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UNIVERSITY OF OKLAHOMA

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# Pitch Internalization Strategies of Professional Musicians

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

Kathy Thompson
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Pitch Internalization Strategies of Professional Musicians

A Dissertation APPROVED FOR THE
SCHOOL OF MUSIC

BY

Dr. Nancy H. Barry

Dr. Michael R. Rogers

Dr. Alice Lanning

Dr. Ella Joy Nelson

Dr. Sanna Pederson

Dr. Courtney Vaughn

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## Abstract

Music educators agree that the internalization of pitch from music notation is essential for music literacy, but college music theory teachers often find that students' aural comprehension lags behind their visual comprehension of musical notation. Teachers may find pitch skills difficult to teach because their own cognition has become intuitive through musical experience. Research in aural skills pedagogy has produced neither comprehensive curricular requirements nor an ideal sequence of experiences for pitch internalization. Furthermore, teachers with absolute pitch (AP) cannot know from personal experience how to teach necessary relative pitch (RP) skills.

Results of the Aural Skills Questionnaire were analyzed to determine the types of experience and deliberate practice that led to effective RP skills among 100 professional musicians. Music instruction and ensembles before and during college were considered along with training and experience after college. Participants also compared their own strategies with six metaphors for pitch perception proposed in the author's earlier study, *Thinking in sound: A qualitative study of metaphors for pitch perception*—Follower, Contour-singer, Button-pusher, Builder, Tonal-thinker and Pitcher. Three music educators also analyzed participants' strategies through their scripts for aural tasks and compared them with the metaphors. One additional metaphor was proposed—the Chunker—to describe the pattern-seeking strategy found in many scripts and definitions of other metaphors were revised. Individual interviews with RP experts, chosen on the basis of accuracy in aural tasks and self-assessed confidence, provided additional insights for aural skills pedagogy.

# CHAPTER 1

## Introduction

One basic challenge for music students is to develop their ability to imagine how music sounds while looking at music notation. Seashore (1938) eloquently stated the importance of this challenge: "Tonal imagery is a condition for learning, for retention, for recall, for recognition, and for the anticipation of musical facts. Take out the image from the musical mind and you take out its very essence" (p. 6). One would never argue that a notated score *is* the music. Music involves sound, which certainly exists apart from a score, even without any score. Nevertheless, musical notation is symbolic representation of musical sounds, a communication from composer to performer, and also a tool for analyzing musical sounds, which otherwise are difficult to compare because they unfold in time. Certainly an efficient understanding of notation benefits all aspects of music reading, performing, writing, arranging, and error detection. This understanding is similar to the command of written language for communication. Language literacy opens the door to thinking and to metacognition, just as music literacy opens the door to musical understanding and analysis. However, the necessity for music literacy is even greater. Notation cannot substitute for music as written communication can substitute for speech because musical meaning arises from sound.

Music educators agree that comprehension of music notation is indispensable for music literacy. However, college music theory teachers often find that students' aural comprehension lags behind their visual comprehension of musical symbols. Often students attempt to analyze only through visual identification of music notation, without any real aural connection. Unless hearing is the basis for analysis, the analyzed score

becomes an ineffective substitute for an aural process. Rahn (1980) encouraged the understanding of musical notation as musical mind training, or "constructive brain-washing." Teachers must be diligent in training students to comprehend the sounds behind the symbols.

Several terms describe the ability to imagine the performance of a musical score, including inner hearing, aural imagery, the hearing eye, aural perception, and audiation. Because of its easy comparison with visualization, Karpinski (2000) suggested and defined the term *auralization*, "the process of hearing music in the absence of physical sound" (p. 3). Rich auralization would include many dimensions and qualities of music, including pitch, rhythm, instrumentation, articulation, texture, and form. None of these should be neglected in aural skills training. However, the most difficult aspects for most students to anticipate in an unfamiliar work are the pitches and their relationships. Klonoski (1998) suggested that pitch internalization is the greatest indicator of musical competency and that teachers should address this skill thoroughly before moving on to other skills. The internalization of pitch is the focus of this dissertation.

Musicians use either absolute pitch (AP) or relative pitch (RP) strategies to internalize pitch from musical notation and also to comprehend pitches and their relationships while listening. The two strategies are quite distinct, if not entirely opposite. Musicians with AP, sometimes called "perfect pitch," recall pitches easily without reference to other tones in a passage of music. To understand musical meaning, though, they must learn to analyze the contextual relationships of the tones. Musicians who do not have AP must develop a sense of RP, the skill to relate tones to each other, before they can auralize. RP understanding is important knowledge for everyone, but for

internalizing pitch the starting point for musicians with AP is fundamentally different than for those without it. While RP musicians must analyze tonal relationships before they can auralize a passage of music, AP musicians can auralize the sound before analyzing tonal relationships.

Although I have learned to use solmization and other RP strategies, my AP perspective is a hindrance in understanding how pitch internalization develops for musicians who do not rely on AP. My research in aural skills began with a survey of the background experiences and self-assessment of music reading skills among elementary teachers enrolled in a graduate level Kodály class (Thompson, 2001). This study indicated considerable discrepancy between the age participants started reading music and the age they began to auralize music from notation. Most musicians in that study indicated that they learned to internalize pitch several years later than they learned to read music to play an instrument.

*Metaphors for Pitch Perception*

My subsequent qualitative study (Thompson, in press) examined the pitch internalization strategies of undergraduate music students through descriptions of their thought processes during sight-singing and aural tasks. From analyzing their strategies and comparing them with my own, I characterized six metaphors for pitch perception: the Follower, the Contour-singer, the Button-pusher, the Tonal-thinker, the Builder, and the Pitcher. These metaphors will be described briefly here. More detailed descriptions appear in the Aural Skills Questionnaire in Appendix A. (Revised definitions on the basis of this study appear in Appendix J.)

The first metaphor, the Follower, is not actually a pitch internalization strategy,

but it is included because it is a common behavior of many students when they are not required to think independently. The Follower depends on another singer or sound source and is adept at making quick adjustments to match pitch. The Contour-singer internalizes the up and down aspects of notation, but the actual melody is out of focus, and intervals are approximate. The Button-pusher uses notation quite effectively for sight-playing and may pretend to finger an instrument to aid in pitch internalization. The Tonal-thinker keeps the tonic triad and/or a scale in mind, often, at least initially, through tonal syllables or numbers. The Builder measures intervals from one note to the next to internalize pitch. With AP, the Pitcher aims for a known pitch target in his mind without necessarily relating it to other pitches in a musical context. Students readily understood these metaphors and could see their strategies in one or more of the metaphors.

*Need for the Study*

The present study evaluates the same metaphors to see if they also characterize the pitch internalization strategies of professional musicians who have completed their formal training and perhaps have had subsequent career experiences that contributed to their development. Studying the development of RP is important in developing curriculum for students with various experiences and attitudes. I will discuss the needs for the study briefly as they relate to my own teaching experience.

Freshmen come to college with various levels of musical experience. Most come with good musical intuition for determining whether pitches "sound right or wrong," at least in the styles of music familiar to them. Many comprehend pitch notation without difficulty to play correct notes on their instruments. In a typical freshman class, one or two students may internalize pitch easily because they have AP. A few others may have

learned to internalize pitch from choral experience that stressed sight-singing with one of several solmization systems, perhaps reinforced with hand signs or body movements. Often vocalists have very little actual music reading experience, having learned their repertoire through listening to recordings or rote teaching. Other students, especially pianists, may recognize sizes and qualities of intervals between pitches because they have focused on interval identification, at least visually and kinesthetically if not aurally. Though instrumentalists may be quite good at sight-playing, many do not imagine the sound *before* it comes out of the instrument. Their aural image is in hindsight.

Students also have various attitudes about learning to auralize. Sight-singing is often terrifying to instrumentalists who have had little singing experience and would prefer not to sing at all, especially alone and in front of classmates, or to vocalists who have always followed stronger singers in their sections. Many instrumentalists are quite defensive about their lack of ability to internalize pitch; they resent having to learn another way of thinking when they could easily go to an instrument or recording to hear an unfamiliar passage. Some are embarrassed when they cannot sight sing a simple melody accurately because they know they can play very complex ones. All students have developed the ability to recall familiar tunes, especially ones they have practiced for performance. However, tonal memory often disengages the mind from actually decoding notation, allowing discrepancies if they do not offend one's musical intuition. For most students melodic dictation is frustrating, even overwhelming, because it involves several interrelated competencies, any one of which might subvert their attempts to notate the melody correctly. Another current attitude involves the use of technology. Many students question why we need to learn to auralize if we can hear a recording or let a computer

play the music.

Aside from the diversity in students' experiences, skills, and attitudes, the difficulty in designing an aural skills curriculum arises from the complexity of the cognitive process. Many questions plague my teaching. Where do we begin when we are actually not at the beginning of musical experience or training? What kinds of activities and exercises stimulate inner hearing for students who already have an ear history without connection to notation? How does one *think* to auralize music? Though arguably not always the best approach, our own experiences do guide the strategies we teach our students. Certainly, designing an effective aural skills instruction is problematic for AP teachers with no innate understanding of what it takes for non-AP students to learn to internalize pitch. Furthermore, teachers who have learned to use RP strategies effectively do not always know what kinds of experiences nudge their AP students, who already sight sing and identify individual musical sounds so easily, toward a greater understanding of tonal function. Every music teacher is responsible for guiding students toward a rich aural understanding of tonal relationships. But how much skill in pitch internalization should teachers expect from students with either AP or RP perception during the usual four semesters of undergraduate aural skills instruction? What kinds of practice are most beneficial for college students to become competent auralizers?

Two previous surveys support the need for this study. Collins' (1979) comprehensive survey of sight-singing trends in American colleges reported teachers' frustrations that not enough time is allowed in the curriculum for aural skills, that no basic standard for competency exists for college aural skills, and that students do not appreciate the relevance of aural skills instruction to their lives as musicians. Collins

expressed concern that many sight-singing classes were taught by teachers or graduate assistants with little or no training for teaching aural skills. Lack of available teaching materials was not a concern, but this study revealed "no obvious successful course arrangements or mnemonic device toward the teaching of this skill" (p. 198). Collins concluded that research in the music profession should focus more seriously on teaching and learning the skill of sight-singing.

A decade later Pembrook and Riggins (1990) similarly surveyed over 300 universities for current trends in aural skills instruction, finding that sight-singing was the most emphasized activity for freshman classes, and that in sophomore classes the amount of time spent on sight-singing and dictation was almost equal. Error detection received the least amount of instructional time. Several respondents to this survey indicated frustration. One response, "Send help!" (p. 239), expressed frustration with attitudes of students, other teachers, and administrators, as in Collins' earlier study. The trend appeared at that time to be moving away from an integrated approach to theory and aural skills that was prevalent in Collins' 1979 study. Many instructors were using their own materials rather than textbooks, and 71% supplemented classroom work with computer assignments. Pembrook and Riggins suggested a possible distribution of teacher-designed materials. Certainly a forum for sharing effective practices would benefit the profession. These surveys supported the need for research to guide teachers toward a better understanding of the development of aural skills.

*Purpose for the Study*

The purpose for the study was to provide a greater understanding of how RP strategies develop through the experiences, practices, and strategies of professional

musicians. Their pitch internalization strategies were compared with the strategies of students in my previous research (Thompson, in press). If the metaphors effectively helped to express ways of thinking about aural tasks, and if they were a complete catalog of descriptions, then they might be useful for discussing aural skills. Another purpose was to determine the kinds of deliberate practice that enabled RP experts to internalize pitch. Comparisons between RP musicians who were more successful auralizers with those whose skills were not as well developed could provide direction for curriculum development. Yet another purpose was to illuminate the difference between RP and AP perception. The ultimate goal is to contribute insights to aural skills pedagogy.

*Research Questions*

Specific questions for this research study were

1. Which experiences, practices, and strategies do musicians consider effective in learning to internalize pitch?

2. How do musicians assess the value of solmization systems for pitch internalization?

3. If musicians learned to internalize pitch through solmization, do they consciously continue to think through syllables for pitch internalization?

4. How do musicians in various professions rate their own pitch internalization skills and needs?

5. Are the metaphors proposed in my previous research with students also descriptive of strategies for pitch internalization for the professional musicians in this study?

*Value of the Study*

Information from this study may be valuable to the following:

1. Teachers with AP who desire to understand which practices and strategies are effective in leading students to an understanding of RP.

2. Teachers with RP who desire to understand which practices and strategies are effective in challenging students with AP to a greater understanding of tonal relationships.

3. All aural skills teachers who attempt to design an effective curriculum and to articulate to students the kind of training that professional musicians have found necessary and beneficial to develop their pitch internalization skills.

4. Students who can be encouraged by the accomplishments of those who have successfully learned to internalize pitch and motivated by knowing which practices are effective for developing this skill.

5. Writers and publishers interested in writing textbooks for aural skills courses.

6. Music educators interested in learning if and how musicians further develop their aural skills after leaving the academic environment.

*Content of the Dissertation*

The dissertation consists of six chapters. Chapter 1 serves as the introduction and description of the needs and purposes for the study, and concludes with a list of terms and their definitions for this study. Chapter 2 is a review of relevant literature. Chapter 3 describes the procedures and participants for the study. Chapter 4 presents the findings of the Aural Skills Questionnaire, which comprised the first stage of this research. Included are tables of descriptive statistics and a discussion of the free-response questions on the

survey. The results of the interviews of relative pitch experts from the second stage of the research are found in Chapter 5. The final chapter summarizes the research and discusses implications for aural skills pedagogy and future research. Appendices include the Aural Skills Questionnaire (Appendix A), the Institutional Review Board application for this study (Appendix B), and the Informed Consent Form (Appendix C). Responses to the open-ended questions are published in Appendices D, E, and F. Several examples of the evaluators' analysis of participants' scripts for aural tasks appear in Appendix G. Appendices H and I contain participants' scripts for the two additional melodies during the individual interviews. Revisions of the metaphor definitions based on this research are listed in Appendix J.

*Definition of terms*

absolute pitch, or absolute pitch recall (AP) – the ability to recognize and/or produce instantaneously the letter name of a pitch without an external reference.

auralization – the process of hearing music in the absence of physical sound (Karpinski, 2000, p. 3).

aural skills instruction – training in the comprehension of what one hears while listening to music and what one auralizes while looking at a musical score.

chunking – perceiving patterns or groups among smaller units of information. Butler (1992) defines a chunk as "an aggregate of smaller units of information that have been grouped mentally to form a larger single percept" (p.223).

cognition – the activity of knowing; a conception or perception based on, or affected by, knowledge (Butler, 1992, p. 223).

constructivism – theory that knowledge is "constructed" through multiple insights and

perceptions

deliberate practice – training which includes focus on a well-defined task for developing a skill and opportunities for repetition and correction of errors (Ericsson, 1997). As related to musical activity especially, Ericsson's definition excludes performing and recreational playing.

dictation – an ear-training activity in which one writes in musical notation what he hears performed.

error detection – process of locating an error in notation or in performance as one listens to music.

metaphors for pitch perception – characterizations of strategies for aural tasks (Thompson, 2002).

perception – the awareness and judgment of a sensation, mediated by prior knowledge (Butler, 1992).

perfect pitch – a common name for absolute pitch recall.

pitch internalization – the process of imagining pitch and/or pitch relationships in the absence of physical sound.

professional musician – one whose vocation involves performing and/or teaching music. In this study some of the orchestra musicians had other jobs outside music, but all have performed music beyond their college training.

relative pitch (RP) – the ability to identify pitches with reference to another tone or within a tonality.

RP expert – Participants in this study were ranked according to their self-assessed confidence in relative pitch skills and the number of correct responses on aural

tasks in the Aural Skills Questionnaire. Eleven participants selected from the highest quartile ranking were interviewed individually for their perspectives on the development of RP. They are the RP experts for this study.

script – a verbal (oral or written) description of one's understanding of an action or one's strategy for acting or solving a problem.

*solfège* – use of syllables to designate the names of pitches in notation. Historically *solfège* indicated the system in which C is always *do*, D is always *re*, etc., sometimes called fixed-*do* or stationary-*do* to distinguish it from a movable-*do* system, i.e. *tonic sol-fa*. In current literature, however, the term is often used to mean any use of the syllables *do, re, mi*, etc. Because so many participants in this study used the term in their scripts to refer to movable-*do* syllables, the broader meaning of the term will be used here, and the more limited system will be called fixed-*do*.

solmization – a system of syllables or numbers for aural recognition of pitch.

strategies – the cognitive tools for musical tasks

*tonic sol-fa* – the use of syllables to designate function within a scale in a movable-*do* system of solmization.

transcription – ear-training activity in which one writes in musical notation the music that he knows, or has unlimited repetitions to comprehend. (This activity is similar to dictation, but depends less on short-term memory.)

# CHAPTER 2

## Review of Relevant Literature

To focus on the development of relative pitch and its implications for college instruction, I have reviewed relevant literature in these areas: aural skills activities and limitations, sequencing for aural skills instruction, solmization, research in cognitive psychology with applications for music, the nature and limitations of absolute pitch, and qualitative research methodology. A summary of this literature is offered here as a foundation for the study.

### *Aural Skills Activities and Limitations*

Rogers (1984) stated that aural skills instruction is charged with "the single goal of developing internal musical perception—the ability to hear musical relationships accurately and with understanding" (p.100). Traditionally the instruction is separated into two related parameters, sight-singing and ear-training. Sight-singing activities include not only singing unfamiliar melodies, but also exercises and familiar tunes to establish a stockpile of common pitch patterns. Ear-training activities include identifying scales, intervals, and chords, notating melody, rhythm, and harmony from dictation, and detecting errors in notation or performance.

Rogers (1984) warned, "It is easy for teaching materials, a single course, or an entire ear-training program to become mired in the purely perceptual level of hearing" (p.101). Because of the human desire to grade objectively, many teachers have chosen to dwell on the identification of scales, intervals, and chords, which may be assessed simply right or wrong, rather than to use longer examples in their musical contexts. Most textbooks and computer software for ear-training have this same focus. Computers

effectively handle the drill and allow students to work at their own pace with instant feedback for the objective answers, but they cannot determine the cause of students' mistakes or suggest strategies for listening and comprehension. Rogers asserted, "Right answers can even be irrelevant or injurious if proper listening habits are slighted" (p.102). Furthermore, the assumption has been that students would then transfer these isolated bits of knowledge to other musical contexts. Buehrer (2000) argued that rather than a ready transfer, this approach "provides students, in the long run, with a very rigid way of hearing these musical events" (p. 7). For example, the same interval can sound quite different in different contexts because of tendencies of tones within a key. Both Rogers (1984) and Karpinski (2000) warned against teaching students to read by intervals before they have acquired a good sense of tonal function. Rogers argued that overly emphasizing intervals "reduces the hearing process to a chain of localized hops from point-to point—all somehow equivalent" (p. 131), rather than contributing to understanding tonal relationships.

Klonoski (1998) discussed another concern with using external sound sources and isolated tasks to teach pitch internalization. Teachers usually play the textbook selections on a piano for students to identify or notate. Recordings of the exercises, often with synthesized sound, are provided for some textbooks and for computer programs. Klonoski suggested alternative exercises especially for the first stages of instruction for students having difficulty with matching pitches: hearing the tonic pitch and retaining it, identifying the starting pitch in relation to tonic, hearing scale degrees and simple patterns, and hearing the tones of the tonic triad. These are important preliminary steps that textbooks, and perhaps teachers, generally assume that students have already

developed. Klonoski stressed that if the goal is pitch internalization, we must teach how to develop that skill, not just assume that students will make all the necessary connections for competence from traditional ear-training exercises. Karpinski (2000) also discussed many early cognitive skills involved in the development of relative pitch, including matching and remembering pitches, hearing melodic contour, discriminating stepwise motion from larger intervals, inferring tonic function, and identifying scale degrees. Success with sight-singing and dictation depends on these preliminary skills.

The inherent difficulty for aural skills teachers is to measure what the eye "hears" while silently reading musical notation. Sight-singing and dictation are the usual exercises and assessments for pitch internalization. Rogers (1984) emphasized that these activities should not be considered ends in themselves, but a means of producing "a certain kind of listener who can hear sound as meaningful patterns" (p.100). This is often hard for students to comprehend, especially when they are constantly graded for accuracy in small details. Yet the rationale from teacher to student maintains: "How can I know what you see until I hear what you sing or read what you write?"

Scripp (1995) found that sight-singing is indeed "a strong indicator of the internal processing of music notation, particularly with regard to pitch" (p.315). Scripp's research showed that previous experience playing music on an instrument, singing with musical accompaniment, or the ability to learn "by ear," do not predict internal understanding of the music. He noted that sight-singing develops in much the same way for both vocal majors and non-vocal majors at the college level. Comments from his subjects also suggested a qualitative difference between sight-playing and sight-singing. Pitch internalization is difficult to grade through sight-singing, however. Scripp demonstrated

that accuracy alone is an insufficient measure of pitch perception. He found in certain stages of development that mistakes in sight-singing actually increased as students learned to comprehend structural pitches and leave out embellishing tones to reduce the complexity of a sight-singing task or to recover from an error. More discussion of Scripp's study will follow in connection with current research in music cognition.

Karpinski (1990) described four broad phases in developing dictation skills: hearing, short-term melodic memory, musical understanding, and notation, all of which have sub-phases which must be taken into account in developing competency for dictation and assessment. If students can notate what they hear, they are certainly demonstrating the ability to auralize pitch and rhythm. However, there are problems with the use of dictation as a primary activity for ear-training. Complexity in assessing which phase or phases students have trouble doing has already been mentioned. Dictation exercises also consume an inordinate amount of class time, with successful students finishing quickly and struggling students wanting to work much longer than feasible. A third problem is the lack of relevance of dictation to more practical uses of auralization. Buehrer (2000) effectively argued how this lack of relevance has direct bearing on students' attitudes toward ear-training. He proposed more relevant tasks, such as error detection, transcription, and comparison of performances, where the need to know is more apparent.

*Sequencing Aural Skills Instruction*

Another issue for teachers is how to sequence the aural skills instruction. Many authors of aural skills textbooks have ordered the topics to correlate with current music theory texts. Damschroder (1995) states: "*Listen and Sing* is designed to coordinate with

the tonal portion of an undergraduate music theory program. The arrangement of materials follows as closely as possible that of standard textbooks on tonal music theory" (p. ix). However, Klonoski (2000) questions this integrated approach for ear-training:

> There is a tacit assumption here that needs to be examined more explicitly; namely, that the sequence of topics typically found in tonal theory texts, normally a highly refined and logical conceptual ordering, also represents the optimal perceptual ordering. (¶6)

Conceptual ordering based on perceptual development has been a prominent concern in the Kodály approach to music literacy for children (Choksy, 1999). Beginning with the most natural *sol-mi* name-calling pattern and progressing through common tone-patterns in folk songs to more difficult patterns, educators following Kodály methodology attempt at every level to prepare new concepts first through hearing and responding to new patterns, then labeling the concepts, and finally practicing the concepts in new repertoire through listening, singing, reading, writing, and creating activities. Houlahan and Tacka (1990a, 1990b) have applied the Kodály approach, using movable-*do* with *la*-minor to the college curriculum in their textbooks.

Another conceptual approach in current sight-singing and ear-training textbooks has assumed that a gradual introduction of interval types is the best sequence (Gottschalk & Kloeckner, 1997). Some authors have composed melodies within strictly defined parameters to meet the requirements of the conceptual sequence (Berkowitz, Fontrier, & Kraft, 1997). Most textbooks I have reviewed contained some author-composed melodies as well as carefully graded melodies from music literature progressing from simple diatonic melodies to more difficult chromaticism, as in Damschroder (1995), Henry

(1997), and Ottman (1996). Karpinski's (1988) thorough reviews of five popular sight-singing texts compared organization, curricular sequence, instructions, types of exercises, source of melodies, introduction of rhythms, printing, binding, etc. In reviewing the texts he raised many of the issues for pitch internalization already mentioned. One particular concern for Karpinski was also of great concern for this study. None of the texts espoused a particular solmization system. Karpinski suggested that makes textbooks more versatile for instructors' preferences. However, by eliminating specific instruction through solmization, textbooks have not contributed to the understanding of how any particular solmization is able to effect growth in perception.

Other curricular ideas in the literature have been based on newer research in cognition. Brink (1980) was one of the first to discuss a cognitive approach to teaching aural skills as applied music theory, urging contextual study as opposed to isolating sonic events. Brink was concerned that perceptual knowledge without structural knowledge is abstract, far removed from any consideration of actual music. She proposed that aural skills be taught simultaneously from the "top down" (structural knowledge) and from the "bottom up" (perception of sonic events). Buehrer (2000) similarly proposed structuring units around complete works, with parametric listening activities and group projects to solve musical problems. Approaching auralization from many perspectives "criss-crosses" and heightens understanding in authentic musical contexts. Covington (1992) and Marvin (1994) have also contributed examples of this curricular design, which de-emphasizes dictation activities in favor of error detection, improvisation, performance comparisons, and reflections on strategies. Larson (1995) promoted introducing tonal patterns on the basis of musical tension and the expectation of resolution. Milford's

(1992) "Scalesthenics" method was likewise based on the understanding of musical motion along with kinesthetic reinforcement. Foulkes-Levy's (1996) work with tonal markers, though more abstract, also approached musicianship through tonal patterns, rhythmic reduction, and structural analysis. No one has yet fully studied any of these newer curricular ideas, nor indicated more effectiveness for one curricular approach over another, but it is exciting to see that new ideas are being explored to make aural skills more relevant to students.

*Solmization*

Another issue of great concern for aural skills instructors is the choice of a solmization system for internalizing pitch. Current literature is full of opinion and theoretical argument but surprisingly devoid of comparative research. Textbook authors generally have not specified the use of a particular system, leaving that to the discretion of teachers or students. Karpinski (2000) encouraged well-informed solmization choices based on how musicians learn and what teachers want them to learn, rather than from the "I was trained that way" rationalization, though he suggested that perhaps a teacher's ability to persuade students to practice any system diligently is the key ingredient to success. Rogers (1984) also thoroughly discussed the solmization options, admitting that all have various strengths and limitations for musical mind training.

Movable-*do* systems relate syllables or numbers to function. Rogers (1984) explained that this method stresses hearing skills rather than music reading (for instrumental playing). "All keys, then, are treated, through transposition, as one, and the learning of the system becomes the goal rather than reading notes" (p. 133). They are also useful in analysis for discussing and reinforcing patterns. Rogers cited as disadvantages

of movable-*do* syllables their ineffectiveness in non-tonal contexts, their difficulty in modulating passages, and their too-specific meaning if allowing only one possibility in an ambiguous passage.

Proponents for singing with numbers have claimed advantages in their ease of learning and remembering, in their relationship to analysis symbols, and in their link to interval distances. Some number systems inflect the number-name for minor and chromatic tones, though the more typical one uses the same number for inflected sounds on the same line or space, allowing musical intuition to make the half-step alterations from major to minor mode (Milford, 1992).

Others have contended that the exclusive use of syllables provides the most effective pitch internalization, especially with young children who are likely to mix beat number concepts with pitch number concepts, or for young instrumentalists who use numbers for fingerings. Considerable debate exists even within the movable-*do* camp, however, concerning the use of *la*-minor or *do*-minor. The former, also called *tonic sol-fa,* claims ease in vocal music reading when *do* is the same for any relative key signature whether in a major, minor, or other modal scale. Syllable inflection need not occur unless accidentals are indicated, and the common modulations between relative major and minor keys are approached without inflection (Houlahan & Tacka, 1992). *Do*-minor proponents have argued for similarity in tonal function because *do* is always the tonic pitch, and the common structures and modulations between parallel major and minor keys are particularly illuminated (Pershing, 2000; Smith, 1991, 1992). Of these movable-*do* options, music theorists generally prefer *do*-minor for theoretical analysis, while many music educators prefer *la*-minor for sight-singing, especially in areas where the Kodály

approach is used in elementary and secondary schools.

The European tradition has been to use fixed-*do*, or *solfège* in its historical meaning, in the way that Americans use letter names, i.e., C is always *do*, D is *re*, E is *mi*, etc. Some fixed-*do* singers modify chromatic tones by inflecting the syllable (i.e. C# is *di*, Db is *ra*, etc.) while others use the same syllable for any alteration of a particular pitch name (i.e., C, C#, and Cb are all called *do)*. The advantage is visual; the same line or space always has the same syllable within a given clef. After enjoying proficiency with movable-*do* long before encountering fixed-*do*, Multer (1977) adamantly claimed that the latter should be taught from the beginning. Fertitta (2000) agreed, saying that *solfège* syllables are merely substitutes for letters of the music alphabet, just easier to sing, but not meant to account for pitch inflections or tonal function. "Awareness of these properties is, however, assumed to be 'automatic'" (p. 99).

Collins' (1979) study indicated movable-*do* syllables and scale-degree numbers were the most often used systems for solmization in American colleges. Pembrook and Riggins' (1990) survey revealed the same trend. Scale-degree numbers were most popular (23%), followed by neutral syllables (20%), movable-*do* with *do*-minor (18%), and movable-*do* with *la*-minor (16%). Though many opinions and systems persist, no experimental research has yet proven one solmization method superior to all others for internalizing pitch, nor indicated how several approaches might be used in combination or in sequence for refining musical understanding. The question remains as to which system or combination of systems is most efficacious for developing skill in pitch internalization.

*Research for Aural Skills Pedagogy*

In the 20th century most of the research in aural skills pedagogy has concerned recognition of sonic events and application of their labels (Karpinski, 2000). Right or wrong answers at this perceptual level of hearing are easy to measure, and thus have a natural appeal to empiricists, as well as to teachers for graded assessments. Though current literature in aural skills pedagogy follows the general trend in education to move beyond isolated pitch tasks toward cognitive structuring and to constructivist theories, applications of cognitive psychology to music have been relatively slow in coming (Buehrer, 2000; Klonoski, 2000; Marvin, 1995; Scripp, 1995). Gardner (1983) included musical intelligence as one of several "frames of mind," having a unique system of symbols. Important to Gardner's theory of multiple intelligences is that the ability to use a symbol system to solve problems is a measure of the level of intelligence in a certain domain. Researchers have begun to investigate subjects' understanding of musical notation to determine various levels of cognition. Novices and experts differ in effective application of the symbol system to perform musical tasks and analyze musical meaning.

One especially thorough research study examined the symbols system approach to music intelligence. Scripp (1995) developed a detailed model for the cognitive development of skill in reading music. His cognitive map shows four stages of cognition as subjects interact with musical notation through production, perception, and reflection. Scripp's evaluation of production involved both sight-playing on an instrument and sight-singing, but of these he emphasized that only sight-singing is an indicator of pitch internalization. He measured musical perception through error detection and also considered students' reflections about their cognitive strategies through responses to

interview questions. Scripp found that college students' growth in perception occurred *after* production and reflection, to the surprise of the faculty and researchers at New England Conservatory. "While individual dimensions of development may share parallel courses of change, the sequence of development among young children (who proceed from perception, to production, to reflection) is the reverse of that of conservatory students" (p. 319). However, Scripp did not indicate specifically which types of instruction helped the students to move from one stage of his cognitive map to another. No student in the two-year study actually progressed from the first stage to the fourth (final) stage; the model is based on composite observations of students beginning at different cognitive levels. That his subjects were talented performers from a prestigious music conservatory signals concern for what can actually be expected of students during undergraduate training.

*Absolute Pitch*

Many studies in the last decade have explored the fascinating nature of absolute pitch: Baharloo, Johnston, Service, and Gitschier (1998); Chin (1997); Clausen (1994); Costall (1985); Gregersen, Kowalsky, Kohn, and Marvin (1999); Hantz, Kreilich, Marvin, and Chapman (1997); Klein, M., Coles, M.G.H., and Donchin, E. (1984); Marvin and Brinkman (2000); Miller and Clausen (1997); Miyazaki (1993); Takeuchi and Hulse (1993). Absolute pitch (AP) in the strictest sense has been defined as the ability to recognize instantaneously the letter name of a pitch without a given reference pitch (Takeuchi & Hulse). Baharloo et al. classified AP possessors in three different groups, from those with the most complete accuracy to those with less accuracy. Of all who claimed AP, 70% were in the most accurate group. Their research also identified one

sub-group who could identify piano tones perfectly, but could not accurately identify pure tones. The study also confirmed earlier anecdotal reports (i.e., Ward & Burns, 1982) that an AP possessor's pitch perception may shift by a semitone after the age of 45. Several studies indicated that some combination of genetic predisposition and early musical training is necessary for a person to develop AP, finding that those who have it had formal music instruction before the age of six, and yet the majority of all students who begin music instruction before age six do not develop it (Baharloo et al.; Chin; Costall; Gregersen et al.).

Costall (1985) found that intensive efforts by adults to learn to identify pitches with a fixed reference did not result in the same cognitive structures as those who had absolute pitch from childhood. Barkowsky (1987) argued that saying AP can be learned is to give AP a new definition (p.26). His study indicated systematic and multi-dimensional differences in the hearing mechanisms of AP and RP subjects. Rush (1989) investigated David Burge's (1983) claims that he and other adults have learned absolute pitch recall through listening to the chroma or "color" of tones. Results indicated that AP skills can be improved with training, and that performance is more closely related to progress through Burge's method than to the amount of effort expended by the subjects. Some devoted considerable practice but were not able to progress to the end of the course, and their results were not as remarkable. Only five subjects (19%) were able to complete the course; three performed above the 50% level, and of these only one was in the range of AP possessors without training. The question remains whether there are enough benefits of AP perception to devote considerable amount of time to develop it.

Karpinski (2000) mentioned that some have learned to "mimic AP" through

sensations of vocal placement or instrument-specific cues as points of reference, but these approaches are not the same as AP. Students with AP have an undeniable advantage in immediate pitch internalization. However, if students have not acquired AP before they enroll in college, it is most unlikely that they will develop it to a usable degree without considerable daily practice.

Absolute pitch does have limitations (Karpinski, 2000; Marvin, 1995; Miyazaki, 1993). Marvin observed that pianists with AP have some difficulty with intonation in their singing or playing outside equal temperament tuning, because they tend to listen to isolated pitches rather than to tonal relationships. Following a score when music is performed in a key other than the one notated is confusing, as is reading the notation for transposing instruments. Sight-singing in a key other than the one notated requires constant transposition if the AP musician has not learned RP strategies. Marvin (1995) also described difficulties with harmonic dictation if AP listeners have not been trained to hear harmonic function. Such students try to transcribe letter names and then analyze for function rather than to listen for function. Miyazaki found that a non-AP control group showed a slightly higher level of performance than AP listeners in identifying intervals in keys with greater numbers of sharps and in slightly out-of-tune contexts. Considerable differences among AP subjects in these tasks indicated to researchers that AP listeners had some degree of RP, but without its development (or the suppression of AP), AP listeners find their strategies ineffective in many musical situations. Marvin (1995) outlined several tasks to shift AP listeners out of total dependence on AP strategies, including working away from notation with tonal syllables or numbers to increase their awareness of tonal function. Miyazaki further suggested that teachers should provide

young children explicit training in relative pitch, even calling it "remedial treatment for children having AP" (p.70).

AP studies have been based almost entirely on empirical research. Miyazaki, for example, studied small differences in response time as an indicator of the difference in RP and AP pitch perception. No qualitative research with AP possessors has surfaced in my reading, and no studies of any kind have shown that having AP makes a better musician.

*Methodology*

My interest for this study was stirred by Potter's (1990) qualitative study of the dictation practices of 25 subjects with diverse backgrounds who demonstrated the best skills in melodic dictation among students and faculty from a large university school of music. Potter chose not to use subjects with AP, but among the unexpected observations in his study was that it was difficult to find musicians without AP with good dictation skills. Several subjects claimed to be "rusty" though they had been good at dictation as students. (Evidently that skill had no direct relation to success in their professional lives.) Potter noticed that many worked silently from a good sense of internalized pitch, so it was difficult to tell what they were thinking, yet many insights surfaced in his study. Researchers in Potter's study observed the subjects as they were actually doing the task through repeated listening, as well as through videotapes, though researchers agreed that the videotapes were the least helpful indicators. Subjects were encouraged to discuss what they were thinking as they completed the task. Because participants used different colored pens for their response to each hearing, researchers could also analyze the layers of thinking involved. Potter's qualitative design emphasized a natural setting for studying

the participants in his research, based on Lincoln and Guba's (1985) guidelines for naturalistic inquiry.

Other recent cognition research has favored such multiple measures of assessment, including participants' reflections about their tasks. Education researchers have recognized the value of scripts which are representations of knowledge structures (Dharmadasa, 1998; Maki, 1990; Nelson, 1986; Shank & Abelson, 1977). Scripp (1995) measured not only production through performance and perception through error detection, but also reflection on strategies. These reflective comments served as scripts for their strategies. Buehrer (2000) also discussed how reflection "describes internal dialog that identifies not simply the content of one's thinking, but the circumstances, experiences, and processes that led to one's current conceptions" (p. 43). Both Buehrer and Scripp emphasized the importance of this metacognition not only for assessing one's current level of understanding but also for its significance to the learner in future tasks. Buehrer's statement summarized this point: "reflective thought not only strengthens one's understanding of a conceptual structure that has worked in the past, it also enables a learner to predict other situations in which that conceptual structure might work" (p. 44). Likewise oral and written scripts from auralization tasks were the basis for the characterizations of students' strategies for internalizing pitch in my earlier research (Thompson, in press).

Expertise in reading music requires many related skills. Ericsson, Krampe, and Clemens (1993) studied the role of deliberate practice in achieving expert musical performance. After reviewing a century of laboratory studies of learning and skill acquisition Ericsson (1997) concluded, "The most effective learning requires a well-

defined task with an appropriate difficulty level for the particular individual, informative feedback, and opportunities for repetition and correction of errors" (p.27). The term *deliberate practice* characterizes such training. Until students are able to define, monitor, and correct their own practice, the teacher's crucial role in structuring deliberate practice in the developing musician cannot be denied. Ericsson's conclusions indicate a focus for pedagogical research--the idea that we can discover insights into the acquisition of skills by studying the experience and practice of expert performers.

> If we are seeking insights into the true limits of human potential we should identify the critical elements and the organization of the training for the most successful students and then examine the mechanisms and skills that have been acquired to master the highest levels of performance...If the mechanisms of expert performers and those of the general population only differ in the degree to which they are developed then the implications from the study of expert performance to the potential improvement of achievements in everyday life would be great (Ericsson, 1997, p. 9 ).

Several other approaches within the discipline of qualitative inquiry influenced this research design. Constant comparative research design (Bogdan & Biklen, 1998; Schwandt, 2001) provided a framework for evolving insights to be explored further through purposeful sampling until additional analysis contributes no new information, in this case until no new practices or strategies emerge, so that conclusions are grounded in the data. Trustworthiness is therefore based both on the reporting of all perspectives among the participants and on saturation from continuous sampling until no other perspectives surface.

An emergent design precludes knowing all the difficulties the research may encounter. However, one initial concern was that in scripts for cognitive tasks people often chunk together schematic elements, making it difficult to assess all the process-thinking that is involved in a task. This might hinder the understanding of pitch internalization from the scripts of experts. Rogers (1984) mentioned that musical perception becomes so intuitive that some of the steps involved may be overlooked or difficult to recall and analyze. On the other hand, Ericsson (1997) provided support for studying experts in their ability to recall information about completed tasks:

> As part of their normal cognitive processing, experts' think-aloud protocols show that they generate a complex representation of the encountered situation, where information about the context is integrated with their knowledge to allow selection of actions as well as evaluation, checking and reasoning about alternative actions (p. 34).

In summary, aural skills pedagogy is still in need of research to determine the best practices for internalizing pitch. The need has been well documented in the literature, along with teacher and student frustrations in the attempts to teach and learn. Types of musical experience, solmization, aural tasks, and new cognitive approaches need to be evaluated in comparison with the effective deliberate practices of expert auralizers to promote effective curriculum design.

# CHAPTER 3

## Methods and Procedures

The experiences, practices, and strategies of professional musicians in developing pitch internalization were the focus of this study. Music lessons and ensembles before elementary school, during elementary school, in secondary schools, in college, as well as post-college training, were the indicators of experience considered in this study. Such experiences provided fertile opportunities for pitch internalization skills to grow, and sometimes included specific instruction as well. Practices were more narrowly construed to mean deliberate practices that contributed to skill in pitch internalization. Strategies were defined here as the approaches for internalizing pitch. Scripts in this study were participants' verbal representation of strategies for solving aural tasks which required pitch internalization. The metaphors that participants used to characterize their strategies in this study were from my previous study with undergraduate students in music theory classes (Thompson, in press). These definitions of the metaphors appear in Appendix A.

Qualitative inquiry is important in cognitive research to present multiple perspectives, especially in this case where there are many strategies to pursue aural tasks. Participants with RP freely expressing their own ways of knowing was considered more insightful for research than simply choosing among responses that an AP teacher could imagine. Therefore, open-ended questions, "other" responses, and requests for reflection frequently appeared in the survey for the first stage of the research. Likewise interview questions for the second stage were structured to allow relative pitch experts to discuss their skills from their own perspectives.

*Aural Skills Questionnaire*

The Aural Skills Questionnaire (ASQ) in this study was revised and expanded from surveys used in two previous studies. In the first study (Thompson, 2001) elementary music teachers were asked to describe their background experiences in music and to assess their own music reading skills. Interviews with college students in the second study (Thompson, in press) also helped refine and expand the questions about experiences that might be relevant to the development of pitch internalization strategies. The current survey and auralization tasks were presented as a pilot study to graduate students in a music education research course. Their responses and the insights of several other colleagues also shaped the survey. The ASQ is reproduced in Appendix A.

The ASQ was designed to elicit information from professional musicians about experiences, practices, and strategies which have contributed to their own pitch internalization skill. The first of four parts of the ASQ was designed to reveal participants' music lesson and ensemble experience from pre-school through post-college instruction. The second part was a self-assessment of aural skills and strategies for internalizing pitch. Participants indicated whether they had absolute pitch recall, and whether they thought they had developed a good sense of relative pitch. Other items included multiple-choice questions concerning practices and strategies, a Likert-type scale for rating confidence in various aural tasks and strategies, and open-ended questions about participants' practices in developing relative pitch and the importance of pitch internalization in their daily activities.

The third part of the survey, the Auralization Task, consisted of four short melodies which were performed on a piano and audio-taped for use in a group setting.

Participants were asked to choose which of two similar notated melodies was performed, or to notate the melody if different from either notated melody, and then to describe their process for choosing each answer. Either the starting pitch or the final pitch was given for each melody, and participants were told that the given pitch would be the same even if the melody played were different from either of the notated ones. This task involved auralization, error detection, and melodic dictation skills. The two notated melodies for each task were similar in contour to each other, requiring more than a superficial understanding of contour to choose the correct response. The first three melodies were diatonic with obvious Eb Major or C Minor tonal implications. The fourth was an atonal melody beginning on Eb. The examples were limited to only five or six tones and were played twice to minimize the difficulty of remembering what was played, and thus to eliminate tonal memory as a primary factor in the thought process. The expressed purpose of the aural tasks was to trigger the participants' thinking about strategies without significantly raising their level of text anxiety. The specific instruction was "write what you heard that made you choose your answer."

For the final section, the Sight-singing Task (SST), participants were asked to prepare to sight sing a melody, specifically to try to "hear it in your head." The diatonic major melody, similar to those found in many freshman level sight-singing texts, was six measures long in duple meter, with a range from low *so* to high *do*. The melody involved more skips than scale steps, but the skips were based on tonic, sub-dominant, and dominant harmonies, again making the task more difficult than a simple contour strategy would allow, yet with pitches predictable enough for musicians to comprehend without great difficulty or anxiety. I played the starting pitch on a piano. After preparing silently

to sing the melody, participants were asked to describe in writing their strategies for internalizing the pitch. After allowing time for this written response, I played the melody and asked participants to designate whether or not it matched how they thought it would sound, and if not, how it was different.

After completing these tasks, participants were asked to read the definitions for six metaphors for pitch perception and to determine whether these characterizations described their own strategies for sight-singing, for sight-reading music on an instrument, and for auralizing. They were also asked to describe another strategy or to suggest another metaphor if they could think of a different or better way to describe their thinking process.

The survey research of the first stage had several purposes. Designed first to discover trends of experience and practices among professional musicians that might relate to the research questions, it also was the tool to identify and select "relative pitch experts" for more thorough interviews in the second stage. Other intentions were to assess the comprehensiveness of the metaphors for pitch perception, to probe their usefulness in discussing pitch internalization strategies, and to discover success or lack of success with different strategies. The Institutional Review Board Application and Informed Consent Form for this study appear in Appendices B and C.

*Participants*

Adult musicians ($N$=100) from a mid-western state participated in this study. All participants were members of at least one of the following associations: a metropolitan professional music teachers' association, a community orchestra, a state collegiate music theory teachers' association, a liberal arts university music faculty, and the elementary

general music and secondary vocal music teachers from a suburban school district.

*Research Settings*

Most of the 90 members of the professional music teachers' association were independent piano teachers; others taught voice or other instruments in private studios. The survey was administered at the end of a regular monthly meeting in the choir room of a church in connection with a brief explanation of my previous research. Of the 43 members present, 34 turned in surveys. Two were not used because they were turned in without signed consent forms, and two others left too many questions unanswered. (The survey was the last item on a long agenda, and several members had to leave before completing the survey.)

The second survey was conducted at a state music theory conference with 19 teachers in attendance. Collegiate music theory teachers from throughout the state were invited to attend this yearly conference, which convened in the choir room of a university. The survey was incorporated into a presentation of my research with university students (Thompson, in press). Of the 19 professors who attended the conference, 16 turned in surveys. Of these one did not sign the consent form, and another left too many questions unanswered to be useful.

Nine music professors from a private liberal arts university completed the surveys in two different sessions. The university had five full-time faculty members and twelve adjunct professors during the semester the surveys were conducted. The first session with three faculty members occurred at the end of a regular faculty meeting in a music classroom, and the other session with six faculty members occurred during a break in semester performance exams in the university's recital hall. (Five other adjunct faculty

members from this music department completed the surveys with one of the other organizations described here.)

Fourteen elementary music teachers of a total of sixteen in the school district participated in the survey during their fall in-service workshop. The session occurred in an elementary music classroom as part of a presentation of my former ear-training research. All ten secondary vocal music teachers from the same school district met in a high school choir room for their winter in-service meeting for a presentation of the same ear-training research. All attendees at each in-service meeting returned completed surveys.

From a community orchestra of approximately 60 regular members, 23 members chose to participate at one of three sessions before or after regular rehearsals. There were 48 performers in attendance when the invitation was extended to participate in the research. The surveys were administered in a college music classroom in the building where orchestra rehearsals were held. The community orchestra membership included public school music teachers, university music teachers, some undergraduate and graduate music students, as well as performers who worked in music-related professions other than performing or teaching, and some in professions other than music. The six undergraduate student members in the orchestra did not participate in the study.

In each of the research settings I briefly explained my research procedure and asked the musicians to sign the consent form and to indicate whether they would be willing to grant an individual interview if chosen for the second stage of the research. Participants completed the aural skills questionnaire and the aural tasks. Of the 106 surveys administered, 33 male and 67 female participants returned consent forms and

completed the survey sufficiently to serve as the basis for this research.

*Vocational Groups*

As is typical for musicians, many participants in this survey listed more than one area of work in the music profession, and several work at other jobs as well. Most of the participants (82%) indicated that they currently teach music at least part-time, either in private studios, schools, or universities. The membership of the six groups of participants and the setting for administration of the survey have been described individually, but for the analysis of results participants will be considered in four groups: independent music teachers, K-12 music teachers, college music faculty, and community orchestra members. This decision was made for several reasons. First, the liberal arts music faculty and the music theory teachers will be considered together because they all teach at the university level, and several from the college have taught or occasionally teach music theory and/or aural skills classes. Likewise, most teachers at the music theory conference teach or have taught other collegiate music courses as well. These two groups have more in common than not, and combined they offer a more comparative population with the other groups.

The elementary and secondary teachers will also be considered as one group. In this state, all music teachers are required to have K-12 certification, and several have taught at more than one level. They are all public school teachers from the same school system, and all work more with vocal than instrumental music. Although two indicated also teaching private piano or voice lessons, and two occasionally teach vocal music methods as adjunct teachers in local universities, there are more similarities between the elementary music and secondary vocal music teachers than with college faculty, independent studio teachers, or orchestral performers. Combining the groups also makes

this population more comparable to the other groups.

The orchestra had the most diverse population, including public school music teachers, college music teachers, graduate students, and other professional and amateur performers. However, all performed on instruments other than piano, and their association with the orchestra created unity within this group as well as distinction from the others. Table 1 shows the numbers of participants in each group as well as their age groups.

Table 1

*Age Range and Number of Participants by Vocational Group*

| Vocational group | 18-25 yr. | 25-34 yr. | 35-44 yr. | 45-54 yr. | Over 55 yr. |
|---|---|---|---|---|---|
| Indp. teachers ($n$=30) | 2 | 4 | 2 | 9 | 13 |
| K-12 teachers ($n$=25) | 4 | 7 | 6 | 5 | 3 |
| College faculty ($n$=22) | 0 | 4 | 7 | 7 | 4 |
| Orchestra ($n$=23) | 2 | 4 | 4 | 8 | 5 |
| All participants ($N$=100) | 9 | 19 | 19 | 29 | 24 |

*Data Analysis*

Data from the survey were analyzed using SPSS 11.0. Spreadsheets from Microsoft Office XP were used in preparing the tables published in this dissertation. Three music educators, including myself, analyzed all the aural task scripts for metaphors. One of the other educators is a retired secondary vocal music teacher, and the other currently teaches piano and music theory at the college level.

The purpose of the second stage interviews was to explore experts' paths to

relative pitch, their current strategies for internalizing pitch, what kinds of deliberate practice they deemed most beneficial, and their opinions about the best practices for teaching pitch internalization. Most of the questions for the interviews are listed in the Institutional Review Board Application in Appendix B, though some were not relevant to every participant, and in many cases additional questions were asked for clarification. Eleven participants were purposely chosen from the highest quartile of the first stage participants on the basis of their confidence and correct responses on the aural tasks. They were also deliberately chosen from each of the participant groups. All indicated that they had developed a good sense of relative pitch (ASQ 2.3) and that they were confident in their ability to auralize an unfamiliar tonal melody with pitch accuracy (ASQ 2.17-2.20). They also answered all of the tonal aural tasks (AT 1-3) correctly and rated their confidence for aural tasks on the high end of the continuum, though two missed the atonal task (AT 4). All agreed that they had internalized the Sight-singing melody correctly (SST 2). Finally, they each indicated willingness to participate in the interview stage by initialing the consent form. The participants are listed with their pseudonyms in Table 2. Further description of their experience follows in Chapter 5.

Table 2

*Interview Participants' Gender, Age, and Vocation*

| Participant | Gender | Current age group | Current vocation |
|---|---|---|---|
| A –"Art" | M | 35-44 | choir and band director, clarinet teacher |
| B –"Bob" | M | 45-54 | piano tuner, church musician, guitar teacher |
| C –"Carl" | M | >55 | college choir director |
| D –"Deb" | F | 45-54 | voice and piano teacher |
| E –"Ed" | M | 35-44 | college band director, administrator |
| F –"Fran" | F | >55 | vocal music teacher, accompanist |
| G -"Gloria" | F | >55 | violinist |
| H -"Helen" | F | 35-44 | elementary music teacher |
| I –"Iris" | F | 35-44 | piano teacher, composer, performer |
| J –"Jan" | F | >55 | college piano and aural skills teacher |
| K -"Ken" | M | 45-54 | college aural skills teacher, administrator |

*Researcher's frame of reference*

The introduction and review of the literature reflects my interest and past research in aural skills instruction. Because I have been the interviewer and primary analyst for this research it is important for readers to understand my experience and frame of reference. I have included the following information for the reader to evaluate my perspective. My major instrumental concentration has been piano and my secondary instrument is viola. Through public school years I also sang in school and church choirs. My undergraduate degree was in music education, and my master's degree was in piano

performance and pedagogy. Before teaching at the college level I taught elementary general music for two years, and piano lessons to pre-college and adult students for more than twenty years. I have taught music theory and aural skills courses at a liberal arts university for ten years. Other college teaching assignments have included applied and class piano, piano pedagogy, elementary music education, and string ensemble.

My AP was discovered soon after I began piano lessons at age five. I cannot remember when I did not associate pitch with notation. I have both enjoyed the advantages and experienced the limitations of absolute pitch described in the literature review, including difficulty in out-of-key contexts. I have struggled to overcome equal-tempered pitch "categories" for intonation on string instruments. My undergraduate ear-training stressed *fixed-do* syllables, which for me was only an alternate way to name absolute pitches, not to discern tonal function. I first taught myself *movable-do* syllables along with my elementary music students. I have not yet solved the solmization question in my college teaching, having experimented with numbers, pitch names, and *movable-do* with both *do-based* and *la-based* minor. Within the last eight years I have completed two aural skills courses and three Kodály method courses, all of which involved singing with *movable-do, la-based minor* solmization. After considerable practice singing familiar tunes and sequential exercises with tonal syllables but without notation, and practice in sight-singing from syllabic notation, I am better able to sight sing and hear tonal function with syllables. My difficulty in sight-singing from pitch notation lies in thinking the correct syllables quickly, not in finding the pitch, so tonal function still does not totally drive my cognition. I use both absolute and relative pitch strategies to check each other in many situations. I currently find that recordings often sound sharp to me, especially in

favor of "white keys," especially if I do not know the key of an unfamiliar work. I have also noticed that I can sight sing music pitched a half step flat without as much difficulty as I formerly experienced. Though I have learned to use relative pitch processes and can will myself to use relative pitch strategies somewhat, I still find it difficult to understand what constitutes a truly effective and efficient approach for pitch internalization for students without absolute pitch.

Results of the Aural Skills Questionnaire are reported in Chapter 4. Results of interviews with the designated RP experts appear in Chapter 5. Further discussion, applications for aural skills pedagogy and implications for future research follow in Chapter 6.

# CHAPTER 4

## Results of the Aural Skills Questionnaire

Results of the Aural Skills Questionnaire (ASQ) are reported and discussed in this chapter. First, the findings of participants' previous musical experience and aural skills training are furnished to provide rich descriptions of the musicians in the study and comparisons among the vocational groups. Second, the results are presented that designated the relative pitch (RP) experts in this study. All participants without absolute pitch (AP) were divided into quartiles based on aural task scores and self-assessed ratings for confidence in aural skills. Such groups allowed comparison between more and less skilled RP participants, and also demonstrated the differences between RP and AP participants. The remainder of the chapter presents the results which pertain to each research question. Tables of results allow comparisons among the following groups: all participants, the four vocational groups described in Chapter 3 (independent teachers, K-12 teachers, college faculty, and orchestra musicians), the highest quartile (HQ) and lowest (LQ) quartile of RP participants based on confidence and skill, and also the AP participants. Some results are reported only for the 76 participants who indicated that they were confident in their ability to internalize the pitch for unfamiliar tonal melodies. (Those who were not confident in their ability were instructed to skip ASQ 2.17-2.20, which pertain to that skill.)

### *Participants' Training and Experience*

Piano lessons provided the first music reading experience for 70% of all participants. By the age of six, 37% of the participants had begun to read music, and by age ten, 92%. In Table 3, which shows participants' first reading experience, the "other"

responses included singing at home, singing in church, and percussion lessons.

Table 3

*First Reading Experience*

| Vocational Group | Piano | Choir | Wind | String | Elem. | Other |
|---|---|---|---|---|---|---|
| Indp. teachers ($n$=30) | 94% | 3% | 0% | 0% | 3% | 0% |
| K-12 teachers ($n$=25) | 84% | 8% | 0% | 0% | 8% | 0% |
| College faculty ($n$=22) | 68% | 5% | 9% | 0% | 5% | 14% |
| Orchestra ($n$=23) | 26% | 17% | 26% | 17% | 9% | 4% |
| All ($N$=100) | 70% | 8% | 8% | 4% | 6% | 4% |

Among all 100 participants, 76 expressed confidence in their current ability to internalize pitch for unfamiliar tonal melodies. Of these confident auralizers, only 23 (33%) indicated they had begun to auralize by the age of 10. By the time college instruction began, 47 (68%) of the confident auralizers indicated they could auralize an unfamiliar tonal melody from notation.

The musicians indicated multiple instructional experiences before college. All but nine had more than one type of performing experience. Of these, five had studied only piano, two only French horn, and two only violin. All the others (91%) reported a combination of vocal, piano, and other instrumental experience, and 35% reported experience in all three areas. No participant had only vocal experience. Most participants (86%) began training before or during elementary school. Table 4 presents participants' lesson and ensemble experiences before college, and Table 5 indicates the percentages for each type of instruction.

Table 4

*Pre-College Private Lesson and Ensemble Experience*

| Vocational Group | Pre-school Lessons | Elementary Lessons | Secondary Lessons | Pre-college Ensemble |
|---|---|---|---|---|
| Independent teachers (*n*=30) | 33% | 100% | 97% | 90% |
| K-12 teachers (*n*=25) | 20% | 88% | 92% | 96% |
| College faculty (*n*=22) | 23% | 82% | 91% | 95% |
| Orchestra musicians (*n*=23) | 30% | 70% | 96% | 100% |
| All participants (*N*=100) | 27% | 86% | 94% | 96% |

Table 5

*Pre-college Piano, Instrumental, and Vocal Instruction*

| Vocational group | Piano alone | Other instr. | Piano, voice | Piano, instr. | Voice, instr. | Piano, voice, instr. |
|---|---|---|---|---|---|---|
| Indp. Teachers (*n*=30) | 7% | 0% | 30% | 13% | 0% | 45% |
| K-12 teachers (*n*=25) | 8% | 0% | 48% | 0% | 4% | 40% |
| College faculty (*n*=22) | 5% | 0% | 27% | 27% | 18% | 23% |
| Orchestra (*n*=23) | 0% | 17% | 0% | 26% | 35% | 22% |
| All (*N*=100) | 5% | 4% | 27% | 16% | 13% | 35% |

Table 6 shows whether participants' major concentration in college study was

voice, piano, or another instrument. Among the instrumentalists were 11 string players, 11 woodwind players, 7 brass players, 1 percussionist, and 1 guitarist.

Table 6

*College Piano, Instrumental, or Vocal Emphasis*

| Vocational group | Piano | Vocal | Instrumental |
|---|---|---|---|
| Indp. Teachers ($n$=30) | 87% | 10% | 3% |
| K-12 teachers ($n$=25) | 32% | 64% | 4% |
| College faculty ($n$=22) | 45% | 27% | 27% |
| Orchestra ($n$=23) | 0% | 0% | 100% |
| All participants ($N$=100) | 44% | 25% | 31% |

Most participants reported multiple ensemble and lesson experiences in college as well. Because so many participants had a variety of musical experiences, no attempt has been made in this study to compare results strictly on the basis of types of music lesson or ensemble experience, or on the basis of piano, vocal, or instrumental emphasis in college.

*Self-assessments for Relative Pitch Skills and Confidence*

Simple yes or no questions indicated whether participants thought they had absolute pitch recall and whether they had acquired a good sense of relative pitch. Participants could have answered yes to both, no to both, or yes to one and no to the other. They also assessed confidence in their own ability to internalize pitch for an unfamiliar tonal melody. Table 7 compares the responses to these questions among the vocational groups.

Table 7

*Self-assessments for AP, RP, and Pitch Internalization*

| | Absolute Pitch | | Relative Pitch | | Pitch Internalization | |
|---|---|---|---|---|---|---|
| Vocational groups | yes | no | yes | no | yes | no |
| Indp. Teachers (*n*=30) | 30% | 70% | 73% | 27% | 73% | 27% |
| K-12 teachers (*n*=25) | 0% | 100% | 84% | 16% | 80% | 20% |
| College faculty (*n*=22) | 13% | 87% | 95% | 5% | 82% | 18% |
| Orchestra (*n*=23) | 4% | 96% | 83% | 17% | 70% | 30% |
| All participants (*N*=100) | 12% | 88% | 83% | 17% | 76% | 24% |

The ASQ sought subjective self-assessments rather than objective assessments for most of the questions. No objective assessment for AP was conducted. Though the literature recognizes several categories of AP abilities, the assumption that most musicians know whether or not they have AP by the time they have completed college instruction is generally accepted (Baharloo et al, 1999). Twelve participants indicated AP. Eight of these were piano teachers, and three more were college teachers who also teach piano. The other was an instrumentalist. Even though nine of these indicated that they had also developed good relative pitch skills, all AP participants will be separated from the others in subsequent reports in order to obtain a clear idea of relative pitch perception when there is no ability to perceive the pitch in any way other than by relating given tones to each other. Two additional participants indicated "no" to having absolute pitch, but qualified the response on the survey form. One wrote "almost" beside the question. The other wrote "not perfect." Several other responses on these participants'

surveys indicated AP thinking (i.e., "I imagine each sound individually" and "I heard the pitches"). For the purpose of comparing strategies in this study the results of these two participants are reported in subsequent tables with the AP group rather than with RP experts.

The relative pitch and confidence in aural skills assessments were even more subjective. However, a high degree of integrity in personal assessment was demonstrated in this study. Participants who rated their confidence the highest on tonal tasks also scored the highest on the aural tonal tasks. (See Table 8.)

Table 8

*Cross Tabulation of Confidence Ratings with Aural Task Scores*

| | Participants' Aural Task Scores | | | |
|---|---|---|---|---|
| Confidence Rating | 1 correct response ($n$=4) | 2 correct responses ($n$=18) | 3 correct responses ($n$=32) | 4 correct responses ($n$=48) |
| 2.00-2.25 ($n$=6) | 2 | 3 | 1 | 0 |
| 2.50-2.75 ($n$=5) | 0 | 3 | 2 | 0 |
| 3.00-3.25 ($n$=13) | 0 | 6 | 4 | 3 |
| 3.50-3.75 ($n$=17) | 1 | 4 | 5 | 7 |
| 4.00-4.25 ($n$=17) | 1 | 0 | 9 | 7 |
| 4.50-4.75 ($n$=17) | 0 | 0 | 8 | 9 |
| 5.00 ($n$=24) | 0 | 0 | 3 | 21 |

*Designation of Relative Pitch Experts*

As mentioned above, the results of the 14 AP participants have been removed from consideration from the quartile rankings for relative pitch skills. The remaining 86 participants were ranked on a 12-point scale on the basis of 12 survey responses. One point was given for a positive answer to the question, "Do you think that you have developed a good sense of relative pitch?" Another point was assigned for completing the section of the ASQ that was prefaced by this statement: "If you are confident in your ability to internalize the pitch for unfamiliar tonal melodies, please answer the next four questions" (ASQ 2.17-2.20). Answering these questions thus indicated the participants' confidence in their pitch internalization skill. On a five-point Likert-type scale participants assessed their confidence in five tasks: sight-singing, auralization, melodic dictation, singing an atonal melody, and transcription (ASQ 2.5-2.9). The average of these self-assessments yielded up to five points. Participants received up to four points for correct responses to the four auralization tasks (AT1-4), and the remaining point was given for a positive answer to the self-assessment for sight-singing (SST2), "When you actually heard the melody performed, did it match how you 'heard it in your head'?"

Participants from each vocational group fell within each quartile. Those in the HQ scored at least 10.6, and those in the LQ scored 7.4 or below on the 12-point scale described above. Table 9 shows the distribution of participants in each quartile and those with AP (or almost AP).

Table 9

*Quartiles Based on Confidence Ratings and Aural Task Scores*

| Vocational Group | Highest quartile | Second quartile | Third quartile | Lowest quartile | AP |
|---|---|---|---|---|---|
| Indp. Teachers ($n$=30) | 4 | 7 | 5 | 4 | 10 |
| K-12 teachers ($n$=25) | 4 | 6 | 7 | 8 | 0 |
| College faculty ($n$=22) | 11 | 3 | 3 | 2 | 3 |
| Orchestra ($n$=23) | 2 | 6 | 6 | 8 | 1 |
| All participants ($N$=100) | 21 | 22 | 21 | 22 | 14 |

The quartile division based partially on subjective assessments of confidence has been verified here by comparing participants' aural task scores with their assessment of confidence. All 21 HQ participants expressed confidence in their ability to auralize. Their mean confidence ratings ranged from 3.6 to 5 on a 5-point scale. On the four auralization tasks, 19 completed all correctly, and the other 3 missed only one. Thirteen LQ participants indicated that they were not confident in their auralization ability. The range of mean confidence ratings for LQ participants was 1.8 to 3.4 on the 5-point scale. None completed all tasks correctly; one missed all four. The most frequent score for LQ participants was 2 ($n$=10). Table 10 offers a comparison of mean scores.

Table 10

*Comparison of Mean Scores and Confidence Ratings*

| | Aural Task 1-4 Scores 0-4 correct responses | | Confidence Rating 1-5 point scale | |
|---|---|---|---|---|
| AP/RP Quartile | Mean | SD | Mean | SD |
| HQ ($n$=21) | 3.86 | 0.359 | 4.46 | 0.411 |
| LQ ($n$=22) | 2.14 | 0.834 | 2.67 | 0.506 |
| AP ($n$=14) | 3.79 | 0.579 | 4.46 | 0.782 |
| All ($N$=100) | 3.17 | .9 | 3.74 | 0.866 |

*First Reading and Auralization Experiences*

Other comparisons among HQ, LQ, and AP participants are shown in Tables 11, 12, and 13. All AP participants began to read music in piano lessons. Piano lessons provided the first reading experience for the majority of RP participants in each quartile. The mean age for this first reading experience was between 5 and 6 years of age for participants with AP. The mean age was slightly higher for HQ and even higher for LQ, suggesting that early instruction or early experience may play a role in effective pitch internalization.

The question about the beginning age for auralization (ASQ 2.17) was addressed only to those who considered themselves confident auralizers. For this reason the responses in Table 12 were fewer than the total number in each quartile, except for the HQ. This comparison was shown for all quartiles because of the rise in age, though admittedly the large age range for each quartile allowed considerable overlap. The mean

age of confident auralizers (14.64 yrs.) indicated that most thought they could internalize pitch before college instruction began. Indeed 47 participants reported auralizing before the age of 18. All HQ participants and all except four other confident auralizers reported auralizing by age 23, approximately the time their college training would have ended. Subsequent training or experience enabled these four to succeed with this skill. This data must be seen only as a general trend, since it was based entirely on self-estimation of a skill that developed over time. However, the age of auralization was noteworthy in comparison with the age that music reading began. For RP participants there was quite a difference between the age the musicians began to read music and the age they began to internalize the pitches for what they were reading.

Table 11

*Quartile Comparison of Age and First Reading Experience*

| AP/RP | Age of First Music Reading | | | First Reading Experience | | | |
|---|---|---|---|---|---|---|---|
| Quartile | Mean Age | SD | Age Range | Piano | Vocal | String | Wind |
| HQ (*n*=21) | 7 | 2 | 5 yrs.-12 yrs. | 81% | 9% | 0% | 9% |
| LQ (*n*=22) | 8.36 | 1.99 | 6 yrs.-12 yrs. | 77% | 0% | 14% | 9% |
| AP (*n*=14) | 5.69 | 1.03 | 4 yrs. - 7 yrs. | 100% | 0% | 0% | 0% |

Table 12

*Quartile Comparisons for Age of Auralization*

| AP/RP Quartile | Mean Age | SD | Age Range |
|---|---|---|---|
| HQ (*n*=21) | 13.52 yr. | 5.35 | 5-23 yr. |
| Second quartile (*n*=14) | 15.71 yr. | 5.99 | 8-30 yr. |
| Third quartile (*n*=13) | 17.54 yr. | 6.45 | 9-35 yr. |
| LQ (*n*=8) | 21.13 yr. | 13.22 | 10-50 yr. |
| AP (*n*=13) | 8.38 yr. | 3.57 | 4-14 yr. |
| Total for ASQ 2.17 (*n*=69) | 14.64 yr. | 7.58 | 4-50 yr. |

*Gender and Instrumental Emphasis*

Gender comparison (Table 13) indicated a greater percentage of females with AP, and a greater percentage of males with RP proficiency in the HQ. In this study piano majors comprised most of the AP group (*n* =12) and approximately half the HQ (*n*=10).

Table 13

*Quartile Comparisons for Gender and College Instrumental Emphasis*

| | Gender | | College Emphasis | | |
|---|---|---|---|---|---|
| AP/RP Quartile | Male | Female | Piano | Voice | Instrument |
| HQ (*n*=21) | 57% | 43% | 48% | 29% | 23% |
| LQ (*n*=22) | 27% | 73% | 27% | 27% | 45% |
| AP (*n*=14) | 14% | 86% | 86% | 7% | 7% |

*Discussion of Survey Results and Research Questions*

*Research Question 1: Which experiences, practices, and strategies do musicians consider effective in learning to internalize pitch?*

Tables 3-6 at the beginning of this chapter present the musical experiences reported by all the participants. The variety of responses to the survey question (ASQ 2.18), "What instruction or practice enabled you to auralize unfamiliar music," indicated that there is not one obvious answer, nor a consensus among participants. Surprisingly low was the credit given to class instruction (22%). Interval training, numbers, fixed pitch, and *solfège* could refer to ear-training class instruction, but even if these activities were included, the total was only 35% for class instruction. On the other hand, many in this study (68%) did indicate that they could auralize before they began college instruction. Only six participants claimed that *solfège* was the effective practice that enabled their pitch internalization. Eighteen more considered piano lessons, or piano in combination with other instruction, as effective for pitch internalization. Most (75%) mentioned only one response; the others mentioned two, except for one who mentioned three and another four. Table 14 lists the frequency of responses mentioned alone or in combination with one of the others for the 73 confident auralizers who responded to the question.

A little disputed assumption for aural skills instruction is that solmization is the foremost deliberate practice that fosters growth in relative pitch understanding. The results for the second research question were thus important to the first question as well. Participants' strategies for pitch internalization are discussed in regard to Research Question 5 later in this chapter.

Table 14

*Effective Instruction or Practice to Auralize*

| Response | Frequency | | Percent ($n$=73) |
|---|---|---|---|
| | alone | in combination | |
| piano | 7 | 11 | 25% |
| class instruction | 9 | 7 | 22% |
| chorus or singing | 0 | 11 | 15% |
| absolute pitch | 8 | 0 | 11% |
| sight-reading | 6 | 2 | 11% |
| *solfège* | 6 | 0 | 8% |
| solo practice | 5 | 0 | 7% |
| instrumental training | 3 | 1 | 5% |
| listening | 3 | 1 | 5% |
| interval training | 1 | 2 | 4% |
| fixed pitch training | 2 | 0 | 3% |
| teaching others | 2 | 0 | 3% |
| accompanying | 1 | 1 | 3% |
| composition | 0 | 2 | 3% |
| numbers | 1 | 0 | 1% |
| shaped notes | 1 | 0 | 1% |

*Research Question 2: How do musicians assess the value of solmization systems for pitch internalization?*

Participants were asked which solmization system they most often used for sight-singing (ASQ2.13). Almost half indicated the use of movable-*do* syllables, with *do*-minor slightly ahead of *la*-minor. Including the use of scale-degree numbers, 59% of all participants used solmization dependent on tonality for sight-singing. (See Table 15.)

Table 15

*Solmization for Sight-singing*

| AP/RP Quartile | *do*-minor | *la*-minor | numbers | fixed-*do* | neutral |
|---|---|---|---|---|---|
| HQ (*n*=21) | 30% | 25% | 10% | 0% | 35% |
| LQ (*n*=22) | 32% | 18% | 5% | 5% | 32% |
| AP (*n*=14) | 21% | 0% | 14% | 7% | 57% |
| All (*N*=100) | 26% | 24% | 9% | 6% | 33% |

Participants also identified all strategies other than solmization that they used for sight-singing. (See Table 16 for responses to ASQ 2.14.) Choices were thinking intervals from note to note, imagining the sound of each tone individually, thinking about the relationships of the letter names, imagining fingering on an instrument, and no particular strategy. An "other" blank encouraged reporting additional possibilities.

Table 16

*Strategies Other Than Solmization for Sight-singing*

| Participant group | Intervals | Indiv. tones | Letter names | Instr. fingering | No strategy | Multiple strategies |
|---|---|---|---|---|---|---|
| HQ (*n*=21) | 91% | 29% | 24% | 52% | 0% | 81% |
| LQ (*n*=22) | 73% | 18% | 0% | 41% | 9% | 32% |
| AP (*n*=14) | 71% | 86% | 21% | 36% | 7% | 93% |
| All (*N*=100) | 75% | 27% | 17% | 47% | 11% | 64% |

Six participants wrote additional responses to this question (ASQ 2.14) in the "other" blank. One mentioned: "hearing the shape of the melody," a contour strategy. The other five responses clearly showed perception of underlying harmony: "harmonic structure," "tonic-dominant and other functional interval relationships," "chordal outlines vs. scalar," "relating to tonic triad and other triads," and "harmonic relationships."

Participants were also asked to indicate all the strategies they used for melodic dictation (ASQ 2.16). "Think by intervals from one pitch to the next" was the choice most often selected. Other choices were "convert sounds to syllables," "convert sounds to numbers," "think how it would feel on an instrument," "convert sounds directly to letter names," and an open-ended "other" blank to describe the strategy. Table 17 indicates the frequency of response for each strategy and for the use of multiple strategies.

Table 17

*Strategies for Melodic Dictation*

| AP/RP Quartile | Syllables | Numbers | Fingering | Letters | Intervals | Multiple |
|---|---|---|---|---|---|---|
| HQ (*n*=21) | 38% | 19% | 43% | 48% | 76% | 90% |
| LQ (*n*=22) | 41% | 18% | 23% | 18% | 68% | 67% |
| AP (*n*=14) | 7% | 14% | 29% | 57% | 43% | 43% |
| All (*N*=100) | 35% | 17% | 35% | 30% | 71% | 70% |

"Other" responses (*n*=7) for melodic dictation indicated thinking about the implied harmony. Some participants looked for patterns in tonal relationships and in the rhythmic context. Others mentioned reference pitches. One frankly said, "Guess!" Responses for this question (ASQ 2.16) are quoted in Appendix D.

*Research Question 3: If musicians learned to internalize pitch through solmization, do they consciously continue to think through syllables for pitch internalization?*

Most musicians are exposed to solmization systems at some point in their training. Table 18 shows how many participants in this study had tried each solmization system for sight-singing (ASQ 2.15). An overwhelming 93% of the participants in this study had tried some kind of solmization, and 71% had tried more than one system. Because most college aural skills instruction does require solmization, this was not surprising. More participants (64%) had tried scale-degree numbers than any other system. LQ participants indicated less experience overall with solmization systems than HQ participants, except for fixed-*do* and movable-*do* with *do*-minor.

Table 18

*Solmization Systems Tried*

| Quartile | fixed-*do* | *do*-minor | *la*-minor | numbers | letters | multiple |
|---|---|---|---|---|---|---|
| HQ (n=21) | 10% | 33% | 52% | 76% | 52% | 81% |
| LQ (*n*=22) | 14% | 41% | 32% | 46% | 32% | 45% |
| AP (n=14) | 43% | 50% | 36% | 86% | 71% | 93% |
| All (*N*=100) | 24% | 43% | 45% | 64% | 54% | 71% |

In anticipation of the discrepancy between the large number of musicians who had been exposed to a solmization system and those who did not continue to use it, another question (ASQ 2.20) was specifically directed to confident auralizers: "If you no longer need to use tonal syllables, describe what enabled you to quit using them." Of the 76 participants who considered themselves confident auralizers, 34 participants (45%) reported using syllables at least some of the time to auralize unfamiliar music. Among the 39 participants who shared their reasons for no longer using syllables to auralize, the most frequent response (*n*=11) was that they never needed them. Nine more cited familiarity with notation, and six others said they had little need for them in their current musical tasks. Four mentioned interval training and two others mentioned understanding chord relationships.

Of the 21 HQ participants, 11 reported using syllables at least some of the time, though three indicated little need for them in their current musical tasks. For the remaining ten participants who did not use syllables at all, the most frequent free response indicated ease with notation (*n*=4), followed by interval training (*n*=2). Two

indicated that they never needed syllables. One credited *Scalesthenics*, a specific sight-singing approach (Milford, 1992), and another mentioned chord training. These free responses are reported not for statistical purposes, but to indicate the variety of reasons participants no longer use solmization. Responses to ASQ 2.20 are quoted in Appendix E.

*Research Question 4: How do musicians in various professions rate their own pitch internalization skills and needs?*

The open-ended question for "current profession" (ASQ 1.13) made it impossible to code explicitly for different professions. As mentioned previously, several participants were members of more than one of the groups in this study. Several have both performing and teaching jobs, and others teach more than one type of course. A few are employed outside the music profession as well. Some listed their profession simply, "musician." For these reasons the four vocational groups described in Chapter 3 served as the basis for comparison for this research question as well.

Eight survey questions (ASQ 2.5-2.12) asked participants to rate their confidence in aural skills and strategies on a 5-point Likert-type scale with "5" indicating the greatest confidence and "1" the least confidence. The first five questions concerned tasks all the musicians had likely encountered: sight-singing a tonal melody, auralizing an unfamiliar melody, identifying melodic intervals, sight-singing an atonal melody, and notating a familiar melody. Table 19 is a compilation of the self-assessments for confidence in performing these tasks.

Table 19

*Self-assessed Confidence in Aural Skills*

| Participant groups | sight-sing tonal melody | auralize unfamiliar melody | identify melodic interval | sight-sing atonal melody | notate known melody |
|---|---|---|---|---|---|
| Indp. teachers (*n*=30) | 4.07 | 4.33 | 4.32 | 3.03 | 4.07 |
| K-12 teachers (*n*=25) | 4.04 | 3.84 | 3.88 | 2.54 | 3.72 |
| College faculty (*n*=22) | 4.36 | 4.27 | 4.54 | 2.91 | 4.32 |
| Orchestra (*n*=23) | 3.26 | 3.87 | 3.74 | 2.13 | 3.7 |
| All (*N*=100) | 3.94 | 4.09 | 4.13 | 2.7 | 3.95 |

*Note.* Mean ratings on 1-5 Likert-type scale.

Participants also rated their confidence with the three instructional strategies presented in Table 20. Kodály training often involves the use of Curwen hand signs to indicate tonal patterns and relationships within the scale. There was little indication from this study that musicians outside the public schools have learned to use them to any great extent. Participants at every research session except the public school in-service workshops asked for an explanation of the term, and eight did not indicate any rating. Because the scale did not go lower than 1, confidence with hand signs for groups other than the K-12 teachers would likely be even lower than indicated in this comparison. Independent teachers as a group were more confident with numbers for sight-singing, while all other groups indicated more confidence with syllables, especially the K-12 teachers. Among all the groups, orchestral musicians were clearly less confident with both the sight-singing tasks and the specific sight-singing strategies listed in Tables 19

and 20. Their instrumental training likely did not emphasize such strategies, and sight-reading on an instrument did not demand the same cognitive process for them.

Table 20

*Confidence With Tonal Strategies*

| Participant groups | Use Curwen hand signs | Sight-sing with syllables | Sight-sing with numbers |
|---|---|---|---|
| Indp. teachers (n=30) | 2.00 | 2.89 | 3.45 |
| K-12 teachers (*n*=25) | 3.96 | 4.12 | 3.12 |
| College faculty (*n*=22) | 1.38 | 3.67 | 3.59 |
| Orchestra (*n*=23) | 1.24 | 2.43 | 2.38 |
| All (*N*=100) | 2.22 | 3.28 | 3.17 |

*Note.* Mean ratings on 1-5 Likert-type scale.

Another open-ended question (ASQ 2.21) concerned the importance of pitch internalization in musicians' daily activities. Table 21 shows the frequency of responses among the 100 participants. Multiple reasons were cited by 36 participants, though 12 left the question blank. "Knowing sound before playing" is a very general reason which would include most all the others. "Choosing music" and "error detection" also overlap the general category, "teaching." Some differences were noted between the orchestra members and the other groups. All six participants who indicated that auralization was not important to them were orchestra members, and all who did indicate its importance for intonation were orchestra members. No orchestra members listed choosing music or improvisation. All other reasons were found among participants in all groups. All

responses to ASQ 2.21 are recorded in Appendix E.

Table 21

*Importance of Auralization in Daily Activities*

| Reason | Frequency |
|---|---|
| Knowing sound before playing | 29% |
| Teaching | 20% |
| Singing | 20% |
| Error detection | 14% |
| Choosing music | 12% |
| Mental Practice | 11% |
| Composition | 9% |
| Improvisation | 7% |
| Listening enjoyment | 5% |
| Analysis | 4% |
| Intonation | 4% |
| Not important | 6% |

*Research Question 5: Are the metaphors proposed in previous research with students also descriptive of strategies for pitch internalization for the professional musicians in this study?*

Participants answered all the survey questions and aural tasks before the metaphors along with their definitions were provided. All but two of the 100 participants answered the questions regarding the metaphors. Three participants simply answered

affirmatively without identifying the metaphor, but all others ($n$=95) identified one of the metaphors or a combination of them to characterize their strategies for sight-singing and auralization. One or more of the metaphors were chosen by 84 participants to describe their sight-reading strategies as well. Of the 16 participants who did not choose a metaphor for sight-reading, five did not answer the question, and nine indicated that the metaphors did not describe their sight-reading on an instrument. Sight-reading was not the primary focus of the research, but the question was included to see if participants recognized a cognitive difference between sight-reading on an instrument and either auralization or sight-singing. Results were analyzed to see if participants chose the same or different metaphors for sight-reading on an instrument. Indeed, 38 indicated the Button-pusher metaphor either alone or in combination with other metaphors to describe their strategy for sight-reading on an instrument, while only 13 chose that strategy for sight-singing and 16 for auralization. A few differences appear between metaphors chosen for sight-singing and for auralization, though the differences are much less than between sight-reading and either of the other musical tasks. Table 22 indicates the frequency of all metaphors participants chose to describe their strategies. Participants agreed that the metaphors described their strategies for sight-singing, sight-reading, and auralization. Both professional groups and quartile groups have been included in these comparisons. Tables 23, 24, and 25 show the percentages of participants who chose each metaphor for these three tasks.

Table 22

*Self-ascribed Metaphors for All Participants*

| Musical task | Follower | Button-Pusher | Contour-singer | Tonal-thinker | Builder | Pitcher |
|---|---|---|---|---|---|---|
| Sight-singing | 6% | 16% | 5% | 67% | 41% | 11% |
| Sight-reading | 2% | 38% | 6% | 29% | 31% | 10% |
| Auralizing | 0% | 13% | 10% | 60% | 34% | 10% |

*Note.* (*N*=100)

Table 23

*Self-ascribed Metaphors for Sight-singing*

| Participant Group | Follower | Button-pusher | Contour-singer | Tonal-thinker | Builder | Pitcher |
|---|---|---|---|---|---|---|
| AP/RP Quartiles | | | | | | |
| HQ (*n*=21) | 5% | 5% | 5% | 86% | 33% | 0% |
| LQ (*n*=22) | 23% | 36% | 13% | 55% | 41% | 5% |
| AP (*n*=14) | 0% | 0% | 0% | 29% | 21% | 71% |
| Vocational Group | | | | | | |
| Indp. Teachers (*n*=30) | 6% | 9% | 3% | 60% | 44% | 19% |
| K-12 teachers (*n*=25) | 12% | 16% | 0% | 84% | 40% | 4% |
| College faculty (*n*=22) | 5% | 5% | 9% | 77% | 14% | 14% |
| Orchestra (*n*=23) | 0% | 35% | 9% | 48% | 65% | 4% |
| All (*N*=100) | 6% | 16% | 5% | 67% | 41% | 11% |

Table 24

*Self-ascribed Metaphors for Sight-reading*

| Participant Group | Follower | Button-pusher | Contour-singer | Tonal-thinker | Builder | Pitcher |
|---|---|---|---|---|---|---|
| AP/RP Quartiles | | | | | | |
| HQ (*n*=21) | 0% | 14% | 0% | 45% | 30% | 5% |
| LQ (*n*=22) | 0% | 55% | 14% | 23% | 23% | 0% |
| AP (*n*=14) | 0% | 14% | 0% | 46% | 39% | 46% |
| Vocational Group | | | | | | |
| Indp. Teachers (*n*=30) | 3% | 25% | 9% | 28% | 28% | 15% |
| K-12 teachers (*n*=25) | 0% | 48% | 12% | 24% | 24% | 4% |
| College faculty (*n*=22) | 0% | 32% | 0% | 36% | 23% | 9% |
| Orchestra (*n*=23) | 4% | 52% | 0% | 30% | 52% | 9% |
| All Participants | | | | | | |
| (*N*=100) | 2% | 38% | 6% | 29% | 31% | 10% |

Table 25 shows the five metaphors participants chose for auralization strategies, which is the specific focus for this study. (The Follower metaphor would be an impossible choice for auralization, since it is an individual and silent activity.) The notable difference between the Tonal-thinker and Builder for HQ and LQ and among the professional groups will be discussed further in Chapter 6.

Table 25

*Self-Ascribed Metaphors for Auralizing*

| Participant Group | Button-pusher | Contour-singer | Tonal-thinker | Builder | Pitcher |
|---|---|---|---|---|---|
| AP/RP Quartiles | | | | | |
| HQ (*n*=21) | 5% | 10% | 86% | 29% | 0% |
| LQ (*n*=22) | 18% | 18% | 46% | 41% | 5% |
| AP (*n*=14) | 0% | 7% | 43% | 23% | 62% |
| Vocational Group | | | | | |
| Indp. Teachers (*n*=30) | 3% | 3% | 60% | 40% | 20% |
| K-12 teachers (*n*=25) | 16% | 12% | 76% | 32% | 8% |
| College faculty (*n*=22) | 14% | 9% | 62% | 14% | 9% |
| Orchestra (*n*=23) | 22% | 17% | 30% | 48% | 0% |
| All participants | | | | | |
| (*N*=100) | 13% | 10% | 60% | 34% | 10% |

Among undergraduate students in Thompson (in press), second-year ear-training students indicated more combinations of strategies than did freshmen, especially the combination of tonal thinking and interval building. This mixed metaphor has been designated the Tone-Builder. Among the professionals in this study the use of multiple strategies was even more evident. Many participants (44%) chose both Tonal-thinker and Builder metaphors. Multiple strategies appeared in the scripts for 82 participants.

*Usefulness of the metaphors.* Two criteria pertain to the usefulness of the metaphors. First, the metaphors could be considered useful if participants agreed that they accurately described their own strategies. Conversely, they seem appropriate if participants could think of no better ways to describe their strategies. If participants could conceive of no other strategies for internalizing pitch, the metaphors might stand as a representative catalog of strategies. Second, if several music educators could identify the same metaphorical strategies in participants' scripts for their aural tasks, then the metaphors could be considered an effective means of communication. Strategies which do not fit the definitions of the metaphors should challenge the catalog of metaphors. In discussing these results the term *strategy* has been reserved for each cognitive tool that participants indicated in their scripts. Participants described their strategies before they were introduced to the metaphors for pitch perception. The term *metaphor* represents both the participants' choice of characterizations for their own strategies and the labels later applied by the music educators who analyzed the scripts.

Results indicated that participants readily accepted the metaphorical characterizations of their strategies. Furthermore, comments from many participants after they completed the surveys provided anecdotal evidence, as did many responses to open-ended questions in the survey. One wrote, "These are great descriptions – thank you for them." Another teacher commented, "I think your categories are descriptive and cover virtually every approach I've encountered in teaching." An AP participant wrote, "I think the 'Pitcher' metaphor is a perfect description of what I do."

After being introduced to the metaphors, ten participants even used them immediately to answer the final question (SS3E) on the survey, which asked them to

reflect upon changes in their thought processes since college instruction began. One participant claimed, "Before college [I] started out as 'Button-pusher' and still use this strategy some but am now primarily a 'Tonal-thinker' after college ear-training/sight-singing classes." Another participant stated his evolution in these terms: "I imagine I was more of a Follower, Button-pusher, and/or Builder when I began college instruction, and gradually evolved into a Tonal-thinker over time." Another participant also said that she "changed from the Follower to the Tonal-thinker and Builder." Yet another indicated he is currently "much more Tonal-thinker for melodies and Builder for tuning." The ease with which these participants expressed themselves so soon after reading the descriptions of the metaphors demonstrated their effectiveness for communication.

The usefulness of the metaphors for instruction also depends on the ease in which teachers can analyze participants' scripts in the metaphorical terms. Not only must teachers and students alike associate the definitions of metaphors with strategies, but they must also be able to link the metaphor with other terms they use to describe their strategies. Can a teacher apply these metaphors consistently given the words students use to describe their strategies? This question was answered in this study by having two music educators other than the researcher analyze the participants' scripts for metaphors. A vocal music teacher and a college teacher independently studied the scripts for evidence of the metaphors. The observations of the vocal music teacher compared with mine were the same in all but 10 cases initially. After discussion we agreed on all. (In most of these cases one of us identified only one strategy where the other saw more than one.) The college teacher's later assessments were also very similar to mine, and the few that were different were easy to discuss and clarify. The purpose of using the metaphors

is to discuss cognition, not simply to pigeon-hole someone's strategies, so some variance would be tolerable. In the aural skills class such clarification would benefit both the teacher and the student's understanding of the process. All of us noticed a few scripts which were ambiguous, as well as some strategies which seemed to go beyond, or were more specifically defined, than the six metaphors which were originally proposed. Both colleagues remarked how easy it was to determine the metaphors in most of the scripts, and how readily we agreed in our analyses. Examples of the scripts and their evaluations appear in Appendix G.

*Evidence of Strategies in Scripts*

Before reporting the frequencies of the metaphors found in participants' scripts, typical scripts from the aural tasks are presented here which the three analysts agreed were exemplars for each metaphor, except for the Follower. Even though some participants indicated that they were Followers on occasion, the nature of the tasks in this survey demanded individual response. Appropriately, the Follower strategy was not found in the scripts.

*The Button-pusher.* Scripts involving fingerings or instruments were linked with the Button-pusher metaphor. Pianists mentioned "visualizing the keys." One described the kinesthetic sensation: "I feel each note as on a piano keyboard." A violinist indicated fingering and connection with letter names, "Thought Ab – $4^{th}$ finger skip to F."

*The Contour-singer.* The Contour-singer metaphor sometimes included comparing pitches in a non-specific context, i.e., "direction of notes" and "contour and prediction seemed right." Some referenced one of the other tones: "The second pitch and the final pitch were different." Another "listened to hear if [the third pitch] was higher or

lower than the initial pitch played."

*The Tonal-thinker.* Scripts involving *solfège* or numbers indicated the Tonal-thinker metaphor. Many just said, "used syllables," "*solfège*," or "thought about key and numbers in relation to pitches." Others reasoned, "I knew this [second pitch] wasn't *ti* or *la*," and "thought *do* on Eb and listened for *la* at beginning." One described tonal thinking through numbers: "In my mind I auralize the tonic...From that I know the sound, or rather I anticipate the sound of 2-4-7-5-1." Another mentioned both syllables and numbers: "Eb orientation to *solfège* used. First leap 1 to 5."

*The Builder.* Scripts which included distance between pitches, interval qualities, or half-step references illustrated the Builder metaphor. Some simply marked intervals under the notes ("m3...2nd"). Another script was quite complete in terms of interval analysis: "1st and 3rd notes ½ step apart, 2nd note and last were a whole step apart; major 3rd from 3rd note." Another described preparing for the aural task "by being alert for the tri-tone in [choice] A or the step motion Eb-E in [choice] B." For the atonal task one wrote, "The beginning pitch was a half step lower than the ending pitch (up an octave)."

*The Tone-Builder Combination.* Scripts which refer both to *solfège* and to intervals indicated both Tonal-thinker and Builder strategies. As in Thompson (in press), I have used the mixed-metaphor, "Tone-Builder" to designate this combination. Examples of the Tone-Builder combination in scripts included, "The first three pitches were *la do mi,* the G to Ab sounded like a half step..." and "The last interval was *sol-do*, so I worked backwards by intervals." Two scripts also defined the-Tone-Builder in general terms: "I used the intervals from the given tonal center" and "interval recognition; key feeling." Often the perfect fourth interval was mentioned in context with

*sol* and *do*, as in "4th down from *do* (*sol*)." Sometimes the intervals were connected with numbers: "I heard the descending P4, then responded to 4-2-1 the next 3 notes of the fragment."

*The Pitcher.* The Pitcher metaphor was often obvious because the scripts mentioned perfect pitch: "I heard the pitch. I have perfect pitch." One simply said, "Heard these particular pitches." Another said, "I followed the notes of [choice] A until I heard a wrong pitch...." One described specific pitches: "I heard E instead of F# as the third note." Another more subtle indication was the marking of the flats in the notated task (AT3). A Tonal thinker would hear these within the key, not as absolute pitches.

*Ambiguous and incomplete Scripts.* Some scripts were too incomplete to analyze effectively, and in a few cases no scripts were provided along with the answers. Some scripts were incomplete because participants relied on guessing or on some level of intuition or perception that they found hard to express. A few admitted guessing, or partially guessing, i.e., "Third note was half step above first. Past that I'm guessing." Incompleteness may also be explained in script analysis for experts because the cognitive process is difficult to separate into component strategies. By nature some participants were better able to analyze the components; some may have chosen to express only the most prominent strategy.

Other scripts that were ambiguous in terms of the metaphors mentioned reference pitches. If a reference pitch is the tonic pitch, then this strategy could be characterized as the Tonal-thinker. Often the reference pitch was listed along with an interval, i.e., "I related the E to the Eb, then measured the other intervals." When used in combination with other strategies, it might provide an extra check point or anchor to support Tonal-

thinker or Builder strategies. For example, one participant wrote, "I related the first pitch ahead of time [before the example was played] to the given pitch." In this case it is impossible to tell from the explanation whether the relationship was figured by interval or by function in the scale. In other cases the reference pitches were not related to intervals or tonal function, i.e., "I thought the third note was lower than D," and "The second pitch and the final pitch were different." Listening for a reference pitch was mentioned in scripts of 37 participants. The analysts agreed that scripts which mentioned reference pitches without other strategies were most similar to the Contour-singer strategy, where pitches are related to each other mainly by the visual contour of the notation, along with one fixed point of reference. Reference pitch thinking does involve a sense of tonal memory as well. However, without the stimulation of tonal or intervallic thinking it remains an imprecise tool for most aural tasks.

*Analysis of Metaphors in Scripts*

Table 26 shows the frequencies of metaphors based on the music educators' analysis of all the scripts for each participant. In this table the percentages are given for the Button-pusher, Tonal-thinker, Builder, and Pitcher if only that one strategy appeared in the script. Though evidence for the Contour-singer metaphor was found seven times, participants always reported it in combination with another strategy. Similarly the Button-pusher metaphor alone was observed in one script, but in 16 others along with other strategies. The Pitcher metaphor was observed alone for three participants and in combination for nine more. Most participants' scripts (83%) mentioned combinations of strategies. The most often cited combination was Tonal-thinker and Builder (Tone-Builder).

Table 26

*Determination of Metaphors from Aural Task Scripts*

| Participant Group | Button-pusher | Tonal-thinker | Builder | Pitcher | Tone Builder | Other Comb. |
|---|---|---|---|---|---|---|
| AP/RP Quartiles | | | | | | |
| HQ (*n*=21) | 0% | 0% | 5% | 0% | 86% | 9% |
| LQ (n=22) | 0% | 5% | 18% | 0% | 56% | 32% |
| AP (*n*=14) | 0% | 7% | 0% | 21% | 50% | 21% |
| Vocational Group | | | | | | |
| Ind. Teachers (n=30) | 0% | 13% | 10% | 10% | 60% | 7% |
| K-12 teachers (n=25) | 4% | 4% | 0% | 0% | 76% | 16% |
| College faculty (n=22) | 0% | 5% | 5% | 0% | 82% | 9% |
| Orchestra (n=23) | 0% | 4% | 9% | 0% | 61% | 27% |
| All Participants | | | | | | |
| (N=100) | 1% | 7% | 6% | 3% | 69% | 14% |

*Correspondence of Metaphors and Scripts*

Self-ascribed metaphors for aural tasks matched the music educators' analysis of scripts in 94 of 100 cases. The remaining six cases included two participants who simply answered "yes" when asked if the metaphors described their strategies. (See Table 27.) This correspondence was determined by comparing all the metaphors participants identified for themselves for both sight-singing (SST.3A) and auralizing (SST.3C) with all the strategies music educators found in the scripts for the four auralization tasks and

the sight-singing task. (Metaphors chosen for sight-reading on an instrument were not included in this comparison because there were no sight-reading performance tasks in this study.)

Table 27

*Self-ascribed Metaphors Matched With Analysis of Scripts*

| Comparison of metaphors and strategies | Percentage ($N$=100) |
|---|---|
| All metaphors in scripts | 31% |
| Two of multiple metaphors in scripts | 13% |
| One of multiple metaphors in scripts | 50% |
| Incomplete information or mismatch | 6% |

*Additional Strategies and Metaphors*

Even though strongly encouraged to suggest additional metaphors or strategies, 82% of the participants could not think of a better way or a different way to describe their thought processes. Some of the additional strategies which were suggested appeared similar to one of the metaphors already described. One reiterated a contour strategy: "I think of the shape of the melody." Another response was similar to the Pitcher: "I hear the pitch of each note without relating it to names or numbers, intervals – just the sound." Another was essentially the Tonal-thinker strategy: "I always went back to *do*. If there is a tough interval or cadence – I will hear the *do* and go up either in triad or scale until I can hear the target pitch." Perhaps the next could be an enlarged view of the Tonal-thinker: "Relate to 'Gestalt,' trying to think how individual notes relate to the whole of being in a key." Another suggested a visual component to the Button-Pusher metaphor: "I

also visualize (not as actively as I used to, but still some) a piano keyboard – I do not 'push the notes,' but my mind sees a note, then the piano note – second, I sing it." Three instrumentalists mentioned the aural connection a Button-pusher strategy might yield. One asserted, "Sometimes I hear the instrument in my head," and another, "In atonal music, I hear the notes on my instrument." One violinist commented after completing the survey that "Finger-flopper" might replace Button-pusher for his particular strategy.

Other responses to this request for additional metaphors indicated combinations of strategies, such as, "Fingering with interval awareness" (Button-pusher and Builder), and "I see both the interval and the location in the scale in my head to determine the sound" (Builder and Tonal-thinker). Some indicated using blended strategies in particular for atonal music. One admitted, "In music that changes tonalities often, I tend to use 'building' skills as well, though I still think of the isolated interval in *solfège*, even if it's not correct diatonically." One participant analyzed her blend of strategies in these terms: "Since I do not have AP – I would say my abilities could best be described: Builder 30%, Pitcher 70%. I can use my 'Builder' skills somewhat when transposing." This puzzling response, coming from one who did not claim to have AP, is discussed in Chapter 5. (All responses for this survey question are recorded in Appendix F.)

Though many indicated that the metaphors or combinations of them covered all the possibilities, a few participants did mention additional strategies, or more specific strategies, within broader ones. When asked if any of the metaphors describe the way you approach sight-singing or auralization, one participant responded, "No, not precisely. Mine is more like a combination of Button-pusher, Contour, and Tonal-thinker, yet there still is some part of the approach's description missing (maybe a scanning technique

might help the description)." Others mentioned looking for patterns. One suggested, "seeing repeated patterns in music and hearing." Another described it more completely: "I hear structure and tendencies. In other words, my goal from the outset is to look for patterns."

A more specific strategy that also fits into the category of pattern-seeking is harmonic thinking, which was mentioned in several ways. One claimed, "I think how the pitches fit harmonically." Another saw harmony as an extension of tonal thinking: "My 'triad' referencing is actually tonal thinking, but somewhat different and is more contextual." Harmonic thinking was mentioned by 34 participants. All three analysts independently recognized its presence. Several references were made to recognizing dominant seventh chords, i.e., "I could hear the chord the first four notes outlined: V7." Others mentioned the minor chord in the melody for Aural Task 2, i.e., "outlines the c minor triad—vi in Eb," and "thought cm triad to check for [choice] A or B." Because harmonic thinking was so prevalent in the scripts and because a few participants actually suggested it as an additional strategy, I have concluded that another metaphor should be added to the catalog. Combining the "scanning technique" to look for patterns suggested in some scripts with the recognition of harmonic or chord structure in several others, the term "chunking" comes to mind. This term, which has been in educational literature for half a century, was defined in Butler (1992) as "a perceptual group" (p. 223). Marvin (1995) also spoke of harmonic thinking in terms of chunking. The metaphor proposed here for this blend of tonal thinking and pattern seeking for internalizing pitch is "The Chunker."

*The Chunker*. Chunkers scan the score for patterns in music which have been

previously heard and identified. This strategy combines tonal thinking and/or interval building into chord structures or melodic patterns which musicians identify both visually and aurally. This combination may be related also to the kinesthetic sense which pianists develop to allow them to block (or "chunk") various melodic figurations or arpeggiations under their hands. An effective harmonic Chunker must be able to classify letter names, intervals, and accidentals into larger units of information and to identify chords in their various positions and inversions quickly. Melodic Chunkers might see cadential melodic figures, chord arpeggiations, or sequences which help them quickly retrieve the sound from their storehouse of tonal patterns. They might also see structural pitches with various embellishments which are also housed in their aural memory. The Chunker metaphor was evaluated during interviews with the second stage participants. Chapter 5 contains further discussion of this strategy.

*Comparison of Strategies for Aural Tasks*

Several responses quoted above indicated growth from Button-pusher and Contour- singer toward Tonal-thinker, Builder, or Tone-Builder, and some also toward harmonic thinking. Two questions have emerged from the data already discussed. Are the metaphors effective in discussing students' growth in aural skills? Do they indicate more and less effective strategies for aural tasks? Two comparisons seem relevant to these questions. The first involved looking for differences between the strategies which yielded correct and incorrect answers for each aural task. Second, a general comparison between HQ and LQ participants' strategies might suggest ways to encourage weaker students to move toward more effective strategies for the aural tasks. In this section comparisons were based on the metaphors which the music educators identified in the scripts.

A brief review of the aural tasks is presented here for reference. For each aural task participants were given two notated melodies similar in contour. They were asked to choose which melody was played for them, A or B, or to notate the melody if it were different from either choice. The reference pitch notated in the final measure was sounded before each melody was performed. In the tables which follow, the percentages for the single metaphors—Button-pusher (Bp), Contour-singer (Cs), Tonal-thinker (Tt), Builder (B), and Pitcher (P)—indicate that only one metaphor was found in the script for the task. The Tone-Builder (TB) percentage includes any combination that includes both the Tonal-thinker and Builder metaphors, unless the harmonic thinking strategy appeared in the script. The percentage for harmonic thinking (Ht) includes all participants who included harmonic thinking in combination with any other strategies. Scripts which mentioned multiple strategies other than Tone-Builder or harmonic thinking are shown as other combinations (OC).

*Aural Task 1.* For Aural Task 1 (AT1) the given pitch F was the starting pitch (see *Figure 1*). The choice between the notated melodies was essentially between a much more likely cadential melodic pattern, which was played, and a non-cadential melody, though both were diatonic and could be understood in the context of Eb Major. The melody played had strong V7 to I harmonic underpinning, though only 15 participants mentioned the harmonic implication. Responses from 96 of the 100 participants were correct. Two of the four who answered incorrectly did not indicate a script, and the others tried the Button-pusher and Contour-singer strategy without success. Table 28 indicates the analysis of the scripts for AT1.

*Figure 1.* Aural Task 1.

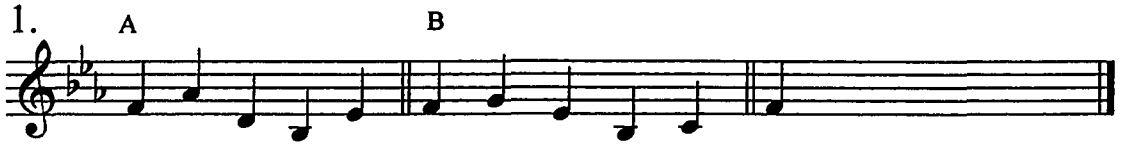



Table 28

*Frequency of Metaphors in Scripts for Aural Task 1*

| Response | Bp | Cs | Tt | B | P | Ht | TB | OC | Blank |
|---|---|---|---|---|---|---|---|---|---|
| Correct (*n*=96) | 1 | 1 | 15 | 33 | 7 | 15 | 15 | 2 | 7 |
| Incorrect (*n*= 4) | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

Note. Bp = Button-pusher; Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; P = Pitcher; Ht = Harmonic thinking; TB = Tone-Builder; OC = Other combination

*Aural Task 2.* Both choices in Aural Task 2 (AT2) had strong harmonic implications (see *Figure 2.*)The contrast between them was the C Minor tonality as opposed to the V7 to I in Eb Major. The given pitch Eb was the final pitch for each choice, purposefully chosen because it could be easily interpreted in either tonal context. Responses were mostly correct (93%), though again many did not mention the minor harmony in their scripts. (See Table 29.)

*Figure 2.* Aural Task 2.

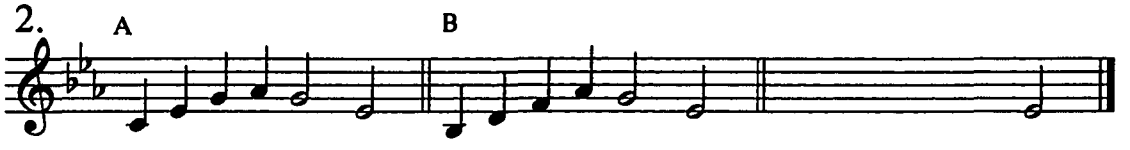


Table 29

*Frequency of Metaphors in Scripts for Aural Task 2*

| Response | Bp | Cs | Tt | B | P | Ht | TB | OC | Blank |
|---|---|---|---|---|---|---|---|---|---|
| Correct ($n$=93) | 0 | 6 | 14 | 21 | 5 | 26 | 7 | 2 | 12 |
| Incorrect ($n$=7) | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 2 |

*Note.* Bp = Button-pusher; Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; P = Pitcher; Ht = Harmonic thinking; TB = Tone-Builder; OC = Other combination

*Aural Task 3.* The third task (see Figure 3) proved to be the most difficult in terms of correct responses. Involving the hearing and remembering of both pitch and rhythm, melodic dictation is more difficult than sight-singing and also demands a thorough knowledge of the notational symbol system of music. Only 57% of participants correctly notated the melody. The two choices and the melody actually performed had the same contour, but the second pitch was *sol* rather than *ti* or *la*. The first (given pitch) and last three pitches actually matched choice B, which participants indicated in 32 of the 43 incorrect responses. No participant indicated choice A which had two incorrect pitches. The other nine participants attempted to notate the melody correctly but failed to do so. (See Table 30.) There was a preponderance of Builders who answered incorrectly.

*Figure 3.* Aural Task 3.

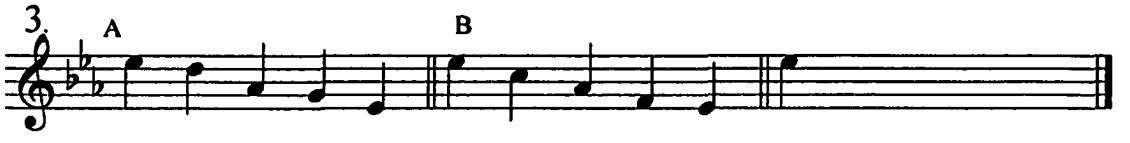


Table 30

*Frequency of Metaphors in Scripts for Aural Task 3*

| Response | Bp | Cs | Tt | B | P | Ht | TB | OC | Blank |
|---|---|---|---|---|---|---|---|---|---|
| Correct (*n*=57) | 0 | 0 | 10 | 15 | 6 | 5 | 7 | 2 | 12 |
| Incorrect (*n*=43) | 0 | 3 | 5 | 28 | 0 | 1 | 3 | 0 | 7 |

*Note.* Bp = Button-pusher; Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; P = Pitcher; Ht = Harmonic thinking; TB = Tone-Builder; OC = Other combination

Aural Task 4 (see Figure 4) involved a 5-note atonal fragment. Again the choices had the same contour, and this time the first pitch (given) and the second pitch were the same in both choices. The last three notes of both choices had the same relationship to each other; they both outlined major-minor seventh chords (F#7 and E7). Many scripts for correct responses mentioned comparing the 1st and 3rd notes, which were a half-step apart. In this case scripts which mentioned the reference pitches being a half-step apart indicated to analysts the Builder metaphor. Most participants appropriately chose the Builder strategy for this task, but it is notable that several Tonal-thinkers heard the last note as *ti*, compared to the first note as *do*. (See Table 31.)

*Figure 4.* Aural Task 4.

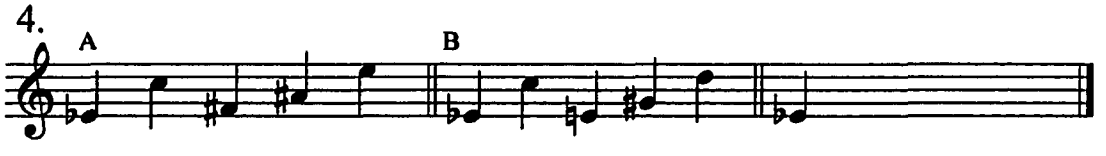


Table 31

*Frequency of Metaphors in Scripts for Aural Task 4*

| Response | Guess | Cs | Tt | B | P | Ht | TB | OC | Blank |
|---|---|---|---|---|---|---|---|---|---|
| Correct (*n*=71) | 1 | 1 | 5 | 42 | 5 | 2 | 6 | 4 | 5 |
| Incorrect (*n*=28) | 2 | 4 | 0 | 16 | 1 | 0 | 0 | 0 | 5 |

*Note.* Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; P = Pitcher; Ht = Harmonic thinking; TB = Tone-Builder; OC = Other combination

*Sight-singing Task.* For the Sight-singing Task (See Figure 5), 75 participants indicated that their auralization matched the melody after hearing it performed, and 24 indicated that it did not in some way. One participant described her strategies but failed to indicate whether her auralization matched the performance. Though there could be risk of inflation in the self-assessment for this task, there is indication of more Button-pusher and Contour-singer strategies among those who indicated that their auralization did not match the performance. (See Table 32.)

*Figure 5.* Sight-singing Task.

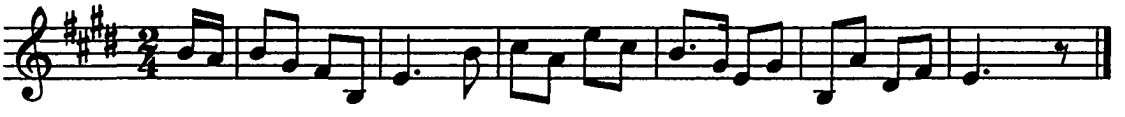


Table 32

*Frequencies of Metaphors in Scripts for Sight-Singing Task*

| Response | Bp | Cs | Tt | B | P | Ht | TB | OC |
|---|---|---|---|---|---|---|---|---|
| Correct (*n*=75) | 1 | 0 | 30 | 5 | 5 | 13 | 12 | 9 |
| Incorrect (*n*=24) | 2 | 3 | 6 | 3 | 0 | 2 | 6 | 2 |

*Note.* Bp = Button-pusher; Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; P = Pitcher; Ht = Harmonic thinking; TB = Tone-Builder; OC = Other combination

*Analysis of Responses*

Comparison of the HQ and LQ shows more reliance on the blended strategies, Tone-Builder and harmonic thinking, for HQ. That several scripts were missing for the LQ participants indicates that strategies might not have been as well-defined in their minds. All 21 HQ participants answered all aural tasks correctly, except for three who missed the atonal task. All indicated success with the SST. Among the 22 LQ participants were 18 correct responses for AT1, 16 for AT2, only 1 for AT3, and 11 for AT4, while 8 indicated success with the SST. (See Table 33.) More scripts from the LQ indicated reference pitch (Cs) strategies, and considerably more Builder strategies.

Comparison of correct and incorrect responses for sight-singing indicates that the Button-pusher and Contour-singer strategies alone were ineffective. Tonal-thinker, Tone-Builder, and harmonic thinking dominated the correct responses for both groups, as shown in Table 34.

Table 33

*Quartile Comparisons of Strategies for All Aural Tasks*

| Quartile | Response | Cs | Tt | B | TB | Ht | Missing |
|---|---|---|---|---|---|---|---|
| | | Strategies in Scripts for AT 1 | | | | | |
| HQ | correct (*n*=21) | 1 | 6 | 6 | 2 | 6 | 0 |
| LQ | correct (*n*=18) | 0 | 2 | 13 | 2 | 1 | 0 |
| LQ | incorrect (*n*=4) | 1 | 0 | 1 | 0 | 0 | 2 |
| | | Strategies in Scripts for AT 2 | | | | | |
| HQ | correct (*n*=21) | 0 | 6 | 4 | 4 | 7 | 0 |
| LQ | correct (*n*=16) | 2 | 4 | 9 | 0 | 1 | 0 |
| LQ | incorrect (*n*=6) | 1 | 1 | 2 | 0 | 1 | 1 |
| | | Strategies in Scripts for AT 3 | | | | | |
| HQ | correct (*n*=21) | 0 | 7 | 5 | 3 | 3 | 3 |
| LQ | correct(*n*=1) | 0 | 0 | 0 | 0 | 0 | 1 |
| LQ | incorrect (*n*=21) | 3 | 1 | 14 | 1 | 0 | 2 |
| | | Strategies in Scripts for AT4 | | | | | |
| HQ | correct (*n*=18) | 0 | 1 | 12 | 3 | 1 | 1 |
| HQ | incorrect (*n*=3) | 0 | 0 | 3 | 0 | 0 | 0 |
| LQ | correct (*n*=11) | 1 | 0 | 8 | 1 | 0 | 1 |
| LQ | incorrect (*n*=11) | 2 | 1 | 6 | 0 | 0 | 2 |

*Note.* Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; TB = Tone-Builder; Ht = Harmonic thinking

Table 34

*Comparison of Strategies for Sight-singing Task*

| Quartile | Response | Bp | Cs | Tt | B | P | TB | Ht |
|---|---|---|---|---|---|---|---|---|
| HQ | correct (n=21) | 0 | 0 | 11 | 2 | 1 | 5 | 2 |
| LQ | correct (n=8) | 0 | 0 | 4 | 2 | 0 | 0 | 2 |
| LQ | incorrect (n=14) | 2 | 2 | 3 | 3 | 0 | 4 | 0 |

*Note.* Bp = Button-pusher; Cs = Contour-singer; Tt = Tonal-thinker; B = Builder; P = Pitcher; TB = Tone-Builder; Ht = Harmonic thinking

*Effectiveness of Strategies*

Correct and incorrect responses for all tasks were cross tabulated with the strategies found in the scripts in terms of the metaphors. The tabulations represent 495 of 500 possible answers to the four aural tasks and one sight-singing task. (Two answers were left blank, and three scripts indicated guessing.) Table 35 shows the percentage of correct and incorrect responses for each metaphor. Again the figures for Button-pusher, Contour-singer, Tonal-thinker, Builder, and Pitcher include those scripts which yielded only one metaphor for the task. The Tone-Builder percentage includes any combination that includes both the Tonal-thinker and Builder metaphors, unless harmonic thinking appeared in the script. The percentage for harmonic thinking includes all scripts which mentioned chords or harmony alone or in any combination of strategies. Other combinations include cases where multiple strategies appeared in the scripts but did not contain the Tone-Builder combination or indication of harmonic thinking.

Table 35

*Effectiveness of Strategies for Aural and Sight-singing Tasks*

| Strategy in Scripts | Correct answers | Incorrect answers |
|---|---|---|
| Contour-singer (*n*=21) | 38% | 62% |
| Button-pusher (*n*=5) | 40% | 60% |
| Builder (*n*=160) | 73% | 27% |
| Tone-Builder (*n*=56) | 84% | 16% |
| Tonal-thinker (*n*=85) | 86% | 14% |
| Harmonic thinking (*n*=65) | 94% | 6% |
| Pitcher (*n*=29) | 97% | 3% |
| Other combination strategies (*n*=22) | 91% | 9% |
| No strategy listed (*n*=52) | 69% | 31% |
| Total (*N*=495) | 79% | 21% |

All strategies were effective for some of the cases and ineffective for others. Tonal thinking either alone or in combination with the Builder was effective most of the time. Scripts with indications of harmonic thinking proved very effective. The Builder strategy alone was not as effective as it was in combination with the Tonal-thinker. In fact, the Tonal-thinker strategy alone was approximately as effective as the combination Tone-Builder.

Findings for the second stage of the research, which consisted of 11 individual interviews, are discussed in Chapter 5. Chapter 6 includes a summary of all findings and further discussion along with applications for aural skills pedagogy.

# CHAPTER 5

## Results of the Interviews

### *Selection of the Participants*

The second stage of this study consisted of interviews with relative pitch (RP) experts to focus on the experiences and deliberate practice that enabled their effective pitch internalization. Two participants from the AP group and ten from the highest quartile (HQ) of RP participants were invited to discuss their pitch internalization skills in individual interviews. One HQ participant did not respond, but eleven participants agreed to be interviewed. The sample was purposefully chosen to include each vocational group, each major performance concentration (voice; piano; string, woodwind, brass, and percussion instruments), and both AP and RP aural skills teachers. Though limited to AP and HQ participants with RP, several were purposefully selected because their surveys indicated unusual circumstances. One was chosen because he had no private instruction before college and another because she indicated on the survey that she did not have "perfect" pitch, though her other responses demonstrated AP thinking. Still another had a degree in music education, but her primary job was outside the music profession. Participants were not selected on the basis of their pre-college experience, age, or gender, though the sample actually did include variety in these areas as well.

### *Settings for the Interviews*

The interviews occurred between two and six months after participants completed the ASQ, and all occurred within a three-week period in my office or another location suggested by the participant. Nine interviews were recorded on audio-tape for later transcription. Two participants submitted some written responses to interview questions

after telephone interviews. All participants were quite willing to share their experience and cognitive strategies, and to explore their thought processes concerning two additional melodies. In this chapter background information for each interview participant is presented first. Then the original research questions are explored again through comparisons among the interview responses. A thorough analysis of participants' thought processes for two additional melodies is presented in connection with the last question.

*Descriptions of the Participants*

Pseudonyms have been assigned to participants for ease in reporting and reading. The alphabetical names reflect the gender of the participants but have no other relationship to them.

Art was a doctoral student in music at the time of this study. Formerly a band director in the public schools, he taught clarinet at the college level, directed a church choir, and conducted both a community band and a community orchestra. His earliest recollection of singing from musical notation was from the hymnal in church in the sixth grade. He credited his growth in aural skills to learning to play the ukulele and singing from a "fake book." "I started teaching myself to sing songs out of it, and that's how I started figuring out that certain patterns of notes had particular sounds." He could internalize pitch before college instruction began, though his "wonderful instruction" in college provided "all the names for things I had been exposed to."

Bob was a certified piano tuner. He also taught guitar to high school and college students, performed as a percussionist, guitarist, and singer, and directed a church music ministry. His first pitch internalization began with singing church hymns with shaped-notes in fifth grade. He estimated that he was "more of a Contour-singer in high school

with a good aural sense of key" before college instruction provided his knowledge of key signatures. He indicated that his 23 years as a piano tuner has advanced his interval recognition, and listening to guitar students while watching the score has helped his pitch perception. Pitch internalization was especially important to him for vocal arranging.

Carl's graduate degree was in conducting. He directed choral ensembles and taught music at the college level. Though he had no private music instruction before college, he first read music playing trombone in band in elementary school. Carl was not sure when his pitch internalization began, though certainly not before his college training. In rehearsing groups while in college he supposed he "could tell when something was played wrong before he had the ability to audiate as you would for sight-reading." He trained himself to sight-sing through constant practice over one summer in preparation for graduate entrance exams. He sight-sang with movable-*do* from a textbook, checking himself on a piano and analyzing "what is that sound, and being able then to remember." His aural skills have improved by "teaching theory at one point and just doing music."

Deb was an independent piano and voice teacher with mostly pre-college students. She has accompanied and sung in church choirs. Deb first learned to read music in piano lessons at eight years of age. She played saxophone during pre-college years, but voice was her collegiate concentration. She was not sure when auralization began, but thought she "just grew into it" primarily through playing so many scales on the piano during her pre-college lessons. Accompanying for choirs and vocal students strengthened her skills, especially because of the need to think how to play a new piece in the short time between seeing new music and having to play it. Her pitch thinking has also been enriched by teaching voice and piano students, though she thinks now that her sight-

reading skills may not be as good as they once were because she had not encountered much unfamiliar music recently.

Ed served as a college music administrator, teacher, and band director at the time of the survey. He completed graduate degrees in music theory and conducting. His primary instrument was trombone. At age five he began to read music at the piano but doubts that he really could hear internally from a score before college training. He remembered that even then it did not come easily, and that he "really had to work at it" through sight-singing with movable-*do*, *la*-minor. Conducting, evaluating the sounds from his ensemble, and studying scores boosted his auralization skills after college. "I try to do a lot of internal hearing with the scores that I study."

Fran was a secondary vocal music teacher with a graduate degree in music theory. She began reading music in piano lessons at age seven, and credited her first auralization around age 13 to "listening to my mother sing alto to my dad's tenor melody," and learning to sing alto in church choir. High school and college training encouraged hearing different intervals by remembering the opening interval of various tunes, but she later realized that this strategy was not always effective. Teaching secondary vocal music and accompanying choirs caused her pitch perception skills to grow. Frustrated at first with the inability of her students to sight-read, she reported great success with the *Scalesthenics* approach to sight-singing for her junior high choruses, using scale-degree numbers, body motions, and musical imagery.

Gloria played violin in the community orchestra. She began reading music along with piano lessons at age five, and she thought she could know how the music would sound beginning with this early instruction. For the development of her aural skills she

credited growing up with parents who were musicians and being constantly surrounded by music. "I think it did just happen," she claimed. Gloria began violin lessons in elementary school. Later she majored in music education, but she has never taught music or worked in the music profession other than to perform occasionally in a quartet for various functions. She did not play her instrument for a number of years, but has been playing with the community orchestra and quartets for the last 15 years. Gloria chose the Builder metaphor for her pitch internalization during the survey research, though it became clear to her during the interview that she relied primarily on kinesthetic thinking through the piano: "I wasn't aware of that until just now. I really do visualize a keyboard."

Helen has been an elementary music teacher for 15 years. In pre-school years she began informal voice lessons with her father, a college choir director, and piano lessons, which continued through college. She played the piano by ear at first; her music reading began around age 7. Helen's mother was also an elementary music teacher, and the four children in her family often sang together in church when they were young: "I was singing alto around 7 or 8, and since I had more piano skills my dad would give me the alto part." Helen credited piano and choir with enabling her to auralize unfamiliar music by the age of 10. Though introduced to *solfège* as an undergraduate in college, post-graduate Kodály training enabled her to use syllables confidently. Helen indicated that she already "had the pitches down" from pre-college interval training: "I just had to rethink it into *solfege*." She described her current sight-reading strategy as an equal combination of intervals, *solfège*, and letter names.

Iris has taught adults as well as pre-college students in her private studio. She has

performed as a jazz pianist and as a singer in a select community chorus and has published several compositions and arrangements for piano. Though she did not admit it on the survey, her aural task responses revealed her AP perception. She began to read music at age 6 on the piano. Her early experience with saxophone likely confused her sense of pitch somewhat, but by junior high she understood the concept of "concert C." She chose not to declare that she had AP, because she could still function if the pitch is within a half-step of concert pitch, and she knew that some AP musicians cannot do that. Her teachers recognized her AP perception by junior high age, however. She cannot remember getting any instruction in sight-singing, "other than learning from my own mistakes." She identified her strategies as 70% Pitcher and 30% Builder. She credited her improvisation and jazz performing, along with teaching and playing experience, in increasing her aural "harmonic vocabulary." Iris is a passionate believer that piano students must sing; her students often auralize their pieces from notation with the piano key cover closed.

Jan taught piano and aural skills at a university. She began reading music in piano lessons at age 6 and also sang with *solfège* in elementary music class. She could not remember her first auralization experience, though she remembered being very aware of her AP in junior high choir when she could not sing the alto line of a piece she knew when it was pitched in the "wrong" key. College instruction really did not help her aural skills because she could already do the exercises, though she admitted thinking backwards, "I always heard the notes and then I would figure out what's the interval I'm supposed to write." Dictation was easy as well, though rhythm challenged her more than pitch. Mental transposition has always been difficult for Jan; she cannot look at the

notated pitch and play another very successfully. Like Iris, she can will herself to think a half-step in either direction of concert pitch. She has used *movable-do* confidently in her teaching.

Ken, a pianist and organist, taught aural skills and theory courses and served as an administrator in a state college. His piano instruction began at six, and even as a pre-teenager he played the piano for church. He remembered always being a good sight-reader and being able to read the music silently in the music stores, but could not remember when auralization began. He developed pitch internalization as "a by-product of a host of other musical experiences." His undergraduate training focused on part-writing rules, with little experience in analysis of orchestral or choral music. His ear-training consisted primarily of assigned sight-singing melodies to be practiced between class meetings, and he spent little time on them. Instruction in ear-training at the master's level enabled him to "systematize aural skills...For the first time in my life, [I] actually practiced and enjoyed work in aural music theory." Ken asserted that all music theory skills should be considered musicianship, and his descriptions of teaching activities demonstrated that concern for integrating them. He tried to give his students many approaches, and encouraged students "to use the ones that 'work' for them and forget about the others."

*Discussion of Interviews and Research Questions*

*Research Question 1: Which experiences, practices, and strategies do musicians consider effective in learning to internalize pitch?*

*Experiences of interview participants.* Table 36 allows comparison of background experiences among the second stage participants. Most participants had considerable

musical experience from an early age. Piano lessons were the first music reading instruction for all but three participants. Four began piano instruction before elementary school, and all but three had piano instruction during elementary years. Except for Ed, all who started piano lessons at a young age said they learned to auralize through piano lessons. All except Carl had instrumental or vocal private lessons in high school, and every one performed in at least one secondary school ensemble. Eight participants had more than one type of private instruction during high school. Ensemble experience in college indicated nine in choir, seven in band, and two in orchestra. All except Carl and Ed indicated that they could auralize their music from notation by the time they entered college. All participants completed ear-training courses and piano lessons as part of their music major in college. The data suggested that having multiple musical experiences stimulated pitch internalization but did not ensure its development.

Most found it difficult to pinpoint the time they knew they could internalize pitch accurately. A few mentioned a different age on the survey than during the interview. For this study the primary point is that the auralization did not happen with the beginning of music reading. None of these participants remembered specific instruction for internalizing pitch in any private lessons, whether their RP thinking evolved with effort or not. Only three, Gloria, Helen, and Jan, remembered some early experience with syllables for sight-singing in music classes or choir.

Table 36

*Music Reading and Instrumental Experience*

| Participant | Age of first music reading | Age of first recognized auralization | First instrumental instruction | College instrumental or vocal concentration |
|---|---|---|---|---|
| Art | 12 yr. | 16 yr. | clarinet | clarinet |
| Bob | 6 yr. | 10 yr. | percussion | percussion, brass |
| Carl | 11 yr. | 18-23 yr. | trombone | trombone |
| Deb | 8 yr. | 18 yr. | piano | voice |
| Ed | 5 yr. | 20 yr. | piano | trombone |
| Fran | 7 yr. | 13 yr. | piano | piano, organ |
| Gloria | 5 yr. | 6 yr. | piano | violin |
| Helen | 7 yr. | 10 yr. | piano | piano, voice |
| Iris | 6 yr. | 14 yr. | piano | piano, voice |
| Jan | 6 yr. | 13 yr. | piano | piano, organ |
| Ken | 6 yr. | 8-10 yr. | piano | piano, organ |

*Effective Practices for Pitch Internalization*

Table 14 in Chapter 4 lists the wide variety of responses to what kind of practice enabled participants to internalize pitch (ASQ 2.18). The variety was pronounced for this sub-group as well. Six RP experts cited different specific responses. Art taught himself to recognize patterns in songs while learning to play the ukulele. Bob learned to sing hymns with shaped notes. Deb thought her pitch skills came from playing scales on the piano.

Gloria, Iris, Jan, and Ken indicated the skill developed naturally without conscious effort, while Carl and Ed indicated it took very deliberate practice with solmization, and though it was difficult for them to achieve, they were confident auralizers after a period of concentrated study. Fran was taught to recognize intervals in a high school theory class, but she estimated mediocre success even after college training: "At graduation I was 50% know and 50% guess. A few aural tools were in place but I could not apply them consistently." Subsequent teaching experience helped her to auralize more effectively, and all mentioned that they had improved since college days.

Participants were also asked about ineffective class activities for their skill development in sight-singing or internalizing pitch. Five RP participants talked of frustration with *solfège* in college, saying that it was unnecessary because they already knew the pitches to sing and the syllables just slowed them down or confused them. On the other hand, two instrumentalists thought *solfège* was definitely the path to pitch internalization when they did become serious about learning to auralize.

Fran's response to the question of ineffective practice perfectly illustrates concern for teaching isolated intervals (Karpinski, 2000; Rogers, 1984). She explained her frustration with the Builder strategy in these terms:

> Unless intervals were set in the same "tonal landscape" as the song in which I learned them, I was lost. I couldn't use the dominant-tonic starter of 'Hear Comes the Bride' if the perfect fourth in front of me was happening between two other scale-degrees. It felt like some kind of weird, superimposed bi-tonality. I kept thinking there has to be a better way to hear pitch. I found myself leaning more on music theory and rule-predictability than anything else.

*Effective Strategies for Pitch Internalization*

Table 37 lists interview participants' responses for two questions: "Which solmization system (if any) do you most often use for sight-singing?" (ASQ 2.13); and "Which other strategies (if any) do you most often use for sight-singing?" (ASQ 2.14). All participants indicated multiple strategies, and all included thinking about intervals. Six reported using movable-*do* syllables, three with *do*-minor and three with *la*-minor. Art reported both syllables and numbers. Fran only used numbers for sight-singing. The other four used neutral syllables. Data suggested no common approach but success with several.

Pitchers Iris and Jan indicated the response, "imagining the sound of each tone individually," but I was surprised that four RP participants without AP chose this Pitcher response as well. Gloria and Deb mentioned that they thought individual tones in connection with piano fingerings once they had identified one pitch (whether concert pitch or not), while Art and Carl indicated that familiarity with pitches in the scale allowed that kind of thinking once they were grounded in a particular key. This data raised an important question for solmization. If RP musicians could auralize effectively through the individual tones from a reference pitch or a scale, would not mastery of scale spelling eliminate the need for solmization?

Iris offered "harmonic thinking" as an "other" response. Ken described his harmonic thinking as "chordal outlines vs. scalar." Because it was mentioned by several in their scripts, harmonic thinking might have been selected by others had that choice been offered. This response will be discussed more thoroughly in connection with Research Question 5.

Table 37

*Strategies Most Often Used for Sight-singing*

| Participant | Strategies |
|---|---|
| Art | movable-*do/do,* numbers, intervals, individual tones |
| Bob | intervals, letter-names |
| Carl | movable-*do/do*, intervals, individual tones |
| Deb | movable-*do/la*, intervals, individual tones, piano fingerings |
| Ed | movable-*do/la*, intervals, letter names, trombone |
| Fran | numbers, intervals, piano fingerings |
| Gloria | intervals, individual tones, piano fingerings |
| Helen | movable-*do/la*, intervals |
| Iris | intervals, individual tones, harmonic structure |
| Jan | movable-*do/do*, intervals, individual tones |
| Ken | piano fingering, chordal outlines vs. scalar |

*Research Question 2: How do musicians assess the value of solmization systems for pitch internalization?*

All interview participants had tried sight-singing with either movable-*do* or numbers, and seven had tried both. Three had tried fixed-*do,* and six had sung with letter names. Table 37 indicates participants' preferences at the time of the study. Jan tried both forms of movable-*do* and numbers in her teaching but preferred syllables over numbers for chromatic inflection and *do*-minor for harmonic consistency between parallel major and minor scales. Ed and Carl championed movable-*do* as the way they learned to

auralize. Ed learned to sight-sing with *la*-minor "though at times I've felt like I preferred *do*-minor also." Of his experience with fixed-*do* in graduate school Ed said, "It didn't click with me." Art learned numbers first, but preferred the vowel sounds of *solfège* because "it helps you learn what to do with your mouth on the basic syllables." However, he admitted that he knew how to internalize pitch long before he learned the syllables.

Art and Helen favored the Kodály approach of introducing and practicing the syllables sequentially in elementary teaching, though Helen admitted that by the end of fifth grade her students were reading only pentatonic music. Art thought it would be too time consuming to introduce it for his church choir program.

Ken did not require his college music students to use solmization, though he explained several approaches and expected his students to build their own system through analysis.

> I have never fully understood all the debate that goes on about *solfège*, movable-*do*, numbers, and neutral syllables, and have determined that, at least for me, the purpose of sight-singing is to "know how the music goes" – and to that end, I don't believe that it matters at all what system a student uses. My experience in the classroom is that there is so much frustration with any system of numbers, syllables, and so on, that attention to pitch and rhythmic accuracy is inadequate and insufficient.

Fran's experience as a junior high choral director convinced her that *sol-fa* syllables were much more difficult for her students than numbers. "I prefer numbers for scale-degrees, rather than syllables. They are easier to use, not only forwards and backwards, but also in random order."

In summary, responses indicated no consensus for the value of solmization among these participants. Three of the eleven experts claimed that solmization enabled them to internalize pitch. Others liked using *solfège* to sight sing, to communicate with their students, and to teach, but they indicated that they added *solfège* after they could internalize pitch successfully. Table 38 indicates responses for ASQ 2.19, "Do you currently use tonal syllables for auralizing unfamiliar music?" Related discussion continues in regard to the next research question and in Chapter 6.

Table 38

*Use of Tonal Syllables for Auralizing*

| Participant | Response |
|---|---|
| Art | Yes. I think I could sing without them, but I like using *solfège* syllables. |
| Bob | No. |
| Carl | Sometimes. |
| Deb | No. I can just hear the notes. |
| Ed | Yes. |
| Fran | Not *solfège*, but numbers. |
| Gloria | No. |
| Helen | Yes. |
| Iris | No. Not needed. |
| Jan | Yes, when teaching. I never think of anything except the note sounds. |
| Ken | No. Never used them. |

*Research Question 3: If musicians learned to internalize pitch through solmization, do they consciously continue to think through syllables for pitch internalization?*

Participants chose whether to hum or sing with any syllables or numbers during the interview. No one chose to sing with *solfège* during the interview. Fran sang with numbers, but the fact that all others sang the tonal melody with a neutral syllable or hummed revealed that singing the syllables was unnecessary for them to internalize the pitch. The four who answered that they still used syllables offered several explanations for not singing with them during the interview. Carl, whose scripts showed a mixture of interval, tonal, and harmonic thinking, indicated that he thought *sol mi* at first then intervals. He made a "conscious shift to *solfège*" in m. 2. "That would have been the first note that I probably consciously thought where is mi, what is the sound of *mi* back up to *do*?" For the other pitches he was "just seeing the patterns" and "knowing the notes."

Though Ed had asserted that "movable-do syllables probably provided the most beneficial aid" for learning to auralize, he explained he no longer needed to sing with them.

> I was thinking note names as I first examined the melody. Probably a mix of *do re mi* and note names, but the note names were definitely prominent for me...I was thinking on many of them—ok, this is *la ti do ti la,* but at this point it doesn't necessarily help me to verbalize that while I'm doing it. It's adding a step.

Art and Jan similarly explained that they could sing with syllables, and some even crossed their mind as they sang, but they primarily learned syllables to use in their teaching, long after they learned to auralize. Even though Helen used *solfège* syllables

daily in her teaching, she chose to sing on a neutral syllable. She described her process, "To find the beginning pitch I was thinking *solfège*, but from there on it was just easier for me to read the intervals." She also indicated using a couple of reference pitches to anchor her tones.

Fran explained her thinking in terms of scale-degree numbers and intervals, and then sang the melody with numbers. She sang the pitches of the tonic chord before she sang. She admitted surprise that her thinking "was drawn away from scale-degree orientation to chordal structure. It was a lot easier to think a descending V triad in the second measure than 9-7-5." She also mentioned kinesthetic and harmonic associations: "I felt in my hands the G minor chord moving to D minor," and at the end, "I felt in my hands I 6/4 – V – I."

Three more credited ease with notation for their independence from the syllables. One mentioned chord relationships and another, interval training. Most participants in this study expressed frustration that they can sing the right pitch before they can think of the right syllable when they sing with *solfège*. This question was important for me to understand, because I had found it so difficult for my students or myself to be accurate in thinking all the syllables fast enough to sing them at a moderate tempo, even after considerable practice. I thought for myself this was because I was essentially labeling a pitch I had already internalized through AP. I knew the *solfège* did not drive the cognition for me, but I thought RP thinkers used syllables in order to know the pitch. Perhaps solmization is one of those skills that mastery eventually makes unnecessary; it leaves a sub-conscious etching on the brain that surfaces only when needed. Fran encouraged her students to drop the numbers for a neutral syllable as soon as they have internalized the

melodic motion. They use numbers for warm-up exercises, but not for sight-singing past the initial stages. As Fran stated it bluntly, "The last thing you need with the tyranny of the beat is excess baggage."

*Research Question 4: How do musicians in various professions rate their own pitch internalization skills and needs?*

Participants' many uses for pitch internalization are discussed in Chapter 4. The interviews focused more specifically on how participants' skills have continued to develop in their work. The teachers interviewed found auralization essential for musical tasks, and many mentioned that their skills had greatly improved through teaching. The AP teachers indicated that their RP skills have grown as they tried to understand how their RP students think. Most of the musicians grew in their pitch internalization abilities because of their need to analyze music, to evaluate music for purchase, to read scores for conducting, to correct mistakes in performances, to practice mentally, to improvise, and to compose. They remain convinced of its importance for musicianship.

*Research Question 5: Are the metaphors proposed in previous research with students also descriptive of strategies for pitch internalization for the professional musicians in this study?*

*Strategies for the tonal melody.* During the interview participants were asked to auralize one tonal melody (see Figure 6) and one atonal melody (Figure 7), and then to describe their strategies. These tasks were similar to the aural tasks they completed along with the ASQ, but in this instance the scripts were oral, allowing me to clarify their perception and explore their cognition to a greater extent. Particular attention was given to the new metaphor, the Chunker. Participants evaluated whether or not the metaphor

effectively described the pattern-seeking strategy. The portions of the interviews which involved the aural tasks appear in Appendices H (tonal melody) and I (atonal melody).

*Figure 6.* Tonal Melody for Interview.

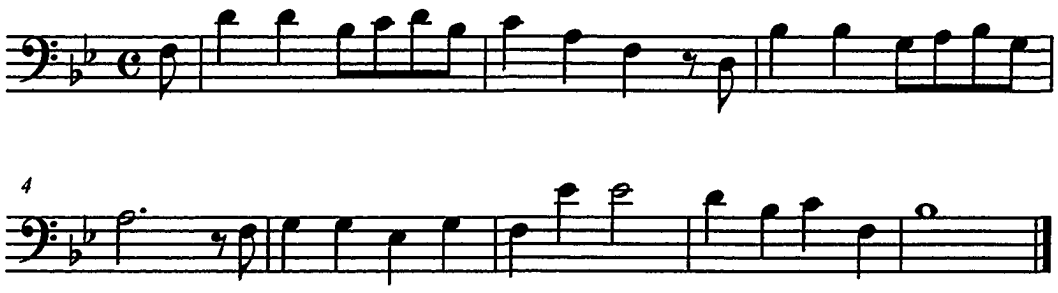


Table 39

*Analysis of Scripts for Tonal Melody*

| Participant | Button-pusher | Tonal-thinker | Builder | Pitcher | Harmonic thinking | Reference pitch |
|---|---|---|---|---|---|---|
| Art | no | implied | yes | no | yes | no |
| Bob | no | yes | yes | no | yes | no |
| Carl | no | yes | some | no | yes | no |
| Deb | yes | some | yes | no | no | no |
| Ed | no | yes | no | no | yes | no |
| Fran | yes | yes | some | no | yes | no |
| Gloria | yes | no | some | no | no | no |
| Helen | no | yes | some | no | no | yes |
| Iris | no | yes | no | yes | yes | no |
| Jan | no | no | no | yes | no | no |
| Ken | yes | yes | no | no | yes | yes |

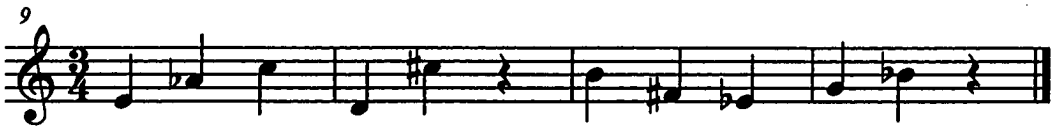
Seven participants sang the tonal melody correctly, and four missed only one tone. Three initially missed the second pitch in m.6, but then sang the correct pitch immediately and finished the melody in tune. Helen missed the last pitch in m.2, but she recovered with the tonic pitch in the next measure. She knew she had missed the pitch, and expressed difficulty hearing it when she sang through it a second time, but her tonal-thinking enabled her to stay in the key. Table 39 compares the strategies participants mentioned for the tonal melody in the interview. Though all participants were able to hear the melody correctly, the profiles of their strategies were somewhat different. Art, Bob, and Carl indicated similar thinking, but this much individuality was surprising among all the HQ participants and also between the AP possessors, Iris and Jan.

No starting pitch was given for these melodies. Participants showed no concern about picking a starting pitch, though all but one chose pitches no more than three half-steps below the absolute starting pitch. When asked if they would be able to sing it easily in a different key after hearing it in "their mind's key," each RP participant thought that would not be a problem. Jan and Iris, the AP thinkers, indicated they would have to think a new key signature in their mind to transpose, but both indicated they would probably be able to think within the key to sing it in tune if no more than one half-step off in either direction. Bob, Carl, and Ed described the very same process for picking a starting pitch if they were consciously trying to match concert pitch. All said their lowest note was usually around F, and they would think by interval to the starting pitch from that reference pitch. Art explained that he knew his voice had "a break around middle C or D," so he could use that as a reference.

*Strategies for the atonal melody.* Participants primarily mentioned intervals when

describing how they tried to hear the atonal melody (see Figure 7), but a few mentioned other strategies as well. Profiles of strategies (see Table 40) were more similar for this task. Eight participants used enharmonic pitches to auralize more common intervals (i.e., changing the first interval from a diminished fourth to a major third, and/or the augmented second to a major third in m.3), or to create larger tonal chunks (i.e., an augmented triad in the m.1, or a B major triad in the m.3). For several participants the Eb major triad in the last measure was the extent of their tonal thinking. These scripts demonstrated harmonic thinking, which implied some tonal-thinking, hence the "implied" designation under Tonal-thinker for those who mentioned no other tonal-thinking. Four used reference pitches to help internalize the larger intervals. The reference pitch strategy here was closely related to building. Helen described this strategy for the first two measures: "I would have to think this one [E] back in my head and think down a step [for D]. Then I'd go up a half-step from here [C to C#]."

*Figure 7.* Atonal melody.




Gloria was alone in reporting kinesthetic thinking for this one. Her fingers constantly moved as she auralized and sang, making her Button-pusher strategy quite evident. Her explanation without any enharmonic thinking also suggested a Button-pusher: "I know what a jump from E to Ab is...I really do visualize a keyboard." Her statement about reference tones indicated a mixture of tonal memory and Builder strategy: "I get these first three notes, and then I go back and hear this E, and I know there is a step down, and I remember what that C sounded like, so the C# is easy."

Table 40

*Analysis of Scripts for Atonal Melody*

| Participant | Button-pusher | Tonal-thinker | Builder | Harmonic thinking | Reference pitch | Enharmonic thinking |
|---|---|---|---|---|---|---|
| Art | no | implied | yes | yes | no | yes |
| Bob | no | yes | yes | yes | no | yes |
| Carl | no | yes | yes | yes | no | yes |
| Deb | no | no | yes | no | yes | no |
| Ed | no | implied | yes | yes | no | yes |
| Fran | no | yes | yes | yes | no | yes |
| Gloria | yes | no | yes | no | no | yes |
| Helen | no | implied | yes | no | yes | no |
| Iris | no | implied | yes | yes | yes | yes |
| Jan | no | implied | yes | yes | no | yes |
| Ken | no | yes | yes | yes | yes | yes |

Surprisingly enough, neither Iris nor Jan relied on their Pitcher strategies in this context. Both explained how their strategies shifted away from AP to RP strategies:

> Jan: "The first thing I thought of was, 'That's E to Ab—it's easier for me to think of a major third.' So I'm going into intervallic mode, not so absolute...I'm not sure I would trust myself completely to just sing E to Ab, but I probably could do it. Does that make sense?"
>
> Iris: "That's why I don't think that I think by AP, because if it's atonal, I've got to find some way for the notes to have relationships to each other to make sure that I

am solid with them. I can't just say coming from this note I'm going to think an Ab pitch and out it's going to come, because it's not going to come out right on it unless I find a way to really think that relationship...I think I'm comfortable enough with those intervals, but I would try to find the C# from the C...here again I'd be thinking that's a minor third, but I'm going to think D# to make it more comfortable to think that interval."

*The Chunker metaphor.* Participants easily saw their strategies in terms of the Tonal-thinker and the Builder, and all indicated that the new metaphor, the Chunker, was a good description for pattern-seeking and the more advanced harmonic thinking. Seven participants mentioned chords or patterns in both melodies. The tonal melody included a sequence which several could see as a melodic chunk. For the atonal melody enharmonic spelling allowed several participants to chunk the last two measures in particular, and three mentioned hearing the first measure as an augmented triad. Even the AP participants used harmonic thinking at least to check themselves. Three RP participants, Gloria and Deb, and Helen, did not use harmonic thinking; they more readily imagined the individual notes on a keyboard in Button-pusher fashion.

Several mentioned reference pitches, and this may indeed be a strategy worthy of its own metaphor, though I did not propose one in this study because it most often seemed related to other strategies. Among the interview participants, Helen especially used reference pitches, as did Gloria and Ken. Though in Helen's script the reference-pitch seemed to be a primary focus, it appeared as a way to check if a larger interval had been sung correctly by relating the tone in question to a tone other than the one it followed. Tonal memory was an integral part of her strategy.

The final chapter summarizes the findings of the research study. Refinement of the definitions of the metaphors is described, and pedagogical applications of the metaphors are discussed, along with other aural skills approaches suggested by interview participants. The chapter concludes with implications for future research.

# CHAPTER 6

## Summary, Pedagogical Applications, and Implications for Future Research

### *Summary of the Study*

The Aural Skills Questionnaire (ASQ) and subsequent interviews encouraged both a broad look and an individual look at pitch internalization. The survey stimulated thinking through multiple-choice questions about experience and strategies for 100 musicians, including piano teachers, public school music teachers, college music professors, and orchestra members. The second section called for self-assessment of confidence in pitch internalization using a Likert-type scale. Open-ended questions also encouraged participants to acknowledge as many factors in pitch internalization as possible. Aural tasks provided opportunities for participants to use the strategies and to discuss them immediately. Characterizing strategies through metaphors presented additional opportunity for reflection. Eleven individual interviews provided multiple perspectives into the experiences, deliberate practice, and strategies that enabled pitch internalization to develop. The desire to understand individual thinking was repeatedly expressed in all survey instructions and in the interviews. That most participants were music teachers with a strong desire for effective ear-training methods provided cooperation and dependability. Two music educators, one with both absolute pitch (AP) and relative pitch (RP) skills, and the other with fine RP skills but without AP, independently analyzed scripts and interviews to confirm or question my interpretations of the answers. Their findings concur with the interpretations of the data presented in the last two chapters.

*Limitations*

The primary purpose of this study was to explore the development of relative pitch. Because of the fundamental difference in pitch perception between AP and RP, I wanted to uncover as many relevant issues as possible. The survey was designed to provide both quantitative and qualitative data, which have been reported in the last two chapters. However, several limitations of this study should be stated here. Though the cooperation of all the participants has been superb, many indicated difficulty in remembering some aspects of their skill development either because of the length of time and breadth of experience in the intervening years, or because of the complexity of analyzing thought processes which have become rather intuitive and involve various ways of knowing. Several participants gave different or more complete explanations in the interview than on the survey questions where a choice of responses was provided. Others were surprised that they actually thought differently as they worked on the aural tasks than they had indicated in the more general survey questions. The simplicity of the aural tasks and the subjective answers prevented definitive answers to the questions My AP frame of reference has likely limited my ability to ask some of the important questions. Nevertheless the data have indicated some general trends that warrant consideration. This study confirmed the complexity of music perception discussed in Rogers (1984), and underscored the need for individual assessment, qualitative response, and discussion of specific tasks to understand how pitch internalization develops.

*Validation of the Metaphors for Pitch Perception*

The primary contribution of this research to aural skills pedagogy is the metaphorical characterization of various strategies for internalizing pitch from notation.

Musicians in this study validated the characterizations of the metaphors for pitch perception first proposed in Thompson (in press): the Follower, the Contour-singer, the Button-pusher, the Tonal-thinker, the Builder, and the Pitcher. Participants were able to identify their strategies in terms of the metaphors, and two other music educators were easily able to assess their thought processes in the same terms from their scripts of participants' strategies. Combinations of RP strategies were common, especially among musicians in the highest quartile (HQ). (Quartiles were based on correct responses to aural tasks and self-assessed level of confidence with RP skills.) Several AP participants likewise used a combination of RP strategies along with their Pitcher strategy. The Tonal-thinker and Builder strategies formed the Tone-Builder combination, which was often reported by participants and observed in their scripts. That the Builder strategy alone was less effective than in combination with tonal-thinking confirmed pedagogical concern that interval recognition should be grounded in tonal context (Karpinski, 2000; Klonoski, 2000; Rogers, 1984).

Two additional strategies appeared in several scripts: reference pitch and harmonic thinking. Scripts with reference pitches have been discussed as a variation or combination of contour, interval, and tonal thinking. The reference was usually stated in terms of contour (same pitch or close), interval thinking (i.e., whole step or half step away), or tonal relationship (i.e., *ti do*). Sometimes it was used as an additional way of checking for accuracy. No new metaphor was proposed for reference pitch thinking because of this ambiguity, but the definitions of the metaphors have been revised to include this type of thinking. (See Appendix J for revised definitions of the metaphors.)

Harmonic thinking was analyzed as a culmination of several processes. Many

participants scanned for melodic patterns or looked for chord patterns. Though certainly dependent on a high degree of understanding of both tonal and interval relationships, harmonic thinking goes even beyond the Tone-Builder combination because of the scanning, or pattern-seeking component. Buccheri (2002) recently reported, "Einstein once distinguished humans from other life forms by suggesting that we search out patterns when they are obscured, and manufacture them when they do not exist. We are pattern-seekers in the extreme." Pattern-seeking appeared in the scripts for both AP and RP thinkers. Participants mentioned seeing chords, harmonic relationships, and melodic patterns. Several mentioned enharmonic spelling as a way of seeing relationships between tones even in the atonal melodies.

*The Chunker*. After analyzing data from the first stage of this study, I proposed "The Chunker" as a metaphor for this pattern-seeking strategy. The concept of chunking has been mentioned in educational literature as well as in music cognition for many years (Butler, 1992; Marvin, 1995). The eleven interview participants readily ratified this term to describe this process of scanning for patterns or chunks of tones with recognizable relationships. The Chunker metaphor has been defined here through analysis of participants' scripts:

> Chunkers scan passages of music for relationships between groups of pitches which they recognize as patterns. Past experience provides the ability to conceive the sound of these groups of pitches, or chunks, as they auralize. Chunks may involve melodic sequences, structural tones, chord patterns, harmonic progressions, or other recognizable relationships. In atonal music Chunkers may

use enharmonic re-spelling to facilitate hearing familiar pitch relationships beyond thinking intervallically for successive tones.

*Using the Metaphors in Aural Skills Teaching*

Discussing strategies for pitch internalization proved helpful in assessing students' strategies for internalizing pitch in Thompson (in press). For the current study professional musicians demonstrated their ability to assess their own strategies and to understand other ways of thinking through the metaphors. The metaphors are good communication tools for aural skills classes and could be used in private lessons and ensemble rehearsals as well. They are simple enough to use with pre-college students and provide a good entry point for talking about pitch internalization. A teacher could present the various metaphors as ways of accomplishing aural tasks. The Follower and Contour-singer are preliminary strategies for actual pitch internalization, but even young singers know if they are following others or just approximating the pitch from the melodic shape. Some students readily admit that they only "push the buttons" for the notes they see without imagining the tones, but for others pushing the buttons might actually trigger auralization. Experimenting to see if students can sing what they pretend to play might provide valuable insight into their kinesthetic connections.

Students might indicate which strategies they think they use, and then, in connection with aural tasks, they could indicate their scripts orally or in writing to compare with the metaphors. The teacher could ask questions to focus on sound, such as "What did you hear that made you choose your answer?" or "How did you know that would sound that way?" Pitcher strategies can usually be recognized through the preponderance of letter names in scripts, or from statements like, "I just heard the pitches

in my head," even without necessarily introducing the metaphor. Teachers could encourage Pitchers to become Tonal-thinkers as well. Finally, teachers could promote The Chunker as a highly desirable strategy.

Writing scripts can encourage students to think rather than to guess, and to indicate their perceptions to their instructors. Teacher-student conferences are ideal for assessing growth and clarifying each student's understanding. Ken regretted that his individual sessions with students were only for testing with little time for feedback. Using scripts along with aural tasks could be a way to isolate students who need more individual attention. Short-answer questions are useful inquiries into pitch perception, but they do not tell the whole story. The interviews demonstrated the greater value of discussing strategies in the context of real musical tasks. What one thinks he would do is not always what he does in real time. Gloria claimed to be a Builder at first, but in her interview she noticed with surprise that her "piano fingers" constantly moved as she sang, and that she did not consciously think of interval types. Helen said she "usually used *solfège*" much more than she did at her interview. (She likely would not have missed the *sol-mi* interval if she had been using *solfège*.) Allowing such reflection after tasks provided a different way to assess and to discuss pitch internalization.

That the Tonal-thinker strategy has been shown to be more effective for pitch internalization than the Builder strategy alone is related to Klonoski's (2000) desire for a perceptual ordering for the aural skills curriculum. Intervals should be heard and explained as the relationship of two tones within a tonal context, rather than isolated entities at first. The usual resolutions of intervals with active tones could be pointed out as their interval labels are introduced so that the sound is allied with the understanding.

If college students are Builders who are not grounded in Tonal-thinker strategy, that weakness could be discussed and corrected with a strong dose of tonal-thinking.

Also in regard to Klonoski's concern about perceptual order, one might question if the metaphors fall along one perceptual path toward auralization. Responses in this study suggested that the order of musical instruction and experiences might cause the paths to be different. Most musicians start as Followers by imitating the singing of parents or recordings. Art and Bob began reading music as Contour-singers from the hymnal, and soon figured out how to be Tonal-thinkers. Ed described the change in his thought processes: "I imagine I was more a Follower, Button-pusher, and/or Builder when I began college instruction, and gradually evolved into a Tonal-thinker over time." Deb's path was "Follower, (very young), then Button-pusher, Contour-singer, Builder, Chunker." Fran said she started reading as a Contour-singer, then progressed "to Button-pusher to Builder to Tonal-thinker to Chunker." Iris moved rather quickly from Button-pusher to Pitcher from early instrumental experience. Jan's early *solfège* experience did not inform her Pitcher skills until much later. She demonstrated how AP musicians can even become Chunkers without being good Tonal-thinkers, if they could identify isolated chords without perceiving them in a tonal context. Clearly training and experience play a role in different paths to pitch perception. Likely there is not just one ideal perceptual order for aural skills instruction at the college level, given the different experiences of students.

Another important consideration is whether all musicians can or should be able to perceive music in several or all of these ways. Perhaps some of the strategies play a more dominant role for some musicians than others, but all represent important aspects of

musicianship. The quick response of a Button-pusher is important for sight-playing. The Builder's mastery of interval recognition also facilitates piano-playing, score-reading, and enharmonic thinking. Tonal-thinking is the gateway to understanding musical tendency, expectation, and expression, and it enables budding Builders and Pitchers to make sense of musical patterns. At the beginning of this study I limited the Pitcher to the isolated pitch targets of AP thinkers, and still I do not think the Pitcher metaphor is necessary for RP musicians. However, several RP participants indicated "thinking individual pitches" on the survey because they had so thoroughly internalized pitch relationships among letter names that they did not consciously think through intervals or scale degrees. This is a broader definition of the Pitcher metaphor than originally intended, but some RP experts did characterize their thinking in this way. All the metaphors except the Pitcher characterize perceptions that are necessary for all musicians. This multiple perception ideal is allied with Buehrer's (2000) constructivist position.

*Other Pedagogical Applications*

One question emerged and pervaded my thinking throughout this research. Whose job is it to teach pitch internalization? There seems to be some buck-passing among music educators, likely not intentional, but perhaps uninformed. No interview participant could remember any teacher in private lessons who provided direct instruction for hearing pitch before it was played. A few had *solfège* training in public schools, though the great number of music objectives for elementary music classes and the small amount of time allotted to music reading often afford no more than a cursory introduction. Certainly there is little time for individual evaluation. Instrumental teachers teach music

reading often from a Button-pushing strategy—connecting note names with fingering combinations, without imagining the sound they should produce. Some school systems or individual teachers teach sight-reading, but most emphasize polishing and performing. Sight-reading is encouraged in many competitions, but many music teachers, administrators, and parents more readily excuse lower sight-reading ratings than lower performance ratings. Few see their role as did Fran: "From early on, the goal of helping kids hear pitch has consumed my interest. If I had to make the choice, I would invariably spend free minutes honing the life-skill of pitch perception over making pretty music."

Choir directors and voice teachers often record music for vocalists to learn their parts rather than "waste" valuable lesson or rehearsal time in trying to read the notes. Private music teachers who are more directly involved with individual students also often fall into the trap of spending most of the lesson time preparing one or two pieces for contests, recitals, or juries. The cycle only intensifies as the gap widens between musical understanding and the difficulty of repertoire. Piano teachers are certainly aware of the need to teach note recognition from the staff to the keyboard, and many emphasize intervallic reading, and key relationships through the major pentachords. However, two opposing dilemmas have plagued piano teachers. One is that students who "play by ear" (i.e., by knowing the sound before playing) often hunt for correct pitches by trial and error, rather than play efficiently from notation. The other extreme finds students playing the notes one after the other from notation with little attention to musical expression. The difficulty is teaching students how to internalize notation into meaningful sound chunks before the tones are played. Internal hearing must be involved to turn the notes into tones. Furthermore, it is difficult to know to teach what one has not been taught, much less to

know how to teach it. In this regard this study has revealed some practical suggestions for developing musicianship skills.

*Acknowledge the mystery and honor the individuality.* Studies in cognition have not yet unraveled the mystery of how musical understanding takes place or if there is one optimal perceptual order. We do not know why fourteen young pianists in this study developed AP, while others who started lessons early did not. We do not understand why some musicians can use Button-pushing strategies to internalize pitch, but others do not connect sound with fingerings. We are not entirely sure why pitch internalization seems to be a by-product for some musicians, yet others reach high levels of performance without the skill to internalize pitch accurately from notation. Students should take comfort in Ken's conviction after years of teaching experience: "I'm convinced more and more that these skills can be developed to a degree by most serious music students—but that some are given 'the gift' in such a way that it becomes a natural part of their music learning and often does not require as much work by those select few to hone the skills as they develop their musicianship skills."

College aural skills instructors obviously cannot change the order of their students' previous experiences or the extent of their natural talent. Data in this study provided overwhelming evidence that different approaches and combinations of strategies promote successful pitch internalization. This study has also shown how inappropriate it is to categorize pedagogy for pitch internalization only in terms of AP versus RP cognition. Previous chapters have indicated that RP experts in this study had individual combinations of strategies for pitch internalization, as well as different explanations for how it developed. Some participants learned to internalize pitch with

little apparent effort other than that required to read music for playing their instrument. They could not remember when they did not connect notation with sound. Others never knew inner hearing from notation was possible or expected for musicians before a rather rude awakening in freshman music theory. College instruction simply provided the labels for intervals and patterns that some participants had already internalized, while for others pitch internalization came with great effort in classes or individually in the practice room. Many indicated that subsequent experience in their profession enabled or refined their skills.

College teachers especially should respect the diversity in the sense-making process that experience and practice have furnished their students. Perhaps the optimal circumstance would be to teach ear-training in private lessons in the way that we teach applied music lessons. Teachers would have time to assess individual comprehension and prescribe efficacious remediation. What initially might sound more advantageous for the student, though, would certainly be less practical in the light of music department budgets and faculty load. It would also limit the constructive sharing of ideas with fellow class members, the vicarious understanding of other students' pitch problems, the joy of harmonious sight-singing, and the awareness of different approaches to broaden their cognition and enlighten their own future teaching.

It is imperative that teachers think outside the way we were taught or the way we currently think to internalize pitch. Deb credited her pitch skills to piano playing. She was so convinced of its importance in reading music that she discouraged high school vocalists from majoring in music if they had not yet learned to play the piano. Though many participants mentioned the importance of piano playing for auralization, there are

successful auralizers like Carl, who did not begin college with piano skills but learned to auralize through sight-singing with *solfège*. On the other hand, some teachers insist upon mastery of *solfège* whether or not the student is able to work effectively without it. It is especially important for an AP teacher to study other strategies for perception. Discussion of strategy could promote healthy dialog; if the teacher thinks in one way and the student another, both can be enriched. Besides discussing strategies with students, talking to colleagues about effective strategies has proven beneficial for me in this study. We should empower students to explore strategies with a determination to create their own combination of ways of knowing, in this case for internalizing pitch.

*Expect pitch internalization.* Beginning students should be aware that they indeed can hear music in their heads in the same way that they can see an image in their mind as they read words. Elementary teachers begin with simple tonal patterns, first sung, then associated with syllables and hand signs, and later identified and manipulated on the staff. Helen shared the "Beethoven Game" that she and other Kodály teachers have used with elementary students: "I remind them how Beethoven couldn't hear except in his head, and then I'll sign the pitch patterns...and they have to echo with the sign and singing too." Another pitch internalization activity is identifying a "mystery tune." This works well as a quick attendance-taker for music fundamentals classes. A phrase of a familiar folk song or hymn is notated on a staff for students to identify silently. If a student does not know the name of the song, or has trouble remembering the title, he may sing the phrase correctly for credit. Notating familiar songs, or phrases, is another silent classroom activity that demands pitch internalization.

AP teachers need to learn tonal thinking and to learn to teach it. Iris exemplified a

fine AP teacher who has thoroughly developed her own RP skills and has incorporated singing and ear-training activities into piano lessons. "I have them sight sing everything as beginners, and I start from the very beginning 5-finger patterns doing some *solfège*, some hand signs, doing some singing, 'up a skip, down a 2nd,' trying to really vocalize or audiate, or even just say what the interval is before the finger goes there so they are thinking intervallically and trying to hear that."

Minimizing Follower behavior is a challenge for aural skills classes. Sight-singing could actually encourage it, especially if the teacher sings along with the students, or if students always sing together. Activities to encourage individual thinking could include singing canons or multi-part exercises with one on a part, alternating singing with auralizing, allowing students to lead exercises, and having students describe their own ways of hearing a passage. Jan had her students create error-detection activities for the class, and then she participated in them, demonstrating her intention to continue exercising her skill. Rather than humming, two participants mentioned "silent whistling" as a technique for internalizing pitch during silent reading and dictation activities in ear-training classes. Ken described this as "doing everything physically to whistle except to make the sound." This silent thinking for hearing internally is similar to the idea of sub-vocalization mentioned by Klonoski (2000), in which students physically prepare to sing without actually singing. Fran offered good advice for problem-solving when students make mistakes in sight-singing:

> The single most important ingredient in correcting pitch-perception errors is silence. The worst mistake a teacher can make is allowing students to arbitrarily "test" pitches. This fills the air with "vocal clutter" and cancels any opportunity

to rethink scale-degree patterns, or even to calculate where the sound of Tonic is. Quiet wait time is critical to any hope of recovery. There are some students who will start from ground zero if necessary to mentally sing to the problem pitch. To not allow these kids a moment to do this is to stifle leadership. If all else fails, then the teacher can re-establish the sound of Tonic as a point of reference.

Many participants cited piano playing as the beginning of their musical understanding. Because of the potential for visual-kinesthetic recognition of intervals, chords, and scales, teachers should encourage students to associate sounds with the notation and the look and feel of the keyboard. Ken said, "I try to tell my students that they have a 'magic keyboard' right under their fingertips that they can use to their advantage." Kinesthetic connections could be explored occasionally by having students pretend to play a sight-singing melody on the piano or any other instrument. Perhaps the greatest value of thinking kinesthetically at the keyboard is the entry point to chunking various arpeggiated patterns. At more advanced stages fluent sight-playing demands scanning for patterns and quick kinesthetic response to them. Fran indicated that accompanying increased her ability "to grasp bigger chunks of musical information," especially harmonic relationships.

*Examine the role of solmization.* This study revealed that *solfège* does not always drive the cognition for sight-singing. Only six participants in the entire study credited *solfège* alone as the practice that enabled their auralization, and even they do not use it to internalize every pitch now. Nevertheless, 34 participants reported still using syllables to sight sing at least some of the time. Perhaps the most intriguing aspect of solmization is its sub-conscious imprint on the mind, allowing us to think through syllables or numbers

when we encounter a pattern not yet internalized. One participant explained pitch internalization in these terms: "Some of it is instinctive – or maybe already set in my mind without really thinking about it. When I come up to music that I don't have an instinct about, I'm probably closest to the Tonal-thinker."

Teachers should recognize the strengths of each type of solmization and use it for those advantages. The advantages cited by participants in the interviews agreed with Karpinski (2000) and Rogers (1984). Fran indicated that numbers are quicker for most people to grasp, and seem especially easier to think than *solfège* when melodies move downward. They also relate to Roman numerals in harmonic analysis. However, Art used numbers in college, but said now as a choir director he prefers movable-*do* syllables because they are easier to sing. Helen mentioned that young piano students might easily confuse tonal numbers with finger numbers. Jan was quick to say how confusing it was to have worked with both types of *movable-do* syllables. For college students who grew up with *la-minor* or for music education students who are expected to continue to use them in elementary teaching, perhaps it would be best to shift to numbers when discussing harmonic relationships.

One common visual image for a musical scale is a ladder. Indeed, scale came from the Latin word *scala*, meaning ladder. This image, however, may contribute to an ineffective understanding of the tones in a scale, even if the rungs of the ladder are closer for *mi-fa* and *ti-do*. What really drives tonal thinking for experienced musicians is the expectation, or tendency, of the tones to move toward the pitches of the tonic triad. Fran expressed functional expectation as "looking for tendencies and structural pitches." Another participant mentioned thinking "how individual notes relate to the whole of

being in a key." If numbers, letters, or syllables are introduced simply as labels for rungs in a ladder, houses on a street, or other equal entities without a tonal hierarchy, then they do not effectively communicate tonal function. Thinking of *solfege* syllables or numbers as labels is a particular danger for AP teachers, who apply syllables after internalizing the pitch. I neglected tonal motion or function, the essence of tonal-thinking, in my original definition for the Tonal-thinker metaphor (Thompson, in press). This definition has been revised to include tonal function, and appears with the other revised definitions in Appendix J.

Fran's *Scalesthenics* (Milford, 1992) approach to sight-singing begins with "mirroring" body motions to indicate tonal imagery motion or stability. Students progress through singing simple tonic triad exercises with numbers to the four basic exercises that include other more active tones within the 12-note (diatonic) range from low 5 to high 2, the normal song range. Common tonal patterns are sung with numbers and body motions until students can sing the tones during sessions of kinesthetic "Follow-the Leader." After internalizing the pitches through the kinesthetic motions, students sing the tones with scale-degree numbers—first from graph notation, then single line notation—and then progress to reading these 12 tones from the staff. Other diatonic and chromatic tones are added after these are secure. Musical imagery allied with the kinesthetic experience makes the *Scalesthenics* approach so effective. Curwen hand signs and *Scalesthenics* motions have the benefit in instructional settings for the teacher to indicate a sound through a sign for students to sing or hear in their minds. The signs and motions for the more active scale-degrees 2, 4, 6, and 7 physically demonstrate restless tones moving toward the more stable tones of the tonic triad. Larson (1995) extended this potential for

teaching inner hearing through concepts of musical motion or tendency tonal patterns to the college classroom for improvisatory and analytical thinking.

Certainly *solfège* can be a tool, but it should not be forced past the point of usefulness in sight-singing. Every interview participant and several others mentioned knowing the sound before "adding" the *solfège*, so in those circumstances it was not part of their cognitive process for internalizing the pitch. *Solfège* for pitch internalization is somewhat ironic, for almost as soon one becomes proficient in singing the syllables they become unnecessary for the task. Perhaps after we have learned to use the tool, we should put it away, then bring it out for review or for adding a new concept. To remember every syllable in real time for sight-singing is too cumbersome.

Participants primarily mentioned *do*, *mi*, and *sol* in their scripts and discussions. Perhaps solmization for sight-singing could be simplified by using only the syllables for the tonic triad. After all, every other pitch is only a whole-step or half-step away, and each has a tendency to return to *do*, *mi*, or *sol*. To a similar end Jersild devised a set of sight-singing exercises based on tendency tone patterns (Rogers, 1996). Though he does not specify numbers or syllables, the tones of the tonic chord provide the framework for hearing all other diatonic and chromatic pitches. Certainly teachers should present solmization to encourage tonal thinking, and continue to encourage it if it helps the student to internalize pitch. However, to use it to the point of adding it after the fact limits cognition for other aspects of auralization, such as tempo, dynamics, and articulation, which sight-singing could accommodate if the process were not impeded by too much thinking about the name for every pitch.

*Master the language.* Music is a language of symbols; the more refined the

understanding of the language, the better the perception. Mastery of a language evolves slowly. Learning to read in sentences and phrases starts with understanding how words are put together and practice in reading. Iris described it in these terms:

> The whole harmonic thing is just finding a way. I use the analogy when you are reading by pitch it's like c – a – t...You've got to be able to find that word, that pattern that makes cat. You know how that sounds. You know how that feels and seek to find those pattern relationships when you are doing it so you can pattern that material together, because it's then no longer thinking 15 things, it's only 5.

Several participants emphasized that mastery of notation eventually enabled them to auralize without using tonal syllables after they had learned to think through syllables. The preponderance of harmonic thinking among HQ participants suggested a high dose of instant chord recognition. Perhaps many good pianists do not need tonal syllables because they have already absorbed tonal function from chunking the symbols through scales, arpeggios, and chord progressions, their "functional" piano skills. They use letter names with tonally-informed cognition. Speed drills, both in class and on the computer, encourage that Pavlovian response to music notation that prevents struggling with notes and chords and allows chunking to happen.

*Minimize the fear.* Students often appear traumatized by ear-training tasks, especially graded ones. This study evoked several horror stories from college days either during or after the survey. Two scripts mentioned ear-training phobia even for these simple tasks: "Unsure—blocked by panic" and, "This is very difficult—there is so much involved. I think that situational stress may also be a big factor in the success of auditory perception."

Art knew the value of encouraging his students. "I always tried to convince my kids from Day 1 that they were sight-singing geniuses so the music at first would be very accessible, and then they would gradually add on there." Sometimes teachers forget how stressful sight-singing is for struggling students. One participant mentioned that she initially panicked when she realized this survey included ear-training and sight-singing tasks, but that the necessity of writing a script for her thinking made her focus on the strategy rather than her fear. She was amazed at what a difference that made in her comprehension. Certainly scripting inhibits the tendency of students to guess rather than to think. Verbal discussion, especially in proximity to the aural task, is also important for clarifying one's strategies, and though time-consuming, it is beneficial for teachers to assess problems and growth.

*Challenge AP students.* Though they have little in common with RP thinkers in regard to pitch internalization for individual pitches, AP students have everything in common in relating pitches for musical understanding. The initial strategies for auralization differ, but the important product is musicianship. AP students might need the explanation that there is a difference between perceiving pitch and perceiving function. AP listeners hear pitches individually, so *solfège* is unnecessary for internalizing pitch. However, applying *solfège* or numbers away from notation produced the kind of RP perception for me that encouraged hearing aural patterns, tendency tones, and harmonic function. Reading songs just from syllables or numeric notation also forced me out of AP mode. Learning to take dictation with *solfège* syllables or numbers also helped to instill pitch relationships and function. Iris and I both found that the *Scalesthenics* approach stimulated thinking about tonality and melodic motion apart from AP perception.

Many traditional exercises do not lead the AP student to new cognition. Jan described her strategy for calculating intervals: "I was very backwards with my aural skills. I always heard the notes and then I would figure out what's the interval I'm supposed to write." For harmonic dictation she would write down the pitches and then analyze the function. Transposition also was very difficult for Jan in college, so developing skills to cope with out-of-key situations would be important. Reading music in alto and tenor clefs and auralizing scores for transposing instruments at concert pitch are real problems AP students encounter. Many AP listeners, especially pre-college and college students, have more difficulty hearing in keys with more sharps and flats, or in situations where recordings are slightly sharp or flat (Miyazaki, 1993; Takeuchi & Hulse, 1991). Iris, Jan, and I have all been able to suspend AP somewhat to work in situations a half-step away from concert pitch. Exercises under these conditions may stimulate more RP thinking for AP listeners. Jan mentioned having more difficulty internalizing rhythm than pitch. Transcriptions involving rhythmic complexity might be a good assignment for AP students while others in the class are working with pitch.

*Implications for Future Research*

Much is yet unknown about the development of musical skills. Future research, both qualitative and empirical, will likely evolve in many interesting directions. Several indications in this research suggest additional study. Because so many RP experts claimed that their auralization skills came so naturally, perhaps studying successful auralizers who initially had more difficulty with pitch internalization would uncover more deliberate practice or instruction to inform aural skills pedagogy.

This research discovered good models of instruction for encouraging pitch

internalization among piano teachers and vocal music teachers in the public schools. Perhaps further research would locate good practices for helping beginning band and orchestra students to internalize pitch. It would also be interesting to know if there are best practices for pitch internalization among any church or community choir programs which successfully extend music literacy to community musicians who have not had such training.

Milford's (1992) *Scalesthenics* is a relatively new approach to music reading that definitely warrants further study. The method seems simple and quick to teach yet effective in explaining the relationship of sound and notation. Her tonal imagery and kinesthetic ideas are engaging, but they are not just gimmicks; they contribute to a global musical experience with concepts that provide an early understanding of tonal motion and expression which can expand along with students' maturity. This warrants further exploration for aural skills pedagogy.

A more intensive look at solmization is still needed. This study does not give a clear picture of its role in pitch perception for everyone. Many claimed they did not need it at all, but it certainly helped others to develop the sense of tonal function that is necessary for pitch internalization. Some mentioned that the syllables were just below the surface, or that they could have sung them if asked. Is solmization useful for all musicians? What benefits does solmization provide other than pitch internalization? Is there a developmental advantage for numbers over syllables at a certain age or for certain tasks? Are we receiving the maximum benefit from the effort that is put into solmization? Such questions remain.

For piano pedagogy additional research is implied as well. The conclusion of

many pianists was that they learned to auralize through their piano playing long before *solfège* was introduced. However, several pianists in this study did not consider themselves confident auralizers, and college teachers indicated that not all their student pianists have good pitch internalization skills. A study focused on the kind of piano instruction and deliberate practice that does produce good pitch internalization would be helpful.

*Conclusion*

Thirty years ago Kodály (1974) expressed the concern for music education to address the critical development of the mind for musicianship.

> The psychological procedure of our whole music-making is faulty—it must be inverted. So far it is the fingers that have run ahead, with the head and the heart hobbling after them. The way of the true musician is the opposite: he starts with the head and the heart and from there directs the fingers, the larynx, or whatever instrument (p.163).

Iris expressed the same commitment to auralization in her piano teaching:

> As far as I'm concerned, if they can't sing it they can't play it, and if they don't know how they want it to sound before they start, they're already in trouble in tempo, mood, anything... I say to my students, do not ask your fingers how to do anything, because they really don't have a clue. They'll find the most unmusical way, the hardest way, the most tense way to do it. Don't ask them to make the music until you are so sure in your mind how you want it to sound. Then it's just a matter of willing it to happen.

Auralization is foundational for musical understanding, and pitch internalization

is an important component. Hearing how pitches function in tonality has been historically the intent of aural skills instruction. This study indicated no need to depart from that tradition; it confirmed the need to teach it more effectively. Helping students to internalize pitch is the responsibility of all teachers who intend to promote musicianship. We should encourage auralization in the young, insist on it for all college students, and continue the pursuit of effective ways to teach it.

References

Baharloo, S., Johnston, P. A., Service, S.K., & Gitschier, J. (1998). Absolute pitch: An approach for identification of genetic and nongenetic components. *American Journal of Human Genetics 62*, 224-231.

Barkowsky, J. (1987). An investigation into pitch identification behavior of absolute pitch and relative pitch subjects (Doctoral Dissertation, University of Illinois at Urbana-Champaign, 1990). *Dissertation Abstracts International*, A 48/07, 1688.

Berkowitz, S., Fontrier, G., & Kraft, L. (1997). *A new approach to sight-singing*, 4th Ed. New York: Norton & Co.

Bogdan, R. C., & Biklen, S. K. (1998). *Qualitative Research for Education: An Introduction to Theory and Methods, (3rd Ed.)*. Boston: Allyn and Bacon.

Brink, E. R. (1980). A cognitive approach to the teaching of aural skills viewed as applied music theory (Doctoral Dissertation, Northwestern University, 1980). *Dissertation Abstracts International*, 80-05699.

Buccheri, J. (2002, September). Finding your own music: A case for free improvisation. *CMS Newsletter*. Retrieved March 2, 2003, from http://www.collegemusicsociety.org.

Buehrer, T. E. (2000). An alternative pedagogical paradigm for aural skills: An examination of constructivist learning theory and its potential for implementation into aural skills curricula. (Doctoral Dissertation, Indiana University, 2000) *Dissertation Abstracts International*, DAI-A 61/04, 1210.

Burge, D. L. (1983). *Perfect pitch: Color hearing for expanded musical awareness*. Presque Isle, MI: American Educational Music Publications.

Butler, D. (1992). *The musician's guide to perception and cognition.* New York: Schirmer Books.

Chin, C. S. (1997). The development of absolute pitch. In A. Gabrielsson (Ed.), *Third Triennial ESCOM Conference Proceedings,* (pp. 105-109). Uppsala, Sweden: University of Uppsala Press.

Choksy, L. (1999) *The Kodály Method I,* (3rd Ed.) Upper Saddle River, NJ: Prentice Hall.

Clausen, H. H. (1994). A psychophysiological study of pitch naming and memory. (Thesis, University of Illinois at Chicago, 1994). *Dissertation Abstracts International,* 56, 01B, 0548.

Collins, I. H. H. (1979). Current attitudes and trends in the teaching of sight-singing in higher education. (Doctoral Dissertation, Temple University, 1979). *Dissertation Abstracts International,* A 40/05, 2338.

Costall, A. (1985) The relativity of absolute pitch. In P. Howell, I. Cross, and R. West (Eds.), *Musical structures and cognition,* New York: Academic Press, 189-208.

Covington, K. (1992). An alternate approach to aural training. *Journal of Music Theory Pedagogy 6,* 5-18.

Damschroder, D. (1995). *Listen and sing.* New York: Schirmer Books.

Dharmadasa, K. H. (1998). Elements of self-regulation in high school students' scripts and their relation to goal orientations in particular learning situations. (Doctoral Dissertation, Auburn University, 1998). *Dissertation Abstracts International,* A 59/05, 1456.

Ericsson, K. A. (1997). Deliberate practice and the acquisition of expert performance: an overview. In H. Jorgensen and A. Lehmann (Eds.), *Does practice make perfect?: Current theory and research on instrumental music practice*, Oslo, Norway: Norges musikkhøgskole, 9-51.

Ericsson, K. A., Krampe, R. T., & Clemens, T. R. (1993). The role of deliberate practice and the acquisition of expert performance, *Psychological Review 100* (3), 363-406.

Fertitta, R. (2000). What's the use? Practical applications of fixed-do. In Williams, J. K. (Ed.), Conference report: Developing the musical ear, *Journal of Music Theory Pedagogy 12*, (1998), 98-99.

Foulkes-Levy, L. (1996). A synthesis of recent theories of tonal melody, contour, and the diatonic scale implications for aural perception and cognition. (Doctoral Dissertation, State University of New York, 1996). *Dissertation Abstracts International*, A 57/09, 3737.

Gardner, H. (1983). *Frames of Mind.* New York: Basic Books.

Gregersen, P. K., Kowalsky, E., Kohn, N. & Marvin, E.W. (1999). Absolute pitch: Prevalence, ethnic variation, and estimation of the genetic component. *American Journal of Human Genetics 65* (3), 911-912.

Gottschalk A., & Kloeckner, P. (1997). Functional hearing. NY: Ardsley House Publishers.

Hantz, E.C., Kreilich, K.G., Marvin, E.W., & Chapman R.M. (1997). Absolute pitch and sex affect event-related potential activity for a melodic interval discrimination task. *Journal of the Acoustical Society of America 102 (1),* 451-460.

Henry, E. (1997). *Sight-singing*. Upper Saddle River, NJ: Prentice Hall.

Houlahan, M. & Tacka, P. (1990a). Sound thinking: A suggested sequence for teaching musical elements based on the philosophy of Zoltán Kodály for a college music theory course. *Journal of Music Theory Pedagogy 4* (1), 85-89.

Houlahan, M. & Tacka, P. (1990b). Sequential order for the preparation, presentation, practice and evaluation of rhythmic and melodic concepts. *Journal of Music Theory Pedagogy 4* (2), 243-267.

Houlahan, M., & Tacka, P. (1992). The Americanization of solmization, *Journal of Music Theory Pedagogy 6*, 137-151.

Karpinski, G. S. (1988). Five recent sightsinging texts, *Journal of Music Theory Pedagogy* (2), 275-296.

Karpinski, G. S. (1990). A model for music perception and its implications in melodic dictation, *Journal of Music Theory Pedagogy 4* (2), 191-229.

Karpinski, G. S. (2000). *Aural skills acquisition: The development of listening, reading, and performing skills in college-level musicians*. New York: Oxford University Press.

Klein, M., Coles, M.G.H., & Donchin, E. (1984). People with absolute pitch process tones without producing a P300. *Science* 223, 1306-10.

Klonoski, E. (1998). Teaching pitch internalization processes. *Journal of Music Theory Pedagogy,* 12, 91-96.

Klonoski, E. (2000). A perceptual learning hierarchy: An imperative for aural skills pedagogy. *College Music Symposium On-line, 40.*

Larson, S. (1995). "Integrated music learning" and improvisation: Teaching musicianship and theory through "menus, maps, and models." *College Music Symposium, 35*, 76-90.

Lincoln, Y. & Guba, E. (1985). *Naturalistic Inquiry.* Beverly Hills, CA: Sage Publications.

Maki, R. H. (1990). Memory for script actions: Effects of relevance and detail expectancy. *Memory & Cognition, 18* (1), 5-14.

Marvin, E. W. (1994). Intrinsic motivation: the relation of analysis to performance in undergraduate music theory instruction. *Journal of Music Theory Pedagogy, 8*, 47.

Marvin, E. W. (1995). Research on tonal perception and memory: What implications for theory pedagogy? *Journal of Music Theory Pedagogy, 9*, 31-90.

Marvin, E. W. & Brinkman, A. R. (2000). The effect of key color and timbre on absolute pitch recognition in musical contexts. *Music Perception, 18*(2), 111-131.

Milford, M. J. (1992). *Scalesthenics: A New Adventure in Sight-Singing.* Santa Fe, Texas: Panorama Publishing and Production.

Miller, L. K. & Clausen, H. (1997). Pitch identification in children and adults: naming and discrimination. *Psychology of Music, 25*, 4-17.

Miyazaki, K. (1993). Absolute pitch as an inability: Identification of musical intervals in a tonal context. *Music Perception, 11* (1), 55-72.

Multer, W. (1977). Solmization and musical perception. *Theory and practice, VIII* (1), 29-51.

Nelson, K. (1986). *Event knowledge: Structure and function in development.* Hillsdale, N. J.: Lawrence Erlbaum Associates, 1-18.

Ottman, R. W. (1996) *Music for sight-singing,* (4th Ed.). Upper Saddle River, NJ: Prentice-Hall.

Pembrook, R. G. & Riggins, H. L. (1990). "Send help!": Aural skills instruction in US colleges and universities. *Journal of Music Theory Pedagogy, 4,* (2), 231-241.

Pershing, D. (2000). The thinking ear. In Williams, J. K. (Ed.), Conference report: Developing the musical ear, *Journal of Music Theory Pedagogy, 12,* (1998), p.99-100.

Potter, G. (1990). Identifying successful dictation strategies. *Journal of Music Theory Pedagogy, 4*(1), 63.

Rahn, J. (1980). *Basic atonal theory.* London: Longman.

Rogers, M. R. (1984). *Teaching approaches in music theory.* Carbondale, IL: Southern Illinois University Press.

Rogers, M. R. (1996). The Jersild approach: A sightsinging method from Denmark. *College Music Symposium 36,* 149-160.

Rush, M. A. (1989). An experimental investigation of the effectiveness of training of absolute pitch in adult musicians. (Doctoral dissertation, Ohio State University, 1989). *Dissertation Abstracts International,* A 50/04, 826.

Scripp, L. R. (1995). The development of skill in reading music. (Doctoral Dissertation, Harvard University, 1995). *Dissertation Abstracts International,* A 56/06, 2162. (UMI No. 9534633).

Schwandt, T. A. (2001). *Dictionary of qualitative inquiry* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Seashore, C. (1938). *Psychology of music.* New York: McGraw Hill.

Shank, R.C. & Abelson, R. P. (1977). *Scripts, plans, goals and understanding: An inquiry into human knowledge structures.* Hillsdale, N.J.: Lawrence Erlbaum Associates.

Smith, T. A. (1991). A comparison of pedagogical resources in solmization systems, *Journal of Music Theory Pedagogy, 5*(1), 1-23.

Smith, T.A. (1992). Liberation of solmization: Searching for common ground. *Journal of Music Theory Pedagogy,* 6, 153.

Takeuchi, A. H. & Hulse, S. H., (1993). Absolute pitch. *Psychological Bulletin 113*: 345-361.

Thompson, K. A. (2001). Developing audiation: Music teachers' self-assessment of skills and intelligences. Unpublished manuscript, University of Oklahoma.

Thompson, K. A. (in press). Thinking in sound: A qualitative study of metaphors for pitch internalization strategies. *Journal of Music Theory Pedagogy.*

Ward, W. D., & Burns, E. M. (1982). Absolute pitch. In D. Deutsch (Ed.), *The Psychology of Music,* Orlando: Academic Press, 431-451.

Appendix A

Aural Skills Questionnaire

I. Music Experience

1.1 Check each kind of private music instruction you received before entering first grade:

( ) None ( ) Vocal ( ) Piano ( ) Instrumental _____
(name of instrument)

1.2 Check each kind of private music instruction you received during grades 1 through 5:

( ) None ( ) Vocal ( ) Piano ( ) Instrumental _____
(name of instrument)

1.3. Check each kind of private music instruction you received during grades 6 through 12:

( ) None ( ) Vocal ( ) Piano ( ) Instrumental _____
(name of instrument)

1.4. Indicate your ensemble experience before entering college:

( ) choirnumber of school years _____

( ) band number of school years _____ instrument _____

( ) orchestra number of school years ___ instrument _____

( ) other (please explain): _____

1.5. Indicate your private (applied) music instruction (if any) at the college level:

( ) None ( ) Vocal ( ) Piano ( ) Instrumental _____
(name of instrument(s))

1.6. Indicate your ensemble experience in college:

( ) None ( ) Choir ( ) Band ( ) Orchestra ( ) Small ensemble ( ) Other_____

1.7. What was your major performance concentration in college? _____

1.8. What was your secondary emphasis (if any)?_____

1.9. At what age did you first learn to play or sing from music notation? _____

1.10. This first music reading experience occurred in connection with what instruction? **(Check one.)**

( ) Playing the piano
( ) Playing a string instrument
( ) Singing in choir
( ) Playing a wind instrument
( ) Singing in elementary music classes
( ) Other _____

1.11. Age: ( ) under 25 ( ) 25-34 ( ) 35-44 ( ) 45-54 ( ) over 55

1.12. Gender: ( ) Male ( )Female

1.13. Current profession: _____

II. Aural Skills Self-Assessment

2.1. How many semesters of college ear-training/sight-singing classes have you completed?_____

2.2. Describe any additional training in aural skills you have had: _____

_____

_____

2.3. Do you think that you have developed a good sense of relative pitch? ( ) Yes ( ) No

2.4. Do you have absolute pitch recall, sometimes known as "perfect pitch?" ( ) Yes ( ) No

**Please rate your confidence in your own aural skills by placing "X" in the appropriate box, with "5" indicating the greatest confidence and "1" the least confidence.**

| | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| 2.5. I can sight sing a tonal melody with pitch accuracy. | | | | | |
| 2.6. I can auralize ("hear in my head") the sound of a melody when I see musical notation without first hearing it performed. | | | | | |
| 2.7. I can easily identify melodic intervals when I hear them. | | | | | |
| 2.8. I can sight sing an atonal melody with pitch accuracy. | | | | | |
| 2.9. If I can sing a melody from memory I can notate the pitches accurately. | | | | | |
| 2.10. I can use Curwen hand signs along with tonal syllables. | | | | | |
| 2.11. I can sight sing with *movable-do* syllables accurately at a moderate tempo. | | | | | |
| 2.12. I can sight sing with numbers accurately at a moderate tempo. | | | | | |

2.13. Which solmization system (if any) do you most often use for sight singing? **(Check one.)**

( ) *Fixed-do solfège* ( ) Scale degree numbers
( ) *Movable-do syllables (with do minor)* ( ) *Movable-do* syllables *(with la minor)*
( ) No solmization system (Neutral syllable, such as doo or la)
( ) Other_____

2.14. Which other strategies (if any) do you most often use for sight singing? **(Check all that apply.)**

( ) Thinking intervals from note to note.
( ) Imagining the sound of each tone individually.
( ) Thinking about the relationships of the letter names.
( ) Imagining fingering on an instrument. If so, which instrument?_____
( ) No particular strategy
( ) Other_____

2.15. Which solmization systems have you ever tried for your own sight singing? **(Check all that apply.)**

( ) *Fixed-do solfège*
( ) *Movable-do with do-minor*
( ) *Movable-do with la-minor*
( ) Scale degree numbers
( ) Letter names of pitches
( ) Other _____

2.16. Which strategy or strategies do you use for melodic dictation? **(Check all that apply.)**

( ) Convert sounds to syllables first.
( ) Convert sounds to numbers.
( ) Think how it would feel on an instrument.
( ) Convert sounds directly to letter names.
( ) Think by intervals from one pitch to the next.
( ) Other_____

If you are confident in your ability to internalize the pitch for unfamiliar tonal melodies, please answer the next three questions. If not, please skip to question 2:21.

2.17. When did you realize that you could auralize ("hear the music silently in your head") when looking at an unfamiliar passage? Age _____ (or Grade) _____

2.18. What instruction or practice enabled you to auralize unfamiliar music?

_____

_____

2:19 Do you currently use tonal syllables for auralizing unfamiliar music? ( ) Yes ( ) No

2:20 If you no longer need to use tonal syllables describe what enabled you to quit using them?

_____

_____

2.21. How is pitch internalization important to you in your daily activities, or why is it not important?

_____

_____

2.22. Please add any other comments relevant to your development of pitch internalization. (You may continue on the other side of this paper.)

_____

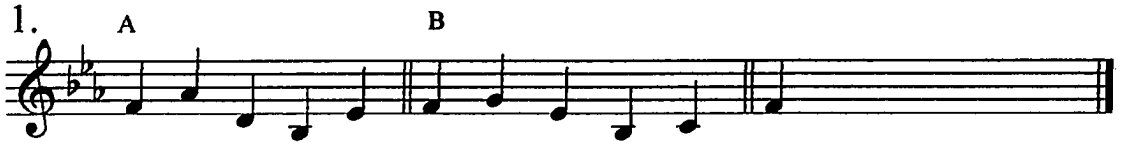
_____

_____

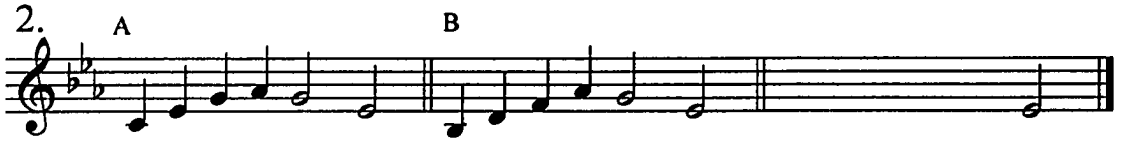
III. Auralization Task

For each 3-measure set you will hear one melody played. If what you hear matches the notation of melody A or B, circle the corresponding letter. If it does not match A or B, then notate what you heard in the third measure. One of the notes is provided as a reference for you. Below each example write what made you decide your answer.

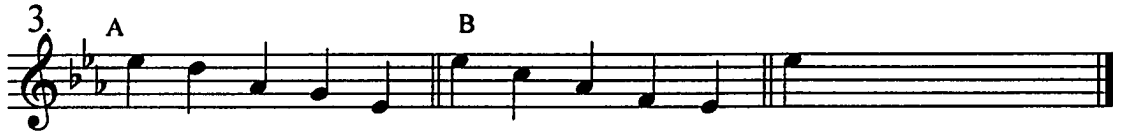
1.



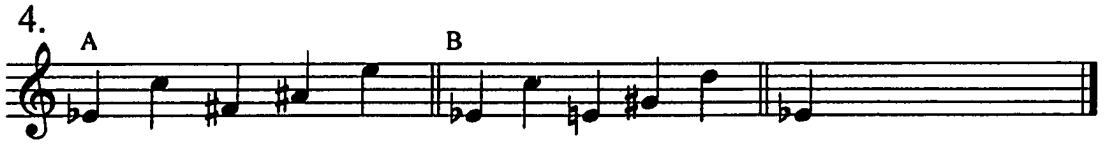

2.



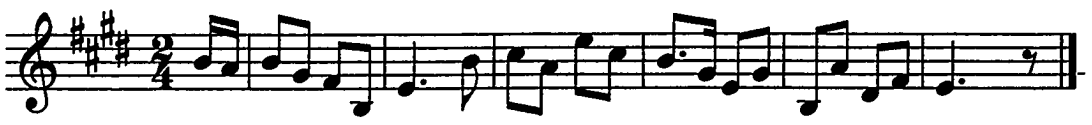

3.




4.



IV. Sight Singing Task



1. Prepare to sing the melody above.

2. When you heard the melody performed, did it match how you thought it would sound?

   yes no If not, how was it different?

3. Please read the descriptions of the metaphors for pitch perception.

   A. Which, if any, of the metaphors characterize the way you approach sight-singing?

   B. Which, if any, of the metaphors characterize the way you sight read music on an instrument?

   C. Which, if any, of the metaphors characterize the way you auralize (hear in your head) unfamiliar music notation?

   D. Is there a better way you can characterize your thought process for internalizing pitch?

   E. Describe how your thought processes have changed since you completed undergraduate college instruction, if they have changed.

V. Metaphors for Pitch Perception

The Follower

Followers usually follow another singer or an instrument to sing unfamiliar music accurately; they do not fully depend on the music notation even while looking at it. Followers are quite adept at making instinctive split-second adjustments to match a stronger singer or an instrumental accompaniment.

The Button-pusher

Button-pushers readily recognize pitch names and can play melodies on an instrument, but they have difficulty imagining how the notes will sound before they play. Sight-singing is often inaccurate, but Button-pushers usually can tell intuitively if they play or sing a wrong note after it sounds. Button-pushers may pretend to use their fingers to "play a melody" when they are trying to auralize.

The Contour-singer

Contour-singers know to move their voices up or down with the notes on the staff, but scale steps and skips range from approximate to inconsistently accurate and sometimes do not stay within the key. Contour-singers may sense that their tones do not match the notes after they sing them. They may or may not have a good sense of where the tonic pitch is, either aurally or visually.

The Tonal-thinker

Tonal-thinkers have a good sense of scale tones and the tonic triad while they are singing. They often sing the scale or the tonic triad in preparation for sight-singing. Most Tonal-thinkers auralize with *movable-do* syllables or numbers, or they know how to spell scales so well that they think letter names within a key. Tonal-thinkers usually sing scale steps in tune and can figure out larger intervals by thinking where they are in the scale (rather than thinking about the size of the interval.)

The Builder

Builders measure intervals from one note to the next. They recognize isolated intervals and know note names well, i.e., in the key of A, they might recognize A to E, and think, "perfect $5^{th}$" rather than "*do-so*." They sight sing primarily by thinking about the size of the interval, not about how the next tone fits in the scale. Builders may have a good sense of tonic but may not always use it to guide them. If Builders miss one interval in singing or dictation, they will likely miss several pitches because they relate to a previous pitch rather than an overall sense of key.

The Pitcher

Pitchers have absolute pitch recall. Their target is a sound associated with the letter name in their memory. Pitchers do not need to use tonal syllables or intervals to sight-sing or auralize music in the key in which it is written, but find it difficult to read and sing music in a key other than the one indicated in the notation. They also find it difficult to play an instrument tuned as much as one half-step sharp or flat. In coping with out-of-key contexts they must transpose through intervallic reasoning or tonal thinking.

Appendix B

INSTITUTIONAL REVIEW BOARD APPLICATION
FOR APPROVAL OF THE USE OF HUMAN SUBJECTS IN AN INVESTIGATION
CONDUCTED ON THE NORMAN CAMPUS AND/OR BY UNIVERSITY OF
OKLAHOMA FACULTY, STAFF OR STUDENTS

Your application for approval of the use of human subjects should consist of eleven (11) copies* of three parts:

PART I - A COMPLETED APPLICATION FORM
PART II - A DESCRIPTION OF YOUR RESEARCH STUDY
PART III - SUBJECT'S INFORMED CONSENT FORM FOR PARTICIPATION IN YOUR STUDY

You should attach supplementary information pertinent to this study that will help the board members in their review of your application, i.e., questionnaires, test instruments, letters of approval from cooperating institutions or/and organizations. Failure to submit these items will only delay your review.

Applications are due not later than the **1st** day of the month in which you wish the proposed project reviewed

Please return completed proposals to:

Campus Mail:
Office of Research Administration
Buchanan Hall, Room 314

U.S. Mail:
Office of Research Administration
1000 Asp Avenue, Room 314
Norman, Oklahoma 73019-0430

Please call the ORA at 325-4757 and ask for the IRB if you have any questions. Please type your responses.

**PART I - APPLICATION FORM**

1. **Principal Investigator:**

Name Kathy A. Thompson
Department Music
Campus Phone No. (home) 405-348-4891 E-mail Address kathy.thompson@oc.edu

If you are a student, provide the following information:
Daytime Phone No. (if different from above) (405)425-5532
Mailing Address_4000 Steven Drive, Edmond, OK 73013

2. **Faculty Sponsor:** Dr. Nancy Barry
Department Music Sponsor's Phone No. 325-4146

**Signatures:**
Principal Investigator_____ Faculty Sponsor _____

If you believe your use of human subjects would be considered exempt from review or qualifies for expedited review as defined in Sections 4 and 12 of the University of Oklahoma Norman Campus Policy and Procedures for the Protection of Human Subjects in Research

Activities, you may submit two (2) copies of this application for initial review. If full Board review is required, you will be required to submit nine (9) additional copies.

Project Title: Pitch Internalization Strategies of Professional Musicians

3. Project Time Period: From September 10, 2002 to September 10, 2003

4. Previous Institutional Review Board-Norman Campus Approval for this project?
Yes ____ No X A similar project was approved in May, but the conference in which the research would have been conducted was cancelled. That project was entitled Auralization strategies of professional musicians--IRB 02-380

5. Are you requesting funding support for this project?
Yes ____ No X

6. Description of Human Subjects:
Age Range 18 -65 Gender (please check one): ___Males; ___Females; X Both

Number of Subjects: Maximum 200

Special Qualifications: All subjects will be musicians.

Source of Subjects and Selection Criteria: Participants will be chosen from professional musicians in one of the following groups: a professional music teachers' association, a community orchestra, music teachers from a public school district, a liberal arts college music faculty, and a state music teachers' conference.

Please check any protected groups included in this study. (none)

___ Pregnant Women ___ Mentally Disabled ___ Mentally Retarded
___ Fetuses ___ Elderly ___ Prisoners
Children

PART II - DESCRIPTION OF THE STUDY

A. Purpose/Objectives

The purpose of this descriptive study is to determine the strategies that experienced musicians use to internalize pitch while looking at musical notation. This process of "hearing" music in the absence of physical sound is called auralization. One dimension of auralization is the internalization of pitch, which will be the focus of this study. One way of studying pitch internalization is to analyze musicians' own scripts that describe how they think about music notation. In an earlier study, "Qualitative Study of the Development of Inner Hearing in College Music Students," I investigated college students' strategies for auralization. After the completion of this study I plan to compare novice and expert approaches to pitch internalization and apply the results to curriculum development for college level aural skills classes. Results of this study will be the basis of my doctoral dissertation.

B. Research Protocol

I will present two types of tasks to all the participants in a classroom setting to help focus attention on strategies for internalizing pitch. The first is to describe in writing the strategies participants use to auralize one notated melody. The second is to listen to four recorded melodies.

For each melody participants will be asked to distinguish which of two notated melodies was performed, or if a different melody was performed, to notate on a musical staff what they heard. Participants will be asked to describe what they heard that made them decide their answers, i.e., their strategies for choosing their answer.

After completing these tasks, participants will be asked to assess in writing six metaphors that describe common strategies for auralization or to suggest other strategies. The metaphors, which are the result of the former study with college students, include the Follower, the Contour-singer, the Button-pusher, the Tonal-thinker, the Builder, and the Pitcher. Each participant will also be asked to complete a questionnaire about his/her aural skills background and teaching experience. Copies of the task forms and questionnaire are attached. Approximately thirty minutes will be required to complete the tasks and questionnaire.

From these participants who indicate confidence in pitch internalization, several will be asked to discuss their music reading in a more extensive interview. These interviews will be conducted individually in my studio or theirs. Interview questions will depend on the participant's profession and particular insight to aural skills instruction. Following is a list of typical questions I might ask at the interview.

I will ask any questions necessary to clarify the participant's open-ended responses on the questionnaire. Some related questions might include:

- Describe the context in which you first knew you could hear in your mind what you saw on a musical score.
- What kinds of assignments and/or class activities were the most effective for you to internalize pitch?
- What kinds of assignments and/or class activities, if any, seemed ineffective for you?
- Do you now auralize better than when you completed your college aural skills instruction? If so, describe the difference.
- Had your college aural skills course prepared you adequately for your profession?
- How has your work influenced your aural skills, especially your pitch internalization skills?

- I will also ask questions about their music reading strategies as participants demonstrate their sight singing with melodies similar to the tasks described above:
- Describe what first caught your attention about this melody.
- Was anything surprising about your performance of the melody?
- When you think how it will sound, how do you think about the starting pitch?
- Do you have a consistent procedure for thinking within a key when you begin.
- If you have been thinking at one pitch level, and a different starting pitch is given, is it easy to transpose what you were thinking?
- Do you auralize kinesthetically through fingers or vocal placement?

- If the participant has absolute pitch I would ask:
- How was your absolute pitch discovered?
- How old were you when it was discovered?
- What problems or inabilities have you encountered?
- How do you think about singing a given pitch?
- Did your aural skills class stimulate your thinking about tonal function?
- Can you sing with movable do syllables or numbers?
- Were any aural skills exercises in college difficult for you?
- Was harmonic dictation difficult for you?

- Do you think of the chord name before the tonal function for harmonic progressions?
- Can you "turn off" your absolute pitch thinking in out of key contexts, as when sight reading in a different key, or following a score in a different key, or listening to a recording of a piece played at a different pitch level?

- If the participant is a music educator I would ask questions appropriate for the type of classes he/she teaches:
- In your experience what are the most effective ways to teach pitch internalization?
- What activities to you use to introduce pitch internalization?
- Do you try to have students hear a melody in their head before playing it?
- What materials do you use for teaching students to sight-sing?
- How do you sequence your instruction?
- Describe the problems your students have in learning to sight-sing.
- What kind of warm-up do you have students do prior to sight-singing activities?
- Describe the process you ask students to do in preparation for sight singing or inner hearing activities.

C. Confidentiality

Participants will write their information on forms which will be numbered in advance of the study. The numbers will correspond to numbers on their consent forms. I will not publish the names of participants in any research report, nor will I publish enough demographic information that would likely indicate any participant. All forms and questionnaires will be stored in a file cabinet in my office after they have been completed. Participants' names will be matched with their questionnaires only if they are selected to participate in the second stage in order to determine their willingness to participate in an interview.

D. Subject Benefit/Risk

Participation is strictly voluntary, and there are no risks to subjects beyond the normal risks associated with everyday life. The tasks are similar to ones all musicians have encountered in their own training and in their professional activities. Subjects may discontinue participation at any time without penalty or loss of benefits to which they are otherwise entitled. On the other hand, the potential benefits are great. The responses may help the music education profession by contributing to the knowledge of the best strategies for developing pitch internalization skills.

Appendix C

INFORMED CONSENT FORM FOR PARTICIPANTS

*for research being conducted under the auspices of the University of Oklahoma-Norman Campus*

You are invited to participate in a research study in aural skills conducted by Kathy A. Thompson, doctoral candidate in music education at the University of Oklahoma. Dr. Nancy Barry, Professor of Music and Coordinator of Graduate Music Education, is the faculty supervisor for the research. The purpose of this letter is to inform you about the nature of this study before you consent to participate. The purpose of this research is to study the strategies musicians use in "auralizing," or hearing pitch in the absence of sound, while looking at notated music. Participants will be solicited from professional musicians in various professional organizations. You must be eighteen years or older to participate.

Two kinds of auralization tasks will be presented. One is to describe in writing the strategies you use to auralize one notated melody. The second is to listen to four short melodies. For each melody you will be asked to distinguish which of two notated melodies was performed, or if a different melody was performed, to notate on a musical staff what you heard. You will be asked to describe what you heard that made you choose your answer. After completing these tasks, participants will be asked to assess some metaphors that describe common strategies for auralization. I will also ask you to complete a brief questionnaire about your aural skills background and experience as a musician. No more than thirty minutes will be required for this first stage of the study.

At a later time a few participants will be asked to participate in a second stage of this research. This will involve an individual interview in my studio or yours to discuss your pitch internalization strategies. The interview will be audiotaped for later transcription. The names of these participants will also be kept confidential, and the tapes will be kept in a locked file cabinet. Please indicate with your initial if you would be willing to participate in such an interview at a later date and to have the interview audiotaped.

*I agree to have my interview audio-taped.* (Please initial.) _____

Your participation in either the first or second stage of this study is strictly voluntary, and there are no risks to you beyond the normal risks associated with everyday life. The names of all participants will be kept confidential. Refusal to participate will not result in any penalty. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. On the other hand, the potential benefits are great. Your responses may contribute to the knowledge of the best strategies for teaching pitch internalization skills.

If you have any questions about this research, please contact Kathy A. Thompson at (405) 425-5532 or Dr. Nancy Barry at (405) 325-4146. If you have any questions about your rights as a research participant, you may contact the Office of Research Administration of the University of Oklahoma at (405) 325-4757.

*I hereby agree to participate in the above-described research. I understand my participation is voluntary and that I may withdraw at any time without penalty or loss of benefits.*

Signature:_____ Date_____

Appendix D

"Other" Responses to Survey Questions

ASQ 2.14 Which other strategies (if any) do you most often use for sight singing? (Check all that apply.)

( ) Thinking intervals from note to note. ( ) Imagining the sound of each tone individually.
( ) Thinking about the relationships of the letter names.
( ) Imagining fingering on an instrument. If so, which instrument?_____
( ) No particular strategy ( ) Other_____

011 – "hearing the shape of the melody"
017 – "thinking in phrases and tonic-dominant, and other functional interval relationships within the phrase; then relating phrases to each other (within the overall form of the piece – ABA, or whatever). I do scan the whole piece quickly for form and formal relationships."
026 – "harmonic structure"
035 – "hearing the *solfège* syllables"
040 – "relating to tonic triad and other triads, dominant, subdominant, etc."
043 – "chordal outlines vs. scalar"
049 – "harmonic relationship"
085 – "relating to movable do"

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ASQ 2.16 Which strategy or strategies do you use for melodic dictation? (Check all that apply.)

( ) Convert sounds to syllables first. ( ) Convert sounds directly to letter names.
( ) Convert sounds to numbers. ( ) Think by intervals from one pitch to the next.
( ) Think how it would feel on an instrument. ( ) Other_____

017 – "I hear the pitches as particular notes."
018 – "Think by triads."
033 – "Determine *solfège* of longer rhythmic values—helps determine relationship of surrounding pitches."
036 – "Use tonic and dominant or specific pitch references."
043 – "harmonic analysis"
056 – "piano fingering"
070 – "thinking of how the notes fit in the key"
084 – "establish key first (also selected convert sounds to syllables first)"
085 – "both intervallic and key relation"
090 – "guess!"

Appendix E

Responses to Qualitative Questions

ASQ 2:18. What instruction or practice enabled you to auralize unfamiliar music?

001 – "Choir and piano"
002 – "Solfeggio"
005 – "Playing the piano"
007 – "Sight reading"
009 – "I guess possibly early piano instruction"
010 – "All training in college, also started writing music about 16 or 17"
011 – "Learning sounds of middle C and A 440"
014 – "Choir singing, interval recognition from college, theory class, sight reading piano music"
015 – "Private piano Instruction – Pre-college theory classes, but also accompanying in college"
016 – "Lots of singing from different books with changing clef and accidentals. Hearing tasks, dictations."
017 – "Reading (singing and playing) recreationally and in context of my piano and other lesson assignments from an early age on to the present"
018 – "Genes"
019 – "Sight singing and sight reading good college instructors"
020 – "Sight singing/ear-training class at college"
022 – "Sight reading classes"
023 – "I don't know."
026 – "Sight reading. I don't remember getting any instructions other than learning from my own mistakes."
028 – "Looking at so much piano music knowing what it should sound like"
031 – "Playing piano, listening to classical vinyl records and following scores I had checked out of the library"
032 – "Combination of piano and oboe I don't think anyone knows genetics??"
033 – "College aural skills"
034 – "Sing through the melody then play it on the piano."
035 – "Learning *solfège* at a young age, 4th-6th grades."
036 – "Fixed do *solfège*."
037 – "I really developed this skill much before actual "reading" started. I was sound bent before I took lessons. I heard my mother teaching piano lessons all my growing up years."
038 – "Sight reading a lot of accompaniments and hymns. Playing in church, school, contests etc."
039 – "Sight reading music, listening to and dictating melodies and or chord progressions."
040 – "Chord singing. Looking at scores, thinking the pitches then loving it and comparing."
041 – "Solo practice away from class instruction."
042 – "Imagine it being played on a piano."
043 – "No particular instruction. I have always been able to sight read at piano, so I play the lines; there has always been a 'link' between 'playing' and 'hearing-audiation' for me."
044 – "Choral training and sight singing."
045 – "Playing the French horn enabled me to better auralize unfamiliar music because you had to in order to play correctly."
046 – "Teaching piano and vocal music to others."
047 – "Sight singing/ ear-training at high school level."
049 – "Piano- knowing the relationship between pitches."

050 – "Playing unfamiliar exercises, vocalization for warm ups for choir."
051 – "Piano and vocal."
052 – "Sight singing practice in junior high."
053 – "Singing and playing piano."
055 – "Piano and choir."
056 – "Piano and vocal."
057 – "Piano"
059 – "Singing with mother piano lessons."
060 – "Awareness of intervals and how particular notes sound on my instrument."
062 – "Music lessons - my mom being a music teacher."
063 – "Interval sounds, thinking about sounds of pitches and intervals."
065 – "Instrument fingerings."
067 – "A lot of sight-reading, scales, etc."
069 – "Sight reading practice."
071 – "Choir accompanist-playing parts for the singers."
073 – "Playing my own instrument (violin)."
075 – "Lots of practice.
076 – "Theory and sight singing class in college."
078 – "Part singing out of the hymnal at church."
079 – "Unsure."
080 – "Private practice doing sight reading with my mother."
081 – "Theory in lessons"
082 – "Movable do syllables probably provided the most beneficial aid."
085 – "A cappella practice, checking accuracy at piano."
087 – "Perfect pitch."
089 – "Shaped notes."
090 – "Listening to my mother sing alto to my dad's (tenor) melody."
091 – "Practicing and teaching *solfège* (moveable do) sight singing."
092 – "Number system; movable do."
093 – "*Solfège.*"
094 – "Sight-singing in vocal music class."
095 – "Piano – and accompanying choirs and following introduction of their melodic line. I knew what I should hear."
091 – "Use of *solfège.*"
098 – "Piano instruction."
099 – "Music theory classes in college and voice lessons, counterpoint in college."

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ASQ 2.20: If you no longer need to use tonal syllables describe what enabled you to quit using them?

001 – "Do very little singing now."
004 – "Perfect pitch."
005 – "Interval distance."
006 – "More piano playing than singing usage."
010 – "I use letter names."
011 – "Learned sounds of intervals and pitches."
014 – "Many years of piano teaching, accompanying and choir singing."
015 – "Never did."
017 – "Never really needed them with perfect pitch."
019 – "Never really relied on tonal syllables."

022 – "Scale numbers were easier."
023 – "I can just hear the notes."
051 – "Not needed."
031 – "Actually, I developed a sense of relative pitch before I began to use syllables in my teaching. However, no doubt syllables have added to my understanding of pitch function."
032 – "I never think about anything except the note sounds. From many years of teaching, I can adapt to most systems."
034 – "Still use them to strengthen my internal hearing
037 – "I'm not sure that I 'need' to use them. It has become a habit from working with my students."
040 – "Use of chord relationships."
042 – "I didn't learn them in the first place, but had to add them later when required in classes."
043 – "Never used them."
044 – "Confidence in hearing pitches and visualizing them on a staff."
049 – "I think I auralized unfamiliar music without syllables first and then learned to use syllables."
050 – "Look at the notes, contour, always depend on the hearing of it and reading as well as hearing."
053 – "Interval training."
057 – "Sounds directly to letter names."
059 – "Familiarization with written music."
060 – "Not relevant other than arpeggios."
067 – "I can't really say - it just happened."
069 – "Never used them to start with."
071 – "I have always thought in terms of notes."
073 – "Never liked them in the first place. It is like having to learn a foreign language."
075 – "I hear intervals ."
078 – "I think I could sing without them, but I like using *solfège* syllables."
079 – "Never really used them (only when required in classroom instruction)."
081 – "Too confusing."
082 – "Learning to visualize tonal relationships in a visual/kinesthetic way."
085 – "Recognize (without *solfège*) the scale degrees or intervals."
089 – "Knowing key signatures and intervals."
090 – "Learning to hear tonal relationships in a visual/kinesthetic way (Scalesthenics)."
091 – "When following a choral piece I have learned to follow note-to-note successfully. (through *solfège* practice)"

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ASQ 2.21 How is pitch internalization important to you in your daily activities, or why is it not important?

001 – "Pre-hearing the music before playing and recognizing incorrect notes in my playing and the playing of my students."
003 – "Singing – reading music without playing it first."
004 – "I can shop for new music away from the piano. I can write music away from the piano."
007 – "It is 'built in' and unable to discard."
008 – "It is important in my teaching and picking out music when there is not an instrument around, I use it <u>some</u> in composing."

009 – "I love being able to hear a piece and 'see' it notated in my mind...Also, in playing flute obligatos in church to accompany hymns, I like not having to have written music.
011 – "It helps sight-reading and learning music – playing or singing by bar."
012 – "Aid to memorization, aid to bringing out melodic line and tension and release."
013 – "Since the tone of piano is already established, my ear-training was very limited. I do not teach enough ear-training."
014 – "I can quickly audiate piano music up to lower advance to choose music for student study. I can also check student performance accuracy with the score."
015 – "Essential for piano instruction and for sight-reading at piano."
016 – "To keep reviewing what I learned and polishing it to be better."
017 – "I teach music at college level, so of course I use it all the time daily."
018 – "Yes. To select teaching pieces for students."
019 – "Very useful for sight-reading; also for browsing in music stores. Awareness in general in playing – knowing what is coming next. I like to improvise harmonies to my students' scales or beginner's tunes too."
020 – "Sight singing new music at church and in choir."
021 – "Important in evaluating music away from instrument. Not important in that what I play or how on my instrument does not alter pitch."
022 – "Very! For checking student's correctness as they play."
023 – "Picking music for students and small groups."
024 – "Singing in church choir; teaching piano."
026 – "Important – in listening to students as well as my own musical learning. Also – ease in notating as a composer."
027 – "Sight reading in church choir; in listening to correct my students' playing."
028 – "I can select music that is ability/age relevant without having to actually play the piece."
031 – "Reading scores, music analysis, sight reading on piano, teaching."
032 – "It's vital – I would not be doing what I do so quickly and easily without it."
033 – "I teach it."
034 – "Practicing my own vocal performance, working with my chorale ensembles, teaching students and striving to get them to not struggle as I struggled."
035 – "I'm a composition major. Being completely comfortable with pitch must be secondary to putting them together to make music."
036 – "Single pitch internalization is not as important to me as "key" internalization. I am able to hear chords and harmonization's better than single line melodies."

037 – "I daily look at music that I need to hear in my head – looking at students' compositions and assignments, sight reading at the piano."
038 – "I use pitch internalization to aid piano majors – memorize their solos and keep their focus and concentration in performance."
039 – "I find myself having to figure out things by ear often. I tend to have an easier time playing what I hear or think my instrument than singing."
040 – "To 'hear' music that I can not hear in selecting music for class practice and tests."
041 – "Error detection as band director."
042 – "When looking at unfamiliar piano or vocal music, I can hear it without playing it."
043 – "I think it is all "bound up" in my concept of what it means to "read" music – the whole objective."
044 – "As a teacher of aural skills, very important – as a performer, essential to quick music learning, confidence, and interpretation."
045 – "It is very important in seeking out music and being able to quickly hear it and know whether to use it or move on."

046 – "Teaching new songs to my students, teaching them to sight read, learning music in church choir, teaching piano music by intervals to piano students."
047 – "I am able to evaluate a piece of music for use in my daily lessons, and do the same for use with my choir."
048 – "It is necessary to "preview" new music before presenting it to students."
049 – "I teach music. I also play music by ear in a band."
050 – "We need to know and learn to retain where the next sound is and that we can predict the curve of the melody. It is important to determine."
051 – "Teaching music; singing in church choir."
052 – "It helps when learning music to not have to run to the piano."
053 – "I use it everyday in my teaching – especially teaching children the Moveable do system i.e., 'Sing do, mi, sol, la' here's 'do.'"
055 – "It is very important to me as an elementary music teacher – I have to be able to sight read in order to teach it."
056 – "It is important to have the ability to find a pitch point of reference in order to begin singing a piece."
057 – "To teach lessons quickly."
058 – "When teaching a song to students I must first have the melody known occasionally this process is last minute and takes some sight reading and internalization. Also it's essential in voice lessons."
059 – "Not a daily activity, but adds to enjoyment of recorded and live music."
060 – "Tones in head all the time—with students."
061 – "Teaching lessons, rehearsing groups."
062 – "It is not."
063 – "To recognize a pitch internally before playing helps my finger placement on violin."
064 – "Helps with intonation when playing an instrument."
090 – "Not. My current job does not have any music requirement."
066 – "As I hear pitch I imagine the fingerings on my instrument."
067 – "I can visualize the music on the staff."
068 – "Very little importance. About the only pitch instrument I play is tympani and notes are derived from ensemble pitches or built in tuners (to get close)."
069 – "Not much call for it in a technology field."
070 – "It really isn't—because I don't do that on a daily basis. I play an instrument for enjoyment on occasion so I don't have the opportunity to do this on a daily basis."
071 – "I do not currently work at anything that requires it."
072 – "Only when playing music."
073 – "Conducting: part of the job. Administrator: not important."
074 – "Not particularly important except in approaching new church songs."
075 – "I teach music – I use it all the time."
076 – "It is important for leading my students in sight reading skill development and for contest preparation in sight reading."
077 – "I use it mostly for tuning."
078 – "Very important for score study and tuning concerns when practicing, singing, or playing a wind instrument."
080 – "I don't really think about it, I just naturally internalize what I hear automatically."
081 – "Know where pitch is."
082 – "Vital in the ability to perceive melodies and compose – And in the ability to improvise at church."
083 – "I need to figure out melodies by ear many times on gigs. I need to recognize if students are playing parts wrong."
085 – "Score reading."

087 – "Very important – it allows me to be a more effective accompanist/coach – allows me to quickly pinpoint mistakes in singers/instrumentalists, and to learn lots of music in a short time."
088 – "Learning new songs."
089 – "Piano tuning; vocal arranging."
090 – "Vital in the ability to perceive melodies and compose – and in the ability to improvise at church."
091 – "It allows me to have confidence when singing and teaching! It is IMPORTANT for many reasons (I'm still learning)."
092 – "I use it so that I may play music by ear, write melodic tunes, and sing on pitch with high school choir."
093 – "Very important in my teaching. I can scan a piece quickly."
094 – "It is important for me because I teach vocal music and work with my students on internalization of pitches."
095 – "To identify problem areas with my choirs and in perusal of new music – I don't need a piano."
097 – "I teach it every day."
098 – "Very."
099 – "Internalizing the pitch helps me to see a melody of a song and "hear" it before I sing it."
100 – "My daily activities do not include singing or playing an instrument necessarily, so it isn't always important."

Appendix F

Descriptions for Auralization

Sight Singing Task 3D: Can you think of a better way to describe your thought process for auralizing?

002 – "Memorizing."
003 – "I hear the pitch of each note without relating it to names or numbers, intervals – just the sound."
005 – "No."
008 – "No."
009 – "I have always wondered why perfect pitch is so glorified...also I feel that there are many different types—see my note on 2.4 about active and passive pitch...also, I feel that some of it has to be learned, in the sense that I am the most accurate (100%) on the two instruments I studied. [piano, flute]"
011 – "I think of the shape of the melody."
012 – "Relate to "Gestalt," trying to think how individual notes relate to the whole of being in a key."
013 – "Seeing repeated patterns in music and hearing."
017 – "These are Great descriptions – thank you for them, as well as for the reminder to have piano students SING their warm-ups, etc."
020 – "No."
021 – "Unsure – blocked by panic."
022 – "No."
026 – "Since I do not have AP – I would say my abilities could best be described: Builder 30%, Pitcher 70%. I can use my "BUILDER" skills somewhat when transposing.
032 – "No."
033 – "I'm a *solfège* 'junkie.' That's probably why I'm a 'tonal thinker.'"
034 – "No – Contour/Tonal/Builder elements are what I build on."
035 – "In music that changes tonalities often, I tend to use "building" skills as well, though I still think of the isolated interval in *solfège*, even if it's not correct diatonically."
036 – "No – 'tonal thinker' says it all!"
037 – "In atonal music I have to use combinations of tonal thinking with intervals."
039 – "No."
040 – "My 'triad referencing' is actually tonal thinking, but somewhat different and is more contextual."
042 – "Not really. I think your categories are descriptive and cover virtually every approach I've encountered in teaching."
043 – "No – my typical thought is, 'That's just the way the music sounds.'"
044 – "I also visualize (not as actively as I used to, but still some) a piano keyboard. I do not 'push the notes,' but my mind sees a note, then the piano note – 2nd I sing it."
046 – "No."
047 – "Sometimes I hear a pitch in my head and see it on the staff in my head."
049 – "I think how the pitches fit harmonically."
052 – "Not really."
053 – "I think the combination of what I have written in A and C. I am a follower, a tonal-thinker, and a builder."
057 – "This has been very hard for me because I have never thought of it before."

058 – "I was taught to 'internally whistle' so that the intervallic structure is more in place in my memory."
060 – "Fingering with interval awareness."
061 – "In atonal music, I hear the notes on my instrument."
062 – "I always went back to Do. If there is a tough interval or cadence – I will hear the Do and go up either in Triad or scale until I can hear the target pitch."
063 – "No."
064 – "No."
065 – "Nope."
067 – "I can many times see the music on a staff when I hear it."
069 – "I see both the interval and the location in the scale in my head to determine the sound."
070 – "Some of it is instinctive – or maybe already set in my mind without really thinking about it. When I come up to music that I don't have an instinct about, I'm probably closest to the tonal-thinker."
071 – "Not really."
073 – "That is very difficult – there is so much involved. I think that situational stress may also be a big factor in the success of auditory perception."
074 – "No."
076 – "No."
077 – "No."
078 – "Sometimes I hear the instrument in my head."
080 – "Not really."
081 – "No."
082 – "I believe this (Tonal-thinker) accurately describes the approach I use."
083 – "I really don't like classifying sound by pitches. I think of it as colors. Sometimes when improvising I like to hear what happens."
084 - "No."
087 – "Nope. I think the 'pitcher' metaphor is a perfect description of what I do."
090 – "I hear structure and tendencies. In other words, my goal from the outset is to look for patterns."
091 - "No, tonal nails it on the head."
093 – "No, hits the nail on the head."
094 – "Not really!"
097 – "No."
099 – "No."

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SST 3.E: Describe how your thought processes changed since you began college instruction if they have changed.

001 – "Use key – scale and intervals after college and mainly contour thinking before college."
003 – "Reference do key – harmony – do – sol; became tonal thinker instead of button pusher."
005 – "When I began teaching, my thought processes changed some."
007 – "Interval isolation – writing and recognizing."
009 – "I have always wondered why perfect pitch is so glorified...also, I feel that there are many diff types—see my note on #24 about active & passive pitch...also, I feel that some of it has to be learned, in the sense that I am the most accurate (100%) on the 2 instruments I studied. I was truly amazed to enter freshman music theory and see how sight singing could be such a struggle."

010 – "The number method really helped and has remained effective for me."
011 – "I have a better sense of absolute pitch, but far from perfect."
012 – "I had no experience with sight singing before college."
013 – "I don't have perfect pitch, but in the past few years I can hear piano music in the concert key at sight (I'm excited about this – But I can't name an isolated pitch).
015 – "Too long ago – I don't remember."
016 – "Add more."
017 – "I'm more aware than ever of intervals and of the relationship."
018 – "None—I could do this naturally and with instruction received in high school."
019 – "The more ear-training and tech. studies of chords, thirds, arpeggio scales (i.e., lots of daily studies) on flute and also piano as well as learning the quality of chords (Mm – mm; dim etc.) refined my ear over time."
020 – "Before college started out as button-pusher and still use this strategy some but am now primarily a 'tonal-thinker' after college ear-training/sight singing classes."
021 – "I learned to recognize aural intervals. Intellectual learning – not a natural practiced skill. Not enough singing experience, or thought about the need."
022 – "Totally!"
023 – "Yes – more serious about it!"
027 – "They are more fine-tuned as my harmonic vocabulary has increased."
028 – "I am much more aware of keys – intervallic more – differences in major/minor pitch."
029 – "I have changed since I began college instruction from the pitcher to the tonal-thinker."
030 – "I think more in terms of relationships. Interval to interval and chord groupings."
031 – "The use of movable do syllables has sharpened my knowledge and perception of tonal structure and relationships."
032 – "When I began college, I heard only notes. I knew nothing at all about intervals or pitch relationships. My thought processes continued to change as far as being able to label and put things in a context the more theory I had. (Rhythmic accuracy, both performing and taking dictation, was my hardest area.)"
033 – "Only with the last 8 years have I become 'married to *solfège*' (almost)."
034 – "I was so behind when I went to college that I had to practice a good deal. I came from a rural school with no choral program and a weak church choir – my first "real" experience was all-state/tri-state and a couple of other auditioned situations. I practice each day to keep my strengths/skills going.
035 – "Repetition has helped more than anything I have a good background, but my aural skills weren't challenged until college."
036 - "As a freshman, I did not think I could develop skills in sight singing and ear-training as I seemed to be far less skilled than other students. I found that by using good knowledge of written music theory, I could accomplish ear-training. Example: a chord progression I-IV-V –I, knowing triad order made sense. It could not be I-V-IV-I. Therefore I began to hear chord progressions before I could hear melodies. After awhile I began to hear chords in melodies, which helped dictation and sight singing."
037 – "They've not changed much."
038 – "Much more analytical. In college I just imagined how it sounded relating to scales, chords. I have relative pitch – imagine how it sounds on the piano."
039 – "I seem to always know where a progression is going – and I can sight read much better since teaching.
040 – "To think more of scales and then leaps that reference specific triads and chords (V7, ii7, and fully dim. $7^{th}$ chords). This I began in my teaching career – use of Ottman, Music for Sight Singing."
041 – "Focus on primary triad (Do Mi Sol or La Do Mi – minor) where is the leading tone!"
042 – "I try to be more aware of different styles of learning and to accommodate them."

043 – "Skills learned independently (piano, written theory, aural theory, rhythmic drill, etc.) have "merged" into one: music reading."
044 – "So along ago...better recognition of intervals. I visualize less and hear key relationships more."
045 – "I was introduced more to syllables and intervals when I went to college. As a younger person, I was more the contour singer."
046 – "Changed from the follower to the tonal thinker and builder."
047 – "I didn't even think about hearing music before singing or playing before I went to college. I am glad my professor encouraged me to develop that skill."
049 – "A lot more *solfège* added to my process."
050 – "Yes, I believe the experience of having to sing and write melodies of different music periods and doing the process."
051 – "I never used Sol Feg before college."
052 – "Use movable do even more."
053 – "No change really."
056 – "With instruction I moved from contour only to adding "tonal" and "builder skills. I also use key of c as reference with *solfège*."
058 – "I moved from contour to tonal/builder, but still follow, a lot."
061 – "I learned moveable-do whereas before thought scales, chords and could hear some notes on my instrument in my head."
062 – "They were just refined."
063 – "More recognition of intervals and thinking about how those should sound before playing or singing."
064 – "I have used solfeggio and interval relationships more since college, but my thought processes haven't changed."
065 – "Thought process has not changed but skill level has. Job and family take more time now than music did when young."
066 – "I hear the pitch of sharps and flats much better than years ago and can see intervals and better how they will sound."
067 – "I've learned much more about reading music since college. My fellow musicians have taught me much more, i.e., finding points in a passage to target."
068 – "I developed the two skills described above in sight singing class and in performance on my instrument. Before college, these skills didn't exist."
069 – "Better understanding of form and analysis and how chords and melodies are built helped the listening and planning."
070 – "I became more aware of the framework of a particular key and how notes fit into that key. Sight-reading was extremely difficult for me at first."
071 – "I learned intervals in music theory and this helped in finding pitches."
073 – "About sight singing/ear-training: college instruction was a great dismal failure. One of my teachers, supposedly a famous one, used all sorts of "new" symbols and hand gestures – it was like learning a whole new language rather than concentrating on the notes! – I am not sure I ever met an "ear-training" professor in college that I thought did me any additional good. I think that, somehow, for me the whole process is rather intuitive and just getting over the nervousness of having it "tested" is what ultimately did me the most good. The do re mi and #'s are also similar problem
075 – "No change."
076 – "More tools to work with and more developed relative pitch."
077 – "Much more tonal thinker for melodies and Builder for tuning."
078 – "Pitch distance has become more solidified as I've been exposed to more sounds and scores."
080 – "More often now I use intervals."

081 – "No."
082 – "I imagine I was more of a follower, button-pusher, and/or builder when I began college instruction, and gradually evolved into a tonal thinker over time."
083 – "I have had to try to forget about a lot of traditional maj. min. tonality in order to use more advanced chromatic harmonies like octatonic, whole tone, and other scales. I like colors instead of pitches."
084 – "Builder (not very good one) to Tonal."
085 – "It became more automatic and sub-conscious."
086 – "More knowledgeable about intervals and note names, keys and finding do."
087 – "None. I've had perfect pitch for as long as I can remember."
089 – "I learned key signatures in college. I was probably more of a contour singer in High School with a good aural sense of key."
090 – "In college the only strategy recognized was memorizing and applying intervals. The premise...once you know the sound of P4 is Here Comes the Bride" and a P4 down is "Old McDonald,'" you're set for any and all circumstances where ascending and descending P4s are found. Although at the time I didn't know how to verbalize it, I sensed in my musical psyche that all P4s are not equal. On the one hand, mentally, I knew they were mathematically the same acoustical measurement, but in contrast, actually in contradiction, my musical heart said, 'Tilt.' Otherwise, my success rate at sight-reading these would be consistent. I didn't say anything at the time. I just assumed the problem was somehow connected to the hearing loss I suffered as a young child. Later a workshop speaker talked about 'natural tendencies' in the scale – relationships between stable and unstable tones." Intuitively, I knew this was the missing piece of the sight-reading puzzle."
091 – "My thought process has changed in how I view this. It is now extremely important to me in my teaching."
092 – "I do not usually auralize by number."
093 – "Just more confident."
094 – "They haven't changed, just hopefully improved."
095 – "I learned the names and structure of triads, or chords and could use this to assemble the pitches into a recognizable bundle."
097 – "My processes improved more significantly after I was teaching – real sight-singing did not occur for me until after I taught several years."
098 – "Haven't changed much. Hopefully, they are better though."
099 – "Thought processes have not changed. I only get more confident in ear-training and sight reading."
100 – "I had no exposure to auralization instruction prior to college (although I considered myself a musician) and therefore had thought processes limited to tonal thinking."

Appendix G

Examples of Scripts for Aural Tasks With Metaphor Evaluation

| P# | Aural Tasks | Script | Strategies | | |
|---|---|---|---|---|---|
| | | | E1 | E2 | E3 |
| 006 | AT2 | First interval sounded more like m3. | B | B | B |
| 017 | AT3 | Heard these particular pitches - I also hear and visualize intervals on the piano. | P/B/Bp | P/B/Bp | P/B/Bp |
| 021 | AT1 | m3 [indicating 1st two notes] and 5 1 [ last two notes] | TB | TB | TB |
| 023 | AT2 | listened for so and la, then listened for a c minor triad & for the 3rd and 5th note to be the same. | T/rp | T/h | T/h/ rp |
| 026 | AT1 | I heard the "pitches" and the harmonic context of the pattern (Bb7 to Eb) | P/h | P/h | P/h |
| 031 | AT3 | I audaged *ti* and *la* though without thinking the syllable [drew arrows]; heard *sol* instead of *ti* or *la* | T | T | T |
| 031 | AT4 | I prepared by being alert for the tri-tone in A or the step motion Eb-E in B. | B | B | B |
| 051 | AT2 | I heard the Eb [given] on the 2nd and 6th sound. | rp | rp | rp/Cs |
| 060 | AT2 | Heard 3rd and 4th notes 1/2 step. Realized B was wrong. Decided it started 3rd below. | B | B | B |
| 075 | AT1 | I listen to intervals in relation to chords and tricks like "Here comes the bride." | B | B | B/h |
| 078 | AT1 | Broken chord ID [wrote Bb7 and Eb]. | h | h | h |
| 080 | AT1 | Thought about how this would sound on my violin, and the last two notes gave it away. | Bp | Bp | Bp |
| 082 | AT3 | Opening do-sol was 1st clue that pattern was not A or B I thought *solfège* syllables for remainder. | T | T | T |
| 090 | AT4 | First the M6th, then the raised starting pitch, the M3rd, then the tri-tone? | B/rp | B | B/rp |
| 093 | AT1 | Listen for *r f t s d* or *r s d s l*—I am very dependent on *solfège* because it's all I've known. | T | T | T |
| 094 | AT2 | I used intervals for the beginning and numbers for the end | TB | TB | TB |
| 096 | AT4 | Direction of notes and interval skips. | Cs/B | Cs | Cs/B |

*Notes.* P# = Participant number; E1, E2, E3 = Evaluators (Music Educators)
B = Builder; Bp = Button-pusher; Cs = Contour-singer; rp = reference pitch; h = harmonic thinking; P = Pitcher; T = Tonal-thinker; TB = Tone-Builder Combination

Appendix H

Analysis of Scripts for Tonal Task from Interviews

"Art" Chunker, Builder

KT: What first caught your attention about this melody?
A: It's funny. If I were presenting it in the class I would immediately think about the *solfège*. But just looking at it, I just make up syllables to go with the notes.

KT: Make up syllables to go with the notes?
A: Like [sang the first two phrases of the melody da, da, da...] I wouldn't think the *solfège*. I could sing *sol mi mi do re mi do*.

KT: So you're applying the label after you realize what the sound of the pitch is going to be?
A: I look at the notes first and I can hear it in my head but the syllables come after the fact.

KT: Are you thinking through the letter names then?
A: No. I really don't. I can kind of hear a chordal background with it [C], and I think about distances between notes [B]. The first thing I thought when I saw the first two notes was M6. And I used to think "My Bonnie," so there are lots of strange associations, and I'm not sure all of those little snapsies are particularly efficient, but I'm just another individual I guess.

KT: But you do see the underlying harmony?
A: Yes, sure, I chord, dominant function chord, the minor $6^{th}$, the minor 3 or the 5 in the $4^{th}$ bar [C].

---

"Bob" Builder; Tonal-thinker; Chunker

KT: What first caught your attention about this melody?
B: The first interval [B]and then I looked back at the key signature, so I was thinking sol mi [Tt]. just stepwise melody. I see the V chord [C], C A F. I'm thinking what chord would go with this in order just to hear the whole harmony structure—the g minor here.

KT: So you see definite patterns in there.
B: I definitely see the notes individually, but then I think it's a part of a larger harmonic structure, which is going to help me think the whole harmony.

KT: How do the note names fit into your thinking? Do you think all the note names?
B: Automatically know them, but it wasn't really a part of knowing what the pitches were. When I was seeing A, I was thinking *ti* [Tt].

KT: So you're really thinking through *solfège*, though you indicated that *solfège* didn't really do you that much good in college.
B: I only said that just to identify it for you. I don't know that I thought *ti* when I saw A, but I'm thinking it's the $7^{th}$ of the scale [T]. It's all meshed together.

KT: So you're thinking scale degree number a little more than that, but you were translating it for me.

B: I do find myself trying to teach a group of singers a part, because I know a lot have done the *solfège* thing, so I can default to that pretty quickly.

KT: Just hum through it.
B: [hummed it correctly, except he sang the $6^{th}$ in m.6, then immediately adjusted to the $7^{th}$.]

KT: Good. Was there anything that surprised you about your performance of the melody?
B: Surprised me that I didn't hit the Eb. I knew it was just the F7 chord [C].

---

"Carl" Tonal-thinker; Builder; Chunker

KT: What first caught your attention about this melody?
C: The key signature, and then knowing that was *sol* to *mi* [Tt], and just not thinking *solfège* here, just doing intervals [B] and then knowing that was the V chord [C], going back down to sol, and then thinking that $3^{rd}$—that would have been the first note that I probably consciously thought where is *mi*, what is the sound of *mi* in that key back up to *do*. And so those two notes probably were even more than this, because that's a common pattern. So this was computed *solfège*.

KT: You didn't think a minor 6th here, you thought *mi* to *do*?
C: Right, no, I didn't think intervallically there at all. And from here on it was the conscious shift to *solfège*—those two intervals. After it was through repetition over many times knowing what those sounds are without having to consciously *solfège* them, but there definitely was conscious thought.

KT: Did you think harmonically here [m.5]?
C: Not in terms that that's the IV chord...Now here I thought probably that's the $7^{th}$ of the V chord, whereas had it not been that F, I probably would have thought of it in terms of *fa*. Because it outlines that $7^{th}$ chord, I thought of it in terms of the $7^{th}$. And here was just knowing the notes.

KT: OK, hum through it once.
C: [hums all quickly and correctly]

KT: Was anything surprising about your performance of the melody?
C: Well, this is the interval [end of m.2] to me that, well for one thing it comes off the V and it's got a strange resolution. Melodically it's kind of an awkward way to do it. That's the one interval that I had to really focus and concentrate—what are those two pitches?

KT: But you had thought about it ahead of time.
C: But even then that took more concentration than any place else in the piece.

---

"Deb" Chunker; Builder; Button-pusher

KT: I'd like to have you look at this melody and see what you think when you see it.
D: I see patterns and intervals [C, B]. That's what I saw first, and then when I got down to the $2^{nd}$ line, I knew there wasn't a pattern like the beginning, so I started looking for intervals to relate to. The 7th I went, "Oh no a $7^{th}$.

KT: To hear the $7^{th}$, though, do you hear as a $7^{th}$ or hear it relating to the other pitches or chord structure.

D: I hear the 7th.

KT: Do you hear the underlying harmonies as you sing?
D: No.

KT: Start it on any pitch you want to.
D: (Sang accurately until m.6, correctly adjusted the 7th after singing it as 6th.)

KT: You were really close to Bb if not right on it.
D: But I'm not all the time. I was lucky.

KT: The patterns that you see are mainly the melodic pattern itself?
D: Right. I knew that had to be *do*, so I just sang the same pattern that I did here.

KT: Then you corrected when you hit under the pitch. Was that just a vocal thing?
D: I knew when I hit the note that it was a 6th. I knew I had to go up.

KT: Were you visualizing piano keys when you heard this?
D: Yes. [Bp]

---

"Ed" Tonal-thinker, Chunker,

KT: What first caught your attention about it?
E: Well, outlining of chords, fitting it into the key [T, C]. I'm seeing outlining the chords and it's got passing tones and moves to dominant or maybe iii chord. So I'm thinking chords.

KT: OK, just hum through it, or sing it through with *solfège* if you wish.
E: [Hummed it correctly until m.6, sang a 6th and corrected it to the 7th.]

KT: So you heard the chords pretty much all the way through obviously corrected...
E: Yes, I missed the dominant 7th there.

KT: Was that more a vocal slip?
E: I think it was more nerves doing it on the spot.

KT: I think a lot of people really do hear in their head more easily than they can sing it. Was anything surprising about your performance of the melody?
E: No, it sounded like I expected it to sound, and really just the nerves factor kicked in.

KT: Were you recognizing letter names of notes as you heard it in your head or sight-sang?
E: Yes, I was thinking note names as I first examined the melody. Probably a mix of *do re mi* and note names, but the note names were definitely prominent for me.

---

"Fran" Tonal-thinker; Builder; Chunker; Button-pusher

KT: Describe what first caught your attention about this melody. [Response submitted in writing.]
F: My exact thinking process from first glance to sight-singing: I noticed it was written in bass clef. I checked out the key signature. I quickly scanned for any indication it was in minor. I

oriented myself to Common Time. I took note of the fact that it starts on the last half of beat 4. I saw lots of eighth-notes, so decided to set a slow pulse. I looked at the beginning interval and saw that it was Low Five to Three [Tt]. I scanned for other large intervals and took note of the $6^{th}$ and $7^{th}$ [B]. I saw that the range of the melody required me to be ready for a Low Three. I look for the tessitura and decide to pitch the melody in my own lower key. I decided that is enough analysis (about 30 seconds), and now I'm ready to sing. I hum "my" Tonic, hum "1 – 3 – 5 – 8 – 10," then go back to "5" for starting pitch.

KT: Was anything surprising about your performance of the melody?
F: Honestly, my first thought is "What a beautifully crafted melody!" Kudos! Yes, I was very surprised as I sight-sang the melody to see how my thinking was drawn away from scale-degree orientation to chordal structure. It was a lot easier to think a descending V triad in the $2^{nd}$ measure than "9 – 7 – 5" [C]. Because of that mental shift, I was immediately drawn to the momentary feeling of minor. Lovely. It was at this point that my piano skills kicked in. I felt in my hands the g minor chord moving to d minor [Bp]. Honestly, I couldn't help but think "What a great melodic sequence!" Beautiful. Then, because of my orientation toward chord movement expectations, I recognized the next IV chord, going to a $V^7$. I saw this was the safest aural handle, so I stayed in that vein to finish with reference to I – V – I [C]. More specifically, I felt in my hands $I_{6/4}$ – V – I.

---

"Gloria" Button-pusher; (Builder)

KT: Describe what first caught your attention about this melody.
G: Well, bass clef was a little spooky, but I just counted the steps between notes and heard the melody. [B—ambiguous]

KT: Did you notice the key signature first, or think *so* to *mi*.
G: It's just hard because I don't think bass clef very often.

KT: Just hum through it.
G: [Hummed it immediately, correctly, moving fingers as if playing on the piano].

KT: Now you were doing something with your fingers. Were you thinking piano?
G: Yes, I was [Bp].

KT: You don't think through your violin fingers? If it had been in treble clef would you have thought violin fingerings?
G: No, I still would have thought piano.

KT: Did it sound different than it did when you were thinking it in your head?
G: No

KT: If you were trying to pitch it where you thought the concert pitch would be, would you think anything particular to try to get it in the key that it is?
G: No. Look at the key signature and know what is flat and what is sharp.

---

"Helen" Tonal-thinker; reference pitch; Builder

KT: Describe what first caught your attention about this melody.
H: Can I hum? Do you want me to do it in *solfège*?

KT: Not necessarily, do it the way you would do it. You can look through it first.
H: [Hummed the melody very quietly, seemed to have little trouble hearing it at first.—then sang it correctly except for the last pitch in m2.] I don't think that was right. [found do easily and kept going.] [Tt]

KT: That low note was kind of a problem for you but the rest of it was exactly right. You corrected easily. Tell me what you were thinking before you started singing.
H: I had to find the beginning pitch. I had trouble with that.

KT: What do you mean? What kind of trouble?
H: I don't know why. I heard the interval [hums sol-do] but then, no that was Bb. That's what messed me up. I had the F right but the D wrong.

KT: So you were thinking the key signature and the clef first to figure out the pitch. Then you thought through *solfège*, through sol mi, or did you think F to D?
H: To find the beginning pitch I was thinking *solfège* [Tt], but from there on it was just easier for me to read the intervals [B].

KT: Did you think major $6^{th}$ to get up that far, or sol mi?
H: I was thinking sol mi [Tt], and after that I was just thinking intervals [B]. I think maybe it was because I don't read in the bass clef that much. Because I normally do think more *solfège* than I did on this.

KT: Everything else was just right, including that big skip up to the fa.
H: For that I had to go back and listen to the D [indicating the first measure] in my head, I think I might have hummed it before I found the Eb. [rp]

KT: So you had a reference pitch in there too. Was anything surprising about your performance of the melody?
H: No.

K: Did you think *do mi sol* before you started?
H: Just at the very beginning. [Tt]

K: Do you try to think what the high and the low pitches are going to be?
H: I didn't look ahead this time, well a couple of beats.

---

"Iris" Tt

KT: What first caught your attention about this melody?
I: Key of Bb.

KT: And are you just thinking F when you see that note or are you thinking of something in the key?

I: I'm hearing the key, the harmony, the relationship of the chords. I'm harmonizing it in my head. [C]

KT: Go ahead and sing it in your head.
I: [Sings on la about a half-step low, perfectly.]

KT: Was anything surprising about your performance of the melody?
I: No, I sing what I hear in my head. If I can't hear it in my head I can't sing it.

---

"Jan" Pitcher

KT: Look at this melody. Tell me what you see first.
J: I hear it right away. [P] [Hummed it perfectly.] I could do the *solfège* if you want me to.

KT: Did you think through it before you started?
J: No. I scanned it but it wouldn't have mattered –I do read ahead, is that what you mean? I knew it was in Bb right away.

KT: Did you see some patterns before you started; are you really just thinking every note as it comes?
J: Well, I see a whole measure at a time, but no, I wasn't looking for patterns.

---

"Ken" Chunker, Tonal-thinker

KT: Describe what first caught your attention to this melody. [Response submitted in writing.]
K: B-flat, primary triads, no complex rhythm problems, no awkward intervals.

KT: Was anything surprising about your performance of the melody?
K: No, very predictable, easy to sing.

KT: When you think how it sounds, how do you think about the starting pitch?
K: Tonic six-four orientation. [C]

KT: Do you have a consistent procedure for thinking within a key when you begin?
K: "Quick analysis" yields I, V, vi, (V), IV, V7, I, V, I. I think in my "default" key – though I don't know what it even is – since I do not have perfect pitch. I maintain a "floating tonic" [Tt] in the back of my mind somehow, and am able to maintain long-connected notes (the "F" at the beginning and end of the first 2-measure unit, for example) [rp]. I look for long-term lines, in this case a descending line from the high D, to C, to B-flat, to A, to G, and to F, all on strong beats [C].

Appendix I

Analysis of Scripts for Atonal Task from Interviews

"Art" Builder; Chunker

KT: Looking at this atonal melody, what do you think?
A: That's where I refer to my interval thing. First I see 2-note relationships all the way through [B]. I don't get past that. I see two M3s, then m7 and M7, and that's how my mind goes back and forth.

KT: So you chunk mainly in two-note things. Do you see any other chunks you would get?
A: If I step back and look at it a minute, I would go back to chordal thinking. I'd think about an augmented triad in the first bar and a M7 chord [C]. I'd almost fill in the chord in the second bar. The third bar would be a little different. I'd see the major triad with the enharmonic on the bottom. Then the Eb triad.

---

"Bob" Builder; (Tonal-thinker; Chunker)

KT: Look at this atonal melody. What you would do to get an image of it in your mind?
B: I would probably think in terms of M3rds, then down the 7th and up a whole step and down an octave, and a M7 just skipping around by intervals [B].

KT: Would you try to reference this pitch with this one [c, c#]?
B: No, I'd probably just think up a M7.

KT: Anything about the last part of it?
B: The B would come off the C#, just down a step, and then the P4th, I'd just think intervals, down a m3. I'd just do intervals up a M3 and Bb. I would maybe think the Eb chord at the end, just a *do mi sol*, 1-3-5, [Tt, C] but on something like that where it's obviously not as tonal as the other, I'd be thinking intervals primarily.

---

"Carl" Builder; Tonal-thinker; Chunker

KT: How did you think about the atonal melody?
C: First I transposed the Ab to G# because it would be a M3 [B]. So the first bar I thought of as tonal harmony up a M3 and then up to the flatted 6th [Tt], half step above the 5th. Then after that I did intervallically. So I did transposing to a tonal thing and then going intervallically. Then here it was intervallic until I saw the major, tri-tone [?—I think he just looked at it wrong], and the same thing, I just saw a minor 7th and a major 7th.

KT: Did you chunk this [m.3] in any particular way?
C: Just a P4 down, just a whole step and a P4 and m3, I transposed it

KT: To a D#.
C: No actually that [F#] to a Gb, and it may have been because I saw this coming up I knew this would be a tonal root of a triad [C], so I did just a perfect 4th down and that's just a minor 3rd or augmented 2nd [B]. So there are two places that I changed enharmonically. Here because it made

something fit more into a major triad, and here because it was just easier to compute as a m3 than as an A2.

KT: Would you have seen the B to F# to D# as a B chord?
C: I think because of this I saw it as Eb. If it would have been something else, yeah, because that's what I did here. I saw it as a G#.

KT: Did you see that as an augmented chord, or just two successive M3s?
C: No, I didn't think of it that way either. I really thought of it as E G# B#.

KT: B#?
C: The lowered sixth of a major, so I did think of that one in triadic terms, and this one in triadic terms [C]. Then the others were intervallic [B] with an occasional transposition.

KT: Enharmonic spelling?
C: Yes, enharmonic spelling. So really that is changing the system, you referred to a chunk, yes, it's moving to a different system depending on the intervals, whether they fit more naturally into a complete intervallic approach or into a harmonic approach. And whichever seems easiest, you can change.

---

"Deb" Builder

KT: Looking at this atonal melody, what do you think?
D: It would be really hard. I would think E then go up a $4^{th}$ and lower it a half step, and then I would go up a M3, and then drop down a $7^{th}$, and then I would go back to the same note and sharp it [B]. But it would be really slow and really hard.

KT: But you would be thinking a reference pitch either to correct yourself or get back on?
D: Right.

KT: Would you do any enharmonic respelling to make it any easier.
D: I probably would not have, no I didn't think of that, but it would have been easy to do if I had thought of it.

---

"Ed" Chunker; Builder

KT: Look at the atonal melody to see what pops in your head.
E: I see individual patterns that would help me on this and some enharmonic spellings that I might think to simply it somewhat. But this would be something I'd have to spend some time with to be able to perform it effectively.

KT: What kind of patterns do you see?
E: The opening dim $4^{th}$ I'd see as a $3^{rd}$ [B] and then hopefully shift back while singing the G#/Ab and sing a M3 above that and here the M7 and the drop the P4. I tend to think in 5ths and 3rds where I can, and also enharmonically D# instead of Eb in third measure, and the major triad outlined in the last measure [C].

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"Fran" Builder; Tonal-thinker; Chunker

F: (response submitted in writing). OK. My first thought is to head for the hills! My next... the pitches are so disjunct, but at least it's written in the treble clef. I'll have to think intervals and use enharmonics to keep my tonal bearings. In the 1st measure, I'll change Ab to G#, then back to Ab to hear the Major Thirds [B]. My strategy for C down to D is to think G Major and hear Four down to Low Five.

Now I'll make D the Tonic and think the tendency of Seven moving up to Eight [Tt]. Now I'll mentally supply the D, return to G Major, and think Five down to Three [Tt]. From B to F#, my first thought is to sing the descending Perfect 4th of "Born Free" [B]. Now I turn the F# to an enharmonic Gb and think the minor 3rd of "Oh, -- Say..." Now I faint and have to be resuscitated when I see a real live Major Triad!!! [C] I hear the Eb as a new Tonic and sing the familiar "One – Three – Five". What a happy ending.

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"Gloria" Button-pusher; Builder; reference pitch

KT: Looking at this atonal melody. What would you do to try to hear that in your head?
G: Just the same thing. I know what a jump from E to Ab is.

KT: Because of the notes on the piano again?
G: Yes, I really do. I wasn't aware of that until just now. I really do visualize a keyboard. [Bp]

KT: Some think E to Ab is kind of an odd way of spelling this. Do you change it in your mind to a G#, or do you think E to Ab.
G: I would think E to Ab and then...you know, I get these first three notes and then I go back and hear this E, and I know there is a step down, and I remember what that C sounded like, so the C# is easy [rp = B].

KT: OK, so you're relating things to half and whole steps there. Anything else?
G: When I was in college we had this wonderful music appreciation teacher who told us what a sixth would sound like, or like a 7th is like Bali Hai, and I still remember those things.

KT: When you see this interval would you think the Bali Hai?
G: Yes, I just do it with the difficult things like 7ths [B].

KT: Do you think like this is an interval of a 4th, or this is a chord, etc?
G: I don't think I think in terms of chords.

KT: You'd be thinking of one note to the next. Some people might be thinking of a B chord in this measure if you change the Eb to D#. Do you see this, think this as a chord?
G: I look at it and it's a chord, but I don't think I was thinking of it as that.

---

"Helen" Builder; Tonal-thinker; reference pitch

KT: Look at this atonal melody. How you would figure it out?
H: I would sing the 4th, then flat it [B]. I don't think I would have trouble with that. Then I would have to think this E back in my head and think down a step for D. Then I'd go up a half-step from here from C to C#. [B]

KT: So once you got the top and bottom pitches you'd kind of cue off those?
H: Yes. And this one (B) I'd probably go down by half steps from the C# to B. Then I know I'd have trouble with that (F#), but then that would be *do mi sol* at the end (Tt).

KT: So would you think an enharmonic spelling G# for the Ab? Would you hear the 3rd measure as a chord?
H: No, I would just think down the 2nd, but with would be more than a 2nd, an augmented 2nd [B]. I might have trouble with that.

KT: But you wouldn't think about how it would feel on the piano?
H: No.

KT: You would mainly try to think from one pitch to the next with the interval.
H: And with using guidelines from lowest and highest ones. [Rp]

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"Iris" Builder; Chunker

KT: When you look at this atonal melody, what do you hear?
I: I hear the intervals and I would transpose that.

KT: enharmonic?
I: That's why I don't think that I think by AP, because if it's atonal, I've got to find some way for the notes to have relationships to each other to make sure that I am solid with them. I can't just say coming from this note I'm going to think an Ab pitch and out it's going to come, because it's not going to come out right on it unless I find a way to really think that relationship.

KT: That would be RP thinking.
I: So I'm being terribly inconsistent.

KT: No, you're just using everything you have to use. So you think E to G#, and then would you rethink the equivalence there to go on?
I: That wouldn't be comfortable for me to find that note that way (E to Ab) until I started thinking that's Ab and then go from there.

KT: Talk me through the rest of it.
I: I think I'm comfortable enough with those intervals, but I would try to find the C# from the C. [rp = B]

KT: Relate it to check yourself?
I: Yes, here again, I'd be thinking that's a minor third, but I'm going to think D# to make it more comfortable to think that interval [B]. It would be interesting to see if I could really nail this. [Sang, missing 2nd interval and shaky into m. 2, completes it right.] That's hard because I'm not comfortable in that key as opposed to that.

KT: So you use this [d#] as a pivot pitch.
I: Yes, I'd think the BM chord and that's EbM. [C]

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"Jan" Chunker; Builder; Pitcher

KT: When you look at this atonal melody, what do you hear?
J: Now the melody below *solfège* is no help at all. There I would be thinking enharmonically like the Ab would be G#, but then I'd have to rethink to get up to C. Probably, because that's an odd interval, a diminished $4^{th}$. And probably there would be a little maneuvering in the third measure too. I'd be probably thinking a BM chord...[C]. I might think Eb to F#, but I might just as well think of it as D# first, and then in my mind change it back to Eb and do the Eb major chord [C].

KT: So you definitely group them in chords.
J: I'd also be thinking of 2 thirds in a row, because it's really an augmented triad [B, C]. That's about the last thing I thought of though. The first thing I thought of was that's E to Ab. It's easier for me to think of a M3rd. So I'm going into an intervallic mode, not so absolute I'd want to—I don't know I'm not sure I would trust my self completely to just sing E to Ab, but I probably could do it [P]. Does that make sense?

---

"Ken" Chunker; Builder; (Tonal-thinker)

KT: Describe what first caught your attention to this melody.
K: No major/minor key, no complex rhythms (thankfully, since the melody is so strange), e and e-flat, c and c-sharp, b and b-flat, "cadences" with E-flat triad.

KT: Was anything surprising about your performance of the melody?
K: Every note is a surprise; I find myself having to stop and "think intervals" [B] since there is no tonic to relate to; the difficulties for me involved measure 2 – getting TO the low D from measure one, and then jumping back to the high C-sharp.

KT: How do you think about the first measure?
K: Misspelled E+ chord (or A-flat+ inverted)

KT: Do you have a consistent procedure for thinking within a key when you begin?
K: "Quick analysis" yields two "pitch levels" (for a "tonic"-reference) – (1) E [E to A-flat = E to G-sharp, and C = B-sharp, so the opening "triad" is I+] and (2) E-flat, which is outlined in the final three notes. The "modulation" effect from an E to an E-flat "tonic" is not too difficult. [Tt]

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## Appendix J

### Metaphors for Pitch Perception (Revised)

The Follower

Followers usually follow another singer or an instrument to sing unfamiliar music accurately; they do not fully depend on the music notation even while looking at it. Followers are quite adept at making instinctive split-second adjustments to match a stronger singer or an instrumental accompaniment.

The Button-pusher

Button-pushers readily recognize pitch names or associate pitches with fingerings as they play melodies on an instrument, but may have difficulty imagining how the notes will sound before they play. From musical experience Button-pushers usually can tell intuitively if they play or sing a wrong note after it sounds. Button-pushers may visualize a keyboard or pretend to use their fingers to play a melody on an instrument to help them internalize pitch.

The Contour-singer

Contour-singers know to move their voices up or down with the notes on the staff, but scale steps and skips range from approximate to inconsistently accurate and sometimes do not stay within the key. Contour-singers may sense that their tones do not match the notes after they sing them, but may or may not have a good sense of where the tonic pitch is, either aurally or visually. Some may try to anchor their singing by comparison with a reference pitch that is prominent in the melody.

The Tonal-thinker

Tonal-thinkers usually prepare to sight-sing by thinking through the scale or the tonic triad. They recognize the tones of the tonic triad while they are singing and relate other pitches to these tonal anchors. Tonal-thinkers hear larger intervals by thinking of tendencies and tonal function rather than thinking about the size of an interval. Most Tonal-thinkers learned to internalize pitch with *movable-do* syllables or numbers, or they know how to spell scales so well that they are able to think through the letter names within a key.

The Builder

Builders measure intervals from one pitch to the next, or to another pitch in close proximity. They recognize isolated intervals and note names, i.e., in the key of A, they might see A to E, and think, "perfect $5^{th}$" rather than "*do-so*." They sight sing primarily by thinking about the size of the interval, not about how the next tone functions in the scale. Builders may have a good sense of tonic but may not always use it to guide them. If they miss one interval in singing or dictation, they will likely miss several pitches because they are relating to a previous pitch, rather than to an overall sense of key.

The Pitcher

Pitchers have absolute pitch recall. Their target is a sound associated with the letter name in their memory. Pitchers do not need to use tonal syllables, functional relationships, or intervals to sight-sing or internalize pitch in the key in which it is written, but find it difficult to read and sing music in a key other than the notation indicates. They also find it difficult to play an instrument tuned as much as one half-step sharp or flat. In coping with out-of-key contexts they must learn to transpose through intervallic reasoning or tonal thinking.

The Chunker

Chunkers scan a passage of music for relationships between groups of pitches which they recognize as patterns. From past experience they know the sound of these groups of pitches, or chunks, and they apply this knowledge as they auralize. Chunks may involve melodic sequences, structural tones, chord patterns, harmonic progressions, or other recognizable relationships. In atonal music Chunkers may use enharmonic re-spelling to facilitate hearing familiar pitch relationships beyond thinking intervallically for successive tones.