have confirmed that singing skills can be taught (Aaron, 1993; Apfelstadt, 1984, 1986; Cooper, 1995; Goetze & Horii, 1989; Green, 1989; Klinger et al., 1998; Levinowitz et al., 1998; McGraw 1996; Muse, 1994; Phillips, 1985; Phillips & Aitchison, 1997a; Phillips & Vispoel, 1990), resulting in increased singing accuracy. However, researchers in future studies should continue to study the value of various instructional techniques in the elementary general music classroom in increasing singing achievement.

Singing is at the core of general music instruction. Through singing, children can express themselves musically, as well as learn musical concepts. The research community should continue to study singing voice development, and all that it encompasses, so that music educators can provide the best possible instruction for children in music at the elementary level and beyond.

REFERENCES

- Aaron, J. (1993). Using vocal coordination instruction to help the inaccurate singer. *Update: Applications of Research in Music Education*, 11 (2), 8-13.
- Apfelstadt, H. (1984). Effects of melodic perception instruction on pitch discrimination and vocal accuracy of kindergarten children. *Journal of Research in Music Education*, 32, 15-24.
- Apfelstadt, H. (1986). Learning modality: A potential clue in the search for vocal accuracy. *Update: Applications of Research in Music Education*, 4 (3), 4-6.
- Atterbury, B. W., & Silcox, L. (1993). A comparison of home musical environment and musical aptitude in kindergarten students. *Update: Applications of Research in Music Education*, 11 (2), 18-21.
- Cooper, N. A. (1995). Children's singing accuracy as a function of grade level, gender, and individual versus unison singing. *Journal of Research in Music Education*, 43, 222-231.
- 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, 93-99.
- Goetze, M., Cooper, N., & Brown, C. J. (1990). Recent research on singing in the general music classroom. *Bulletin of the Council for Research in Music Education*, 104, 16-37.
- Goetze, M., & Horii, Y. (1989). A comparison of the pitch accuracy of group and individual singing in young children. *Bulletin of the Council for Research in Music Education*, 99, 57-73.
- Gordon, E. E. (1986). *Primary Measures of Music Audiation*. Chicago: G. I. A. Publications.
- Gould, A. O. (1969). Developing specialized programs for singing in the elementary school. *Bulletin of the Council for Research in Music Education*, 17, 9-22.

- Green, G. A. (1989). The effect of vocal modeling on pitch-matching accuracy of elementary schoolchildren. *Journal of Research in Music Education*, 38, 225-231.
- Guerrini, S. C. (2002). The acquisition and assessment of the developing singing voice among elementary students. *Dissertation Abstracts International*, 63 (01).
- Jaffurs, S. E. (2000). *The relationship between singing achievement and tonal music aptitude* (Master's thesis, Michigan State University, East Lansing, 2000).
- Kim, J. (2000). Children's pitch matching, vocal range, and developmentally appropriate practice. *Journal of Research in Childhood Education*, 14, 152-160.
- Klinger, R., Campbell, P. S., & Goolsby, T. W. (1998). Approaches to children's song acquisition: Immersion and phrase-by-phrase. *Journal of Research in Music Education*, 46, 24-34.
- Levinowitz, L. M., Barnes, P., Guerrini, S., Clement, M., D'April, P., & Morey, M. J. (1998). Measuring singing voice development in the general music classroom. *Journal of Research in Music Education*, 46, 35-47.
- McGraw, A. G. B. (1996). An assessment of the effectiveness of vocalises in training elementary school children to sing using head voice. *Dissertation Abstracts International*, 57 (09), 3866A. (UMI No. 9705397)
- Mota, G. (1997). Detecting young children's musical aptitude: A comparison between standardized measures of music aptitude and ecologically valid musical performances. *Bulletin of the Council for Research in Music Education*, 133, 89-99.
- Muse, M. B. (1994). A comparison of two methods of teaching singing to primary children: An attempt to determine which of two approaches to teaching singing is more effective. *Masters Abstracts International*, 33 (01), 30.
- Petzold, R. G. (1969). Auditory perception by children. *Journal of Research in Music Education*, 17, 82-87.
- Phillips, K. H. (1985). The effects of group breath-control training on the singing ability of elementary students. *Journal of Research in Music Education*, 33, 179-191.
- Phillips, K. H., & Aitchison, R. E. (1997a). Effects of psychomotor instruction on elementary general music students' singing performance. *Journal of Research in Music Education*, 45, 185-196.
- Phillips, K. H., & Aitchison, R. E. (1997b). The relationship of singing accuracy to pitch discrimination and tonal aptitude among third-grade students. *Contributions to Music Education*, 24 (1), 7-22.
- Phillips, K. H., Aitchison, R. E., & Nompula, Y. P. (2002). The relationship of music aptitude to singing achievement among fifth grade students. *Contributions to Music Education*, 29 (1), 47-58.
- Phillips, K. H., & Vispoel, W. P. (1990). The effects of class voice and breath-management instruction on vocal knowledge, attitudes, and vocal performance among elementary education majors. *The Quarterly Journal of Music Teaching and Learning*, 1 (1 & 2), 96-105.
- Rutkowski, J. (1986). *The effect of restricted song range on kindergarten children's use of singing voice and developmental music aptitude* (Doctoral dissertation, State University of New York at Buffalo, 1986). *Dissertation Abstracts International*, 47 (08A), 2072.
- Rutkowski, J. (1996). The effectiveness of individual/small-group singing activities on kindergartners' use of singing voice and developmental music aptitude. *Journal of Research in Music Education*, 44, 353-368.

- Rutkowski, J., & Snell Miller, M. (2003). The effectiveness of frequency of instruction and individual/small group singing activities on first graders' use of singing voice and developmental music aptitude. *Contributions to Music Education, 30* (1), 23–28.
- 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 [Special Issue]*, 104–108.
- Small, A. R., & McCachern, F. L. (1983). The effect of male and female vocal modeling on pitch-matching accuracy of first-grade children. *Journal of Research in Music Education, 31*, 227–233.
- Stauffer, S. L. (1985). An investigation of the effects of melodic and harmonic context on the development of singing ability in primary grade children. *Dissertation Abstracts International, 46* (07), 1862A.
- Yarbrough, C., Bowers, J., & Benson, W. (1992). The effect of vibrato on the pitch-matching accuracy of certain and uncertain singers. *Journal of Research in Music Education, 40*, 30–38.

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