# THE EFFECTS
# OF CLASSIFYING, SEQUENCING, AND CODING
# ON THE IDENTIFICATION OF HARMONIC FUNCTIONS

by

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TABLE OF CONTENTS

## ABSTRACT

The purpose of the study was to investigate the effectiveness of different classification systems, content sequences, and coding processes on the aural identification of primary and secondary harmonic functions. Scalar groups used three scale degrees to classify harmonic functions. Scale degrees one, seven, and two defined the tonic (I, IV, vi), dominant (V, vii°, iii), and pre-dominant (ii) classes, respectively. Root groups used the traditional root movement procedure to classify harmonic functions. While deductive groups learned the relevant attributes of harmonic classes prior to learning the irrelevant attributes of class members, inductive groups learned the irrelevant attributes of class members prior to learning the relevant attributes of harmonic classes. Kinetic and verbal groups learned how to encode, remember, and decode harmonic progressions by using instrumental fingering patterns and movable do tonal syllables, respectively.

Forty-eight music students enrolled in ear-training classes at the Hartt School of Music constituted the sample for the study. These classes were randomly assigned to either a scalar or root classification system. In turn, members of each classification system were randomly assigned to either deductive or an inductive content sequence. Similarly, members of each content sequence were randomly assigned to either a kinetic or a verbal code.

Because intact classes participated in the study, two covariates were used to adjust for final differences between the experimental groups. Prior to the treatment, the Tonal Imagery test of the Musical Aptitude Profile and the Tonal Concepts test of the Iowa Tests of Musical Literacy (Level 6) were administered to all of the students.

A three-way multivariate design with two dependent variables was used to analyze the results of the study. Factor A was defined by the levels of classification system, namely, scalar or root. Deductive and inductive content sequences defined the two levels of the B Factor. The two levels of Factor C consisted of verbal or kinetic codes. An aural identification test battery was designed by the investigator to serve as criterion measures. Only root position chords are used on the root subtest; whereas, root position and inverted chords are used on the root/inverted subtest. In addition, the content of each subtest included 48 multiple-choice items, major and minor tonalities, primary and secondary harmonic functions, duple and triple meters, homophonic and polyphonic textures, and chord progressions of varying expectations.

There were no statistically significant three-factor or two-factor interactions on the multivariate or univariate tests of significance. Only the main effects for classification systems was found to be significant on the multivariate test. Separate univariate analyses indicated that the scalar groups obtained significantly higher mean scores than did the root groups on both of the criterion measures. In addition, because the magnitude of difference between the classification systems exceeded .50 of a standard deviation unit, the results are of practical significance. Thus, it appears that the scalar classification is a more effective procedure for teaching the aural identification of harmonic functions.

# CHAPTER I

## PURPOSE OF THE STUDY

### Introduction

Because music consists of organized aural elements, philosophers[1], psychologists[2], theorists[3], composers[4], and educators[5] attribute musical understanding to both perceptual and conceptual processes. That is, musical understanding depends on the ability to comprehend the aural relationships of melody, harmony, rhythm, timbre, texture, register, and dynamics. Although the relative importance of a given musical element may vary from one stylistic

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[1] "The abstractions made by the ear and the eye -- the forms of direct perception -- are our first primitive instruments of intelligence." Susanne K. Langer, Philosophy in a New Key. (New York: Mentor Books, 1942), p. 92.

[2] "Because students infer musical meaning from musical sound by being able to remember, organize, and conceptualize what they perceive, the general purpose of music education should be to teach students to understand what they hear." Edwin Gordon, The Psychology of Music Teaching. (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971), p. 63.

[3] "The basis of any encounter with music is the act of hearing. Music exists in and for the ear: apart from being heard, it does not exist." Victor Zuckerkandl, Man the Musician. (Princeton, New Jersey: Princeton University Press, 1973), p. 83.

[4] "What the lay listener needs is not to acquire facts, but to cultivate the senses." Roger Sessions, The Musical Experience of Composer, Performer, and Listener. (New York: Atheneum, 1950), p. 93.

[5] "In musical learning, hearing, sight, and kinesthetic feel are all involved. It appears obvious that hearing merits primary emphasis, but much music learning is carried on without significant attention to musical hearing." Charles Leonhard and Robert W. House, Foundations and Principles of Music Education, 2nd ed. (New York: McGraw-Hill, Inc., 1972), p. 162.

period to another, the most important elements of tonal music appear to be melody, harmony, and rhythm. Obviously, studies relevant to all three elements are of great importance to music educators. Unfortunately, a review of the literature indicates that investigators have neglected the investigation of harmony. Consequently, the effect of instructional variables on the attainment of harmonic concepts is virtually unknown.

## Content Sequences

Concepts are formed when individuals demonstrate the ability to classify discriminably different events with the same response. Individuals possessing this ability have little difficulty in organizing what they perceive. However, individual differences do exist in concept formation; therefore, different approaches may be more effective for different individuals. Two approaches frequently used in educational research are based on different logical processes. Proponents of a deductive approach advocate a sequence from the general to the specific[6]. That is, individuals attain general concepts and gradually refine them into specific tasks. Moreover, they relate the to-be-learned information to concepts already existing in their minds[7]. Therefore, broader generalizations can be made about other

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[6] Proponents of a deductive approach include Ausubel (receptive learning), Lewin (field-theory), and Bruner (spiral curriculum).

[7] Ausubel advises that anchoring information can be provided through an "advance organizer." That is, material of a more general nature is presented prior to the to-be-learned information. David P. Ausubel and Floyd G. Robinson, School Learning: An Introduction to Educational Psychology. (New York: Holt, Rinehart, and Winston, Inc., 1969), pp. 165-67.

concepts[8]. Conversely, proponents of an inductive approach advocate a sequence from the specific to the general[9]. That is, individuals attain general concepts by first learning prerequisite tasks. Moreover, they cumulatively attain the specific tasks of a general concept[10]. Therefore, narrower generalizations can be made about other specific tasks[11].

How can deductive or inductive approaches be applied to the teaching of functional harmony? To begin with, musical organization is hierarchical; therefore, general concepts can be subdivided into specific tasks. For example, subdivisions of functional harmony are presented in Figure 1. In terms of Figure 1, proponents of a deductive approach advocate a sequence from the top to the bottom. That is, from general classes to specific chord types. Conversely, proponents of an inductive approach advocate a sequence from the bottom to the top. That is, from specific chord types to general classes. Although neither approach has been shown to be effective for all concepts, a recent study found

[8] For a discussion of nonspecific transfer, see The Process of Education by Jerome Bruner. (Cambridge, Mass.: Harvard University Press, 1960), pp. 17-32.

[9] Proponents of an inductive approach include Gagne (learning hierarchies), Banathy (systems approach), and Wiener (cybernetics).

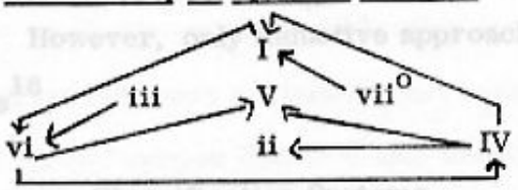
[10] Gagne advises that there are eight different kinds of learning. Specifically, the learning of higher order rules requires the prior learning of simpler rules. Robert M. Gagne, The Conditions of Learning, 3rd ed. (New York: Holt, Rinehart, and Winston, Inc., 1977).

[11] For a discussion of specific transfer, see Ausubel and Robinson, op. cit., pp. 137-74.

General Classes of Functional Harmony[12]

Progression or Regression

Relationship of Specific Classes[13]




Specific Classes of Functional Harmony[14]

Riemann's Three Classification System

| Dominant Class | Tonic Class | Subdominant Class |
|---|---|---|
| vii°, V, iii | I | vi, IV, ii |

McHose's Four Classification System

| 4th Class | 3rd Class | 2nd Class | 1st Class |
|---|---|---|---|
| iii | vi | ii, IV | V, vii |

Harmonic Functions

I , ii , iii , IV , V , vi , vii°

Chord Types

Major, Minor, Augmented, Diminished

Fig. 1. Hierarchical Tasks of Functional Harmony

[12] Cadzen advises that functional harmony involves a sense of motion either toward or away from a goal. Tonal motion may be classified as being either strong, medium, or gentle depending on its relation to a key center and the intervalic relation of adjacent root movements. Norman Cadzen, "The Principles of Tonal Direction in the Motion of Similar Tonal Harmonies," Journal of Music Theory, Vol. 2, No. 2, 1958, pp. 162-92.

[13] Both Piston and Meyer discuss the transitional probabilities between scale degrees in linear and harmonic progressions. Walter Piston, Harmony, 3rd ed. (New York: W. W. Norton and Co., 1969); and Leonard B. Meyer, Emotion and Meaning in Music. (Chicago: University of Chicago, 1956).

[14] Hugo Riemann, Harmony Simplified. Translated by Rev. H. Bowerunge. (England: Augener Ltd., 1895); and Irving Allen McHose, Basic Principles of the Technique of 18th and 19th Century Composition. (New York: Appleton-Century-Crofts, 1951).

that a deductive approach is more effective in teaching difficult concepts[15]. Because functional harmony may be considered a difficult relational concept, it would seem reasonable to expect that some music theorists would advocate a deductive approach. However, only inductive approaches are used in aural perception textbooks[16].

## Classification Systems

Although harmonic elements may be classified in terms of color (chord quality), tension (consonance/dissonance), and structure (close/open), harmonic progressions are usually classified in terms of functions. The functional systems of McHose and Riemann are based on Rameau's concept of fundamental bass. That is, harmonic classes are formed by observing the root movement of harmonic functions. Specifically, root movement of the interval of a perfect fifth. For virtually two hundred fifty years, classification systems based on this rule have not been challenged. However, a recent study has shown that individuals frequently demonstrate confusion in perceiving the roots of harmonic functions[17]. Moreover,

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[15] Even though the tasks of this study may be similar to those encountered in music learning, there may be no physiological basis for generalizing the results to a music setting. Evelyn W. Francis, "Grade Level and Task Difficulty in learning by Discovery and Verbal Reception Methods," Journal of Educational Psychology, Vol. 67, 1975, pp. 146-50.

[16] Bruce Benward, Teacher's Dictation Manual in Ear-Training, 2nd ed. (Dubuque, Iowa: Wm. C. Brown Company Publishers, 1969); Janet McLoud McGaughey, Practical Ear-Training, 2nd ed. (Boston: Allyn and Bacon, Inc., 1966); and Irving Allen McHose, Teacher's Dictation Manual. (New York: Appleton-Century-Crofts, 1948).

[17] Funk found that the secondary parameters of range, dynamics, chord doubling, and contextual situation affects an individual's ability to perceive the root of a harmonic function. Curtis Henry Funk, "An Investigation With Pedagogical Implications Into the Aural Perception of Root in Tri-chords," (Unpublished D. Mus. Ed. dissertation, Indiana University, 1975).

only root position major chords appear to have a sound physical basis[18]. Therefore, although the rule of a perfect fifth may be logical in terms of theoretical analysis, it may be illogical in terms of aural perception[19]. Nonetheless, music theorists continue to emphasize root classification systems.

Some music theorists have postulated that harmony is best understood in linear terms. That is, harmonies that look like chord inversions are in reality contrapuntal sonorities. Therefore, some music theorists have attributed the effect of harmonic functions not to the root phenomenon, but to the position the functions occupy in a scale system[20]. In support of this notion, a recent study indicated that a scalar classification system is more effective than a root classification system in teaching middle school general music students to identify primary harmonic functions[21].

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[18] Music theorists such as Rameau, Schenker, and Hindemith have attempted to use the overtone series to explain the nature of musical laws. The shortcomings of this approach are discussed in "A Clarification of the Tonality Concept" by William Ennis Thomson. (Unpublished Ph.D. dissertation, Indiana University, 1952), pp. 81-107.

[19] As Sessions has said: "A great deal of musical theory has been formulated by attempting to codify laws governing musical sound and musical rhythm, and from these deduce the musical principles. Sometimes these principles are even deduced from what we know of the physical nature of sound, and as a result are given what seems to me an essentially specious validity." Sessions, op. cit., p. 9.

[20] Zuckerkandl and Meyer are proponents of a scalar concept of tonality. Zuckerkandl states: Hearing music does not mean hearing tones, but hearing, in the tones and through them, the places where they sound in the seven-tone system." In a similar vein, Meyer states: "Some of the tones are active. They tend to move toward more stable points in the system -- the structural or substantive tones . . . . Thus in the major mode in Western music the tonic tone is the tone of ultimate rest toward which all other tones tend to move. On the next higher level the third and fifth of the scale . . . join the tonic as structural tones; and all other tones, whether diatonic or chromatic, tend toward one of these." Victor Zuckerkandl, Sound and Symbol. (Princeton, New Jersey: Princeton University Press, 1956), p. 35; and Meyer, op. cit., pp. 214-15.

[21] Manuel Alvarez, "An Experimental Study of the Effect of Scalar and Fundamental Bass/Aural Perception Techniques on Teaching Seventh- and Eighth-Grade General Music Students to Identify Primary Harmonic Functions." (Unpublished M.A. Thesis, State University of New York at Buffalo, 1980).

Research in concept learning and development has demonstrated that two separate abilities are needed to form harmonic classes. Individuals accept class members as equivalent by first attending to common relevant attributes and then by ignoring uncommon irrelevant attributes. Seen in this light, a root classification system appears to be illogical. For example, although the dominant tone is the relevant attribute of the dominant class, this tone is not possessed by the vii$^{o}$ harmonic function; therefore, the relevant attribute must be inferred. However, a scalar classification system can be used to form harmonic classes according to the above criteria. For example, the V, vii$^{o}$, and iii harmonic functions can be accepted as equivalent members of the dominant class because they possess the common relevant attribute of the seventh scale degree. In addition, this class is formed by ignoring the uncommon irrelevant attributes of different chord types and root pitches. Moreover, because a scalar system consists of fewer classes, fewer trials may be needed to identify harmonic functions. Therefore, it seems reasonable to conclude that music educators would want to investigate the efficacy of different classification systems.

## Memory Codes

Hierarchical structures of learning have been formulated for both general and music education[22]. In terms of the music model, the verbal association level of learning appears to be the one that is most often neglected by music educators. That is, the use of verbal codes to describe incoming aural elements. For example, music educators advocate the use of numbers, movable do syllables,

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[22] The former model is summarized in Gagne, op. cit., the latter model is summarized in Learning Sequence and Patterns in Music by Edwin E. Gordon. (Chicago: G. I. A. Publications, Inc., 1977), pp. 9-22.

or pitch letter names to assist individuals in identifying the constituent parts of tonal patterns. Moreover, research has indicated that the use of verbal codes to label harmonic elements tends to improve one's pitch discrimination[23].

This is not to say that all verbal codes are equally effective. Some codes may be more effective as far as how easily they can be encoded, remembered, decoded, and transferred[24]. For example, verbal codes that require more effort to name harmonic functions, than it does to simply discriminate between them, are ineffective. That is, individuals may be able to discriminate harmonic functions but exhibit confusion regarding the selection of associated syllables[25] It follows from this that the perception of harmonic elements may occur prior to the use of verbal codes.

For these reasons, it may be advisable to investigate the efficacy of more fundamental coding processes. Perceptual-motor learning theorists suggest that kinesthetic responses may be used to form internalized representations of external events[26]. In regard to music learning, evidence from several studies confirms the notion that individuals discriminate among musical tones by reproducing what

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[23] Arnold Bentley, Musical Ability in Children and Its Measurement. (London: George G. Harrap & Co., Ltd., 1966), p. 139.

[24] For theoretical discussions of the efficacy of different verbal codes, see "Fixed or Movable Do" by Arnold Bentley. Journal of Research in Music Education, Vol. 7, 1959, pp. 163-68; and Gordon, Learning Sequence. op. cit., pp. 109-14.

[25] Prytulak found that the effectiveness of verbal codes decreases as the number of decoding steps increases. In addition, verbal labels take a relatively long time to learn. Lubomu S. Prytulak, "Natural Language Mediation," Cognitive Psychology, Vol. 2, 1971, pp. 1-56.

[26] Eleanor J. Gibson, Principles of Perceptual Learning and Development. (New York: Appleton-Century-Crofts, Inc., 1969), pp. 53-74.

they hear on the basis of kinesthetic feedback[27]. Moreover, kinetic codes have been shown to be useful in abstracting the properties of mental images[28]. It follows from this that individuals may be able to learn to associate instrumental fingering patterns with the perceptual properties of harmonic functions. Using the information obtained from kinesthetic feedback, they acquire a perceptual "trace" of the aural experience. With continued practice, they learn to develop a standard for what kinesthetic cues "feel" correct. In addition, because the kinesthetic response requires less conscious attention, it tends to be produced in an automatic manner. Moreover, evidence tends to suggest that cross-modal transfer may occur[29]. Specifically, learned musical discriminations may be transferred from the auditory to the kinesthetic modality. Therefore, it seems reasonable to conclude that different coding processes may differentially effect an individual's ability to identify harmonic functions.

## Purpose and Problem of the Study

The purpose of the study was to investigate the efficacy of content sequences, classification systems, and memory codes on teaching college music students to identify harmonic functions. The research questions of primary interest were as follows:

1. Is a scalar or root classification system more effective in teaching college music students to identify harmonic functions?

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[27] Ibid., p. 56. Similarly, Meyer states: "Our ability to learn to perceive visual and auditory patterns is not solely a function of what the senses feed into our nervous system but depends in important ways upon the presence of concurrent motor behavior which is, so to speak, fed back into and thereafter guides the discoveries of the senses." Leonard B. Meyer, Music, the Arts, and Ideas. (Chicago: The University of Chicago Press, 1967), p. 275.

[28] Bruner, op. cit., pp. 33-54.

[29] Gibson, op. cit., pp. 215-31.

2. Under what content sequence do students learn to identify harmonic functions more effectively?

3. Is the effect of a given content sequence more effective for a scalar or a root classification system?

4. What effect does a kinetic or a verbal code have on the identification of harmonic functions?

5. Can the difference between the effects of classification system be atrribuited to the use of either a kinetic or a verbal code?

## Definitions of Terms

1. Scalar Classification System[30]. Scale degree one, two, and seven are used to classify seven harmonic functions into three classes, namely, tonic, dominant, and pre-dominant. That is, scale degree one, the most passive scale tone, is used to classify the I, IV, and vi harmonic functions as equivalent members of the tonic class. Similarly, scale degree seven, the most active scale tone, is used to classify the V, vii$^{o}$, and iii harmonic functions as equivalent members of the dominant class. Finally, scale degree two, the second most active scale tone, is used to classify the ii harmonic function into the pre-dominant class. Therefore, only the most passive and active scale tones are used to denote the three classes of functional harmony.

2. Root Classification System. Root movements based on the interval of a falling fifth are used to classify seven harmonic functions into five classes, namely, mediant, submediant, subdominant, dominant, and tonic. Therefore, six tones are used to form the five classes of functional harmony.

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[30] The principle constructs of the scalar system were developed by Dr. Robert Mols at the State University of New York at Buffalo.