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# The Effect of Key on Vocal Sight-Reading Achievement

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At its most basic level, sight-reading can be defined as the production of accurate pitch and rhythm from a previously unseen musical score. For vocalists, sight-reading principally involves the production of pitches by determining their relationship within a tonal framework. The ability to mentally conceive tonal function and convert it into vocalized pitch is the focus of vocal sight-readers and largely determines their overall success at the sight-reading task. While rhythm plays a role in the sight-reading process, it is clear that rhythm is of secondary concern to vocal sight-readers (Henry, 2011). Vocalists focus on what to sing before they shift their attention to when to sing.

Numerous pitch-reading systems exist, most notably moveable-*do* solfége, fixed-*do* solfége, and numbers. Traditionally, moveable-*do* solfége has been associated with Kodály instruction and is the most frequently occurring pitch-reading system in the United States, while fixed-*do* solfége has been associated with Dalcroze instruction in the United States and has strong roots in the conservatory tradition of Europe. Numbers, an American adaptation of a moveable system, gained popularity among college programs interested in connecting sight-reading with chord structures in music theory. Winnick (1987) provides an overview of the various systems and some of the adaptations. Both Winnick and Smith (1987) recommend different versions of solmization/solfége. Although researchers have investigated the efficacy of particular sight-reading systems (Demorest & May, 1995; Henry & Demorest, 1994; McClung, 2008), no clearly superior system of pitch reading has emerged.

Through the development of the Vocal Sight-Reading Inventory (VSRI), Henry (2001) determined the difficulty level of 28 discrete pitch skills occurring within tonal music. The pitch skills were categorized as scalar, tonic, dominant, subdominant, cadential, modulatory, or chromatic. This identification system, though tonally-based, is compatible with any of the aforementioned sight-singing systems. Although initially Henry did not include the study of rhythmic tasks in the VSRI, subsequently, she categorized rhythmic skills as whole beat, multi-beat, even division, uneven division, combination, and steady beat (2009). Ultimately, Henry investigated the interaction between pitch skill difficulty and rhythm skill difficulty, determining that all skills held their relative difficulty levels, but that pitch skills were given priority regardless of difficulty level (2011).

A subsequent study by Alexander & Henry (2012) similarly sought to determine a pitch skill hierarchy for string players. In addition to establishing difficulty levels for string players on the

pitch skills transferred from the VSRI, a significant difference was found between performances on pitch skills between keys. Three iterations of the test with each pitch skill occurring in D, E-flat, and E, were administered. A significant difference in difficulty level between the keys of D and E was found for 11 of the 31 pitch skills. This may be the result of the different fingerings that instrumentalists must use to play the same tonal skill in varying keys. Would the same be true for vocalists, who require no external physical response to create a particular pitch? For those using a moveable system, key should not matter as long as the pitches can be physically produced. For those using a fixed system, no priority should be given to any particular pitch or pitch combination in terms of recognition or production.

Yet an analysis of commonly used materials for vocal sight-reading instruction indicates variations in the use of key. While a few materials include a variety of keys from the outset (Bauguess, 1984; Crowe, Lawton, & Whittaker, 1961; Telfer, 1992)—for example, the first ten melodies in the Oxford Folk Song Series (Crowe, Lawton, & Whittaker, 1961) include melodies in eight different keys—the majority of materials begin in either a single key or a limited number of keys (Crocker & Bacak, 1988; Crocker & Leavitt, 2005; Crocker & Snyder, 2005; DeWitt, 1998; Eaton, 2006; Hemmenway, Leach, & Wehrung, 1977; Snyder, 2005; Snyder, 1993).

A statewide curriculum in music developed jointly by the Texas Music Educators Association and Texas Music Administrators Conference, specifies key instruction by grade level in Texas choral classrooms: Keys of C, F, and G from 6th through 8th grade; the addition of B-flat and D at High School Level I; E-flat and A at Level II; and the key of E at Level III. Further, vocal sight-reading criteria for Texas large group choral contests, overseen by the University Interscholastic League, specifies certain keys depending on performer level (UIL, 2012).

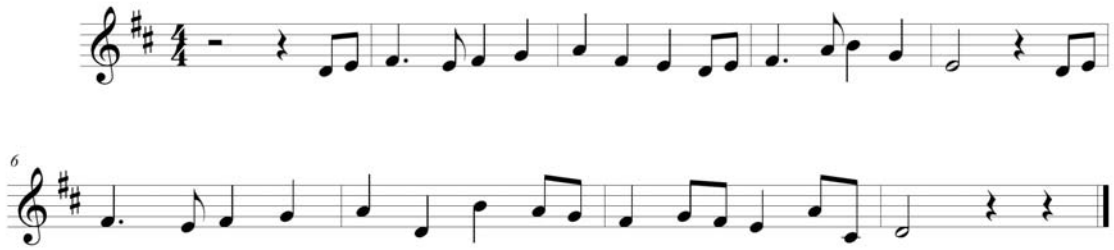
Given the organization of the most prevalent teaching materials and the curricular and evaluative structure for vocal sight-reading in our state, an investigation of the use of key in vocal sight-reading seems warranted. The purpose of this study was to determine the effect of key on vocal sight-reading achievement. Research questions include:

1) What is the overall vocal sight-reading ability of high school choral singers when performing individually, in terms of pitch, rhythm, and total score?
2) Is there a significant difference in scores between performances in different keys?
3) Is there a significant difference in scores between grade levels?
4) Is there a significant difference in scores based on other factors, such as sight-reading system, choral experience, private voice study, keyboard experience, or other instrumental experience?

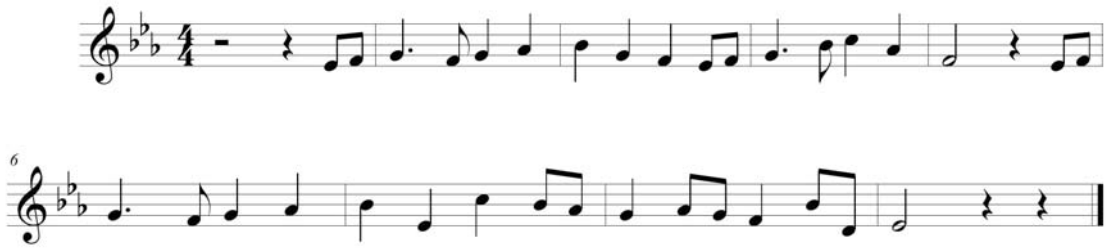
## Method

Participants in this study were high school singers attending a summer choral camp in the state of Texas ($n$ = 280). During the registration process, each participant underwent a sight-singing screening. They completed a brief survey requesting demographic information including their upcoming grade level, choral experience, keyboard experience, other instrumental experience, and sight-singing system. Each participant then individually entered one of three randomly assigned testing rooms, returned the survey, and was asked to sight-sing a single melody. The melody appeared in either the key of F, D, or E-flat, depending on the testing room (see Figure 1).

Key of D



Key of E-flat



Key of F

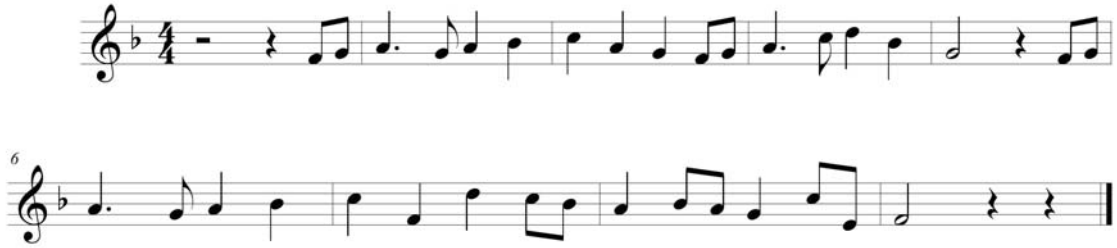


*Figure 1*. Test melody presented in the keys of D, E-flat, and F.

Participants sight-sang using procedures consistent with the Texas All-State Choir audition process. They were asked to sing the melody using their preferred method of sight-singing. They heard the tonic triad, followed by the starting pitch. They were given 30 seconds to study or practice the example, after which time they heard the tonic triad and starting pitch again. They then sang the melody and were scored live by the trained test administrator in the room. Before exiting the room, they received a feedback form with their score.

Upper-level and graduate choral music education students served as the test administrators. During the live scoring, they evaluated the accuracy of six pitch skills and four rhythm skills, identified from the VSRI (Henry, 2001). The melody used in each room was identical, except for the variation in key between rooms. Each participant received a score of 0-10, based on the number of skills that were performed accurately.

## Results

The participants in this study ($n$ = 280) were rising freshmen ($n$ = 17), sophomores ($n$ = 82), juniors ($n$ = 94), and seniors ($n$ = 87). Female singers ($n$ = 172) outnumbered male singers ($n$ = 108). The overwhelming majority of singers reported using the moveable-do system ($n$ = 224), in comparison to fixed-do ($n$ = 34), numbers ($n$ = 1), or other/none ($n$ = 21). Participants averaged 5.15 years of choral experience, with 243 participants reporting private vocal study. One hundred forty-three participants reported some level of piano study, and 81 reported study on another instrument.

The overall mean score for pitch and rhythm was 6.96 out of a possible total score of 10. Pitch skills averaged 4.35/6 or 72.5% accuracy, while rhythm skills averaged 2.61/4 or 65.2% accuracy. Mean scores for each testing condition (key) are displayed in Table 1.

Table 1
*Means Scores by Key for Pitch, Rhythm, and Total*

| Key | Pitch | Rhythm | Total |
|---|---|---|---|
| D ($n$ = 117) | 4.09 | 2.72 | 6.81 |
| E-flat ($n$ = 67) | 4.60 | 2.85 | 7.45 |
| F ($n$ = 96) | 4.50 | 2.30 | 6.80 |
| Combined ($n$ = 280) | 4.35 | 2.61 | 6.96 |

An ANOVA revealed no significant difference between key conditions, $F(2, 277) = 1.32$, $p = .27$. Table 2 contains the mean scores for participants by grade.

Table 2
*Mean Scores by Grade for Pitch, Rhythm, and Total*

| Grade | Pitch | Rhythm | Total |
|---|---|---|---|
| 9 ($n$ = 17) | 3.18 | 1.76 | 4.94 |
| 10 ($n$ = 82) | 3.87 | 2.26 | 6.12 |
| 11 ($n$ = 94) | 4.50 | 2.83 | 7.33 |
| 12 ($n$ = 87) | 4.89 | 2.86 | 7.75 |

Using a post hoc Tukey-Kramer HSD, a significant difference in total score was found between 12th grade and 9th grade ($q = 3.91$, $p < .0007$) and 10th grade ($q = 3.90$, $p < 0007$), and between 11th grade and 9th grade ($q = 3.34$, $p < .005$), and 10th grade ($q = 2.95$, $p < .02$). There was no significant difference between 12th grade and 11th grade. The amount of school choral experience $F(7, 272) = 12.68$, $p < .0004$ or keyboard experience $F(7, 272) = 3.80$, $p = .05$ affected total scores but participation in voice lessons and type of reading system used didn't.

## Discussion

Vocal sight-reading is an important element in the development of choral singer and the creation of independent musicians. Through the state curriculum and contest regulations, Texas highly regulates the introduction and sequencing of keys in sight-reading instruction and competition. While differences in accuracy have been found for string players when the key varies (Alexander & Henry, 2012), this study sought to determine if this would also be the case for singers. Participants sight-read the prescribed melody at 69.6% accuracy, with slightly higher proficiency for pitch (72.5%) than rhythm (65%). Results indicate no significant differences in the accuracy of the identical melody when performed in the keys of D, E-flat, and F.

Key does not appear to be a limiting factor in sight-reading proficiency. However, this population sample had a disproportionately low number of 9th graders ($n$ = 17)—low enough to prevent any meaningful comparison across keys at this grade level. Because rising 9th graders are most likely to be affected by key, further research with larger samples is recommended. Such research seems important considering that both the state curriculum document and UIL procedures call for teaching/testing only in C, F, and G. Likewise, many of the beginning sight-reading texts designed for middle school use restrict their melodies to these same keys. Since there were no significant differences within the other grade levels, which were more robustly represented, future research should focus on the 9th grade population to determine any impact key has at the point when its use has typically been restricted to C, F, and G.

Significant differences were found overall between grade levels, with scores increasing along with grade level. Scores also increased significantly with additional choral experience. This result corresponds to the findings of Demorest and May (1995). It should be noted that previous research has not always found that more choral experience is necessarily associated to higher sight-reading scores (Alexander & Henry, 2012; Henry, 2001; Tucker, 1969). Consistent with previous research, keyboard experience was significantly related to overall success (Demorest, 1998; Demorest & May, 1995; Henry, 2011; Henry, 2001; Henry & Demorest, 1994; Killian & Henry, 2005).

While much time and thought has been put into systematically introducing a sequence of keys for vocal sight-readers—through the state curriculum document, UIL guidelines, and many introductory sight-reading materials—these restrictions may not be necessary, as participants in this study did not seem to be adversely affected by key. Perhaps this population of self-selected, highly motivated students attending a summer choral camp does not represent the typical population of choir classes throughout Texas high schools. Nevertheless, choral music educators may consider selecting materials for sight-reading based on other considerations beyond key, particularly for their more experienced sight-readers.

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