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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* solfège, fixed-*do* solfège, and numbers. Traditionally, moveable-*do* solfège has been associated with Kodály instruction and is the most frequently occurring pitch-reading system in the United States, while fixed-*do* solfège 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/solfège. 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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The Relationship Between Starting Age of Music Instruction and Years of Participation in a String Program Outside School

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It is not uncommon for very young children to start music instruction on string instruments. The Suzuki method is based on the ideas that learning music is similar to learning language and that an early start is beneficial for the development of a love for music as well as musicianship. Indeed, the early years in a child's life are considered critical for the development of certain mental processes and muscle coordination (Suzuki Association of the Americas, n.d.). According to Edwin Gordon's Music Learning Theory, musical aptitude stabilizes after age nine making the period between birth and age nine the most important for increasing musical potential (Gordon Institute for Music Learning, n.d.). Further support for the idea that it is best to start learning an instrument early comes from the analysis of the biographies of musicians (e.g., Manturzewska). Most professional performers start learning to play their instruments early in their lives.

String instruments can fit learners of all ages. The instruments vary in size with the smallest being 1/16 of what is considered a full-sized instrument. This makes it possible for even very young children to play string instruments. In the U.S., it is not uncommon for 4-year-olds to participate in Suzuki instruction (Suzuki Association of the Americas, n.d.). In elementary schools that offer string education, instruction usually starts in the fourth grade (Hartley & Porter; 2009). These practices are all in accordance with the belief that starting early is beneficial for the musical development of children. However, it seems important to consider whether children who start early persist in music instruction. Practicing a musical instrument is a demanding activity that may discourage young learners. In fact, most children who start music instruction discontinue lessons within three years (Waggoner, 2004).

Previous studies have examined the relationship between starting age of formal music instruction and years of study (Duke, Flowers & Wolfe, 1997; Hartley, 1996; Hartley & Porter, 2009). Duke et al. (1997) found that students who took more years of piano lessons had started

instruction at an earlier age than those with fewer years of lessons. In contrast, an earlier study by Hartley (1996) comparing student retention in school music programs, showed no significant difference in the duration of band participation between those who had started lessons in 5th or 6th grade. In other words, an earlier beginning did not yield higher retention rates. Similarly, Kruth (1964) found that the starting grade level was not a significant predictor of dropout rates in secondary school instrumental programs. Contradicting the findings of these previous studies, Hartley and Porter (2009) found that a late start in string instruction was associated with higher retention rates in school orchestra programs. In summary, the results regarding the relationship between starting age of instrumental instruction are conflicting and inconclusive. The purpose of the present study is to investigate this relationship further.

We completed the study with children attending an out-of-school string program associated with a large university. Approximately 250 students aged 4 to 18 enroll in this program and participate in private lessons, musicianship classes, and string ensembles. Two questions guided our study: (1) Is there a relationship between the starting age of music lessons and years of participation in the program? (2) Is there a relationship between selected student demographic characteristics and retention in string programs?

Method

The subjects included in this study were 99 students (female=52, male=47) aged 4 to 16 who registered in the string program at any time between 1998 and 2002 and dropped out within 10 years. Thirty-nine were violin students (female=23, male=16), 17 were viola students (female=10, male=7), 33 studied cello (female=16, male=17), and 10 studied bass (female=3, male=7). We obtained demographic information about each student (sex and date of birth) as well as the instrument of instruction and number of years that the students have participated in the program.

Results

We calculated the starting age of music instruction for each student and established the correlation between this variable and duration of instruction (i.e., number of semester of participation in the program). The correlation between the starting age and years of study was low but significant $r = -0.3498, p = 0.0004$. Students who started earlier stayed in the program longer (see Figure 1).

We also calculated the correlation between starting age and years of study separately for female and male students. We found no significant correlation for female students but a moderate correlation for male students $r = -0.4698, p = .0009$ (see Figure 2).

Finally, we established correlations between the same variables but for each of the four instruments separately. Only for cello students was the correlation significant $r = -0.5064, p = 0.003$. Students who started lessons on cello earlier, remained in the program longer than those who started later.

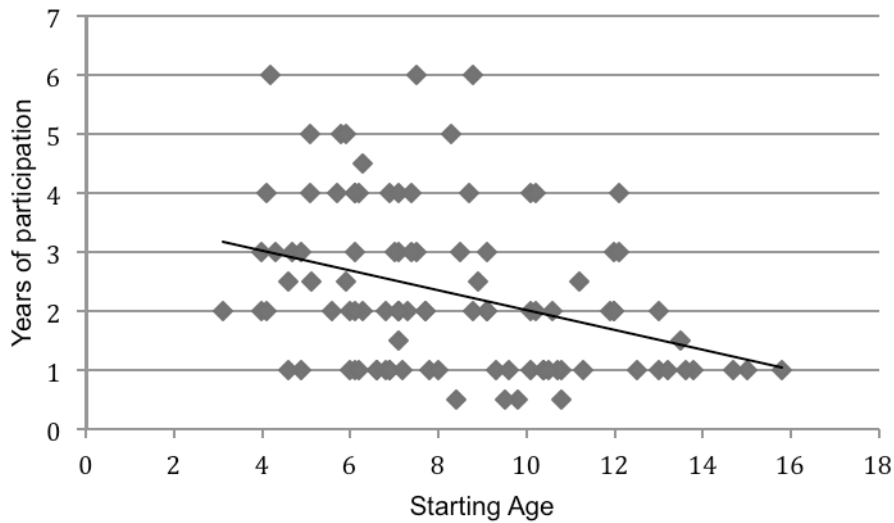


Figure 1. Starting Ages and Years of Participation (All Students)

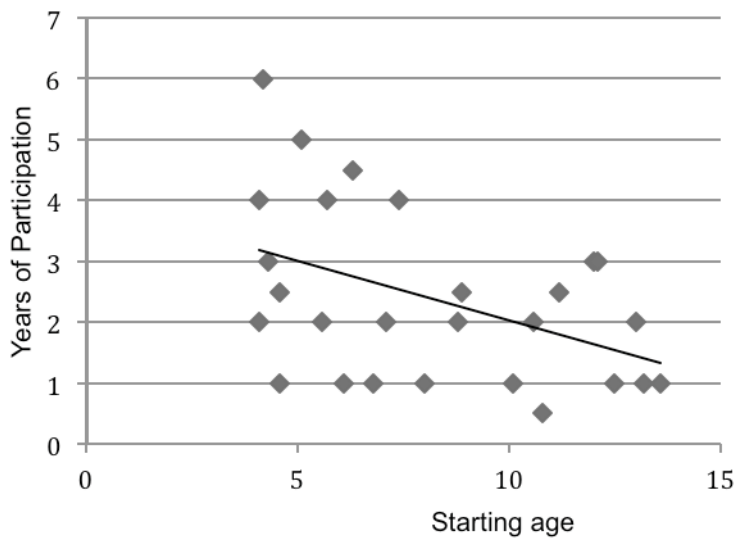


Figure 2. Starting Ages and Years of Participation (Boys)

Discussion

The results of this study show a positive relationship between the starting age of string lessons and the duration of participation in the string program. Although the relationship was not strong, the findings suggest that starting instruction earlier might yield longer participation in out-of-school string programs.

Only 28 out of the 99 students selected stayed in the program after age twelve. This finding shows that most of the students who withdrew from String Project did so before middle school.

Perhaps the transition from elementary to middle school is critical for continuation of music studies. Starting earlier may allow students to take lessons for several years prior to middle school and reach a level of musical independence that would facilitate music making in the future.

The other variable examined in this study was sex. The results show that there was a strong relationship between starting age and the duration of participation in string lessons of male but not female students. This suggests that for boys, starting lessons on string instruments at an earlier age may extend their years of participation in string programs. This finding is particularly interesting considering the results of previous investigations about boys' low positive attitude towards school music programs (Croucher & Reid, 1981; Nolin, 1973) and low likelihood of participating or persisting in piano lessons (Costa-Giomi, 2005; Duke et al., 1997).

The results of the study also show that cello students who entered the program earlier in life, remained in the program longer. It is important to note that the proportion of boys and girls was equal among cello students. In other words, the result that an early start of lessons in cello is associated with longer persistence in the program cannot be attributed to the findings reported earlier regarding the strong correlation between starting age and duration of participation for boys.

Overall, the results of the study provide some evidence supporting the belief that an early start of music lessons may be advantageous for children; starting lessons at an early age may extend involvement in formal music instruction. This seems particularly true for male students and those interested in playing cello. However, this study focused exclusively on the duration of participation in a string program outside school. Further research in other instruments and in other settings is needed to allow the generalization of these results.

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Measurement of Infants' Behaviors with Electronic Music Toys

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Toys with electronic sounds and music are widely present in the everyday experience of infants in more economically developed countries (Bartel, 2001; Ilari, 2011; Young, Street & Davies, 2006; Young, 2009). From crib mobiles to interactive jumpers, activity tables, dancing animals, and toy instruments, music in pre-programmed formats can be heard from numerous and varied sources in infants' environments. Compared to previous generations, young children today hear music that differs not only in its content but also in its source of production, mode of transmission, and integration with other activities or social contexts (Young, 2009). In fact, Young (2009) argues that digital technologies allow the home, as opposed to community sites, to be the primary place for many families' music participation. Commercial music products for infants put recorded melodies literally within a baby's reach, with the potential for repeated experiences with certain music. These products offer varying durations, textures, and timbres of music in a manipulatable "interactive" medium that often integrates sound with tactile, visual, and graphic stimuli. The prevalence of such products suggests an important area of research for many disciplines, including music education. How do these button-activated melodies impact early musical development? How can we measure infants' interaction with electronic music toys?

Investigations of young children's engagement with music technology exist mainly as a component of research with a broader focus (DeVries, 2007; Ilari, 2005; Ilari, Moura & Bourscheidt, 2011; Young, Street & Davies, 2006). Windows into the everyday music experiences of toddlers and preschoolers have highlighted children's experience with music mediated through television, video games, and other multimedia (Gillen & Young, 2007; Lamont, 2008). A time-sampling research study in the U.K. indicated that, for 3- to 4-year-olds, music was heard in some form during 80% of a child's day, that the majority of music episodes involved recorded music, and that the home was the primary place for music experiences (Lamont, 2008). Music participation with digital technologies in the home was equally salient in the case studies of 2.5-year-olds around the world; investigators concluded that electronic music toys and screen media "extended and supplemented the children's everyday domestic music experiences" (Gillen & Young, 2007, p. 92).

In terms of the musical experiences of infants specifically, researchers have relied on information from parent questionnaires and interviews. Their reports confirm that infants in many countries experience music through digital and multimedia formats (DeVries, 2007; Ilari,

et al., 2011; Young, et al., 2006). Positive perceptions of infants' electronic music toys emerge from parents' enthusiastic descriptions of the toys and their multiple functions (Merkow, 2012; Young, 2008). At the same time, some parents choose to avoid the noise of the toys, and others express concern that they may over-stimulate infants (Merkow, 2012). Research suggests that some parents use commercial music DVDs or toys as a temporary "babysitters" for their children (DeVries, 2007; Ilari et al, 2011) or that parents may view the products as substitutes for their own lack of musical ability (DeVries, 2007). Parents' decisions to purchase music resources may be motivated by pressures to adhere to societal expectations and buy products endorsed by "experts" (Ilari, et al., 2011; Young et al., 2006).

Among music educators, opinions on the value of electronic music toys in early childhood vary considerably (Campbell, 1998; Campbell & Lum, 2007; Kersten, 2006; Levin & Rosenquest, 2001; Marsh, 2002; Nardo, 2008; Young, 2007; Young, 2008). Kersten (2006) and Nardo (2008) offer recommendations on the use of music technology for preschoolers but do not address the age group of infants. For preschool teachers, Kersten encourages selection of digital instruments or toys that play tunes "of musical value" and are within children's singing range (2006, p. 18). The toy used in observations for this paper, the Munchkin Mozart Magic™ Cube, has been highly recommended for 2- to 6-year olds as a teaching tool for timbre recognition (Kersten, 2006, p. 28).

Susan Young, whose literature contributes to the field that reflects upon the presence and role of digital music products in early childhood (2007, 2008, 2009; Young et al., 2006), suggests that the multi-modal functions in digital toys match young children's multi-modal, imaginative nature of engagement. Young proposes that toys with digital technologies allow children to engage their attention flexibly and interact with the dynamic "mosaic of overlapping and non-linear information" typical of the digital world (2007, p. 325). For example, toys such as a toddler's play cell phone afford opportunities for self-initiation, autonomy, and control on the part of the child (Young, 2007, p. 341). Other authors agree with Young in that electronic toys enrich children's play, and that these devices appropriately reflect the present technology- and media-rich culture (Campbell, 1998; Campbell & Lum, 2007; Marsh, 2002). On the other hand, Levin and Rosenquest (2001) express concern regarding the appropriateness of electronic talking, sounding, and moving toys. They argue that products, such as the "Rock-n-Roll Ernie," limit children's creativity and detract from quality social and verbal interactions between children and adults. These strong opinions for or against the value of electronic music toys, however, generally lack supporting empirical evidence.

Measurement of Infants' Music Behaviors

To begin exploring infants' interaction with digital music products, I undertook a project to observe videos of infants playing with such a toy. The issue of measurement--what to measure and how--was important to address before pursuing further research. What behaviors can be observed during children's interactions with electronic music toys? What patterns emerge as salient or meaningful during infants' play?

Even though a measurement tool for infants' responses to electronic music toys did not previously exist, researchers have contributed documentation of children's music behaviors in other contexts. The musical behaviors of young children have been systematically observed since the Pillsbury Foundation project in the late 1930s (Moorhead & Pond, 1941). A school dedicated to researching the natural music making of children, ages 18 months to 8 years, set a precedent in providing varied musical materials and an unstructured environment to encourage spontaneous

musical activity. The directors of the school were perhaps the first in the United States to bring attention to children's musical development as an observable and important area of study (Moorhead & Pond, 1941).

Since that time, early childhood music educators have developed various systems to describe and classify early musical development (Bolton, 1997; GIML, 2011; Music Together, 2008; Lai, 2008; Valerio, Reynolds, Morgan & McNair, 2012). Edwin Gordon positions musical behaviors within a framework of stages called preparatory audiation. Gordon refers to the music learning of infants as "acculturation," which includes three stages of response: absorption, random response, and purposeful response (GIML, 2011). Music Together®, a music curriculum for infants through 4-year-olds, provides music teachers with an observation scale for children's tonal and rhythmic development (2008). In terms of music behaviors observable in infants, most recently, an observation tool to assess young children's music-related behaviors was developed by Valerio, Reynolds, Morgan, and McNair (2012). The instrument utilizes a parent questionnaire to collect information about the activities parents use with their children and what music-related behaviors are observable.

In general, systems for observing young children's musical behaviors are designed for wide-ranging use by practicing teachers or parents, not as specific protocols for research studies. The presence of electronic music products in most babies' homes introduces a prominent context for which to observe infants. The purpose of this study was to design a measurement tool that can be used to observe infant response to and interaction with electronic musical toys.

Method

Participants

For the purposes of this observational study, participants were obtained from home videos posted on YouTube, which are deemed to be in the public domain and usable for academic research purposes by the fair use provision. I began the process of collecting sample videos by querying a search with the terms "baby music toy." Among the search results, one particular electronic music toy commonly appeared, the Munchkin Mozart Magic™ Cube (abbreviated in this paper as the Cube or the toy). Because I could easily access numerous videos featuring an infant and the Cube, I decided to use this particular toy as the primary criterion for selection. By performing additional queries for "mozart magic cube" and "music cube," as well as following YouTube's suggested links, I collected 37 videos with infants and the Cube. Next, I chose to limit the developmental age of the sample by selecting only videos in which the infant was sitting by him or herself; thus, infants who were lying down or who walked with the toy were excluded. The length of the video (more than 30s and less than 4 min) and clarity of the recording were additional factors in selection. The final sample included 10 videos of infants (5 boys) posted on YouTube between September 11, 2007 and June 17, 2012. Two of the infants appeared in non-English speaking homes. The adult(s) recording the video, though unseen, were also included in the study, as their speech dialogue could be observed. In all cases, the infant was the only child who appeared, and he or she was seated on a soft floor in a living room or bedroom. The settings in which infants played presented few distractions from the toy; other objects were only present and within reach in two videos.

Materials and Procedure

I used SCRIBE software (Duke & Stammen, 2011) to code and analyze observations from the YouTube videos. A web browser extension allowed me to save YouTube videos and then open them for analysis in SCRIBE. I created a custom SCRIBE template to measure and code the video content. The markers included infant behaviors (gaze, vocalizations, dancing, and mouthing), toy behaviors (activation of the music on/off, change in melody) and adult behaviors (verbal directives, praise, narrative, and touching the toy). The targets of infants' looking fell into three mutually exclusive categories: toy, camera/person, or other. Glances under one second were not recorded. Vocalizations were measured for durations according to natural pauses; one vocalization could include a single syllable utterance or 10 seconds of continuous babbling. I defined "dancing" as infants' repetitive movement that lasted more than three seconds and involved physical rocking or waving arms. I performed seven or more passes with each video in order to observe overlapping or co-occurring variables. A trained independent observer also used the SCRIBE template to observe 20% of the sample videos. The overall reliability of observers for frequencies of behaviors (infant vocalizing, infant looking at toy/camera/other, music on) was 73%. In terms of duration, the difference in timed data of the two observers averaged 1.9 seconds, with a range of 0.2 to 6.3 seconds.

In addition to gathering quantitative data with SCRIBE, I took handwritten notes on anecdotal observations and I transcribed the parents' speech. Finally, I obtained a Munchkin Mozart Magic™ Cube so that I could see and handle it "in person" and understand how the toy functions.

The Munchkin Mozart Magic™ Cube

The toy is a brightly colored, plastic six-inch cube with soft rubber corners. A small switch turns the electronic functions on or off. Each of the six sides of the Cube has a square button with an image and the word label of a musical instrument (violin, harp, French horn, flute, and piano) or the orchestra. When a button is activated, music plays and a red light pulses from behind the instrument picture. The "main" orchestra button activates one of eight Mozart melodies. When the main button is pressed and music is playing, a user can press the button again to skip to the next tune of the series. By default, the main button sounds the fullest texture combination with every instrument side flashing light. The Cube's other five buttons allow alterations to the timbres and textures of the music. For example, the user may subtract the voices of four different instruments and hear "Twinkle, Twinkle" played only by the flute. In sum, Cube users have the opportunity to hear melodies in various combinations of countermelodies, accompaniments, and instrumentation. Once the toy is activated, it will continue to sound until the melody comes to an end (an average of 21 seconds). The eight Mozart melodies featured in the Cube are listed on the toy's packaging. I further documented the musical characteristics of key, tempo, and meter as rendered by the toy (see Table 1). All of the tunes are in a major key and the tempos range from moderate to fast, between 90 and 140 beats per minute.

Table 1

Characteristics of Melodies Played by Munchkin Mozart Magic™ Cube

Melody	Key	Tempo	Meter	Duration (s)
Non Piu Andrai	D Major	120	Duple	20
Country Dance No. 5	A Major	132	Duple	30
Come Sweet May	F Major	90	Compound duple	21
Twinkle	D Major	116	Duple	25
Magic Flute	A Major	95	Duple	21
March in D	B Major	126	Duple	15
Landler	C Major	140	Triple	21
Don Giovanni	C Major	130	Duple	19

Results

Infant behaviors are listed in Table 2 as individual subjects' data averages.

Table 2

Infants' Behaviors with Mozart Magic Cube.

	Sex	Video length	Looking at toy (%)	Looking at camera (%)	Looking at other (%)	Music on (%)	Music off (%)	Melodies played	Vocalizations	Mouthing	Dancing
Emma	f	1:33	57	14	28	54	45	2	10	yes	
Leo	m	3:01	63	29	7	67	32	4	10		
Zane	m	2:06	73	19	6	64	35	1	2	yes	
Joe	m	0:43	63	36	0	75	20	1			yes
Martin	m	2:57	56	18	26	88	10	2	2		yes
Jack	m	2:09	78	9	12	51	49	1			
Serena	f	0:53	29	69	0	50	48	1			yes
Cammie	f	1:06	61	38	0	82	16	1	14		
Madison	f	3:23	74	13	11	48	42	3	5		yes
Lucy	f	1:02	83	3	0	60	40	2	4		
Average		1:53	64	25	9	64	34	1.8			

Looking times

Infants' looking times to three target areas (toy, camera, and other) were summed and calculated as percentages of the total duration of video. Infants spent the majority of time looking at the toy ($M = 63\%$). They directed their gaze to an adult or to the camera for the second greatest amount of time ($M = 24\%$), and to other areas in the environment for the least time ($M = 9\%$). Some infants (25%) did not look at anything besides the toy and the cameraperson in their environment.

Vocalizations

During the videos, a majority of infants (70%) made vocal sounds, including hums, sighs, grunts, babbles, and laughs. One child produced sustained periods of babbling, the longest of which lasted 16 seconds and happened while she looked at the toy and heard music. Another of the infants also babbled, saying "dada" and "gaga" while the music played and after it stopped. A

third infant laughed throughout her play with the Cube, while a baby boy squealed with laughter at one climatic point when looking at his parents.

Physical interaction with the Cube

All infants had at least some physical contact with the Cube, although the nature of this contact varied. In most of the videos, infants handled the toy by grasping and patting its surface. In two cases, infants picked up and held the toy off of the floor with two hands. The toy's shape allowed all of the infants to rotate it, either in their laps or on the floor, such that orientation of the instrument buttons changed. One infant was observed pointing at the flashing lights that flashed on her Cube. Two others used the toy as a balancing prop to pull themselves up to a kneeling or standing position. Two infants were observed briefly mouthing or chewing the toy.

Dancing

Twenty-five percent of the infants also showed repetitive rhythmic movement, coded as dancing, while interacting with the Munchkin Mozart Magic™ Cube. These four infants expressed different types of rhythmic movement, but each individual showed a consistent and characteristic motion throughout his or her video. Rhythmic movements included one or a combination of the following motions: arm waving, rocking forward and back in a sitting position, bouncing, and rocking in a crawling position. Periods of dancing lasted between less than a second and 14 seconds ($M = 3.6$ s). Dancing movement coincided with four of the different melodies, in versions with single and multiple instrumental textures.

Toy Behaviors

To investigate the activity of the toy, I recorded the number and length of intervals in which music played during each infant's video and calculated the duration of music as a percentage of the total duration of the video. The Cube's music sounded for the majority of the time in the videos ($M = 64\%$, $SD = 13.9$). On average, intervals during which music played ($M = 15.2$ seconds) were longer than intervals of no music ($M = 9.6$ seconds). I also recorded the rate at which music turned on. On average, the music was initiated, or started from silence, three times per minute ($SD = 1.7$). Since all surfaces of the Cube are sensitive to activation, I recorded the source of initiation every time music played. Activation resulted most often from contact with the infant's hand (56%). In other cases, infants used their thumbs in isolation to successfully press the button (12%). Unintentional contact between the toy and a baby's foot resulted in 16% of activations. The remaining initiations of music occurred when the toy brushed the floor (2%), when the baby mouthed the toy (2%), or when an adult touched it (2%). Ten percent of the activations were unobservable due to the perspective of the video camera.

Across the ten sample videos, I heard five of the eight possible melodies programmed in the Cube (the first five listed in Table 1). The melodies of the toy maintain their sequential order, although not every infant's video started on the first melody. Country Dance No. 5, the second tune, was played most frequently, while the fifth tune, Magic Flute, was heard in only one video. Infants listened on average to two different melodies during the course of each video.

Adult Behaviors

In this study, adult participation was considered an important element. First, parents' decisions and actions contributed to the data collection: They provided the Cube toy, decided to record their infant's play, and chose to publicly share the video. Additionally, many of the adults talked to the infant or the camera audience on their recordings.

Adult verbal participation during an infant's play with the Cube varied in frequency and content. Content data was not available for two videos in which parents spoke foreign languages. The number of spoken phrases ranged from no comments in one video to 28 comments during a two-minute video. The adults behind the camera assumed different levels of involvement. Some were quiet observers and responded only when the baby seemed to be looking at the camera for a response. Others acted as instructors, giving frequent directions, encouragement and praise. The majority of adult dialogue was infant-directed. Phrases spoken to infants included directives related to the toy, directives unrelated to the toy, praise, and other infant-directed talk. Comments directed to adults included narrative or asides about the infant and the toy. Examples of each adult comment category are listed in Table 3.

Table 3

Example of Adults' Comments During Videos

Infant-directed				Adult-Directed
Toy-related directives	Unrelated directives	Praise	Other ID talk	Narrative
"Can you push one of the buttons?"	"Can you show me the sign for drink?"	"Good job!"	"That's something, isn't it?"	"Uh.. that doesn't sound like the piano."
"Get it, Madison."		"Very nice, Leo."	"Are you sittin' and playin'?"	"There is Zane with his Mozart Music Cube that he adores."

Discussion

Development of a systematic observation tool

Through a systematic process of observing infants on video, I created a measurement system to record and assess their interactions with an electronic toy. Collecting data from a non-standardized source of home videos presented some limitations and challenges. First, the age of the infants in the sample is unknown. Though all of the babies had achieved the milestone of

sitting up, several months of age difference potentially exists between the youngest and oldest; within this age range substantial changes in perceptual, cognitive, social, and motor development can occur. The types of behaviors observed and results would likely be different if age was more homogenous in the sample.

Data from a reliability observer demonstrated overall high degree of agreement on observations. The greatest discrepancies in data resulted from an unclear definition of infant looking behavior; the reliability observer recorded any movement of the eyes as a change, whereas I (the primary researcher) disregarded the momentary glances. In the future, I would train an observer to count a looking occurrence only if it lasted for more than one second.

The variable of intention or motivation was not addressed in this study, yet is an important one to investigate. The sensitive buttons and particular cube design of this toy make it especially challenging to observe intentional actions. For example, when a baby's hand activates the button, the cause is often ambiguous: Was it because she was banging on it as she does on all surfaces, rotating the object, trying to touch the light, waving her arms to dance, or purposefully hitting the button? Furthermore, the child's motivation to interact with the toy is obscured by the toy's accidental activations, when music and lights play without choice or obvious cause. While it may be possible to investigate infants' intentional behavior with a different kind of electronic music toy, I imagine that sensitive buttons are quite common on these types of products. Easily activated buttons accommodate infants' level of physical strength or coordination and increases the likelihood that the sounds will function. Admittedly, determining whether infants' actions are intentional is a complicated task and requires an experienced observer. Nevertheless, an experimental procedure that positions the toy out of reach or offers a choice of toys may help highlight the infants' motivations and intentions.

General discussion

“This is a multi-purpose [toy] – teether (slash) entertainer (slash) teaching tool!”
- Mother's voice in video

The satisfaction with the Mozart Magic™ Cube that this mother expressed is a common theme in the sample of YouTube videos used in this study. What observations did parents make of their infants that motivated them to record and share the video publicly on the Internet? The process of reviewing a sample of videos provided insight onto adult perception of the Cube and interpretations of the child's behaviors. First, the access to numerous videos with the same toy is likely a result of the Cube's popularity, and the distinctiveness of its name. I found these videos in large part because parents chose the words “Mozart” or “music cube” in the description of their babies' videos. The video descriptions themselves reflect the relative importance of the toy and the experience it provides for the baby. For example, one video was titled “Singing with the Mozart Music Cube” (as opposed to simply “Singing”). Many of the videos appeared to be set up as opportunities to showcase the infants' play with the toy, since few other objects were within reach. The evident parental amusement with the Cube in this study mirrors the enthusiastic reviews of infants' electronic music toys, as documented from parent interviews (Merkow, 2012; Young et al., 2006).

Systematic observations in this study revealed that, as one mother mentioned, the Cube affords multiple kinds of interactions. The tactile, visual, and auditory features of the toy aroused different responses from the infants. Many of these behaviors correspond to other researchers' observations and categorizations of infant music behaviors (GIML, 2011; Music Together,

2008). For example, Emma and Lucy's vocalizations may be considered a "random response" in Gordon's acculturation phase, as their sounds were in response to, but unrelated to the music stimuli (GIML, 2011). Infant movement while interacting with the toy corresponds to documentation of rhythmic development in the Music Together® observation scale (2008). It is important to keep in mind, however, that existing assessments of music behaviors emerged from the traditional contexts of early childhood music classes or live parent-child musical interactions, not in semi-solitary play with a toy. It is interesting to consider how the music mediated through a toy may elicit similar and different responses than those described by Gordon and Music Together®.

The data collected on the toy's "behavior" when manipulated by an infant was especially informative. From casual viewing of videos, my previous perception was that the Cube changed melodies rapidly and played fragmented phrases in music. However, in this study, the music was turned on less frequently than I expected, an average of three times per minute. During videos that lasted around two minutes, infants heard an average of two different melodies. These data demonstrate that infants may prefer to hear complete renditions of melodies and that the melodies are likely to be repeated within a period of play. This makes sense considering the programming of this particular toy; only one of the six buttons causes the melody to change, while the others alter the musical texture. In this case, the toy offers some continuity of the musical material while altering the sound (timbre/texture) in response to touch.

The applications of the measurement tool designed for this study are numerous. Research regarding electronic music toys could address infants' interactions from different disciplines and perspectives. Experimental studies may investigate how the context of music activities, the mode of listening, or repeated experience with toys affects infants' discrimination of musical elements (i.e., timbre, melody, rhythm, pitch, etc.). The impressive movement that infants produce while playing with toys is also subject to research. A recent experiment demonstrated that 4- to 7-month-olds are less likely to demonstrate rhythmic movement in response to music when it is paired with a visual stimulus (Morgan, Killough, & Thompson, 2011). This question of sensory dominance is relevant to the multimodal nature of the Cube and other electronic music toys. Given the abundance of perceptual information – lights, sound, color, shape, and texture – what is most salient to infants? In addition to studying movement responses, infants' vocal responses when playing with electronic music toys are worth further exploration. More specifically, what are the effects of periods of sound and silence on infants' vocal production? Since early child music educators encourage adults to provide purposeful silences to elicit young children's musical responses (Valerio, Seaman, Yap, Santucci, & Tu, 2006), this variable may be important in the context of interactive music products. Finally, the role of social interaction in infants' learning with electronic toy is a potential avenue for research. The mediation of the toy between an adult and child is likely to influence attention and learning, and findings may be compared with the influence of adults in the context of screen media (Barr, 2008). Are infants' experiences with electronic music toys enhanced or hindered by social interaction? What behaviors do adults model when playing with their infants and these toys? Answers to research questions such as these have meaningful implications for parents, music teachers, and early childhood educators.

As researchers and educators, we benefit from a concept of early childhood music experiences that include the diverse ways in which very young children listen to, interact with, and create meaning from music. Digital technologies and electronic music toys are prevalent beginning in infancy, yet we know little about how sound- and light-making, interactive devices are integrated into children's learning and development. The measurement tool outlined in this

paper serves as a starting point for broadening our perspectives on the rich and complex musical environments of infants today.

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An Analysis of Middle School SATB and SAB Choral Sight Reading Contest Literature

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“The voice should not be made to fit the music, the music should be made to fit the voice”
(Collins, 1982, p. 5).

Between 2006 and 2012, 9% of all middle school choral entries in the Texas University Interscholastic League (UIL) Concert and Sight Reading Contest consisted of mixed choirs ($N=842$) (Texas UIL, 2012a). Middle school mixed choirs pose unique pedagogical problems for directors. One such challenge lies in the determination of whether to perform Soprano Alto Tenor Bass (SATB) or Soprano Alto Baritone (SAB) literature. While a director must take into consideration the number, strength, and vocal independence of boys in the choir, the range of the part or parts and the students' progress in the voice change process are perhaps the most critical factors. The purpose of this study was to conduct an analysis of the UIL SATB and SAB middle school sight-reading literature from 2006 – 2012 and the corresponding UIL sight reading contest ratings.

Adolescent Vocal Ranges

Voice mutation, occurring in both adolescent males and females, is one of many physiological and psychological changes that occur during puberty (Gackle, 2011). Choral directors face unique challenges as they seek to find appropriate literature for choirs filled with changing voices. Though the characteristic symptoms of voice change may be less drastic in adolescent females than in males, they are present nonetheless (Gackle, 2011). Gackle (1991, 2011) developed a series of vocal phases for adolescent females that coincide with the stages of pubertal development (see Figure 1). Her ranges have been endorsed by several noted scholars and choral educators including Collins (1999), Cooksey (1999), and Haston (2007). Phase I, Prepubertal or Unchanged, is characterized by a clear, flute-like vocal quality and extends anywhere from ages 8 to 11. During this phase, the female voice is typically flexible and agile, with no obvious register breaks, and closely resembles the male voice at this age. Gackle recommends assigning girls in this stage to the Soprano I voice part. Phase IIA, the Pre-

menarcheal Phase, is when mutation begins. As females enter this phase, the first signs of physical maturation begin to appear, including breast development, height increase, and the development of other secondary sex characteristics. During this stage, girls exhibit more breathiness of tone, and register changes (or *passaggio*) from F4-A[#]4. Girls may experience a loss of their upper register and may have some difficulty in the lowest part of their range. Recommended voice parts are either Soprano II or Soprano I.

The third phase, IIB, the Post-menarcheal Phase, represents the pubertal stage at the highest point of mutation. At this point of development, the voice sounds husky, register changes appear between F4-A[#]4 and D5-F[#]5, and lower notes are more easily produced, giving the illusion of an Alto quality. Girls in Phase IIB may experience some difficulty or discomfort with singing in that voice cracking and breathiness frequently occur and vibrato may begin to appear as the voice progresses through this phase. Recommended voice parts are either Soprano II or Alto. In the final phase, Phase III, the Young Adult Female, the voice is characterized by a timbre that begins to approximate a young-adult quality. Tone becomes richer, range increases, breathiness decreases, registers are more consistent, and the voice is more flexible and agile. The D5-F[#]5 register change is more apparent in this phase, in addition to an increase in volume and resonance capabilities. Recommended voice parts include Soprano I, Soprano II, and Alto. Research undertaken by Williams, Larson, & Price (1990) affirmed many of the characteristics attributed to Gackle's four phases of female vocal development.

The phases of vocal maturation among adolescent males pose infinitely more difficulties for the composer and choral educator. The male vocal anatomy undergoes drastic changes during puberty, the end product being roughly an octave drop in the vocal range (Collins, 1999; Cooksey, 1999; Gackle, 2011; Swanson, 1961). One of the most widely-accepted theories regarding the male voice change process is the "Continuing and Eclectic Theory for the Training and Cultivation of the Junior High Male Changing Voice" developed by Cooksey (1977a, 1977b, 1977c, 1978, 1999), the six phases of which are outlined in Figure 1. He affirmed: "The voice change process in adolescent boys is a predictable, sequential, but sometimes erratic process which generally takes place over a period of one to two years" (1999, p. 12).

When a boy progresses from the Unchanged Stage to the Midvoice I Stage, he will often lose some of his higher pitches (usually C5-F5). As his height and weight begin to increase, his vocal cords start to grow, causing cartilage structure and muscles to develop around his vocal cords. During this phase, initial stages of sexual development begin to occur, e.g. increase in size of primary sex organs and first appearance of pubic hair. Cooksey states the average age of onset is 12-13 years, and this phase can last from several months to a year.

The next phase, Midvoice II, is marked by the emergence of the falsetto register, appearance of register lift points, and some loss of coordination. Average age of onset is 13 years, and this phase can last 12-13 months. The Midvoice IIA Stage is when the voice is most vulnerable to abuse. With onset at 13-14 years of age, and lasting from 1-10 months, Cooksey (1999) maintains this phase is vocally challenging. The falsetto can be difficult to access, singers can lose agility as the range lowers, and boys can become prone to pushing or forcing tone at range extremes. "There are coordination problems with the control of sound, particularly if the voice is forced to sing out of the restricted range. This is the time when many vocal problems are created, and serious dysphonias appear" (Cooksey, 1977b, p. 13). Physical characteristics of the Midvoice II and IIA Stages include a clearly prominent "Adam's apple," continuing increase in

height and weight, a disparity in body proportions, and a rapid growth of the head. As lungs grow larger, breathing capacity increases, and primary sexual characteristics are clearly manifested.

This stage is followed by the New Baritone Stage, in which the range begins to stabilize. While falsetto can be produced more easily, there is less pitch agility, due to the increasing strain to produce notes at the top of the range. This is when the “blank spot” (Swanson, 1961) often begins to appear, wherein boys are unable to produce pitches, typically between C4-F4. According to Cooksey, onset usually occurs around 14 years of age and lasts for 3-5 months. Weight increases begin to subside, and there is a cessation of height increase. This is the pinnacle of the development of sexual characteristics, when facial hair begins to appear and develop, chest and shoulder dimensions continue to increase, and the vocal cords reach maximum length, having grown 1 cm. since the onset of mutation. The singing voice is marked by a loss of childlike soprano qualities, but still lacks a fully developed adult sound. Resonation capabilities in lower extremes are not fully reached. The voice remains light, but approximates the mid-baritone sound.

Finally, the young male enters the Settling Baritone, or “Emerging Adult Voice” Stage. With onset at 14-15 years of age, the singer sees a gradual expansion in his range and vocal capability. Vocal production is more consistent, with a clearer and more focused falsetto register. The chest, shoulders, and muscles continue to develop, but height and weight, body metabolism, and heart rate become stabilized. The singing voice is marked by an increase of body and resonance of tone, along with emerging adult qualities. Voice classification becomes easier to determine. If the voice is to become tenor, some lower notes may disappear.

Onset of Voice Change

Gackle’s (2011) ages of onset for the stages of female voice change (outlined in Figure 1) are widely accepted. Cooksey’s research on the stages of male vocal maturation has been replicated and upheld (Rutkowski, 1985); however, other researchers (Killian & Moore, 1997; Killian & Wayman, 2010; Moore, 1995; Rutkowski, 1985) assert that the age of onset of vocal mutation in boys may be occurring earlier. Cooksey (1999) submitted the most active phase of the voice change occurs on average between 12.5 and 14 years of age, the precise ages of most US middle school 7th and 8th grade boys. Cooksey (1977b) found 8th grade to be the time when the most dramatic voice mutation occurred, and that the most dramatic changes happened over a span of 1.5 -2.5 years. Moore (1995), however, showed that less than 1% of 7th grade boys (generally ages 12-13) had unchanged voices at the *beginning* of the 7th grade year. Moore’s findings were upheld by Killian (1999a), who found that 81.4% of 6th grade boys were in one of the changing voice categories. She found only 18.6% of 6th grade boys to be unchanged. Gackle (2011) stated that girls are also entering menarche and going through puberty earlier than their mothers did. What this means for middle school choral educators, who usually teach students ages 11-14, is that they can expect to have boys and girls of all stages of voice change in their choirs at any given time.

Challenges of Standard Choral Repertoire Ranges

The two voicing arrangements used for Texas UIL mixed choir sight-reading contest literature are SATB and SAB (Texas UIL, 2011a). Cooper noted the importance of each voice having a comfortable part to sing, compatible with his or her range (Collins, 1982). The changing, and often limited ranges of adolescent boys create substantial challenges for the composer and director in providing appropriate choral literature for these young singers. Most SATB music seems to have been composed with fully developed adult voices as the target performing audience, and is in fact, unsuitable for use with adolescent choirs (Cooksey, 1978, 1977a). In SATB literature, the Tenor part is usually too low for Midvoice II to sing, while the Alto part is too high, often requiring many abrupt pitch and register changes, and the Bass part is too low for changing baritones (Cooksey, 1978). Traditional soprano ranges may climb too high and alto ranges may be too low for girls in Gackle's Stages IIA or IIB.

Another option for mixed choirs is to perform music with only three parts, yet many range difficulties present there, as well. At the heart of the dilemma posed by middle school SAB choral literature lies the vocal range of the elusive Baritone part. The "baritone" section in many 7th and 8th grade mixed choirs is often comprised of adolescent boys who are in the midst of various stages of voice mutation. In fact, using Cooksey's (1999) stages of vocal maturation in conjunction with the previously discussed data regarding the age of onset of the various stages in boys today (Killian, 1999a; Killian & Moore, 1997; Moore, 1995; Rutkowski, 1985), a middle school director programming SAB music with his/her 7th and 8th grade mixed choir could realistically expect to have boys with six distinct range capabilities who would be expected to sing the same "Baritone" part. Cooksey (1978) pointed out that the ranges of SAB literature do not accommodate male changing voices in Midvoice II and IIA.

Another mixed choral configuration, generally tailored more towards adolescent voices, is the three-part mixed. In this arrangement, the parts are often labeled using gender-neutral numbers (i.e. part I, II, III). The structure is similar to that of SAB literature, however, the "Bass" part is generally narrower, has fewer skips with less challenging melodic contours, and is generally less difficult than that of an SATB or SAB Bass or Baritone part (Killian, 1999b). The three-part mixed "Bass" part is purposefully restricted to a very limited range (usually less than six notes, often G3-D4) to accommodate boys with changing voices (Killian, 1999b). "Three-part mixed is usually recommended for the less experienced choirs with boys whose voices are beginning to change, whereas SAB is written for the older mixed choirs with more mature male voices" (Collins, 1999). Killian (1998) recommended use of three-part mixed music with boys in the earlier stages of voice maturation, often found in 6th grade, and suggested reserving the wider ranged SATB and SAB literature for boys in later stages of the voice change. Specific three-part mixed choir selections may sometimes be included in SAB UIL listings, but it is not, however, one of the current voicing options allowed in Texas UIL Sight Reading Contest literature (Texas UIL, 2012b).

Swanson (1961) addressed the importance of boys singing in comfortable, attainable ranges, not only to ensure vocal health, but for extra-musical reasons as well, such as feelings of success and encouragement, retention of boys in choir, and more efficient classroom management. Killian's (2000) three-year study, which encompassed the literature selection, gender makeup, and ratings of middle school choirs participating in adjudicated choral festivals, showed that

though the number of boys participating in the festival was increasing each year, the level of success, as determined by a choir's rating, was not. Because choral directors seem to be largely selecting music for their mixed choirs with voicing and ranges that are unattainable for their singers, they are unintentionally setting them up to fail (Killian, 1998, 1999b, 2000, 2003; Killian & Moore, 1997). Killian (2000) found that 71% of middle school mixed choirs performed SA literature at festival, but only 34% of those doing so received Superior ratings. "Few male adolescents are willing to do very long what they are not good at, and all too frequently these young colts are quite resourceful in finding ways of expressing their resistance" (Swanson, 1961, p. 64).

In Texas UIL SAB and SATB sight-reading literature, the Bass and Baritone notes often extend as low as C3 and D3, well below the range of most young adolescent boys (Cooksey, 1999). Because the sight-reading piece is performed a cappella, often directors are advised to simply raise the key in performance, but this often puts the sopranos in the untenable situation of having to sing much too high for comfort, vocal health, and security (Gackle, 2011). Another possible solution is having boys with limited ranges sing the Alto part. This is often met with resistance, however, due to the male's perception of singing alto as being less than "manly," which, at this stage of adolescent development, could be socially devastating (Dilworth, 2012; Roe, 1994).

Method

Participants were intact 7th and 8th grade¹, Conference C, CC, and CCC mixed choirs ($N = 842$) participating in 28 different regions of the annual Texas UIL Choral Concert and Sight Reading Contest for the years 2006-2012. Choirs were assigned either an SATB or an SAB octavo to sight read, based upon the majority voicing of the concert literature selected by the director (Texas UIL, 2012b). For the sake of this study, a determination was made, based upon the majority voicing of each choir's concert literature, to classify a mixed choir as having sight-read SATB or SAB literature. When the voicing of an octavo was not listed on the Texas UIL website, the online commercial music publishing databases of J. W. Pepper Music (2012) and Pender's Music (2012), two leading distributors of school choral music, were consulted. There were 128 instances of unknown voicing for choirs from 2006 – 2012, for which choral directors were contacted. Of these, 26 were unable to be resolved. Therefore, results from those 26 choirs were excluded from the data set.

A panel of three experienced choral adjudicators independently rated each choir's sight reading performance, according to the standards set forth in the UIL Vocal Sight-Reading Competition adjudication rubric (Texas UIL, 2011b), assigning a rating of Superior (1), Excellent (2), Average (3), Below Average (4), or Poor (5). These ratings were then published online annually, by region, as part of the *University Interscholastic League Official Concert & Sight Reading Contest Results* (Texas UIL, 2012a). For the purposes of this study, each choir was assigned a composite rating, formulated by adding each of the three original individual

¹ Composite choirs, which include 6th grade students, are also allowed to compete, as long as the choir is "comprised of a majority of 7th grade students or above" (Texas UIL, 2012b, Section 1102.b.2.B). Entry of such groups is likelier to occur among smaller choral programs.

sight-reading scores together (Baker, 2004). The lower the score, the better the rating, ranging from 3-15. The mean composite rating for each year, and cumulatively for all years, was calculated by averaging all of the raw composite scores for both SATB and SAB choirs, including both Varsity and Non-Varsity entries. Choirs that were labeled “DNA” (Did Not Arrive) or “DQ” (Disqualified) did not receive a rating. These eliminated choirs ($n = 32$) were not included in the calculation of mean ratings.

The scope of this study was restricted to the SATB and SAB octavos used for Varsity and Non-Varsity choirs in the C, CC, and CCC conferences, published by Southern Music (2000 – 2009) and RBC Publications (2010 – 2012). The sole dependent variable consisted of the adjudicator’s ratings of a choir’s sight-reading contest performance. Independent variables included sight-reading literature voicing and a choir’s proficiency designation (Varsity or Non-Varsity).

Results

Of the middle school mixed choir Texas UIL entries from 2006 – 2012, 62.95% ($n = 530$) were classified as sight reading SAB literature, 33.97% ($n = 286$) as reading SATB literature, and 3.09% ($n = 26$) with undetermined voicing. Considerably more middle school choir directors chose to have their mixed choirs sight-read SAB rather than SATB literature. Even though the overall number of choirs reading SAB declined from 84 in 2006 to 63 in 2012, the number of choirs reading SATB remained relatively constant, at 42 in 2006 and 41 in 2012. Although more choirs sight-read SAB literature, Table 1 indicates that choirs reading SATB received better adjudication ratings. The mean composite rating for all SATB choirs receiving scores from 2006 - 2012 ($n = 280$), 3.85 ($SD = 2.02$), was 3.34 points better than that of all SAB choirs receiving scores ($n = 504$), 7.21 ($SD = 3.86$). Furthermore, the mean SATB rating was at least 2.78 points better than that of the SAB for every year of this study.

Table 1

Mean Sight-Reading Composite Rating of All Texas UIL SATB and SAB Middle School Choirs

Year	SATB			SAB		
	<i>n</i>	Mean Rating	<i>SD</i>	<i>n</i>	Mean Rating	<i>SD</i>
2006	41	4.20	2.53	80	8.28	3.70
2007	42	3.63	2.64	73	6.51	3.50
2008	41	3.56	1.45	74	7.85	4.22
2009	36	3.89	2.01	82	6.67	3.85
2010	50	3.73	1.69	69	7.23	3.85
2011	40	3.28	1.24	65	6.95	3.80
2012	39	3.64	1.66	61	6.85	3.92

Note. Composite rating was calculated by combining the individual ratings of the three adjudicators. Three is the best possible composite score, representing three individual ratings of Superior (1), while 15 is the poorest, representing three ratings of Poor (5). Mean rating for all SATB choirs ($n = 280$) was 3.85 ($SD = 2.02$); for all SAB choirs ($n = 504$), it was 7.21 ($SD = 3.86$).

Calculated in terms of number of half steps, the average range of male voice parts (tenor and bass) in SATB voicing for all years was 5.5. The average range of the Baritone part in SAB voicing was 7.71, wider by more than two half steps. The ranges of the male voice parts in the 2006 – 2012 Texas UIL Sight Reading Contest music were as follows:

Tenor: G3-E4

Bass: C3-B3 (Though 2012 was the only year to go below D3).

Baritone: D3-B3 (Non-Varsity optional notes extended up to D4)

In all but one year, optional notes to replace the lowest notes in the Non-Varsity SAB Baritone part (D3, with D4 as optional) were provided. No optional notes were provided, however, for any of the Varsity SAB pieces. The SATB Tenor part, with an average range of 4.43, was the narrowest of the male ranges.

Figure 1 shows a comparison of the above three ranges, representative of Texas UIL SATB and SAB sight reading literature from 2006-2012, along with the allowable ranges for all Texas UIL voice parts, and with Cooksey's and Gackle's recommended ranges and tessituras for the stages of adolescent vocal development. The male ages shown represent an amalgamation of Cooksey's suggestions with results of research regarding the onset of male voice change (Killian & Moore, 1997; Killian & Wayman, 2010; Moore, 1995). As the ages of most US middle school students span from 11 – 14 years, Figure 1 shows that a middle school choir director could

realistically have students in up to nine different stages of vocal maturation in one choir. This results in the daunting task of trying to accommodate nine distinct vocal ranges when selecting music.

According to Cooksey's stages, male students in the Midvoice II and IIA stages would be able sing pitches in the UIL Tenor range; those in the New and Settling Baritone stages would be able to sing the bass pitches; and those in the Midvoice IIA, New Baritone, and Settling Baritone stages would be able to sing the UIL Baritone pitches. None of the UIL tenor, bass, or baritone ranges, however, would be accessible to male students with unchanged voices or in the Midvoice I stage.

Though consistent trends between range width and rating were not obvious, a few anomalies warrant discussion. Of the Non-Varsity SAB selections, the poorest mean composite rating (9.38, $SD = 4.05$) occurred in 2008, the only year in which no optional high notes were provided in the Baritone part as alternatives to singing D3. In 2006, the Varsity SATB selection had the widest Tenor range (7, compared with 3 and 5 the other years), the lowest tenor note, G3, as well as the widest soprano range (12, compared with 7, 8, or 9 most years), and the lowest soprano note (D4, compared with F[#]4 or G4 most years). Interestingly, that same year Varsity SATB choirs had the poorest mean composite rating (4.23, $SD = 2.51$).

The second poorest Varsity SATB mean composite rating (3.87, $SD = 2.65$) occurred in 2007, when the sight reading piece had a wide and low soprano range (exact same as 2006), along with the highest bass span (B3). The best SATB Varsity rating (3.44, $SD = 1.16$) occurred in 2011, when the contest music had the narrowest tenor (3) and soprano (7) ranges. The overall average range of boys' voice parts in SATB was 5.5, corresponding with a mean rating of 3.85 ($SD = 2.02$); in SAB the range was 7.71, corresponding with a mean rating of 7.21 ($SD = 3.86$).

The considerable difference in ratings between middle school choirs reading SATB and SAB literature would seem to indicate that the SAB literature is more difficult for students to perform successfully. If this is true, then why do the majority of middle school directors choose to have their choirs sight-read SAB? One possible reason could be the belief that the boys lack the musical independence to be able to sing in two parts, as required by SATB literature (S. Gulley, personal communication, October 15, 2012; T. Bradstreet, personal communication, October 15, 2012). Another possibility is the director's perception that the boys may be too few in number if divided into two parts to successfully balance the number of girls in the choir (A. Bond, personal communication, October 13, 2012). Yet another reason concerns the makeup of the boys' section in a given year. One director reported selecting SAB sight-reading because that year his choir lacked any true tenors (J. Bourdier, personal communication, October 13, 2012), while another cited the lack of basses, noting that the range of the SAB baritone part required him to transpose the piece higher (J. Price, personal communication, October 12, 2012). Such situations highlight the need for more voicing options to address the diverse ranges present in middle school mixed choirs.

Perhaps consideration of additional three-part voicing options, such as SAT or three-part mixed, for Texas UIL middle school choirs might be beneficial. An added benefit of the three-part-mixed setting is the traditional use of gender-neutral labels, thus enabling a director to assign boys to the middle, or traditional "alto" part, without fear of stigmatization. Another option to accommodate mixed choirs with boys whose voices are either unchanged or in the earliest stages of change, would be to allow them to perform three-part treble, or SSA, literature.

The ranges of the Texas UIL Alto parts for all Varsity and Non-Varsity SSA pieces from 2006-2012 for middle school treble choirs stayed well within Cooksey's recommendations for boys in the Unchanged, Midvoice I, and Midvoice II stages. The ranges spanned from C4 to A4, with the majority of pieces remaining between C4 and F4. A gender-neutral relabeling of the parts, however, would be advisable, to prevent possible embarrassment to boys.

Figure 1, Section A shows the acceptable middle school vocal ranges for Texas UIL sight reading music. Compositional guidelines do not specify which of the two soprano and tenor ranges should apply to the composition of SATB and SAB music (Texas UIL, 2011a). Section B shows, however, that composers have chosen to write to the extremes of both range options. For example, Section A shows the Tenor I acceptable range as A3-F[#]4 and the Tenor II range as F3-D4. Actual SATB compositions' tenor ranges spanned from G3-E4, too low for the Tenor I range and too high for the Tenor II range. The SATB and SAB Soprano parts span the range of Soprano I, the wider of the two options; SATB and SAB Alto parts come within one half step of the allowable maximum range; SATB Bass parts span the entire allowable range; yet, none of the SAB Baritone parts employ the lowest M3, or the highest m2 allowed by current Texas UIL guidelines.

These guidelines allow for an SAB Baritone range from B^b2-C4. The pieces written from 2006 – 2012, however, exhibit a restricted baritone range, from D3-B3. These SAB Baritone parts are already only fully accessible by boys in the Midvoice IIA, New Baritone, or Settling Baritone stages – the latest of Cooksey's stages of male vocal maturation. Even then, the Baritone range does not fully lie within the tessitura recommendations for any of those three parts (see Figure 1). A Baritone part reaching down to B^b2 would only be accessible by boys in the final Settling Baritone stage; and it would lie outside the tessitura recommendations for every single one of Cooksey's six stages. The difficulties of accommodating many different voice types under the banner of the SAB "Baritone" have already been discussed in detail. The problem could potentially be compounded further simply by following current compositional guidelines set forth by Texas UIL. The fact that the Texas UIL range guidelines allow for the Baritone part to extend two half steps lower than the Bass part (C3) is an indicator that something is amiss. Perhaps it is time to reevaluate the current range allowances for Texas UIL middle school mixed choirs.

As Figure 1 illustrates, not all adolescent boys can successfully sing notes in the ranges of the three traditionally male voice parts. In SAB choirs with boys in all stages of vocal maturation, the director must make the decision to either have all boys sing the Baritone part, knowing they will not all be able to access all of the pitches, or to assign some boys to traditionally female voice parts. In truth, assignment to Alto in some situations would likelier be more comfortable for some boys in early stages of voice change. The pitfalls of assigning boys to voice parts with feminine labels, however, has also been addressed. If a mixed choir category is going to continue to be a staple of the Texas UIL Sight Reading Contest, perhaps a reevaluation of the part labels used would be beneficial.

The mean range size of the male voice parts for the SATB compositions was 5.5, while the mean SATB rating was 3.85 (*SD* = 2.02). The mean range size of the male voice part for the SAB compositions was 7.7, while the mean rating was 7.21 (*SD* = 3.86). It is possible that there is a connection between the wider range spans in the SAB literature and the poorer ratings. The poorest Varsity SATB mean composite rating (4.23, *SD* = 2.51) occurred in 2006, when the

soprano and tenor ranges were the widest and lowest. In fact, this was the only year in which the tenor range extended down to G3, notably outside the allowable Texas UIL range for Tenor Is. Conversely, in 2011, when the Varsity SATB mean composite rating (3.44, $SD = 1.16$) was best, the tenor range was the narrowest. The tenor range that year spanned a mere m3, from B3-D4, comfortably within the acceptable Texas UIL ranges for both Tenor Is and Tenor IIs.

The poorest mean composite rating among the Non-Varsity SATB choirs (7.67, $SD = 5.03$, $n = 3$), occurred in 2012, which also saw the highest soprano range, extending up to E5 (exceeding the acceptable range for Soprano II), and the widest and highest tenor range, spanning a P5 from A3-E4 (exceeding the acceptable range for Tenor II).

Though consistent trends between the span of all voice part ranges and mean composite rating were not immediately apparent, it appears that the range of the tenor part is of particular importance. For the SATB Varsity choirs, the best and worst ratings corresponded respectively with the narrowest and widest tenor ranges. Perhaps the tenor part is critical due to the number of boys in the earlier, less stable stages of voice mutation who would likely be singing that part. Cooksey (1999) noted the particular difficulty facing boys in the Midvoice II and IIA stages in terms of voice control and dexterity. The recommended tessituras for these two stages, G^{#3}-F4 and F^{#3}-D 4 respectively, would be better accommodated by the tenor than the bass voice parts in SATB literature.

It is notable that 6 of the 7 Non-Varsity SAB octavos from 2006-2012 include optional high notes that can be sung in place of the low D3s, which would be out of the range of boys in the first three of Cooksey's stages of voice change. It is also quite remarkable that the lone year in which the Non-Varsity SAB octavo did not include optional notes saw the poorest mean composite rating for that division, 9.38. None of the Varsity SAB compositions, however, included optional notes. Nowhere in the Texas UIL (2011a) sight-reading composition guidelines, however, does it even address the inclusion or omission of optional notes for SAB sight-reading compositions in either division.

Baker (2004) and Killian (1998, 1999b, 2000) both noted the importance of literature selection on choral festival rating outcomes and the correlation between literature and a choir's rating. In the same way, literature selection has a direct impact on sight-reading voicing. The difference is that directors are not at liberty to peruse the sight-reading music in advance to make an informed decision regarding voicing and ranges. In the case of Texas UIL Concert and Sight Reading Contest, the majority voicing of a mixed choir's selection of concert literature determines that the choir will sight read one of two voicing options: SATB or SAB. As the previous pages of this study have illustrated, there is a high degree of range variability possible in a given year's sight-reading octavos. Until more voicing options are made available to Texas UIL middle school mixed choirs, directors are essentially required to make a choice between the lesser of two evils: dividing the number of boys into two sections or singing a single male voice part with a wider range.

Discussion

Perhaps it is time to consider making changes to the current Texas UIL compositional guidelines, in order to better accommodate adolescent singers. The allowable keys of C, F, and G Major are also somewhat problematic. All of the mixed octavos for the years 2006-2012 are in the key of G Major. In fact, an examination of the mixed octavos going back to the year 2000

indicated that all but one year's octavos were composed in the key of G Major. The one exception occurred for the Varsity SATB and SAB pieces of 2000, which were written in F Major. As a result of this key decision, the Bass part of the SATB piece extended down to C3. Even more problematic, the Baritone part of the SAB piece, which had no optional notes, also extended down to C3, well beyond the range of most adolescent boys. None of the octavos written between 2000 and 2012 were composed in the key of C Major.

For SAB compositions in G Major, the overwhelmingly most popular key, the Baritone part usually extends down to D3. Due to this low range, and particularly due to the lack of optional notes in the Varsity music, it is not uncommon for directors of SAB choirs to raise the a cappella performance key to A^b Major or A Major. Performing in one of these keys would likely raise the highest soprano note to E^{b5} or E5, which is not ideal, but which is arguably better than requiring the boys to sing notes entirely out of range. Why not consider replacing the possible key of C Major with either A Major or A^b Major, and have students learn to sight read in the actual key of their likely performance? The selection of C, F, and G Major as allowable keys seems rather arbitrary. These keys might be considered the simplest with regards to middle school instrumentalists, requiring the navigation of fewer flats and sharps. Such consideration really has no bearing on vocalists. Adding either the key of A^b Major or A Major would theoretically necessitate singers' needing to become familiar with sight-reading in with a new key; however, whereas instrumentalists might be required to learn additional fingerings for new notes, singers simply need to become accustomed to a new orientation of notes on the staff. In this regard, vocal sight-reading in A^b Major or A Major is no more difficult than sight-reading in C Major.

As discussed earlier, another consideration for mixed choirs would be the inclusion of more voicing options for middle school choirs beyond SATB and SAB. Finally, the inclusion of optional notes to replace those at range extremes should be required for all SAB sight reading compositions, at both the Varsity and Non-Varsity levels. The existing range of the Baritone part is simply too large for all adolescent boys to be expected to navigate successfully.

It is the hope of this researcher that an earnest assessment and evaluation of the current Texas UIL compositional guidelines for middle school mixed choir sight-reading literature might be undertaken by choral educators and changes recommended. It is the duty of choral educators to feed their young singers music which is accessible and which lends itself to successful performance. If we hope to see the participation of adolescent and post-adolescent males in choir continue to increase, it is imperative that such students not be set up for failure by the literature they are expected to perform. After all, as Collins (1982) wisely said, "the voice should not be made to fit the music, the music should be made to fit the voice" (p. 5).

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Making Music as an Adult: What do the Spouses Think?

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In efforts to better understand adult instructional needs, research has examined adult perceptions of music participation. Adult participants in musical organizations have cited musical (Coffman, 1996; Coffman & Adamek, 1999, 2001; Heintzelman, 1988; Kruse, 2008; Patterson, 1985; Rohwer, 2008, 2009, 2010, 2012; Spencer, 1996; Tsugawa, 2009) and social (Coffman, 1996; Coffman & Adamek, 1999, 2001; Dabback, 2006; Kruse, 2008; Rohwer, 2008, 2009, 2010, 2012; Spencer, 1996; Tsugawa, 2009) benefits from participation in music. The cited benefits typically are associated with the musicians themselves, with social benefits usually concerning friendships and interactions between the musicians.

Adults have expressed perceived challenges with music participation, including issues related to health (Rohwer, 2005, 2008, 2012; Rohwer & Coffman, 2006), finances (McCullough, 1981), attendance, and recruitment (Rohwer, 2010). Research has documented information about adult musicians' backgrounds, with many adults having participated in a musical activity in their youth, and many having had musical families (Bowles, 1991; Coffman, 1996, 2002, 2009). In addition to backgrounds, though, there is a need to understand adult musicians' "foregrounds." What do they do with their free time, and how is music participation fitting into their lives and relationships with key others in their social circles?

The issue of support from key individuals has been studied in youth and professional musicians. For instance, the support of parents, teachers, and even positive audience member responses can be important factors in student growth toward musical success (Hargreaves & North, 1997). In particular, "a stable and structured family life when it exists can contribute towards sustaining and motivating learning activities" (Hargreaves & North, 1997, p. 197).

There is a need for research on the extended relationships of amateur music makers, specifically adult hobbyists. Clearly, relationships with key others may be differentially affected across the stages of life, with retirement age triggering changes to how married couples interact and perceive their quality of life (Orthner, 1975). Research has shown that wives can resent the increased presence of their husbands in the home, which may suggest a need for retired couples to have some individual activities (Hill & Dorfman, 1982). This recommendation supports that of Orthner (1975) who proposes that across periods of their marriage, husbands and wives may want to experience leisure in different ways from one another.

As Szinovacz and Davey (2005) state, "more research should address linkages between work and family realms during transitions such as retirement and explore the negotiation processes

surrounding such transitions” (p. 387). In understanding the benefits and challenges associated with adult music participation, then, it may be important to look not just at the music participant, but also at the family unit. Since “developmental and social contexts shape an individual’s retirement decisions and experiences,” there is a “need to consider couples conjointly rather than viewing individuals in isolation” (Kim & Moen, 2001, p. 83). The purpose of the current study was to describe perceptions of adult band member spouses concerning musical participation to obtain a contextual and socially integrated picture of lifelong learning in music.

Method

Forty-two band member spouses took part in the study. The sample consisted of 15 males and 27 female spouses with an age range from 50 to 87 years ($M = 69.09$, $SD = 8.80$) who had been married an average of 41 years (ranging from 10 to 64, $SD = 13.62$). While 31 of the spouses were retired and 31 of the band members were retired, there were four couples that had a retirement mismatch; two of the couples were composed of a retired male spouse and a non-retired female band member, and two couples were made up of a non-retired female spouse and a retired male band member. The respondents were married to band members who played the following instruments: woodwind (28), brass (12), and percussion (2). Three married couples (six participants) in the responding sample were all band members.

The sample was obtained from a population of band members in a New Horizons Band in the Southwest. The study was introduced at a band rehearsal in the spring of 2012. It must be noted that because this study used spouses from only one band, the results may not be generalizable to other band spouses. The band that served as the accessible population had been in existence for 15 years, and served as a developing band for adults; the group played music that ranged from grade one to grade three. Approximately half of the band members had joined the band as beginners on their instrument; the other half had returned to music many years after playing in public school music programs.

An email invitation to participate in the study was sent to band members who were asked to forward the notice to their spouses. The researcher sent two email reminders and made three reminder announcements in band rehearsals as follow-ups to the initial invitation. Of the 74 band members, 65 were currently married and therefore eligible to have their spouses answer the questions for the purposes of the study; the final convenience sample of 42 participant spouses represented a 65% response rate from the accessible population.

The questionnaire comprised 23 questions in several formats, including quantitative, short answer, and open-ended queries. Descriptive statistics including means, standard deviations, ranges, and percentages were used to analyze the quantitative data. All short answer and open-ended qualitative data were analyzed using content analysis procedures to determine the central issues across the responses. The questions were assessed for content validity by a panel of three experts in the area of lifelong learning. An external evaluator analyzed the qualitative coding categories for accuracy and consistency across responses.

Results

The majority of band member spouses tended to view retirement as a favorable aspect of their lives, with responses ranging from ‘Strongly Agree’ (scored 5) to ‘Disagree’ (scored 2) ($M = 4.55$, $SD = .63$, 60% Strongly Agree ($n = 25$), 38% Agree ($n = 16$), 2% Disagree ($n = 1$). The

respondents described the most common shared hobbies they had as travel ($n = 19$), music ($n = 16$), reading ($n = 10$), and going to the movies/theater ($n = 8$). Responses ranged in level of independence, with one spouse stating,

We enjoy any time together. We have bicycled and motorcycled and traveled and read and worked together as a self-employed couple.

On the other end of the spectrum, a spouse stated,

We don't have any shared hobbies. We are pretty independent and respect each other's own interests and time.

For respondents whose partners were also band participants ($n = 6$), the perceived benefits of band participation were associated with time together in an activity they both enjoyed, as suggested in the following comments:

We met in band and have spent 60 years together – music is an enjoyable and integral part of daily living to us.

Band has been good for our relationship because now we have one more shared interest.

The most commonly cited hobbies of the spouses that differed from those of the band member were crafts/needlework ($n = 9$), reading ($n = 7$), and yard work ($n = 6$). When asked about their perceptions about playing a musical instrument in a group, more spouses cited a lack of interest in playing ($n = 31$) than an interest in playing ($n = 11$), with the most common reasons for not wanting to play being a lack of talent ($n = 8$), a lack of time ($n = 7$), and opting to be an audience member ($n = 5$), as represented in the following comments:

I can't carry a tune. I have no musical ear and wouldn't be good at playing a band instrument.

I am so busy in retirement doing so many things that I just don't have time to add one more.

I think I am good "audience material" and that's important too! I enjoy listening and watching others enjoy making the music.

Those citing an interest in playing a musical instrument displayed a lack of knowledge of the instructional resources available to them through the New Horizons program, as suggested in the following comment:

I would like to play an instrument, but I never had music theory or lessons or learned to play when I was a child. I sang in various choral groups and always wanted to learn an instrument but I don't own one and don't have the money to buy an expensive instrument now.

The spouses most commonly perceived positive effects of their spouses' band participation to be sheer enjoyment/happiness ($n = 18$), making friends ($n = 15$), making music ($n = 14$), and learning ($n = 10$), as suggested in the following comments:

I see only positives about his playing in band. He looks forward to rehearsals and interacting with other band members. I love to see and hear the happiness he has.

He stays very busy and has many new friends. It provides his life with a structure.

My husband retired so that he could join more bands that met during the day. Playing increases his happiness but sometimes adds frustration too, but I think that is healthy.

One issue indicated by some spouses as a benefit and cited by others as a negative was time away from their partner. Four participants saw band as a positive distraction that helped keep their marriages healthy. One participant wrote,

Since my spouse is newly retired, he needs time out of the house. This is a positive because it allows me some alone time.

The value of band rehearsals filling free time was noted specifically when one spouse was retired and the other was not, as in the following quote:

I work full time and my job requires a lot of travel. The band provides him with something to occupy his days when I'm working.

When discussed as a negative issue, respondents indicated their band member spouses' time away during rehearsals and performances as a problem. Seven spouses saw band as a possible distraction that caused scheduling conflicts and took away from time that could otherwise be spent together as a couple:

Because he is in multiple bands and has so many practice sessions it is hard to find time to do some of the things I would like to do together. I believe this is what caused his divorce from his first wife.

At times we disagree on the priority of band in our lives as a married couple. I attend many of his band performances but I enjoy other types of music, and he is usually unavailable to attend because he's at a band practice. He's currently in 6 bands.

We have attended his concerts together. Now that he is retired I do not mind all the rehearsals and concerts where I stay at home. Prior to his retirement there were times when I resented his going off at night, etc. and our together time was shortened.

Overall, more spouses reported that their husbands' or wives' band participation improved their relationship ($n = 24$) than those who felt it distracted from it ($n = 7$, or $n/a = 11$). The most common relationship improvement topic mentioned were supporting one another ($n = 7$), time together making music ($n = 6$), and having something important to talk about ($n = 4$). Even in

neutral responses it was evident that support of band member spouses was an important component of the couples' relationships:

Band hasn't improved or detracted from our relationship. We have a good relationship. I am proud of him for sticking with it but it hasn't changed us as a couple.

The most common hobbies that were perceived to have a greater impact than band on the couples' relationships were "together" activities, such as traveling ($n = 11$), and dancing ($n = 7$). One spouse wrote,

Other activities may have a greater impact on our relationship because we do them together.

In terms of changes that the spouses perceived since the musicians joined the band, increased friends was most commonly cited ($n = 36$), followed by increased concert attendance ($n = 24$), and improved health ($n = 8$):

I think band is great. When he first retired he just sat and read all day. With the band he has branched out into so many other activities and he loves making music with all of his new friends.

I think he is more interested in attending local concerts and explaining about the clarinet and playing and some talking about his past musical experiences from long, long ago.

I think he has stayed healthier and more relaxed because of being in band and staying active.

Three participants noted deterioration in health, including problems with back pain ($n = 1$), worsening eyesight ($n = 1$), and respiratory issues ($n = 1$), perceived to be related to band participation:

He plays bass in many area bands and this is hard on his back.

She's saying she needs to get her eyes checked because she is not seeing the music as clearly....a music-specific starting thing?

Band seems to have had a negative impact with more respiratory problems. I've heard wind instruments can do that.

Discussion

In the current study, band spouses noted similar perceived musical and social benefits to those cited by band members in previous literature. In general, spouses thought band participation was a favorable hobby for their husbands and wives. The only activities that were perceived as more important to the spouses were hobbies that the couples could partake in together. This finding may not be generalizable to adults who are less active and at home together more often. Another qualification may be for situations in which one spouse is retired

and the other is not. For these exceptions, the balance of individual and couple activities may need to be different. The appropriate, contextual balance of time together and time apart appears to be an important component of healthy and happy interactions of couples, and this topic may need attention and discussion at the various stages across a couple's lifetime. Since together activities tended to be viewed as favorable in the current study, perhaps adult bands could provide opportunities for couples, even those with a disparity in music experience levels, to participate together. Directors who can communicate with band members concerning opportunities for spouses may be assisting the balance of family dynamics. Information may be able to aid in the necessary negotiation process that is important in the health of any relationship (Szinovacz & Davey, 2005).

While music was perceived to be a valued activity by the majority of spouses, it may be important for directors to realize that band may also be seen in a negative light by some spouses due to the time commitment. To address this issue, directors might focus on bringing family members together and encourage non-musician spouses to advertise upcoming band events or organize receptions, for example. Some spouses in the current study clearly valued their participation as audience members, thus involving audience participation during concerts may bring a spotlight to the listening aspect of the music relationship.

Some couples in this study reported wanting more time apart, as documented also by Hill and Dorfman (1982). For these individuals' band member spouses, additional ensemble participation (e.g., jazz bands or chamber groups), teaching and coaching other musicians, and/or administrative service for local arts organization may provide other enjoyable, out-of-the-home musical experiences.

Directors who are cognizant of the global picture of band members' extended relationships may also realize the need to consider and accept the extended familial ramifications of organizing trips or planning concert and rehearsal schedules. While some band members may have the scheduling freedom to be at every rehearsal and concert, others might have to balance their required commitments with their optional hobby interests. Attending a rehearsal or traveling to a concert may not always be feasible for all members

Increased concert attendance was documented as one possible benefit of band participation. Because concert attendance is an activity that couples can partake in together, band directors may want to consider including time in rehearsals during which information concerning community concerts can be announced. There was also a perception of increased health derived from band participation. It may be worthwhile for directors to provide time for band members to engage in formal or informal discussions concerning issues of importance to them, including health. Directors may benefit from a thorough understanding of health issues common to older adults so that at least healthy physical approaches to performance are consistently encouraged

In conclusion, further investigation into attitudes and perceptions of the complete family unit is warranted to gain a better understanding of life issues affecting leisure participants (Kim & Moen, 2001). Since adult music making can be an enjoyable experience with many possible benefits, it is important for community music practitioners to consider ways to make music participation add to adults' life experiences. Knowledge about band member familial issues may help inform and assist band directors in making decisions that will facilitate healthy relationships at home for their band members. While this study is but a first look at the extended family as part of healthy adult musical engagement, obtaining a contextual and socially integrated picture of lifelong learning in music is an important goal for continued study.

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Health Risks Faced by Public School Band Directors

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Public school band directors face many work-related hazards in their grueling, yet rewarding job. As a school year progresses, directors are expected to work long hours, while trying to balance professional and personal responsibilities. A band director whose career spans multiple decades can potentially face a number of serious medical problems. Some members of the profession develop debilitating maladies, or worse, die as a result of career-related health problems.

From 2001-2011, newspapers reported 40 deaths of band directors, as determined by a Lexis Nexus search. The age, gender, years of experience, teaching assignment, and causes of death have been diverse. Data from this investigation indicated trends that are worth examining.

The deceased band directors were divided into the following age groups: 25-35, 36-45, 46-55, 56-65, and 66+ years. The largest number of deaths occurred in the 56-65 age group, in which 16 deaths were reported. Both the 25-35 and 36-45 age groups reported 6 deaths and the 46-55 age group reported 9 deaths. No deaths were reported in the 66+ age group. This could be attributed to the fact that many band directors have retired by that age.

Closely related to the age of these directors was the number of years they served as a band director. Categories for this analysis included 1-10, 11-20, 21-30, 31-40, and 41+ years. Twelve deaths were reported among band directors who had 21-30 years of teaching experience, making it the highest ranking category. There were six deaths in the 31-40 years of experience group and three deaths in each of the remaining categories.

Of the 40 deaths of band directors reported in newspapers, 34 of them were male and 6 were female. This is not surprising, given that there are more men than women working in this profession. High school directors constituted the largest number of deaths (24), which was considerably higher than the number of middle school directors (6), and college/university directors (3).

Causes of death among band directors were diverse; however heart attacks were the most common factor, with 12 deaths. Additionally, there were three deaths from heart disease and three deaths from brain or heart aneurisms, which are all included in the "Heart" category. Seven

deaths were attributed to cancer and there were three suicides. One death was reported in each of the following categories: fatigue, drug overdose, tragic, lupus, and birth complications. An intriguing finding was that eight of these deaths occurred while on duty, most commonly while traveling with students.

Band directors might have additional health problems that are not life-threatening, but could reduce their quality of life. Scheib (2003) performed a case study following four music educators that were experiencing burnout due to workload stress and role conflicts. Hearing loss is a particular risk for band directors. Research has been conducted pertaining to noise-induced hearing loss (NIHL) and how it can influence career band directors. In a study conducted by Cutietta, Klich, Royse, and Rainbolt (1994) on hearing loss among music educators, they stated, “When signs of NIHL were found, the degree of loss was greater among high school band directors than in the other music teacher related groups” (p. 327). They went on to point out that “there seemed to be a relationship between the degree of loss and the age of band directors” (p. 327) and that men appear to be more at risk for NIHL than women. Chesky (2000) added:

The reason for a noise standard is to protect workers from hearing loss that may eventually become handicapping for communication. For musicians, hearing loss can be a detriment not only to communication, but also to their ability to maintain their livelihood. (p. 17)

The overall mental well being of music educators is an additional source of concern. In their study of music teachers, Fjellman-Wiklund, Sundelin, and Brulin (2002) determined that “an important task for music teacher training is to confirm the power of pedagogy and physical and psychosocial work factors for the students, not only to become a good teacher but also to maintain good health” (p. 3). They go on to address issues closely related to the band directing profession, stating:

If there are enough resources, we may perceive the demand as a challenge, which in its turn leads to a positive development--we learn to handle a difficult situation. Should there be a lack of resources to act, i.e., to have too little control, the demands of work are perceived as a threat. One cannot then learn to deal with unexpected situations, which in turn leads to loss of self-confidence and low self-esteem. This creates negative stress and increases the risk of sickness and ill health. (p. 3)

The body of research regarding health-related risks to music educators is limited. Furthermore, few studies have specifically targeted band directors and the numerous stressors associated with their profession. There is a paucity of research regarding how a band director can prevent career-related health symptoms, thus improving their quality of life and allowing them to be an effective and successful educator for several years.

The purpose of this study was to determine health risks associated with being a career band director and possible ways to prevent these health problems. The results of this study will hopefully provide the band director community some research-based information that can help improve their quality and length of life.

Research questions included the following:

- 1) What health problems are associated with the profession of band directing?
- 2) What are the demographics of band directors at greatest risk for premature death?

3) What are some ways band directors can avoid career-related health risks?

Method

To examine health risks faced by band directors, a pilot study of local instrumental educators was conducted. A researcher-designed questionnaire was sent to urban, suburban, and rural secondary band directors in the North Texas area via Survey Monkey. The majority of the participants were members of the Texas Music Educators Association Region II. The return rate of the survey was 31% (requested respondents $N = 348$, actual respondents $N = 108$).

The first survey question, “Do you know a band director who died prematurely or unexpectedly?” was designed based on the data retrieved from the newspaper accounts mentioned previously. If the answer was affirmative, respondents were asked to indicate the age, gender, years taught, and health issue that may have caused the death.

The second part of the survey addressed the respondent’s personal health issues. First, the respondents were asked to indicate what health problems they had from a checklist provided. The options included skin cancer, hypertension, hearing loss/impairment, diabetes, heart disease, shoulder/neck pain, and sleep apnea. Participants were then asked to answer the open-ended response question, “What health issues do you have that could be attributed to teaching band (if any)?”

The third section of the survey solicited solutions to health issues that were job-related. Respondents were asked to provide open-ended responses to the question, “Do you have any suggestions as to how the health problems associated with being a band director can be reduced or eliminated?”

Results

A total of 30.6% of participants indicated that they knew a band director that had died prematurely or unexpectedly. These respondents were then asked to indicate the age, gender, cause of death, and whether or not the director taught middle school or high school. Deaths were most frequently reported in the 46-55 age bracket, with 12 deceased (33.3%). The group with the second highest number of deaths was 36-45 years, with 11 deceased (30.5%). Next was the 56-65 years category with 8 deaths (22.2%), followed by the 25-35 year age bracket with 5 deaths (13.8%). No deaths were recorded for the 66+ age category. The gender category of deceased colleagues indicated that 35 were male (97.2%) and 1 was female (2.8%).

Examination of years of teaching experience of deceased band directors indicated that 45.7% ($n = 16$) had taught for 21+ years. Those who had taught for 11-20 years ($n = 12$) comprised 34.3% of deceased colleagues and 20% ($n = 7$) had 6-10 years of teaching experience. No deaths were reported among band directors in their first five years of teaching.

The category of grade level taught by the deceased band director consisted of three responses—Middle School, High School, or both Middle School and High School. High school band directors had the highest percentage of deaths with 38% ($n = 13$), followed by 32% ($n = 11$) among directors who taught on both middle school and high school campuses. Middle school band directors had the lowest rate of deaths with 29% ($n = 10$).

Causes of death among band director colleagues indicated that heart complications were the primary factor, leading to 51% of band director deaths. The next factor was tragic circumstances,

i.e. suicide, accidental death, and drug overdose, causing a 29% ($n = 9$) mortality rate. Cancer claimed the lives of 12.9% ($n = 4$) of band directors, 9.6% ($n = 3$) died of undetermined causes, 6.5% ($n = 2$) died of a stroke, and 3.2% ($n = 1$) died of diabetes.

When participants were asked to select from a list what personal medical conditions they could attribute to being a band director, the most frequent response (68.7%) was neck and shoulder pain (see Table 1). Almost half (48.4%) of the band directors reported hearing loss and 31% suffered from sleep apnea. Hypertension was reported by 23.4% of directors and 15.6% had skin cancer. Heart disease afflicted 7.8% of respondents and 3.1% suffered from diabetes.

Table 1

Respondents' ($N = 64$) Health Issues Related to Being a Band Director

Medical Condition	Number of Respondents	Percentage of Respondents
Neck and Shoulder Pain	44	68.7
Hearing Loss	31	48.4
Sleep Apnea	20	31.2
Hypertension	15	23.4
Skin Cancer	10	15.6
Heart Disease	5	7.8
Diabetes	2	3.1

Note. 64 participants provided a total of 64 responses

Participants were then requested to provide open-ended responses regarding personal health issues that could be attributed to teaching band (see Table 2). The most frequent maladies reported included heart disease ($n = 11$), neck/ shoulder/ back pain ($n = 10$), hearing loss ($n = 7$), and stress ($n = 7$). Other work-related issues included anxiety ($n = 6$), obesity ($n = 5$), depression ($n = 5$), ulcer/acid reflux ($n = 4$), skin cancer ($n = 4$), family issues ($n = 4$), exhaustion ($n = 3$), allergies ($n = 3$), alcohol abuse ($n = 2$), and one with vocal problems. One respondent said that they had quit teaching twice in their career to lose weight for health reasons. Another director mentioned his/her cholesterol, blood pressure, and how the time demands of the job made it impossible to eat right and exercise.

Table 2

Respondents' (N = 72) Health Problems Attributed to Teaching Band

Medical Condition	Number of Respondents	Percentage of Respondents
Heart Disease	11	15.2
Shoulder, Neck, Back Pain	10	13.8
Stress	7	9.7
Hearing Loss	7	9.7
Anxiety	6	8.3
Obesity	5	6.9
Depression	5	6.9
Skin Cancer	4	5.5
Family Issues	4	5.5
Ulcer/ Acid Reflux	4	5.5
Exhaustion	3	4.1
Allergies	3	4.1
Alcohol Abuse	2	2.7
Vocal Problems	1	1.3

Note. 55 participants provided a total of 72 responses

Anxiety and stress were also a frequent concern of band directors. Several directors were concerned about possible hearing loss, particularly the inability to hear pitches at certain frequencies. Skin cancer was a health issue of several high school band directors. One director lost his/her voice frequently and another director revealed that bunions were a painful side effect from standing to direct band all day. Tension in the neck and shoulders was a common complaint, as well as lower back pain. One director attributed his back pain to lifting heavy instruments and equipment. Loss of sleep and a lack of family time were also noted. One director attributed his chronic allergy problems to an unclean band hall. A common ailment was being overweight. Stress and pressure placed on one director by his administration caused him to take Xanax to cope with the job, whereas another director resorted to alcohol.

The third and final question in the survey was “Do you have any suggestions as to how health problems associated with being a band director can be reduced or eliminated?” Participants provided 91 suggestions in response (see Table 3).

One teacher stated that not working from home would play a big role. Another director suggested that band directors eat better and learn how to control stress and delegate responsibilities. Having a hobby was proposed by one teacher, yet he added that it was hard to justify the time involved. One respondent stressed the importance of playing his instrument as much as possible in a relaxed environment. A few directors suggested praying and church involvement. Taking vacations was a way for one director to combat stress issues. One respondent advised that directors limit their activities in the band program. Additional recommendations included schools requiring band directors to use earplugs and eliminating marching band.

One participant suggested that healthy habits need to be established early in a band director's career, including setting limitations on the number of hours spent at work. Echoing this sentiment, a teacher stated that directors need to be willing to cut back their hours and that efforts put forth into having honor band or a state champion marching band would be better spent with their families and having a life outside their programs. Another respondent wrote, "Create a more process (rather than product) oriented Music Education culture." Making rehearsals more efficient so there could be less of them was also a suggestion.

Some participants felt that their hearing would have been greatly improved if the acoustical design of their band halls were improved. Another director maintained, "Administrators need to accommodate directors' conditions' and allow for them, instead of overloading them to the point of breaking." One director offered the following words of advice:

I think most health issues can be attributed to the lifestyle that many band directors live. Long hours, high stress, coupled with an exceptionally high workload will cause problems even for individuals that are already physically fit and healthy. Without a major change in the system of expectations of quality, quantity of performances and competitions, lesson planning, and communication, there is little choice for band directors who want to be successful. That success will only come through with the work and stress that is typical of this profession.

Table 3

Suggestions as to How Health Problems Can be Reduced or Eliminated
 Respondents' (N = 91) (open response)

Health Solutions	Number of Respondents	Percentage of Respondents
Better Diet and Exercise	21	23.0
Stress Management	19	20.8
Use Hearing Protection	11	12.0
Adequate Sleep/ Relaxation	11	12.0
Efficient Scheduling	8	8.7
Better Facilities	5	5.4
Delegate Responsibilities	5	5.4
Reduce Marching Band Commitments	4	4.3
Have a Hobby	3	3.2
Perform for Pleasure	2	2.1
Have a Spiritual Life	2	2.1

Note. 55 participants provided a total of 91 responses

With regards to job-related medical issues, one respondent stated:

I think band directors need more resources that are particular to our situations concerning the effects of band noise or music on our hearing. There probably needs to be an initiative to make sure that our practice facilities are engineered properly so that students and teachers do not suffer negative effects over time. I would also appreciate some input regarding skin cancer and marching bands. Are we doing everything we can to protect our students and ourselves? Are there specific guidelines or recommendations that could be targeted specifically for marching band?

Another director added:

I believe that our line of work will always be stressful, especially for those of us wanting to be successful in this field. I think that directors should be encouraged to see their physicians on a regular basis (especially for high school directors and the dermatological

consequences of summer band) and be educated on potential stress-related health risks. I also believe that directors need to take care of themselves emotionally/socially - finding a balance between work and their family, marriage, church/religious beliefs, etc. Hearing from successful directors who have a healthy marriage, a happy family, and a "normal" life outside of work is crucial to our colleagues keeping everything in perspective.

Further, a director offered this advice to his colleagues: "Eat right: I bet band directors buy fast food more than any group in education. Try to exercise some (I did mine at 5:00 am). When you leave the band hall LEAVE your work there. It will be there tomorrow."

Discussion

There are many items to note about the findings of this study. In reviewing the results of the first research question, there were few directors who had a deceased colleague. With only roughly 30% of respondents knowing a colleague that died, it becomes clear that dying on the job is not a mainstream event. This is encouraging for the band director profession. In regards to the age groups of the deceased colleagues, the most common mortality age group was 46-55. The second highest death rate occurred in the 36-45 year age group. It would have been likely to assume the most deaths would be materializing in the older age group categories. These results contrast with the newspaper article research, as the overall death group age was higher.

In the current study there was a considerably higher rate of male band director deaths than female band director deaths, which is logical since there are more men in the profession than women. Unfortunately, we will not be able to know the cause of death for the women band directors due to the structure of the survey. What is interesting to note is that there was only one female band director that died on the job. These findings are congruent with the newspaper research.

Results showed that there were no deaths in the first five years of teaching reported. The results of the study documented an informal trend that those with more years teaching also had an increase documentation of dying mid-career. However, in analyzing the structure of the question it may have been more effectively written if the categories covered 10 years instead of 5 years and if all of the band directors who taught 21+ years were not combined. The findings in this category are in line with what was documented in the newspaper search.

When teaching level demographics of deceased band directors were analyzed, it trended toward high school directors perishing most frequently, followed by the directors who taught both middle and high school. Even still, directors who were reported as being high school teachers had a higher frequency of death than middle school directors. Many of the factors involved in this could be schedule, workload, administrative responsibilities, and high profile performances. Enhancements could be made to this question by adding college and university directors into the research. Many professors are former middle and high school band directors, and they may deal with similar battles. The newspaper data align with the findings that high school directors are more at risk of premature death.

In the last question that focused on deceased band directors, a prevailing cause of death seems to emerge in both the newspaper research and the results of the study—heart issues, accounted for the largest proportion of recorded deaths. The checklist of categories contained in the survey may have been somewhat vague and limiting. There were higher numbers of tragic

circumstance deaths than anticipated, and undetermined causes were the third leading cause of death.

The results of the survey allowed for first-hand opinions from band directors on what health issues they attributed to band directing. Shoulder and neck pain dominated the response rate of the band directors. Long hours of conducting and standing no doubt contributed to this finding. Hearing was also major factor in the band directors' health with nearly half of the respondents suffering at some level from this ailment. This is in keeping with research by Chesky, Cutietta, Henoch, Klich, Rainbolt, and Royse (2000). The survey checklist had hypertension and heart disease separate, however, in retrospect they probably should have been combined into one category as they both pertain to heart health. Hypertension was reported among about one-quarter of band directors and some complained of heart disease in various forms. Back pain could have also been added to the neck and shoulder pain category. This may have solicited a higher response rate, as many band directors suffer from these similar types of pain. Skin cancer was a disease that was reported by a group of the responding band directors. Many directors spend several hours outside in the sun during the summer months preparing for marching season. It is possible that these outdoor working conditions may contribute to these diagnoses. Diabetes did not play a substantial role in the percentages.

The open-ended questions allowed for a glimpse into the morale and working conditions that are unfortunate for these band directors. Providing a free-response format for listing ailments resulted in directors naming numerous medical conditions. Heart disease was a large factor in the health of band directors. Shoulder/neck/back pain was also a major infirmity, while hearing loss and stress was of milder concern.

Reviewing the band directors' descriptions of their health complaints provided a confidential sounding board for the band directors. One director admitted to using Xanax to deal with his school administration's unrealistic expectations. Another director felt he needed to get healthier and quit teaching because he sincerely felt the band director lifestyle was the opposite of a healthy lifestyle. With all of the information gathered thus far, we begin to understand how there are conditions and expectations that can cause band directors' health to deteriorate over the course of their careers.

Several band directors provided possible solutions to health problems in elaborate detail. Justification for including many of their quotes in the study was to help the reader gain insight into their thoughts, feeling, and health. Some of these directors sounded energetic and some sounded dejected. When their quotes were analyzed for use in the data chart, better diet and exercise and stress management were the two suggestions that were mentioned the most frequently. For many band directors, that suggestion is difficult to implement, due to many school-related activities they are required to attend. Most of the suggestions mentioned in the study require implementation by the individual band director. Relying on a school to upgrade facilities or reduce marching band commitments may be unrealistic. The responses suggesting learning relaxation techniques, practicing efficient scheduling, acquiring a hobby, playing music for pleasure, and developing spirituality may be more practical recommendations to aid individual band directors in enhancing their quality of life.

Because this was designed as a pilot study, both the number of survey participants and the geographic area were limited. To acquire more valid data, this study needs to be distributed to a larger population of band directors both within Texas, as well as other states in the US. Additionally, this pilot study revealed several weaknesses in the survey instrument, which were identified in the discussion section. Prior to distributing the survey for a comprehensive study, the suggested alterations should be made.

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