AN EXAMINATION OF THE RELATIONSHIPS AMONG HOME MUSICAL ENVIRONMENT, TONAL MUSIC APTITUDE, AND VOCAL PERFORMANCE ACHIEVEMENT OF KINDERGARTEN STUDENTS

by

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A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Music

Summer 2011

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ACKNOWLEDGMENTS

To my advisor, Dr. Suzanne Burton for always encouraging me to dig deeper. This project could not have happened without your guidance, ever-keen eye for editing, and inexhaustible ability to field questions. Thank you for everything!

To my thesis committee. Thank you for taking an interest in my work and for dedicating your valuable time, effort, and knowledge toward its improvement.

To Katie Makos and Brian Bersh for their many hours of assessment scoring. I appreciate your efforts more than you know!

To my family for their support, love, and miles traveled. Thank you for all that you are.

To Colin, for all of your patience, understanding, and encouragement when I needed them most. I love you lots!
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ABSTRACT

The purpose of this study was to examine the relationships among children’s home musical environments, their developmental tonal music aptitude, and their vocal performance achievement. According to Bronfenbrenner’s (1979) social ecology model, interactions that occur within the home directly relate to those that occur in the classroom. The researcher assumed the role of teacher-researcher, as subjects were kindergarten-aged students from the researcher’s school of employment. Data consisted of a parental survey (aHOMES), a developmental music aptitude test (PMMA) and a vocal achievement assessment (VAAI). Pearson produce-moment correlations were performed. Results of this study show an insignificant relationship between tonal music aptitude and both vocal achievement and home musical environment, but a moderately low relationship between vocal achievement and home musical environment. The researcher also used data from the parent survey to explore the role of race within home musical environment. The results of this study will help music educators to better understand how their students’ home musical experiences help to shape their performance in general elementary music classes.
Chapter 1

REVIEW OF LITERATURE

Introduction

Children enter kindergarten with knowledge and skills that they have obtained from various environments such as home, preschool, daycare, and church. The experiences and social interactions that occur within those environments are unique to each child. No matter the students’ backgrounds and abilities, kindergarten teachers accept the challenge of differentiating their instruction in order to teach standards-based curricula so that their students might be successful in school and in the future. Such is the case for music educators; their students enter the music classroom with varied musical backgrounds and skills, yet all must be taught the same set of skills and concepts. In order to provide their students with individualized, differentiated music education, music teachers, like kindergarten teachers, need to understand their students’ home musical environments (Brand, 1985, 1986; Kirkpatrick, 1962; Mallett, 2000; Shelton, 1966) and the way that those environments relate to developmental music aptitude (Atterbury & Silcox, 1993a; Brand, 1986; Friend, 1939; Zdzinski,
Home Musical Environment

Researchers agree that the home musical environment includes all musical activities that occur within the home setting, including: owning/playing instruments, making music, listening to recordings, and actively watching live performances (Brand, 1985, 1986; Kirkpatrick, 1962; Mallett, 2000; Shelton, 1966). Furthermore, because children’s musical exposure is not limited to their residences, Shelton (1966) includes “…all the musical stimuli provided by… environs in the child’s preschool years that may have results in a musical response” (p. 11).

With the assumption that music-making in the home is influenced by the home environment itself, several researchers (Burton, 2002; Custodero, 2006; Moog, 1976) have surveyed families of young children to determine the ways in which family music-making affects young children’s personal music-making. Burton (2002) and Custodero (2006) found that children who spontaneously sang and chanted during play were often immersed in musical environments; they were frequently sung to and musical toys and devices were present in the home.

Methods for collecting musical home environment data have changed over time. Kirkpatrick (1962) studied the relationship between preschoolers' musical home
environments and their singing ability. The interviews that the researcher conducted, therefore, did not fully survey every aspect of family music-making but instead primarily focused on singing that occurred within the home environment. Three years later, Shelton (1966) similarly studied the home musical environments of first grade students. Shelton’s interview process, which more comprehensively assessed families’ musical home environments than Kirkpatrick's, preceded Brand’s structured *Home Musical Environmental Scale*, or HOMES (1985).

Brand’s HOMES (1985) is one of the most frequently used and referenced home musical environment assessment tools in the research literature. The questionnaire is used to assess musical home environments by addressing four factors: “(a) Parental attitudes toward music and musical involvement, (b) parental concert attendance, (c) parent/child ownership and (d) use of record player, records, tapes [and] parent plays/played a musical instrument” (p. 116). In 1986, Brand applied the HOMES, along with two other assessment tools, in a study of socioeconomically disadvantaged Mexican-American second grade students and their families. The researcher found that there was a moderately significant correlation (r = .43) between students’ musical achievement and parental involvement in musical activities. Other researchers have furthered the investigation of such a relationship and have concluded that parents attitudes towards, responses to, and participation in children’s music-making greatly influence children’s musical environments (Koops, 2011; Mallett,
Parents who believe music to be an important part of their children’s development and environment tend to provide more opportunities and support for music-making in the home than parents who do not.

**Home Musical Environment and Culture**

Because children’s musical environments vary, one can assume that the degree to which parents interact musically with their children varies as well (McPherson, 2009). Parent-child interactions are determined largely by socio-cultural factors (Bronfenbrenner, 1976; Koops, 2010). Custodero (2006) found that children who regularly took part in music-making with their parents “…had such a large repertoire of songs themselves and used songs during other times of the day” (p. 52).

Kreutzer (2001) concluded that Zimbabwean children between ages of three and seven were notably more accurate singers than American children of the same age. Zimbabwean children, who learn to sing as soon as they are developmentally capable—from adult and peer modeling, “…are expected to be able to sing and dance” (p. 210). Kreutzer (2001) noted that children who come from a musically-rich cultural environment are exponentially more accurate singers than those who are not.

The children Koops (2010) observed in The Gambia were absorbed in a similar musically-rich culture to those observed by Kreutzer (2001). The process of learning music seemed to follow a simple sequence of, “listen-observe-do” (p. 27). Since
Gambian children are simply “expected to be musical” (p. 29), their motivation to learn and participate in music is natural and intrinsic. If children are exposed to music frequently and naturally before entering school as Kreutzer (2001) and Koops (2010) have observed, one may infer that their musical achievement will be more advanced than children who receive minimal exposure to music and musical experiences. One can assume that because learning to sing, dance, and chant is not a central part of every culture, however, not all children obtain such musical skills in a similar manner.

**Home Musical Environment and the Media**

Parents’ musical experiences with their children are often strongly influenced by the media (Custodero, 2003; Lum, 2008; Sims, 2008). Through a qualitative examination of parenting magazines, Sims (2008) found articles pertaining to home music-making did not provide parents with adequate research-backed resources. For this reason, the author summarized “music educators should be concerned about the type and quality of information provided and products recommended to parents” (p. 23). Because of the convincing, albeit sometimes poorly-supported, information regarding home music-making available to parents through media sources, perhaps home music environment surveys should contain items that address media usage and exposure.
The purpose of Lum’s (2008) research was to ethnographically examine Singaporean children’s home musical environments to determine the ways in which technology and media impact other areas of children’s musical lives. The researcher found that nearly all Singaporean households contained a television, which was not only used for passive enjoyment but for active and frequent household entertainment. Listening to recorded music was also a prevalent practice among the families observed. When witnessing children’s interactions outside of the home, Lum found that “…patterns of interaction with mass media (singing along with music from radio programs, using musical elements from music in television programs in fantasy play, etc.) become diffused into everyday social practices” (p. 106). As a music educator, Lum stressed the importance of understanding the ways in which media and technology affect students’ musical home environments, and the importance of incorporating elements from those environments into the classroom.

**Home Musical Environment and Music Aptitude**

Friend (1939) was one of the first American researchers to explore the relationship between music-making in the home and children’s musical abilities. Using Seashore’s (1919) *Measures of Musical Talent*, Friend compared kindergarten children’s music capabilities to their home musical environments. In order to assess families’ musical environments, parents were asked to report on all musical
instruments present and played within their homes. Although Friend’s findings were inconclusive, the researcher hypothesized that there was no significant relationship between music ability measured by Seashore’s test and home environment. Both assessment tools used by Friend are rarely used to measure music aptitude today.

In 1982, Brand compared musical home environment to sixth-grade students’ music aptitudes as measured by Gordon’s (1965) *Music Aptitude Profile* (MAP). Following the creation of the HOMES (1985), Brand (1986) again examined the relationship between home environment and music aptitude, this time using Gordon’s *Primary Measures of Music Audiation* (PMMA) (1986). In both cases, the researcher’s conclusions were similar to Friend’s (1939): musical home environment did not seem to be related to developmental music aptitude.

Following Brand, other researchers (Atterbury & Silcox, 1993a; Helper, 2010) examined the same relationship using kindergarten-aged subjects. Atterbury and Silcox (1993a) compared developmental music aptitude as measured by PMMA (Gordon, 1986) and survey results from Brand’s (1985) HOMES, and their results were concurrent with Brand’s (1982, 1986); there seemed to be no significant relationship between home musical environment and developmental music aptitude.

Conversely, Mallett (2000) found that children’s age, along with their home musical environments, positively correlated to their developmental music aptitude. The assessment tool used to measure developmental music aptitude was a children’s
Home Musical Environment and Vocal Performance Achievement

Researchers have concluded that there is a positive correlation between home musical environment and music achievement (Atterbury and Silcox, 1993a; Brand, 1986; Kirkpatrick, 1962; Persellin, 2006; Shelton, 1966). Shelton (1966) interviewed parents to gain an understanding of children’s home musical experiences before entering first grade. Survey questions used in Brand’s HOMES (1985) were derived from elements of Shelton’s data collection sheet. Shelton collected evaluation data that was provided by first grade students’ music teachers to ascertain a level of music achievement. Both Shelton (1966) and Brand (1986) concluded that certain aspects of a child’s home environment, like the presence of recorded music and parents with musical backgrounds, correlated positively to children’s level of musical achievement. Gawlick’s (2002) research suggested the same: children’s musical environments seem to affect their musical abilities.

In 1962, Kirkpatrick surveyed the home musical environments of a small population of parents in California and compared them to the singing ability of the parents’ five year-old children. Even though the survey and assessment tools used were not standardized, the researcher found a strong relationship between home
musical environment and singing ability. Atterbury and Silcox (1993a) and Persellin (2006) also studied the relationship between home environment (as measured by the HOMES) and singing ability in kindergarten-aged children. All researchers concluded the same: children’s ability to sing accurately is related to or affected by the music-making that occurs at home.

**Music Aptitude**

The Handbook of Psychological Testing (Kline, 2000) states that musical ability, or music aptitude, is a person’s potential to act and think musically. Many researchers have studied the relationship between music aptitude and genetics (Friend, 1939; Guerrini, 2005; Kline, 2000), inquiring whether children obtain musical genes from their parents, or if such abilities are gained through environmental experiences. In 1915, Seashore created the first recorded music ability assessment (Kline, 2000). Seashore’s research suggested that musical abilities are inherited like other forms of intelligence. The researcher believed that a person’s ability to express himself musically was dependent upon four “…capacities…sensory, the ability to hear music; [expressive], the ability to express music, associational, the ability to understand music; and affective, the ability to feel music and express feeling in music” (Seashore, 1915, p. 2). Friend (1939) used modified versions of Seashore’s tests to determine whether heredity affects musical ability and found no association between the two.
Although Seashore’s *Measures of Musical Talent* is no longer used today, aspects of it can be seen in Gordon’s PMMA (Gordon, 1986). The PMMA is commonly used by researchers (Atterbury & Silcox, 1993a, 1993b; Brand, 1986; Guerrini, 2005; Hornbach & Taggart, 2005; Persellin, 2006; Rutkowski, 1996) because of its high reliability and validity with subjects between the ages of five and nine. Modeled after Seashore’s measure, Gordon (1986) used discrimination tasks to determine a subject’s music aptitude. Scores on the PMMA provide a measurement of children’s *developmental* music aptitude (Gordon, 1979, 1986). Gordon’s research showed that after the age of nine, children’s music aptitude stabilizes. Because PMMA is designed specifically for children younger than nine, it is considered to be a developmental construct and therefore, children’s scores may fluctuate.

Guerrini (2005) administered three different age-specific versions of Gordon’s music aptitude tests in order to “…gain insight into the role of nature versus nurture in the distribution of music aptitude” (p. 28). Similar to Friend’s conclusion regarding Seashore’s measure, Guerrini found that there was “…no association between music aptitude of parents and that of their biological children” (p. 30). Although the researcher suggested replicating the study using a larger sample, the results (N = 169) imply that all students, regardless of their parents’ abilities, have the potential to be musically intelligent. Musical achievement is a product of learning a musical process; one’s ability to demonstrate musical ability.
Music Achievement Measures

Overall Music Achievement

While music aptitude is one’s musical potential, or capability to think and act musically, Brand (1986) defines music achievement as “…performance as assessed by the students' general music teachers” (p. 114). Whereas aptitude measures include audiation skills, achievement measures, such as Brand’s (1986) Musical Achievement Assessment Form (MAAF), take into account students’ scores on formal and informal evaluations in areas such as music reading, performance, and overall musical knowledge. Colwell’s (1996) Music Achievement Tests (MAT) and Gordon’s (1991) Iowa Tests of Music Literacy function similarly: they provide feedback on school-aged subjects’ ability to read music, along with other music achievement skills. Zdzinski (1992, 1996) used the MAT to better understand the relationships between middle school students’ music achievement, music aptitude, and parental involvement in musical activities. The researcher also chose to supplement cognitive achievement assessments with a performance assessment that enabled researchers to rate subjects' performance skills, such as intonation, tone quality, and instrument technique (Zdzinski, 1996). When children are not yet able to read music or proficiently perform
on a musical instrument, other musical achievement measures, such as vocal performance scales, are used.

**Vocal Performance Achievement**

Because children begin singing at a very young age, measuring vocal performance achievement, or the ability to perform vocally within specific musical guidelines is often possible at all ages. Measuring vocal performance provides educators with a record of musical progress and growth, separate from music aptitude development. To that end, Hornbach and Taggart (2005) studied how singing achievement develops with age, focusing specifically on the relationship between tonal aptitude and singing achievement. The researchers developed their own five-point singing achievement continuous rating scale, which focused primarily on tonal accuracy and melodic contour.

Rutkowski’s (1990) *Singing Voice Development Measure* (SVDM) has been used to determine children’s ability to use their singing voices (Levinowitz, et al., 1998; Rutkowski, 1996; Rutkowski & Miller, 2003). The five-point, continuous SVDM scale focuses on the ways in which children use their voices and not on melodic contour or tonal accuracy. Although the SVDM’s reported reliability is strong ($r = .91$), Rutkowski later developed a more detailed nine-point version of the SVDM
to be used to study children’s singing voice acquisition over time (Rutkowski & Miller, 2003).

The ways in which researchers assess singing ability varies according to their research models. Atterbury and Silcox (2003b) studied how young children’s singing voices were affected by piano accompaniment. Even though the researchers address the fact that their subjects’ singing voices were still developing, the SVDM (Rutkowski, 1990; Rutkowski & Miller, 2003) was not an appropriate measure for their study. Instead, the researchers created a four-point Likert scale which not only addressed whether children used their singing or speaking voice, but their ability to maintain a tonal center and sing melodic phrases correctly as well.

Youngson and Persellin’s (2001) Children’s Vocal Accuracy Scale, later renamed the Vocal Accuracy Assessment Instrument (VAAI), functions as a hybrid of various researchers’ assessment tools. The VAAI was modeled after Rutkowski and Miller’s (2003) nine-point SVDM to include elements of children’s vocal development such as using a speaking or singing voice, but focuses primarily on intonation, pitch accuracy, and vocal range. According to D. C. Persellin (personal communication, August 27, 2010) scoring is easier and more reliable ($r = .92$) than the SVDM and more detailed than Hornbach and Taggart’s (2005) vocal achievement rating scale. For this reason, it has been used by its creators in multiple studies.
(Youngson & Persellin, 2001; Persellin, 2006) and, according to Persellin lends itself well to other research designs.

The Relationship Between Music Aptitude and Music Achievement

Researchers have concluded that many factors, both environmental and genetic, contribute to music aptitude and music achievement. Because of the volatility and discrepancy often found between the two scores, studying the relationship between musical aptitude and musical achievement is intriguing. Gagné (1999) used the researcher-created Differentiated Model of Giftedness and Talent (DMGT) to explain the relationship between music aptitude and achievement: individuals with high music aptitude have the ability or potential to achieve greater than those with low aptitude. This does not, however, suggest a causal relationship. “. . . It is possible for well above average natural abilities to remain simply as gifts and not to be transferred into talents, as witnessed by the well-known phenomenon of academic under-achievement among intellectually gifted children” (p. 40). Recent studies in music education align with Gagné’s assertion: researchers have discovered that kindergartenn-aged students’ vocal achievement scores do not relate to their tonal aptitude scores, thus concluding that music aptitude does not correlate with music achievement (Atterbury & Silcox, 1993a; Hornbach & Taggart, 2005; Rutkowski, 1996).
Summary

Home musical environment is comprised of all aspects of music-making that occur within a child’s home setting. Researchers have investigated the roles of culture and media in children’s home musical environments determining that both strongly influence music development and the ways in which children make music. Researchers have found that there is not a significant relationship between home musical environment and music aptitude. Research concerning home environment and music achievement, however, suggests the opposite: children’s musical achievement is positively related to their home music-making.

It is important for researchers to replicate and improve upon prior research that demonstrates the ways in which home music-making relates to young children’s developing music aptitude as well as their musical performance in the classroom. Researchers have concluded that developmental music aptitude does not predict music achievement (vocal or otherwise). However, they have suggested that a positive correlation can be drawn between home musical environment and musical achievement, but not between developmental music aptitude and home environment. More research is needed for a more complete understanding of these relationships. Furthermore, few studies have explored the relationships and interactions between home music-making within a cultural setting and children’s musical abilities. Doing so will help music educators better understand and appropriately adapt their teaching to
suit their students’ cultural-musical backgrounds. Replicating such studies will help to further validate and explain the relationship between the two.

Kindergarten children’s musical development is strongly influenced by several factors: heredity and innate ability, the home environment from which they come and the teaching skills and methods of their music teachers. Research that addresses all three aspects of childhood musicality will strengthen an understanding of the process by which children grow musically and help families and teachers to support their musical growth along the way.

**Purpose of Study and Research Questions**

With the intent of improving and differentiating elementary music instruction, the purpose of this research was to explore the relationships among home musical environment, developmental tonal aptitude, and vocal performance achievement of kindergarten children. Research questions addressed in the present study were as follows:

1. Is there a relationship between kindergarten children’s musical home environments and developmental tonal aptitudes?

2. Is there a relationship between kindergarten children’s musical home environments and their vocal achievement?
3. Is there a relationship between kindergarten children’s developmental tonal aptitudes and their vocal achievement? and

4. Does race play a role in the musical home environments of kindergarten children?

The following chapter will review important research studies that directly pertain to the aforestated research questions.
Chapter 2

REVIEW OF RELATED LITERATURE

The relationships among home musical environment, developmental tonal aptitude and vocal performance achievement in kindergarten students were examined in the present study. The following research delineates various assessment tools used by researchers in the past and expands upon their applications and functions. In addition, studies that addressed the research questions that are similar to the present study are examined and critiqued.

Vocal Achievement Measures and Their Functions

Researchers develop vocal achievement scales and measures to best suit their specific research designs. Some models, like Youngson and Persellin’s (2001) Children’s Vocal Accuracy Scale, measure pitch accuracy, Others, like Rutkowski’s (1990, 1996) Singing Voice Development Measure (SVDM) measure how individuals acquire their singing voices developmentally. Although the SVDM was slightly modified over time, it has been used in many studies to measure young children’s singing voice development, as compared to other aspects, such as developmental tonal aptitude.
Correlational Studies Using the SVDM

In 1996, Rutkowski examined the effect of small group instruction on kindergarten students’ singing voice development, as measured by SVDM (1990), and developmental tonal aptitude, as measured by PMMA (1986). The researcher also examined the effectiveness and reliability of both small group instruction and the SVDM. Rutkowski’s subjects consisted of 99 kindergarten-aged students from a school in Pennsylvania. Before beginning controlled instruction, the researcher administered both the SVDM and tonal subtest of the PMMA. All subjects received large-group music instruction with their music teacher during the school day. The treatment group, however, received specialized small-group instruction that included opportunities for individual participation. After a nine-month instruction period, students were again administered both assessments.

In order to address the research questions regarding the effect of small-group modeling on singing voice development and music aptitude, the researcher performed two analyses of covariance. The instructional method had no significant effect on tonal aptitude (even though both groups’ aptitude scores increased over time) but positively influenced singing voice development; children in the treatment group showed a greater increase in SVDM scores than those in the control group. The reliability of the SVDM was reported as \( r = .90 \) for the pretest and \( r = .99 \) for the
posttest. Using the Pearson product-moment correlation, the researcher found no relationship between music achievement and tonal music aptitude.

Although the researcher’s primary aim differed from the present study, the number and age of the subjects are the same. In addition, the present study also examined the relationship between vocal music achievement and tonal aptitude, as measured by the PMMA (Gordon, 1986).

Atterbury and Silcox’s (1993b) study similarly tested the effects of a treatment, specifically piano accompaniment, on kindergarteners’ singing ability. The researchers’ subjects consisted of fifteen classes of kindergarten students (N = 205) divided into two groups: an experimental group that received singing lessons without piano accompaniment and a control group that received piano accompanied singing instruction. In addition to comparing the singing ability of the two groups after a year of instruction, the researchers also sought to discover the difference, if any, in musical aptitude scores as measured by the PMMA.

Before the start of the experimental period, students learned a short song and their singing voices were evaluated using a four-point Likert scale modeled after the SVDM (1990). Students scoring a one on the scale were considered “presingers” (Atterbury & Silcox, 1993b) who chanted song text, whereas children scoring a four were considered tonally accurate singers. Toward the end of the test period, the researchers administered the PMMA (1986) and replicated the vocal measure to obtain
posttest scores. Pre- and posttest interrater reliabilities for the vocal measure were reported as $r = .747$ and .859, respectively. These reported reliabilities are lower than Rutkowski’s originally-reported SVDM interrater reliabilities. Although the authors do not address this discrepancy, the difference in reliabilities could be due to the fact that Atterbury and Silcox’s (1993b) used a four-point scale, while the SVDM was five. Using an analysis of covariance, the researchers found no significant difference in singing ability or music aptitude between the two test groups.

Atterbury and Silcox’s research questions are not congruent with the present research study. The significance of the researchers’ study, however, lies in the reliability and validity of their adapted singing scale. The researchers revised Rutkowski’s five-point scale into a four-point scale and reported the measure to be less reliable than the original. The researchers suggest that “a more accurate scoring system might focus on selected phrases within the song instead of making an overall judgment regarding the entire song” (1993b, p. 45). Youngson and Persellin’s (2001) Vocal Accuracy Achievement Instrument (VAAI) addresses both issues: the sixteen-point scale of the VAAI measures young singers’ singing development as well as their individual pitch accuracy.

**Correlational Studies Using the VAAI**

Youngson and Persellin originally developed the VAAI (first named the Children’s Vocal Accuracy Scale) for their 2001 study of the effects of Curwen hand
signs on first-graders’ vocal accuracy. Although the researchers mention modeling the VAAI after Rutkowski’s (1990) SVDM, its primary function was to measure vocal accuracy, not singing voice development. Two classes of first-grade subjects received ten weeks of music class instruction. The classes were taught in the same way, except that one class, the experimental group, received instruction using Curwen hand signs. Before the start of instruction, both classes learned a short song in major tonality and duple meter and were evaluated with the sixteen-point Children’s Vocal Accuracy Scale (later renamed the VAAI). The VAAI was administered again after ten weeks of instruction, using the same criterion song. Interrater reliability for the scale was reported as $r = .90$. The authors did not report test-retest reliability for the measure. The researchers’ results indicated that a) both classes of students’ VAAI scores improved after ten weeks of instruction; b) although the experimental group’s posttest VAAI scores were higher than the control class, they were not significantly higher, indicating that Curwen hand signs may not have had an effect on vocal accuracy.

The present study did not address specific teaching methods; it did, however, use the researchers’ VAAI scale for a similar age group of students. The present study was similar to Persellin’s (2006) study, which addressed the relationship between vocal accuracy as measured by the VAAI and home environment. This study will be addressed in the following section.
**Vocal Achievement and Developmental Tonal Aptitude**

Because obtaining music aptitude scores is relatively simple, researchers often include music aptitude tests in their research protocol to provide a richer understanding of their subjects. The purpose of Hornbach and Taggart’s 2005 study, however, was exclusively that: to determine whether there is a relationship between vocal achievement and developmental tonal aptitude in elementary-aged children. The researchers also sought to discover whether such a relationship changes with age and whether or not school environment and/or age affects students’ ability to sing.

Hornbach and Taggart’s subjects (N = 162) were kindergarten, first- and second-graders from two Michigan school districts with researcher-observed “strong” music programs. The districts had slightly varying environments; one was more urban and the other more rural. Subjects from both schools received similar instruction.

The researchers used two criterion measures for their study: the PMMA (1986) to measure developmental tonal aptitude and a researcher-created, five-point continuous rating scale “that describes the use of the singing voice in the context of melodic contour and key stability” (Hornbach & Taggart, 2005, p. 324). The measure was administered similarly to the VAAI (2001); students were taught a short song in duple meter and major tonality and were asked to sing it into an audio-recorder. Both criterion measures were administered toward the end of the school year for students
(N = 162) in kindergarten, first, second, and third grade. Because the singing achievement measure was administered to varying age groups, the researchers calculated its reliability using Pearson product-moment correlation for each grade and reported a reliability range of $r = .76 - .97$.

The researchers calculated all descriptive statistics for the students at each of the two schools. In addition, they used Pearson product-moment correlations and found that there was little to no significant relationship between singing ability and music aptitude, regardless of school setting or age. The researchers also calculated a two-way ANOVA to determine the effect of the school on singing achievement. Students’ singing achievement scores were significantly higher at one of the schools than the other, suggesting that teaching method may have had an effect on children’s singing ability.

The present study also examined the relationship between developmental tonal aptitude and singing ability. Although only kindergarten students were used, Hornbach and Taggart’s (2005) use of subjects from various school environments and age groups provided important background implications for the study at hand, as well as for music teachers interested in singing voice development. Hornbach and Taggart’s singing achievement scale was not used for the present study for several reasons. First, although the measure’s reported reliability range ($r = .76 – .97$) was considered acceptable, a measure with a more statistically-stable reliability was
desired. Furthermore, the scale’s descriptors are somewhat vague and more qualitative in nature than the VAAI (Youngson & Persellin, 2001). For example, a score of five on Hornbach and Taggart’s five-point scale considers subjects to be “nearly or totally accurate” (2005, p. 325) singers. A score of four describes subjects as singing with “some accuracy, beginning in established key” (2005, p. 325). The VAAI measures vocal accuracy with qualitative descriptors similar to Hornbach and Taggart’s measure, but also includes the number of correctly sung pitches subjects should sing at each point of the scale.

**Summary**

One of the aims of the present study was to examine the relationships between kindergarteners’ singing ability, as measured by the VAAI and the relationships between developmental tonal aptitude as well as home musical environment. Because researchers have created many vocal achievement measures to suit their specific research models, it was important to the present study for the researcher to understand the function and implications of each measure so that the correct model could be chosen to meet the aims of the study. Many studies that use vocal measures address the effects of specific teaching methods on children’s singing ability and development. Because the aim of the present study was to measure vocal accuracy and not teaching method, the VAAI (Youngson & Persellin (2001) was
deemed most appropriate. The VAAI’s high reliability ($r = .90 - .92$) has also been consistently reported (Persellin, 2006; Youngson & Persellin, 2001).

**Home Musical Environment Correlational Studies**

Measures of home musical environment survey all aspects of music-making that occur within a home setting, such as singing, listening to music, playing instruments and watching, participating in, or attending musical performances. Brand’s (1985, 1986) *Home Musical Environment Scale* (HOMES) is one of the most used and adapted models for measure home musical environment in the research literature. Understanding the relationships between home musical environment and other musical aspects such as aptitude and singing ability provide important implications for music teachers and parents regarding the ways in which young children grow musically.

**Brand’s Home Musical Environment Scale (HOMES)**

The HOMES, which was created to survey the home environments of elementary school-aged children, includes fifteen items in Likert-type and survey format. After being edited and assessed for content validity by several other music education experts, Brand distributed the survey to 201 second-grade students at two large schools. A large percentage of the subjects were Hispanic and came from low-
income families. Using Cronbach’s alpha, reliability of the survey was calculated as .86. Further validity was attempted by comparing music teachers’ perceptions of their students’ home environments to reported HOMES scores. Although this method of comparison was not strong, Brand reported that teachers’ perceptions of their home musical environments show a “statistically significant relationship with the construct of [the HOMES]” (1985, p. 45).

In 1986, Brand replicated his previous validation method in order to examine the relationship between home musical environment and music aptitude as well as music achievement. The researcher also sought to determine whether home environment was predictive of musical achievement. Subjects were of the same demographic as in the 1985 study: seven-year-old students from lower income households that attended an urban school. Of the 116 subjects, 98 were Mexican-American. Children’s families were asked to complete the same version of the HOMES used in Brand’s 1985 study. In addition, subjects’ music teachers administered the PMMA to measure developmental music aptitude and the Music Achievement Assessment Form (MAAF), an evaluative scale used to measure music reading, singing and instrumental performance, and terminology. Although Brand does not cite the author or validity of the measure, Brand reported the MAAF’s reliability as $r=.73$. 
In order to address the research purpose, Brand performed several correlational procedures and regression analyses between the criterion measures. Brand also calculated correlations for specific factors of the HOMES, including: parental attitudes, performance attendance, ownership of musical devices and playing musical instruments, and his achievement and aptitude measures. Brand found that there were no significant correlations or predictability between any factors of the HOMES and aptitude scores. Brand did, however, find a statistically significant correlation ($r = .43$, $p < .001$) between the HOMES’ measure of parental involvement and music achievement.

The current research study addressed two of the same relationships examined by Brand (1986): the correlation between home musical environment and developmental music aptitude and the correlation between home musical environment and music achievement. Because Brand’s population was somewhat homogenous and unique (primarily low income families from one ethnic background), the results of the HOMES are not representative of all population demographics. The current study used a more ethnographically and economically diverse population to address this concern. Furthermore, Brand does not cite the author or validity of the music achievement criterion measure. Although the MAAF’s reliability ($r = .73$) is acceptable, the assessment measured a wide range of skills, instead of specific aspects of music-making. The present study used a validated music achievement measure with a much
higher reliability that addressed a singular, clear facet of music-making: singing ability.

**Home Musical Environment and Music Aptitude**

Other researchers have addressed Brand’s research question concerning the relationship between music aptitude and home musical environment. Helper’s (2010) investigated this relationship with kindergarten and first grade subjects, focusing specifically on two research areas: how listening to music is related to music aptitude and how parental attitudes toward and involvement in music are related to children’s music aptitude. In an attempt to replicate aspects of Brand’s study, Helper distributed a home environment survey to subjects’ families and administered the PMMA. Instead of using all four of Brand’s home environment factors (parental attitudes, performance attendance, ownership of musical devices, and playing musical instruments), Helper focused on music listening and parental attitudes. The researcher found no relationships between either of these two factors and PMMA scores.

Mallett’s (2000) study similarly focused on the relationship between aspects of home music-making and developmental music aptitude. Specifically, the researcher sought to “determine if selected factors (parent/caregiver attitudes, home musical environment, socioeconomic status, age of child, or gender of child) were predictive of musical potential in young children” (Mallett, 2000). Unlike Brand’s (1985, 1986) and Helper’s (2010) studies, Mallett’s subjects (N = 161) were
preschool-aged who came from several criteria-specific preschool settings. Instead of measuring music aptitude with the PMMA (Gordon, 1986), Mallett chose to use the preschool appropriate music aptitude game, *Audie* (Gordon, 1989). Subjects’ parents completed a *Parent/Caregiver Survey Regarding Preschool Music* (PSRPM), which consisted of three subsections: demography, the HOMES (Brand, 1985), and a researcher created survey of parental attitudes towards music. The researcher reported the reliability of the HOMES to be $r = .75$, a figure which conflicts with Brand’s reliability report of $r = .86$. In addition, the researcher-created parental attitude survey’s reliability was reported as $r = .86$.

Mallett’s data analyses were similar to Brand’s; the researcher used multiple regression analysis to examine possible predictive relationships and found that both preschoolers’ age and home musical environment as measured by the HOMES predicted developmental music aptitude measured by *Audie*. This finding conflicts with both Brand’s (1986) and Helper’s (2010) conclusions. The discrepancy could be due to the fact that Mallett’s subjects were younger than either of the other researchers, and music aptitude was measured using a different, less reliable assessment tool.

Taggart reported in a 1994 validation study of the measure that *Audie*’s Kuder-Richardson reliabilities are considerably lower ($r = .26 - .38$) than those
reported in the *Audie* test manual \((r = .68 - .69)\) (Gordon, 1989). The validity of the measure, however, was still reported as acceptable.

Mallett also found a moderate positive relationship \((r = .42)\) between HOMES and parental attitudes toward music-making in the home. This finding concurs with Brand’s (1985, 1986).

Although the present study aligns with Mallett’s research aim, several distinctions can be made between the two. First, because the present study’s subjects were in kindergarten, PMMA (1986), which has a higher reliability than *Audie* (1989), was used to measure developmental music aptitude. Because *Audie* was designed for pre-school-aged children, it was not appropriate for this study’s subjects. Like Mallett’s PSRPM (2000), the home environment measured used in the current study (aHOMES) also includes a demographics section to address one of the research questions. It does not, however, include Mallett’s parental attitudes survey. Finally, although Mallett was interested in parents’ attitudes towards music instruction, the researcher does not address music achievement, or the relationship between developmental music aptitude and aspects of musical skill.

**Home Musical Environment, Music Aptitude and Vocal Achievement**

Several studies align with the current research study’s model in that they addressed the same three areas of musical measurement: music aptitude, music achievement, and home musical environment. All of the following studies used
subjects that were younger than first grade (six years of age), who were enrolled in some form of music program. Furthermore, like the present study, all studies outlined below used the PMMA (Gordon, 1986) to measure subjects’ developmental tonal music aptitude.

Based on the premises reported by Kirkpatrick (1962) and Shelton (1965) that home musical environment and music ability are strongly related, Atterbury and Silcox (1993a) examined this relationship using kindergarten-aged (N = 66) subjects who were considered to be singers or non-singers. The researchers used a four-point researcher-created singing ability scale (Atterbury and Silcox, 1993b) and a researcher-created questionnaire to survey subjects’ musical home environments. Both of these assessments were administered at the beginning of subjects’ year of kindergarten. The researchers also administered the PMMA (Gordon, 1986) at the end of the school year, in order to measure developmental music aptitude. Although the researchers do not clearly present research questions, their purpose was to examine the relationships among the three variables and compare their results to prior researchers’ findings, as well as to stress the importance of pre-school and kindergarten-aged students’ musical home and school environments.

At the start of the school year, the researchers administered the singing ability assessment and distributed the home environment questionnaires. Several months later, the researchers administered the PMMA (Gordon, 1986). In order to
score the home environment questionnaires, the researchers assigned numeric values to the questionnaire’s frequency responses: ““regularly" = 1.0, "occasionally" = 0.5, "never" = 0”” (Atterbury and Silcox, 1993a, p. 19). Questionnaire results were then compared to children’s singing ability (either presinger or singer), as determined by the singing ability measure. The researchers reported a significant difference in mean home environment scores between singers and presingers; singers had higher home environment scores than presingers. No significant relationship, however, was found between music aptitude scores and home environment scores. These results align with those of other researchers (Brand, 1986; Helper, 2010). The researchers also concluded that there was no significant correlation between music aptitude and singing ability, although they did not present statistical evidence of such a conclusion.

Atterbury and Silcox sought to replicate aspects of previous research studies in order to validate the relationship between home musical environment and singing ability. Although their research findings were in agreement with previous researchers’ conclusions, two of the three criterion measures the researchers used were self-created. In order to validate the use of previously-established criterion measures, the HOMES (Brand, 1985), SVDM (Rutkowski, 1990; Rutkowski & Miller, 2003) or VAAI (Youngson and Persellin, 2001) should be used as criterion measures due to the internal consistency and validity of these measures.
The purpose of Gawlick’s research (2004), much like that of Atterbury and Silcox (1993a), was to determine how musical education and home settings affect music performance and developmental aptitude in preschool-aged children. To also address the influence of socioeconomic status on music factors, the researcher chose to select subjects from four preschools; two from a wealthy community and two from a lower-income community. Only eight subjects were used in all: two children from each of the four preschools. Of the four children from each school, two received music instruction and two did not. The researcher sought to understand: a) the differences in musical environments, musical aptitude, and performance ability among the four different groups of subjects; b) the relationship between performance ability and developmental music aptitude; c) the relationships among musical home environment, music performance ability and music aptitude; and d) the effect of music instruction and school environment on music aptitude and music performance competence.

To address the research questions, the researcher first sent a questionnaire to all involved music educators and classroom teachers to survey the educational and musical goals of each program. The researcher then administered a self-created set of performance tasks to each of the eight subjects, to measure performance ability. Subjects were also administered the PMMA (Gordon, 1986) to measure developmental music aptitude. Finally, the researcher distributed HOMES (Brand, 1985) to all subjects’ families in order to assess home musical environment. The
researcher concluded that preschool subjects who attend music class had higher music aptitude and music performance scores than those who did not. Children from wealthy communities also scored higher on musical assessments than the economically-disadvantaged subjects.

Gawlick’s (2004) study addressed a total of six research questions with the use of only eight subjects. In order to address all of the research aims, the researcher needed to subdivide the subject pool into four groups of only two students each. This sample size is remarkably small and cannot accurately depict the four home and classroom environments addressed in the study. Gawlick’s study needs to be replicated with a much larger population in order to truly explore the study’s research questions. Furthermore, a more established, validated, and focused musical performance assessment should have been used to measure specific aspects of children’s music-making skills in order to strengthen the researcher’s findings.

In 2006, Persellin conducted a study that most reflects the present study’s research aims. The purpose of Persellin’s study was to determine the effects of specific teaching models, developmental music aptitude, and home musical environment on vocal pitch accuracy, as measured by the VAAI (Youngson & Persellin, 2001). Kindergarten subjects (N = 134) were assigned one of three teaching treatment groups: teacher sings for students, teacher sings with students, or teacher sings for and with students. Each treatment group consisted of between 39 and 49
kindergarten subjects divided into regular class sizes, and was taught by an experienced music teacher. All subjects were administered the PMMA (Gordon, 1986) and received an adapted version of the HOMES (Brand, 1985), to be completed by their caregivers. The researcher did not specify when PMMA testing occurred. Furthermore, all participating music teachers administered the VAAI (Youngson & Persellin, 2001) ($r = .90$) both before and after the eight-month treatment period.

The researcher found that, although kindergarteners’ vocal accuracy improved from the beginning to the end of the treatment period, no specific teaching method was significantly related to vocal accuracy improvement. The researcher did, however, find a significant positive relationship between vocal accuracy improvement and home musical environment. Persellin concluded that music aptitude did not have an effect on vocal accuracy, but the researcher did not present a statistical analysis for that result. Because Persellin’s research aim was to examine how several factors affect vocal accuracy (indicating statistical causation), the researcher did not examine the correlational relationship between music aptitude and vocal accuracy, or between music aptitude and home musical environment.

The current study used criterion measures identical to those used by Persellin (2006). Subjects are also of the same age group. Yet, the research objectives of the present study and Persellin’s (2006) are quite different. Persellin’s subjects received specific treatments in order to determine the effects of differing teaching
methods on aptitude, vocal accuracy, and home environment. Data were analyzed using ANOVA and multiple regressions. Subjects in the present study did not receive treatments; instead, data from the three criterion measures were examined to determine how children’s natural home musical environment might be related to vocal pitch accuracy and singing achievement as well as developmental tonal aptitude.

Summary

Several researchers have utilized young subjects in order to address research questions concerning home musical environment. Kindergarten-aged subjects have spent most of their lives within home-oriented environments and have not received much formal musical training. Such subjects enter kindergarten with varying musical abilities, including singing achievement. One of the aims of the present study was to determine the relationship between home environment and singing achievement. The present study also examined the relationships between singing achievement and developmental music aptitude and the relationship between home environment and music aptitude. Several different vocal measures found in the research literature were examined for their use in the present study. The VAAI (Youngson and Persellin, 2001) was chosen because it best suited the research question addressing vocal accuracy. The present study also included the use of Gordon’s (1986) *Primary Measures of Music Audiation* (PMMA) as a means to measure developmental music aptitude because of its ease of administration and high
reliability \((r = .85)\). Although many of the related studies investigated the relationship between vocal accuracy and music aptitude, most researchers choose to report such results using total PMMA scores, instead of results from the tonal subtest. Persellin (2006) sought to understand the causal relationship between vocal accuracy and developmental music aptitude, but did not report statistics to address cause and effect, and thus, the researcher’s conclusion. The present study used results from the tonal subtests of the PMMA as children’s rhythmic aptitude was not examined.

Most researchers who explore home musical environment cite the use of Brand’s (1985) *Home Musical Environment Scale* (HOMES) yet, the exact measure is not published in any research article or publication. Furthermore, Brand no longer possesses the instrument in its original form (M. Brand, personal communication, March 14, 2009). Therefore, both previously examined studies and the current one used models of the HOMES based on information available in research journals. Most researchers report a high reliability of \(r = .86\). Because HOMES is the most accepted and validated measure of home musical environment an adapted version was used in the current study.

Many researchers have used criterion measures in studies with experimental designs with the intention determining the effects of specific treatments. However, the current investigation applied no treatment. Instead, the researcher examined the relationships among all three variables with the intent of providing the
results and conclusions of the present study to music teachers and parents/caregivers, so that they may apply them to their home-lives and individual teaching and learning situations.
Chapter 3

METHODOLOGY

With the intent of improving and differentiating elementary music instruction, the purpose of this study was to explore the relationships among home musical environment, developmental tonal aptitude, and vocal performance achievement of kindergarten children. The following research methodology was designed to address the research questions of the present study:

1. Is there a relationship between kindergarten children’s musical home environments and developmental tonal aptitudes?
2. Is there a relationship between kindergarten children’s musical home environments and their vocal achievement?
3. Is there a relationship between kindergarten children’s developmental tonal aptitudes and their vocal achievement?
4. Does race play a role in the musical home environments of kindergarten children?
**Definition of Terms**

For the purpose of this research, the following definitions were used:

- *Home Musical Environment* – all of the stimuli within a home environment that allow for music-making or music absorption, not exclusive of music-playing devices, musical instruments, family or individual music-making and/or individual or family musical ideals.


- *Vocal Performance Achievement* – the ability to sing in tune when provided with a vocal model.

- *Race* – inherited biological traits, such as appearance and genetic origin, which cannot be altered. Although race and ethnicity are often used interchangeably, ethnicity describes learned cultural behaviors that can be modified or altered by individuals’ beliefs and practices, whereas one’s race remains constant and unchanged.
Theoretical Framework

The purpose of a theoretical framework in quantitative research is to serve as an organizational tool, to structure and make connections between research questions and hypotheses (Creswell, 2009). Research questions and hypotheses are deduced from overarching ideas and notions present in the theoretical framework. A review of literature revealed that further research on the relationships among musical home environment, music aptitude, and music achievement was warranted. Research questions were developed as a function of the carefully-selected theoretical lens stated below.

Bronfenbrenner’s (1979) Developmental Theory of Ecological Systems

Upon thorough consideration, the researcher determined that the research questions of the present study were best addressed through the lens of Bronfenbrenner’s (1979) Developmental Theory of Ecological Systems. Bronfenbrenner’s theory is based on the notion that “…human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate environment” (Bronfenbrenner, 1994, p. 38). Interactions
that occur within an individual’s immediate environment, their microsystem (1979), are called *proximal processes* (1994). Such interactions must occur frequently and regularly in order to affect an individual’s development. The extent to which interactions occur between an individual and his or her microsystems shapes the degree and direction of the individual’s development. For the purpose of this study, this implies that children’s musical interactions (or lack thereof) within their home environments will in some way influence, or be related to, their musical development (Etopio & Cissoko, 2005).

Bronfenbrenner (1979, 1994) further asserted that interactions *between* microsystems, called mesosystems, also affect children’s development. According to this model, the musical experiences children have in their home environments influence their musical performance and achievement in school. In addition, both environments (home and school) working together should relate to a child’s developmental musical potential, or aptitude (Etopio & Cissoko, 2005; Gordon, 1986). These musical interactions or relationships are considered to be mesosystems.

Gordon (1986) defines music aptitude as a person’s potential to behave or interact musically. This differs from music achievement, which is a measurable description of one’s ability to perform or respond musically. Because music aptitude does not stabilize until around the age of nine, children’s musical development can either be further developed or attenuated depending on the level of musical stimulation
that occurs within their proximal environments (Etopio & Cissoko, 2005; Gordon, 1986).

**Ecological Experimentation**

In order to make assumptions or draw conclusions about such interactions between microsystems, Bronfenbrenner stresses the importance of ecological experimentation (1976). Such research should take place in real-life environments that are not manipulated for the sake of the experiment. Bronfenbrenner takes care to stress the rigor involved in such an experiment:

There are many instances in which a design exploiting an experiment of nature provides a more critical contrast, insures greater objectivity, permits more precise and theoretically significant inferences - in short, is more elegant and constitutes "harder" science than the best possible contrived experiment addressed to the same research question. (1976, p. 5)

In addition, care should be taken to fully describe the natural experimental settings, because every aspect of an individual’s (or subject’s) surroundings help to shape his or her development, and therefore experimental response.
Role of Teacher-Researcher

Because the researcher wished to adhere to Bronfenbrenner’s (1976) principles of ecological experimentation, the researcher assumed the role of teacher-researcher for this study. The subjects and setting used, as well as the researcher’s usual teaching behaviors, were not manipulated or dramatically changed for the sake of the research study. The teacher-researcher has taught elementary general music at the subjects’ school for four years and has come to recognize a strong variance in incoming kindergarteners’ musical abilities. As many kindergarteners have older siblings at the school, the researcher has anecdotally noticed that kindergarten students often have similar vocal abilities to those of their older siblings. Informal observation during regular class time has lead the teacher-researcher to question whether a connection exists between how children make music at home and how they perform and achieve in music class.

Subjects

The subjects for this study were kindergarteners (N = 96) and their parents/caregivers from an elementary charter school located in a suburban city in Delaware, USA. All kindergarten students and families were invited to participate, although doing so was voluntary. Because the elementary school does not charge tuition and is considered to be a public institution, families were of varying socio-
economic status, ethnicity and race, and they all lived within a five-mile radius of the 
school. This noted diversity differs from past studies (Brand, 1982, 1986; Mallett, 
2000; Persellin, 2006) in which subject diversity was either limited or not noted. The 
researcher gained approval from the University of Delaware Human Subjects Review 
Board (see Appendix A) as well as from the school director to conduct this study on 
school premises.

**Criterion Measures**

*aHOMES*

Three key assessments were used to address the research questions. The first 
was an adapted model of Brand’s (1985) Home Musical Environmental Scale 
(HOMES). Reliability of Brand’s HOMES (1985) was reported as \( r = .86 \). HOMES 
was chosen because of its high reliability and frequency of use in studies that examine 
young children’s home musical environments (Atterbury & Silcox, 1993a; Brand, 
1986; Gawlick, 1994; Mallett, 2000; Persellin, 2006; Taggart, 1994). The measure was 
adapted only to update terminology (e.g., CD Player instead of record player) and to 
eliminate a numerical count of musical recordings owned.

The adapted HOMES (aHOMES) (see Appendix B) was used to measure 
subjects' musical home environment, as prompted by the first two research questions 
concerning the relationships between home musical environment and (a) music
aptitude and (b) music achievement. To address the fourth research question regarding the role of race in home musical environment, the aHOMES was used for families to self-report aspects of their culture, such as race and languages spoken in the home. The survey is comprised of fifteen items, which are divided into three subject areas: Demographic Information, Music-Making in the Home, and Musical Devices in the Home. Items on the aHOMES were modified to modernize terminology (e.g., changing record and tape players to music-playing devices). Most response options were in the form of a Likert scale except for the portion that families were to report on the number of musical devices present in their homes.

To score the aHOMES, all descriptors on the survey were converted to numbers for interpretation and analysis, as utilized by Mallett (2000). Likert-scale responses were scored as follows:

Frequently = 3  Sometimes = 2  Rarely = 1  Never = 0

Musical devices reported on the form were tallied, with each device counting as one point. The total reported numeric score represented subjects’ musical home environment; higher scores represented higher levels of musical home involvement. Likewise, lower scores suggest lower levels of musical interaction. Data from the family demographics portion of the aHOMES were not numerically scored; instead they were counted, categorized, and quantitatively compared to other data in order to provide a thicker demographic description of the subjects. Race and number of
languages spoken were tallied and categorized. Data from these groups were then compared. Descriptive statistics were calculated for aHOMES scores by race.

**PMMA**

To address research questions that dealt with developmental music aptitude, the researcher administered the tonal subtest of Gordon’s (1986) *Primary Measures of Music Audiation* (PMMA) (see Appendix C). PMMA is a 20-minute, pre-recorded discrimination measure designed for children between the ages of five and eight, and can be administered to many subjects at once. Although the test is comprised of two subtests, tonal and rhythm, subjects only completed the tonal portion for the purposes of this study. PMMA has a strong reliability with split-halves reliability for the tonal portion reported as $r = .85$ for kindergarten-aged children in the test manual (Gordon, 1986). Kindergarteners were asked to listen to 40 pairs of short recorded melodic patterns and discriminate whether the patterns were the same or different. No reading (musical or other) skills were needed, although subjects were required to discern the difference between *same* and *different* by circling two happy faces for same or a happy and frowning face for different on the answer sheet (see Appendix C). Because such a concept is developmental and may not be cognitively established at the time of testing, teacher aides were trained to assist subjects during testing administration, as suggested by Gordon (1986).
**VAAI**

Kindergarten subjects’ musical singing achievement was measured using the *Vocal Accuracy Assessment Instrument* (VAAI) (Youngson & Persellin, 2001) to address the research questions that addressed vocal achievement. The VAAI, which was originally created as an extension of Rutkowski’s *Singing Voice Development Measure* (1990) is a 16-point scale used to measure young students’ vocal pitch accuracy (see Appendix D). With the reliability of the VAAI reported to be .92 (Persellin, 2006), VAAI measures not only singing voice development like the SVDM but also measures how many pitches children sing correctly in a 24-pitch song.

In order to implement the scale, subjects are taught a short song called See the Bird, which consists of eight, three-note phrases. Subjects then echo, phrase-by-phrase, a recorded voice that sings the song. Responses are then scored according to subjects’ pitch accuracy and consistency of singing voice use. Students who sang all 24 pitches correctly receive a score of 16. A point on the scale was subtracted for each missed note, totaling no more than 10. If a student sang more than 10 pitches incorrectly, he received a score of 5 or lower. Scores between 5 and 1 indicate levels of inconsistent or limited singing ability.
Procedure

The researcher developed the following procedure and then adhered to it strictly throughout the study. During the first trimester of the school year, kindergarten students learned the test song See the Bird (see Appendix D). After two weeks of singing the song in class as a group and as individual students, the teacher-researcher enthusiastically announced to students that the following week, they would have a chance to sing their song as solos into a voice recorder. On recording days, the teacher-researcher explained to students that they could sing “See the Bird” with a voice recorder. The teacher explained that participating was optional. The teacher-researcher then randomly chose subjects by calling on children who raised their hands for a turn. Kindergarteners’ research identification numbers were read before each child listened to a recording of the eight-measure test song and echoed back eight three-note phrases that were first modeled by the researcher’s recorded voice. The recorded song allowed space for student response after each measure. Student responses along with the pre-recorded test song were recorded simultaneously on a small, ZOOM H2 voice recorder.

Two independent judges listened to the recordings and scored them according to the VAAI scale. Subjects who sang all 24 pitches correctly received a score of 16. A point on the scale was subtracted for each missed note, totaling no more than 10. If
a student sang more than 10 pitches incorrectly, he received a score of 5 or lower. Students who did not use a singing voice but chanted the song received a score of 1. Using the Pearson product-moment correlation, interrater reliability for the aHOMES was calculated as \( r = .84 \). Students were tested over two class periods. Only seven out of 132 total kindergarten students chose not to participate. Any data collected from those students were removed from the study.

In January of the same school year, kindergarten families received a letter (see Appendix E) from the teacher-researcher that explained the proposed study. Before distributing the letters, kindergarten teachers were given instructions on distribution and encouraged to “advertise” participation on their classroom websites. The aHOMES (see Appendix B) and an envelope were also included with the letter. In lieu of a consent form, parents were directed to contact the school secretaries if they did not wish for their children to participate in the in-school portion of the study. No parents opted out of the study. Parents who wished to complete the aHOMES were given one week to return the survey, in a sealed envelope, to their child’s kindergarten teacher, who returned them to the researcher. A small incentive (allowing students to play an extra musical game during music class) was offered to the kindergarten class with the most returned surveys to encourage a higher rate of return. The incentive was not defined in the parent letter; it was only identified as a “musical surprise.” All subjects’ identities were removed and replaced with numerical identification markers.
prior to distribution in order to ensure confidentiality. After discarding surveys returned from students who had not participated in the VAAI, 96 surveys were counted for analysis. The sample size accounted for 74 percent of all attending kindergarteners, a highly acceptable rate of return.

During the same week, all kindergarten students, regardless of their participation in the study, were administered the PMMA during their regular music class period. Prior to the test day, PMMA score sheets (see Appendix C) were labeled with students’ identification numbers. The teacher-researcher distributed score sheets as students entered the classroom. Teacher aids, who are always a part of the kindergarten classroom, were briefly trained to ensure that subjects fully understood how to participate and remain on task. After ensuring that all students had test materials (score sheets, pencils, and a hard working surface), the teacher-researcher administered the PMMA according to the test manual’s instructions (Gordon, 1986). Students who were absent on the day of testing made up the PMMA during recess time the following week.

The researcher scored the PMMA test sheets according to the test manual. Scoring masks provided with the PMMA test kit. Masks were placed over test sheets and incorrect scores were marked clearly with a red pen. The researcher counted incorrect responses from each side of the test sheet and then subtracted the total number of incorrect responses from the highest possible score of 40. Scores were
recorded at the top of each score sheet near subjects’ identification numbers. The highest score recorded was 39 correct responses out of 40. The minimum score recorded was 14 correct responses. After data from all criterion measures were collected, the researcher began data analysis.

**Data Analysis**

Descriptive statistics were calculated for all criterion measures, as well as for the two sub-categories of the aHOMES. Pearson product-moment correlations were performed to determine interrater reliability of the VAAI, as well as to address the first three research questions, restated below:

1. What is the relationship between musical home environment and developmental tonal aptitude?
2. What is the relationship between musical home environment and singing ability?
3. Is there a correlation between singing ability and developmental tonal aptitude?

The fourth research question addressed the role of culture in families’ home musical environments. Analysis of the aHOMES was addressed by reporting descriptive statistics and mean scores for each race. The researcher also calculated the percentage of each family that spoke one, two, or more languages in the home.
Teacher-Researcher Bias

Although the researcher knew all of the participants, several procedures were used to protect confidentiality and avoid researcher bias. Surveys and PMMA score sheets were coded with students’ identification numbers prior to distribution in order to mask subjects’ identity. Furthermore, aHOMES data were not read and analyzed until all testing had been completed. In order to further prevent researcher bias, each student’s set of sung responses to the VAAI was recorded followed by the stating of his or her identification number. These data were rated by two independent judges.

Scope/Limitations

This study promises to provide valuable information to better understand kindergarten students’ home musical environments and their relationship to the elementary music classroom. Because the aHOMES included an ethnography section, the teacher-researcher was also able to explore the relationships between kindergarten families’ culture and home musical environment. Due to the large number of participants and limited time, the researcher was not able to interview families directly or assess home environments first-hand. Home musical environment data were somewhat limited and based exclusively on families’ survey answers.
Chapter 4
DATA ANALYSIS

The purpose of this study was to explore the relationships among home musical environment, developmental tonal aptitude, and vocal performance achievement of kindergarten children. The research questions addressed three relationships: a) home musical environment and developmental tonal aptitude, b) home musical environment and vocal achievement, and c) developmental tonal aptitude and vocal achievement. The researcher also sought to understand the role that race played in children’s home musical environment by comparing descriptive statistics of the criterion measures to aspects of the aHOMES demographical data.

Data were collected and descriptive statistics calculated for each criterion measure (see Table 1).
### Table 1: Descriptive Statistics for Criterion Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>Sum</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>aHOMES</td>
<td>28.2</td>
<td>2703</td>
<td>5.77</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>VAAI</td>
<td>9.3</td>
<td>894</td>
<td>3.95</td>
<td>2.5</td>
<td>16</td>
</tr>
<tr>
<td>tPMMA</td>
<td>29.0</td>
<td>2728</td>
<td>5.29</td>
<td>14</td>
<td>39</td>
</tr>
</tbody>
</table>

N = 96; Total score possible for aHOMES = 43; VAAI = 16; tPMMA = 40

Descriptive statistics were also calculated for the two subsections of the aHOMES, Music-Making in the Home and Musical Devices in the Home (see Table 2).

### Table 2: Descriptive Statistics for aHOMES Subsections

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>Sum</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total aHOMES</td>
<td>28.2</td>
<td>2703</td>
<td>5.77</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>Making Music Subsection (MM)</td>
<td>15.19</td>
<td>1458</td>
<td>3.11</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>Musical Devices Subsection (MD)</td>
<td>12.95</td>
<td>1243</td>
<td>3.94</td>
<td>3</td>
<td>21</td>
</tr>
</tbody>
</table>

N = 96; Total score possible for aHOMES = 43; Music-Making Subsection = 21; Musical Subsection = 22
**Home Musical Environment**

To further explore the function of the aHOMES without the influence of other criterion measures, Pearson product-moment correlations between the two aHOMES subsections and aHOMES total scores were calculated (see Table 3).

### Table 3: Subsections of the aHOMES Correlations

<table>
<thead>
<tr>
<th></th>
<th>Total aHOMES</th>
<th>Music-Making</th>
<th>Musical Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total aHOMES</td>
<td>1.00</td>
<td>.75</td>
<td>.85</td>
</tr>
<tr>
<td>Music-Making</td>
<td>.75</td>
<td>1.00</td>
<td>.31</td>
</tr>
<tr>
<td>Musical Devices</td>
<td>.85</td>
<td>.31</td>
<td>1.00</td>
</tr>
</tbody>
</table>

N = 96, \( p < .05 \)

As expected, a strong relationship \( (r = .75) \) was found between the Music-Making subsection scores and total aHOMES scores, as well as between the Musical Devices subsection scores and total aHOMES scores \( (r = .85) \). However, a weak relationship \( (r = .31) \) was found between the subsections themselves.

**Home Musical Environment and Developmental Tonal Aptitude**

To address the first research question, concerning the relationship between home musical environment and developmental tonal aptitude, a Pearson-product moment correlation was calculated between aHOMES and tPMMA scores (see Table
4). An insignificant relationship was found between aHOMES scores and tPMMA
tonal subtest scores.

Table 4: tPMMA and aHOMES Correlations

<table>
<thead>
<tr>
<th></th>
<th>tPMMA</th>
<th>aHOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPMMA</td>
<td>1.00</td>
<td>.14</td>
</tr>
<tr>
<td>aHOMES</td>
<td>.14</td>
<td>1.00</td>
</tr>
</tbody>
</table>

N = 96, (p < .05)

Home Musical Environment and Vocal Achievement

To address the second research question, the researcher first calculated
intrarater reliability for the VAAI (r = .84) and deemed it suitable. Then, correlations
between aHOMES and VAAI scores were calculated (see Table 5). A moderately low
relationship between aHOMES scores and VAAI scores was found to exist.

Table 5: VAAI and aHOMES Correlations

<table>
<thead>
<tr>
<th></th>
<th>VAAI</th>
<th>aHOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAAI</td>
<td>1.00</td>
<td>.33</td>
</tr>
<tr>
<td>aHOMES</td>
<td>.33</td>
<td>1.00</td>
</tr>
</tbody>
</table>

N = 96, (p < .05)
Pearson product-moment correlations were also calculated between subsections of the aHOMES and VAAI and tPMMA scores to further explore the relationships addressed in the first and second research questions (see Table 6).

<table>
<thead>
<tr>
<th></th>
<th>Total aHOMES</th>
<th>tPMMA</th>
<th>VAAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total aHOMES</td>
<td>1.0</td>
<td>.14</td>
<td>.33</td>
</tr>
<tr>
<td>Music-Making Subsection</td>
<td>.75</td>
<td>.07</td>
<td>.27</td>
</tr>
<tr>
<td>Musical Devices Subsection</td>
<td>.85</td>
<td>.17</td>
<td>.27</td>
</tr>
</tbody>
</table>

N = 96, (p < .05)

All relationships were statistically low, with the strongest correlations calculated between total aHOMES and VAAI scores, and between aHOMES subsections and VAAI scores.

**Developmental Tonal Aptitude and Vocal Achievement**

To address the third research question, the researcher using the Pearson product-moment correlation calculated the relationship between tonal aptitude (tPMMA) and vocal achievement (VAAI) scores (see Table 7). Results indicated a low relationship between developmental tonal aptitude and vocal achievement.
Table 7: VAAI and tPMMA Correlations

<table>
<thead>
<tr>
<th></th>
<th>VAAI</th>
<th>tPMMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAAI</td>
<td>1.00</td>
<td>.29</td>
</tr>
<tr>
<td>tPMMA</td>
<td>.29</td>
<td>1.00</td>
</tr>
</tbody>
</table>

N = 96, (p < .05)

Home Musical Environment and Demographics

The fourth research question was addressed by first calculating descriptive statistics for the demographic portion of the aHOMES. First, racial make-up was examined (see Figure 1).

Each subjects’ parents or guardians circled the racial term that best described their family. Families that circled more than one term were coded as mixed. Sixty-four
percent of the total subjects (N = 96) were white. Hispanic subjects comprised the smallest racial group (7.3%).

Next, the researcher calculated descriptive statistics for each race, for total aHOMES scores and aHOMES subsections (see Table 8). Average total aHOMES scores ranged from 24.71 to 31.09. The Hispanic group of subjects had the lowest total aHOMES mean (m = 24.71), while the racially-mixed group showed the highest mean (m=31.09). The Mixed group also had the highest mean scores for aHOMES subsection scores (m = 31.09). The Hispanic group had the lowest mean Musical Device score, and the Asian group had the lowest mean Music-Making sub-section score.

Table 8: aHOMES Descriptive Statistics by Race

<table>
<thead>
<tr>
<th>Race (N)</th>
<th>M Total aHOMES</th>
<th>SD Total aHOMES</th>
<th>M Music-Making</th>
<th>SD Music-Making</th>
<th>M Musical Devices</th>
<th>SD Musical Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black (9)</td>
<td>26.10</td>
<td>4.61</td>
<td>15.67</td>
<td>1.94</td>
<td>10.40</td>
<td>4.25</td>
</tr>
<tr>
<td>Asian (8)</td>
<td>26.70</td>
<td>5.45</td>
<td>13.75</td>
<td>2.82</td>
<td>12.62</td>
<td>3.16</td>
</tr>
<tr>
<td>Mixed (11)</td>
<td><strong>31.09</strong></td>
<td>5.37</td>
<td><strong>16.91</strong></td>
<td>2.54</td>
<td><strong>14.18</strong></td>
<td>3.38</td>
</tr>
<tr>
<td>Hispanic (7)</td>
<td>24.71</td>
<td>4.46</td>
<td>15.14</td>
<td>3.00</td>
<td>9.57</td>
<td>2.77</td>
</tr>
<tr>
<td>White (61)</td>
<td>28.56</td>
<td>5.82</td>
<td>15.00</td>
<td>3.24</td>
<td>13.52</td>
<td>3.83</td>
</tr>
</tbody>
</table>

N = 96 Note: Music-Making and Musical Devices are subsections of the aHOMES. Minimums are noted in italics and Maximums are noted in bold.

Next, the researcher examined the number of languages spoken per race (see Table 9).
Table 9: Number of Languages Spoken Per Race

<table>
<thead>
<tr>
<th>Race</th>
<th>N</th>
<th>M Languages</th>
<th>Subjects Speaking 1 Language</th>
<th>Subjects Speaking 2 Languages</th>
<th>Subjects Speaking 3 Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>9</td>
<td>1.1</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Mixed</td>
<td>11</td>
<td>1.09</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>7</td>
<td>1.86</td>
<td>1</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td>61</td>
<td>1.05</td>
<td>59</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

N = 96

All racial groups had at least one kindergarten subject that spoke two languages. Asian and Hispanic subjects had the greatest percentage (75 and 86 percent, respectively) of bilingual speakers, while Black and White subjects were most likely to speak only one language. Both White and Asian racial groups had one subject each who spoke three languages in their families. Asian subjects were most likely to speak more than one language.

The researcher also calculated the correlation between subjects’ number of spoken languages and aHOMES total and sub-section scores (see Table 10). Although being a part of a specific racial group does not denote cultural linguistic practices (speaking more than one language, for example), a number of participating Asian (75%) and Hispanic (86%) subjects spoke two or more languages. No significant correlations were found between aHOMES scores and number of languages spoken in the home.
Table 10: Correlations Between Number of Spoken Languages and aHOMES Scores

<table>
<thead>
<tr>
<th>Languages Spoken</th>
<th>Total aHOMES</th>
<th>Music-Making Sub-Section</th>
<th>Musical Devices Sub-Section</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.09</td>
<td>.04</td>
<td>.10</td>
</tr>
</tbody>
</table>

N = 96, (p < .05)

Summary

The research questions addressed three relationships: a) home musical environment and developmental tonal aptitude, b) home musical environment and vocal achievement, and c) developmental tonal aptitude and vocal achievement. The fourth research question addressed the role that race played in children’s home musical environment by comparing descriptive statistics of the criterion measures to aspects of the aHOMES demographical data. Correlations between aHOMES scores and tPMMA scores showed an insignificant relationship between home musical environment and developmental tonal music aptitude. Correlations between aHOMES scores and VAAI scores revealed a moderately low significant relationship home environment and vocal achievement. Furthermore, no significant correlation was found a between tPMMA and VAAI scores.
To address the fourth research question, the researcher calculated descriptive statistics for each racial group and for each group that spoke a different number of languages. Subjects who identified themselves as belonging to multiple racial groups (coded as *mixed*) had the highest mean aHOMES total scores while subjects who identified themselves as Hispanic had the lowest mean aHOMES total scores. Asian and Hispanic racial groups reported having the most subjects who spoke two or more languages at home. No correlation was found between number of languages spoken at home and aHOMES scores.

The following chapter will present conclusions based on the results of the present study. In addition, implications for the field of music education and suggestions for future research will be discussed.
Chapter 5

CONCLUSIONS AND IMPLICATIONS

Summary

The aim of the present study was to examine the relationships among three elements of music: home musical environment, developmental tonal music aptitude and vocal pitch achievement accuracy, in kindergarten-aged subjects. The researcher investigated the above relationships through the lens of Bronfenbrenner’s (1979) Developmental Theory of Ecological Systems, which states that interactions that occur frequently and regularly within individuals’ immediate environments affect their development. For the purpose of this study, this implies that children’s musical interactions (or lack thereof) within their home environments will in some way influence, or be related to, their musical development (Etopio & Cissoko, 2005).

The researcher assumed the role of teacher-researcher for the present study. To measure home musical environment and collect basic demographic information, the researcher distributed a modified version of the HOMES (Brand, 1985) (aHOMES) to families with kindergarten children. To measure developmental tonal aptitude, kindergarten subjects were administered the tonal subtest of the PMMA (tPMMA) (Gordon, 1986) as in music class. The researcher measured vocal pitch.
accuracy by administering the VAAI (Youngson & Persellin, 2001). Data from the three criterion measures were analyzed using the Pearson product-moment correlation. The researcher also sought to understand the role that race played in children’s home musical environment by comparing descriptive statistics of the criterion measures to aspects of the aHOMES demographical data.

**Conclusions**

The following conclusions can be made in reference to the purpose of the present study, which was to examine the relationships among home musical environment, music aptitude and music achievement. These conclusions are based on the results rendered from the data collected, and in reference to the conclusions of related research studies.

**Home Musical Environment and Developmental Tonal Aptitude**

In reference to kindergarten-aged subjects’ home musical environment and developmental tonal music aptitude, there appears to be no relationship. This conclusion concurs with prior researchers’ conclusions (Atterbury & Silcox, 1993a; Brand, 1986; Helper, 2010), whose studies incorporated the same- or similarly-aged subjects and criterion measures. The present study’s results regarding home musical environment and developmental tonal aptitude conflict with those found by Mallett
(2000). However, Mallett’s subjects were younger than those used in the present study and the researcher used an unreliable criterion measure of developmental music aptitude than that of the present study or of other studies found in the literature.

**Home Musical Environment and Vocal Achievement**

Regarding the home musical environment and the vocal achievement of kindergarten-aged children it is possible that a relationship exists between the two. Both Atterbury and Silcox (1993a) and Persellin (2006) came to a similar conclusion: kindergartener’s home musical environments measured by the HOMES were positively related to their vocal achievement. It is difficult to judge the similarity in findings between the data from the researchers mentioned above and those from the present study because neither Atterbury and Silcox (1993a) nor Persellin (2006) mention specific correlation data in their studies. However, data from the present study corresponds closely with Brand’s (1986) conclusion that parents’ attitudes about music and their involvement with music are positively related \( r = .43 \) to children’s overall musical achievement. This result as well as that from the present study support prior researchers’ (Kirkpatrick, 1962; Shelton, 1966) conclusions that music-making in the home is related in some way to the way children make music in the classroom.
Music Aptitude and Vocal Achievement

A review of the literature found that no significant relationship has been found between vocal achievement and developmental music aptitude by researchers (Atterbury & Silcox, 1993b; Hornbach & Taggart, 2005; Rutkowski, 1996). The present study confirmed those results noting an insignificant correlation between tPMMA and VAAI scores. These outcomes concur with Gagné’s (1999) Differentiated Model of Giftedness and Talent (DMGT). The conclusions thus stated are thought-provoking. How can children’s singing accuracy be related to their musical home environments and yet unrelated to their tonal aptitude, or potential, as singers?

Discussion

Gagné’s (1999) model supports the notion that, although children with higher music aptitude have the potential to achieve greater than those with low music aptitude, it is possible for music aptitude to remain uncovered or unrealized. Children who demonstrate greater or more advanced musical skills (e.g., singing achievement) might do so because as a result of any number of outside influences: personal drive or intrinsic motivation, participation in a musical preschool or musical play groups, or, for the purpose of this study, musical interactions with peers or family within the home environment. Bronfenbrenner’s (1979) Developmental Theory of Ecological
Systems maintains that children’s development is strongly affected by the frequency and regularity of reoccurring activities and interactions that occur within microsystems, or environments closest to children. Therefore, although how children make music in their homes appears to have no relationship to music aptitude, music aptitude does have the ability to change how children achieve musically.

It is also important to recognize the opposite of what is stated above; it is possible for children with high music aptitude not to demonstrate similar musical achievement. This could be for a variety of reasons. Children might be able to perceive differences in sound or audiate (Gordon Institute for Music Learning, 2011) songs but lack the physical or developmental ability to produce them aloud. On the other hand, a child might have the physical ability to perform musically but lack a musically-rich environment conducive to the modeling of musical exploration.

The present study investigated families’ home musical environments with a survey (aHOMES). Although the survey provided data on broad ways in which families made music, the researcher was unable to observe the frequency and quality of such musical interactions. It is possible that families who nurtured their children musically by frequently singing songs together or engaging in musical play were not accurately identified by the survey questions. These limitations prevented the researcher from making definitive claims about the impact of home musical environment on music aptitude and music achievement.
Home Musical Environment and Race

In addition to examining the relationships among home musical environment, music aptitude and vocal achievement, the researcher sought to better understand the role played by race in children’s home musical environments. Home musical environments varied across racial groups. Subjects who identified themselves as belonging to multiple racial groups (coded as mixed) had the highest mean aHOMES total scores while subjects who identified themselves as Hispanic had the lowest mean aHOMES total scores. While subjects represented five different racial groups, most (64%) identified themselves as white. Therefore, this conclusion should be observed with caution. While researchers (Kreutzer, 2001; Koops, 2010; Lum 2008) have studied the role of specific ethnic groups’ home music-making, there is a paucity of literature concerning race and home musical environment.

Discussion

Although race and ethnicity are separate aspects of personal identity (race implying physical characteristics and ethnicity implying cultural practices), they are interconnected. For this reason, investigative parallels may cautiously be made between them. For example, Kreutzer assessed Zimbabwean children’s singing ability and found that their musically-rich environment contributed to their musical abilities. Although the author did not specify the subjects’ race, over 98 percent of
Zimbabweans are black (Central Intelligence Agency, 2011). Koops’ (2010) subjects from Gambia shared a similar racial make-up and were absorbed in musically-rich environments. While one cannot assume that all black populations come from musical environments, the evidence suggests that racial groups with similar ethnic identities share common ideals about the incorporation of music within their environments.

**Implications for Music Education**

Kindergarteners enter the elementary music classroom with varied musical backgrounds and skills, yet all must be taught the same set of skills and concepts. Music teachers need to understand their students’ home musical environments and the way those environments interact with music aptitude and achievement in the classroom in order to provide their students with individualized, differentiated music education. The present study has indicated that children’s ability to achieve vocally may be related to the music-making that occurs within their homes. It is imperative that music teachers understand their students’ musical backgrounds and offer opportunities to support family music-making outside of the classroom. Results from this study suggest that there is no relationship between classroom vocal music achievement and developmental tonal music aptitude. Elementary music teachers and parents and caregivers of kindergarten children should remember that young children’s music aptitude continues to develop and change until the age of nine (Gordon, 1986). The provision of developmentally-appropriate, differentiated, high-
quality musical experiences should not be underestimated in support of young children’s developing music aptitude (Gordon, 1986; Taggart, 2011).

The present study has explored the role that race plays within the home musical environment. This study demonstrated that differences in levels of home musical environment existed across racial groups. Music educators need to acknowledge and celebrate the variety of ways that children make music at home within the context of their race or ethnicity, and encourage the transport of families’ musical traditions into the classroom.

**Suggestions for Future Research**

The present study examined the relationships between home music environment and developmental tonal music aptitude, home music environment and vocal achievement, and developmental tonal music aptitude and music achievement. Replicating this research is needed to verify the conclusions from this study. Further research is needed to establish the effect of children’s home musical environments on their developmental tonal musical aptitude and singing voice achievement. Furthermore, researchers should study whether specific aspects of home environment, such as owning or playing musical instruments or singing songs as a family affect developmental musical aptitude or singing voice achievement.

Many studies exist that concern children’s developmental music aptitude and aspects of musical achievement (Atterbury & Silcox, 1993a; Brand, 1986;
Gawlick, 2002; Hornbach & Taggart, 2005; Persellin, 2006; Rutkowski, 1996), but few involve subjects with stabilized music aptitude (age nine or older). Furthermore, little longitudinal research is available that tracks children’s music aptitude over time, through development into stabilization. Longitudinal research concerning the stabilization of music aptitude over time and its relationship to musical achievement is needed to fully understand the development and relationship of music aptitude and music achievement.

One of the aims of the present study was to determine the role of race in children’s home musical environment. Race includes biological traits (genetic origin, appearance, skin color) which cannot be altered. Although race and ethnicity are often used interchangeably, they are separate characteristics: ethnicity describes learned cultural behaviors that can be modified or altered by individuals’ beliefs and practices. Research is needed to determine what possible relationships might exist among ethnicity and home musical environment.

This study demonstrated that there are differences in musical home environments among racial groups. Although past researchers have explored specific cultural groups’ home music-making, little literature is available concerning race and home musical environment. More research is needed to determine whether subjects’ races are related to, have an effect on, or in some way predict home musical environment, music aptitude, or musical achievement. Although the school’s
population in this study varied racially, most of the subjects from the present study were of one race (64% white). Replicated research is needed using a balance of racial groups.

Also, because some aspects of home music-making may be related to socio-economic status (owning musical instruments or playing devices, attending concerts, etc.) one could assume that musical home environment could vary by socio-economic status. Although race certainly does not dictate socio-economic status, recent U.S. Census data (2010) suggests a strong connection between the two. Socio-economic status was not surveyed or addressed in the present study and should be investigated in future studies.

With the intent of improving and differentiating elementary music instruction, this research explored the relationships among home musical environment, developmental tonal aptitude, and vocal performance achievement of kindergarten children. The conclusions presented addressed those relationships, as well as the role played by race within the home musical environment. It is important for researchers and educators to continue to explore these relationships in order to contribute to the growing body of literature concerning them. By better understanding the ways in which young children musically interact with their home environments and the impact of home musical environment on musical development, music teachers will in turn further their aims for high-quality, differentiated, informed music education.
Appendices

Appendix A

IRB Approval Letter

DATE: August 29, 2010
TO: Sarah Aherne
FROM: University of Delaware IRB

STUDY TITLE: [186745-1] AN EXAMINATION OF THE RELATIONSHIPS AMONG MUSICAL HOME ENVIRONMENT, MUSIC APTITUDE, AND VOCAL PERFORMANCE ACHIEVEMENT OF KINDERGARTEN STUDENTS
IRB REFERENCE #: 186745-1
SUBMISSION TYPE: New Project
ACTION: APPROVED
APPROVAL DATE: August 29, 2010
EXPIRATION DATE: August 28, 2011
REVIEW TYPE: Expedited Review
REVIEW CATEGORY: Expedited review category # 2, 7

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation. Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Documentation of informed consent has been waived for this study. Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure. Note that approval of this protocol from the University of Delaware IRB does imply approval of the study by the Newark Charter School. Please be sure to obtain all required approvals from the school prior to collecting data.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed. Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office. Please note that all research records must be retained for a minimum of three years. Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure. If you have any questions, please contact Elizabeth Peloso at 302-831-8619 or epeloso@udel.edu. Please include your study title and reference number in all correspondence with this office.
Appendix B

Home Musical Environment Survey

This survey is to be taken by one of the kindergartener’s primary caregivers.

Kindergarten Child’s Name: ________________________________

Demographic Information

Please circle your responses.

1. How many children are in your household? 1-2  3-4  5 +

2. How many languages are spoken in your household? 1  2  3 +

3. How does your family describe themselves?
   White    Black or African American    Hispanic or Latino    Asian
   American Indian    Pacific Islander    Other ____________________

Music-Making in the Home

Please circle the response that best answers each statement:

4. I sing to my child: Frequently    Sometimes    Rarely    Never

5. I sing with my child: Frequently    Sometimes    Rarely    Never

6. I help my child learn songs: Frequently    Sometimes    Rarely    Never

7. I attend live concerts with my child: Frequently    Sometimes    Rarely    Never

8. We use music in our daily routine: (Such as for chores or bedtime) Frequently    Sometimes    Rarely    Never

9. We listen to music in the car: Frequently    Sometimes    Rarely    Never

10. I engage in musical play with my child: Frequently    Sometimes    Rarely    Never
Appendix B, Continued

Musical Devices in the Home

11: Please check all that are present in your home:

___ CD Player/Stereo
___ Mp3 Player or IPod
___ Musical Toys
___ Musical Instruments – How many? ___
___ Computer used to listen to music or do other musical activities
___ DVDs or videos that contain music
___ Other (please explain):______________________________

12. I or other members of our household play a musical instrument: Frequent Sometimes Rarely Never

13. My child plays a musical instrument: Frequent Sometimes Rarely Never

14. My child is allowed to play recorded music (CD’s, MP3’s, etc.) without permission: Frequent Sometimes Rarely Never

15. I purchase recorded music or musical devices for my child: Frequent Sometimes Rarely Never

Thank you so much for your time. Please seal this survey in the envelope provided and return to your child’s kindergarten teacher within a week.
Appendix C

PMMA Tonal Test Answer Sheet
Appendix D

Vocal Accuracy Assessment Instrument

**Children’s Vocal Accuracy Scale**

<table>
<thead>
<tr>
<th>Score Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre-singer: Does not sing, but chants the song text.</td>
<td>See the bird, in the tree, see it fly, o-ver me;</td>
</tr>
<tr>
<td>2. Inconsistent Speaking Range Singer: Sometimes chants, sometimes, sustains tones and exhibits some sensitivity to pitch, but remains in the speaking voice range (A2 to C3)</td>
<td>Look up now, in the sky, there it goes, fly-ing by.</td>
</tr>
<tr>
<td>3. Speaking Range Singer: Sustains tones and exhibits some sensitivity to pitch but remains in the speaking voice (A2 to C3)</td>
<td></td>
</tr>
<tr>
<td>4. Inconsistent Limited Range Singer: Wavers between speaking and singing voice and uses a limited range when in singing voice (usually up to F3)</td>
<td></td>
</tr>
<tr>
<td>5. Limited Range Singer: Exhibits consistent use of limited singing range (usually D3 to F3)</td>
<td></td>
</tr>
<tr>
<td>6. Inconsistent Initial Range Singer with 60% Vocal Accuracy: Sometimes only exhibits use of limited singing range, but other times exhibits use of initial singing range (usually D3 to A3) with 9 missed notes and some intonation problems to achieve 60% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>7. Inconsistent Initial Range Singer with 63% Vocal Accuracy: Sometimes only exhibits use of limited singing range, but other times exhibits use of initial singing range (usually D3 to A3) with 9 missed notes and some intonation problems to achieve 63% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>8. Inconsistent Initial Range Singer with 67% Vocal Accuracy: Sometimes only exhibits use of limited singing range, but other times exhibits use of initial singing range (usually D3 to A3) with 8 missed notes and some intonation problems to achieve 67% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>9. Initial Range Singer with 70% Vocal Accuracy: Exhibits constant use of initial singing range (usually D3 to A3) with 7 missed notes and some intonation problems to achieve 70% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>10. Inconsistent Singer with 75% Vocal Accuracy: Sometimes only exhibits use of initial singing range, but other times exhibits use of extended singing range (sings beyond the register lift: B3-flat and above). Singer also has 6 missed notes to achieve 75% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>11. Inconsistent Singer with 79% Vocal Accuracy: Sometimes only exhibits use of initial singing range, but other times exhibits use of extended singing range (sings beyond the register lift: B3-flat and above). Singer also has 5 missed notes to achieve 79% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>12. Singer with 83% Vocal Accuracy: Exhibits use of consistent extended singing range (sings beyond the register lift: B3-flat and above) and has 4 missed notes to achieve 83% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>13. Singer with 88% Vocal Accuracy: Exhibits use of consistent extended singing range (sings beyond the register lift: B3-flat and above) and has 3 missed notes to achieve 88% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>14. Singer with 92% Vocal Accuracy: Exhibits use of consistent extended singing range (sings beyond the register lift: B3-flat and above) and has 2 missed notes to achieve 92% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>15. Singer with 96% Vocal Accuracy: Exhibits use of consistent extended singing range (sings beyond the register lift: B3-flat and above) and has 1 missed note to achieve 96% vocal accuracy.</td>
<td></td>
</tr>
<tr>
<td>16. Singer with 100% Vocal Accuracy: Exhibits use of consistent extended singing range (sings beyond the register lift: B3-flat and above) and has 0 missed notes to achieve 100% vocal accuracy.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E

Letter to Families

Dear Kindergarten Families,

I hope that your child is enjoying his or her first semester at Newark Charter School. We are having lots of fun in music class playing games, singing songs and learning about musical instruments. Throughout the year, I give students basic music assessments (both written and audio-recorded) which report their musical achievement and potential to be successful. The data from these assessments helps me to differentiate and guide my teaching. In an effort to improve my teaching, I’d like to explore the relationships between these assessments and how children make music at home and use this information to complete my Master’s Thesis in Music Teaching at the University of Delaware.

All kindergarten families are encouraged to complete the attached Home Musical Environment Survey. As a small incentive, the kindergarten class with the most returned surveys will receive a special surprise in music class at the end of the month. Please return the survey by __________ in the sealed envelope provided. Students’ identities will be coded with identification numbers on all assessments and will not be linked to the results of the project.

Thank you so much for your time! You and your child’s participation in this project are voluntary. You may withdraw aHOMES or classroom assessment data from this study at any time by contacting me at saherne@ncs.k12.de.us or (302) 369-2001, ext. 426. Should you have questions regarding your or your child's rights to participate in this study, please contact the University of Delaware Institutional Review Board at 302-831-2137.

Sincerely,

Sarah E. Aherne
Newark Charter School Elementary Music Educator
REFERENCES


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