

THE EFFECTS OF FOUR CONDITIONS OF "SAME" AND "DIFFERENT"  
INSTRUCTION ON THE DEVELOPMENTAL MUSIC APTITUDES OF  
KINDERGARTEN CHILDREN RECEIVING TONAL PATTERN TRAINING

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## CHAPTER ONE

### PURPOSE OF THE STUDY

#### Introduction

The Primary Measures of Music Audiation (PMMA) is a recent contribution to music aptitude measurement.<sup>1</sup> PMMA is unique among music aptitude tests because it is designed to measure the tonal aptitudes and rhythm aptitudes of groups of young children in kindergarten, grade one, grade two, and grade three.

The test is tape recorded in two parts: Tonal and Rhythm. Each part consists of forty pairs of music phrases. Each part of a pair includes one tonal pattern or one rhythm pattern. The children are asked to listen to each pair of patterns, and to determine whether the two patterns sound the same or different. The children record their answers on an answer sheet, but they do not need to know numbers or how to read a language to take the tests.

Prior to the publication of PMMA, it was believed that music aptitudes were fixed, innate traits. Evidence of the stability of music aptitudes was derived from

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<sup>1</sup> Edwin E. Gordon, Primary Measures of Music Audiation (Chicago: G.I.A., 1979).

valid aptitude tests designed to measure the music aptitudes of children in fourth grade and higher.<sup>2</sup> Research conducted with PMMA indicates that the tonal aptitudes and rhythm aptitudes of young children fluctuate because of the child's interaction with his musical environment. Informal exposure to, and instruction in, music have been found to improve the developmental music aptitudes of young children.<sup>3</sup> Two types of aptitude may be differentiated: stabilized and developmental. Stabilized aptitude refers to the music aptitudes of children in fourth grade and higher, whereas developmental aptitude refers to the music aptitudes of children in kindergarten and primary grades.

Two factor analytic studies have been undertaken to investigate the construct validity of PMMA.<sup>4</sup> In those

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<sup>2</sup> For example, see Edwin Gordon, Musical Aptitude Profile Manual (Boston: Houghton Mifflin, 1965) pp. 68-79.

<sup>3</sup> In addition to the evidence presented in the PMMA Manual, see Edwin E. Gordon, "Developmental Music Aptitude as measured by the Primary Measures of Music Audiation," Psychology of Music, 7 (1979), pp. 42-49; Edwin E. Gordon, "The Assessment of Music Aptitudes of Very Young Children," Gifted Child Quarterly, 24 (1980), pp. 107-111; and Edwin E. Gordon, "Developmental Music Aptitudes Among Inner-City Primary Children," Council for Research in Music Education, 63 (1980), pp. 25-30.

<sup>4</sup> Edwin E. Gordon, The Manifestation of Developmental Music Aptitude in the Audiation of "Same" and "Different" as Sound in Music (Chicago: G.I.A., 1981); John M. Holahan, "The Role of Synchronic and Diachronic Audiation in the Measurement of Developmental Music Aptitudes in Kindergarten Children," Unpublished Paper, Temple University, 1982.

studies, it was determined that kindergarten children's ability to identify correctly tonal patterns and rhythm patterns as being the same is unrelated to their ability to identify correctly tonal patterns and rhythm patterns as being different. It would seem that the psychological process of identifying tonal patterns and rhythm patterns as being the same is independent of the psychological process of identifying tonal patterns and rhythm patterns as being different. Thus the Tonal and Rhythm dimensions of developmental music aptitude include four underlying dimensions: Tonal-Same, Tonal-Different, Rhythm-Same, and Rhythm-Different. When PMMA scores are separated into these four dimensions, the data indicate that the correct identification of patterns that are the same is easy, relative to the correct identification of patterns that are different.

These findings corroborate the findings of psychologists studying the development of the child's understanding and use of the terms "same" and "different." Evidence from those studies suggests that the meanings of same and different undergo a developmental process in children between the ages of three and seven years.<sup>5</sup> The coinci-

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<sup>5</sup> In regard to these issues, see Margaret Donaldson and Roger J. Wales, "On the Acquisition of Some Relational Terms," in Cognition and the Development of Language, ed. J.R. Hayes (New York: Wiley, 1970); David W. Bessemer and Mark J. Fischer, Performance of Equivalence Discrimination Tasks by Kindergarten Children, Technical Memorandum, Southwest Regional Laboratory (Los Alamitos CA:



dence of these findings raises some fundamental questions. To what extent is the developmental understanding of the terms "same" and "different" responsible for the observed fluctuation in developmental music aptitude? Is the child's correct identification of sameness, correct identification of difference, or correct identification of both sameness and difference influenced by music instruction? Can the child's correct identification of sameness, correct identification of difference, or correct identification of both sameness and difference be modified by instruction designed to clarify the meaning of the terms "same" and "different"?

To gain insight into those questions, the following problems were investigated with kindergarten children receiving tonal pattern training.

#### Problems

- I To determine the comparative effects of four conditions of "same" and "different" instruction for kindergarten children with high and low levels of tonal developmental music aptitudes on the children's post-instruction tonal developmental music aptitudes,

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SWRL, 1973); David W. Bessemer, Knowledge of the Meaning of the Terms "Same" and "Different", Technical Note, Southwest Regional Laboratory (Los Alamitos CA: SWRL, 1975); Mary Carol Day and Joan S. Bissell, "Criteria for Same and Different Judgments and Visual Comparison Strategies of Four-Year-Olds," Child Development, 49 (1978), pp. 353-361.

as measured by Tonal-Total, Tonal-Same, and Tonal-Different PMMA scores.

The four treatment conditions are:

- 1) Listening to the teacher perform pairs of tonal patterns which are the same and labeled "same" by the teacher.
- 2) Listening to the teacher perform pairs of tonal patterns which are different and labeled "different" by the teacher.
- 3) Listening to the teacher perform pairs of tonal patterns, some of which are the same and some of which are different, and appropriately labeled "same" or "different" by the teacher.
- 4) No teacher performance or labels.

II To determine the effect of tonal pattern training and all "same" and "different" instruction conditions combined on all levels of Tonal and Rhythm developmental music aptitudes of kindergarten children, as measured by the difference between pre-instruction and post-instruction Tonal-Total, Tonal-Same, Tonal-Different, Rhythm-Total Rhythm-Same, and Rhythm-Different PMMA scores.

## CHAPTER TWO

### RELATED STUDIES

#### Design and Constructs of PMMA

The tonal pattern and rhythm pattern content<sup>1</sup> of PMMA was selected on the basis of the results of three studies.<sup>1</sup> In those studies, a taxonomy of tonal patterns and rhythm patterns was created. Relative difficulty levels of those patterns were determined for fourth grade children's correct identification of consecutive aural presentations of pairs of patterns which were the same. Only those patterns which were easily recognized as being the same were selected for use in PMMA.

To identify correctly the sameness or difference of two consecutively presented tonal patterns or rhythm patterns requires retention of the first pattern for comparison with the second pattern. PMMA is designed to measure young children's brief retention of tonal patterns and

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<sup>1</sup> Edwin Gordon, "Toward the Development of a Taxonomy of Tonal Patterns and Rhythm Patterns: Evidence of Difficulty Level and Growth Rate," Experimental Research in the Psychology of Music: Studies in the Psychology of Music, 9 (1974), pp. 39-232; Edwin Gordon, Tonal and Rhythm Patterns: An Objective Analysis (Albany: State University of New York Press, 1976); Edwin E. Gordon, A Factor Analytic Description of Tonal and Rhythm Patterns and Objective Evidence of Pattern Difficulty Level and Growth Rate (Chicago: G.I.A., 1978).

rhythm patterns for immediate comparisons. The verb "to audiate" has been coined to describe musical thinking, including the brief retention measured by PMMA. "Audiation takes place when one hears music through recall or creativity, the sound not being physically present except when one is engaging in performance, and derives musical meaning."<sup>2</sup> When taking PMMA, "the listener reacts to immediate impressions with intuitive responses to what is aurally perceived."<sup>3</sup> Thus the psychological construct of PMMA is the child's immediately audiated impression, which is the referent for making a "same" or "different" judgment.

Evidence of what young children audiate was obtained from two factor analytic investigations of the Tonal subtest items and the Rhythm subtest items of PMMA. In a longitudinal study of children in the standardization program of PMMA, the Tonal and Rhythm subtests were administered annually to a group of children during their years in kindergarten, grade one, grade two, and grade three.<sup>4</sup> The results of the first administration of PMMA are relevant to the present study.

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<sup>2</sup> Edwin E. Gordon, Primary Measures of Music Audiation Manual (Chicago: G.I.A., 1979) p. 7.

<sup>3</sup> Edwin E. Gordon, PMMA Manual, p. 7.

<sup>4</sup> Edwin E. Gordon, The Manifestation . . .

Scores were derived for each item of the Tonal subtest and each item of the Rhythm subtest: one point was awarded for a correct answer, no points were awarded for an incorrect answer. The scores for the forty items of the Tonal subtest were intercorrelated and a principal factors analysis with orthogonal rotation was performed on those intercorrelations. Five factors were found to underlie the forty Tonal subtest items. Scores for the forty items of the Rhythm subtest were intercorrelated and a principal factors analysis with orthogonal rotation was performed on those intercorrelations. Seven factors were found to underlie the forty Rhythm subtest items.

One common characteristic was found among all of the factors derived in the tonal analysis and the rhythm analysis: all items with high positive loadings on a given factor shared the same correct option response, either "same" or "different." They were termed "same" and "different" factors. Bipolar factors included items with one correct option response having high positive loadings and items with the other correct option response having high negative loadings. Of the five tonal factors, two were "same" factors and three were "different" factors. Of the seven rhythm factors, one was a "same" factor and six were "different" factors. These data were the first indication that kindergarten children audiate sameness apart from difference. Stated another way, there is no relationship between how sameness is audiated and how

difference is audiated by kindergarten children.

In a subsequent study, relationships among the "same" and "different" factors of the Tonal subtest items and the Rhythm subtest items combined were investigated.<sup>5</sup> Scores for the eighty items of the Tonal and Rhythm subtests from 277 kindergarten children were intercorrelated and a principal factors analysis with orthogonal rotation was performed on those intercorrelations. Five factors were found to underlie the eighty items of the Tonal and Rhythm subtests combined. Items with high loadings on any given factor included only those items of one aptitude dimension, either tonal or rhythm, and only those items with one correct option response, either "same" or "different." Further, it was discovered that the number of "same" items answered correctly by kindergarten children on the Tonal subtest is moderately correlated with the number of "same" items answered correctly on the Rhythm subtest. Similarly, the number of "different" items answered correctly on the Tonal subtest is moderately correlated with the number of "different" items answered correctly on the Rhythm subtest. Also, the number of "same" items answered correctly on the two subtests is uncorrelated with the number of "different" items answered correctly on the two subtests. In both of the above studies, it was found that more "same" items than "different" items were answered correctly on the two subtests.

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<sup>5</sup> John M. Holahan, "The Role of . . . ."

Thus the tonal and rhythm dimensions of developmental music aptitude are defined by four dimensions: Tonal-Same, Tonal-Different, Rhythm-Same, and Rhythm-Different.

#### Developmental Aptitude

A recent experimental study was conducted to determine the effect of tonal pattern and rhythm pattern training on the developmental music aptitudes of children in first grade.<sup>6</sup> Three-hundred sixty-five children participated in the study. The children were divided into experimental and control groups. Prior to instruction, the children were administered the Tonal subtest and the Rhythm subtest of PMMA. In the experimental group, the children were given five to ten minutes of tonal pattern and rhythm pattern training in each general music class period. The children echoed tonal patterns sung by the teacher first on a neutral syllable, then with tonal syllables. The children echoed rhythm patterns chanted by the teacher, first on a neutral syllable, then on rhythm syllables. The children in the control group were given only traditional instruction in music.

At the end of the academic year, the Tonal and Rhythm subtests of PMMA were re-administered to the children in both groups. The effect of tonal pattern and rhythm pattern training was determined with a pre-test and post-test

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<sup>6</sup> Edwin E. Gordon, *The Manifestation* . . . pp. 35-36.

design. Mean gain scores on the Tonal, Rhythm, and Composite scores for children in the experimental and control groups were compared by using three t-tests. The mean gain of the experimental group was significantly higher than the mean gain of the control group on each of the three measures of developmental music aptitude. In addition, correlation coefficients for PMMA pre-test scores with post-test scores were computed for the experimental and control groups. For the experimental group, the three coefficients ranged from .46 to .58. For the control group, the coefficients ranged from .66 to .79. The results suggest that developmental music aptitudes are susceptible to change as a result of tonal pattern and rhythm pattern training. The observed differences in the correlation coefficients indicate that the relative standing of children changes to a greater extent when tonal pattern and rhythm pattern training are included in instruction than when they are not.

In another study, the effects of same and different discrimination techniques, in addition to other variables, on the aural discrimination and singing abilities of kindergarten children were investigated.<sup>7</sup> Prior to instruction, the eighty-nine children who participated

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<sup>7</sup> Joyce A. DeCarbo, "The Effect of Same/Different Discrimination Techniques, Readiness Training, Pattern Treatment, and Sex on Aural Discrimination Ability and Singing Ability of Tonal Patterns with Kindergarten Children," Diss. Kent State University 1981.



in the study were administered the Tonal subtest of PMMA. The children were assigned to one of two conditions: same and different discrimination techniques or no same and different discrimination techniques. Both groups were given echo singing instruction with eight tonal patterns throughout an eleven week instruction period as part of their regularly scheduled music classes. The design of the same and different discrimination techniques used for experimental instruction is relevant to the present study. On some occasions, the teacher sang pairs of tonal patterns, some of which were the same and some of which were different. Then the teacher asked the children to identify whether the two patterns were the same or different. On other occasions, the teacher performed pairs of tonal patterns, some of which were the same and some of which were different. Each pattern of the pair, however, differed with respect to an "irrelevant" dimension. For example, some tonal pattern pairs were performed in two different melodic rhythms. The children were asked to decide whether the two tonal patterns were the same or different in terms of the intervallic relationships of the patterns, without regard to the irrelevant differences between them. After instruction, the Tonal subtest of PMMA was re-administered to the children.

No significant difference was found between the same and different and no same and different groups on the post-test scores of the Tonal subtest. For the

combined groups, a mean gain of 3.95 points from pre-test to post-test administrations of the Tonal subtest was found. Although it is possible that a mean gain of that magnitude could accrue only as a result of maturation, as DeCarbo suggests, it is improbable that only maturation contributed to the observed gain.<sup>8</sup> Because practice effects have been found to be negligible for PMMA, and because a mean gain of approximately six points can be expected for children as they progress from kindergarten to first grade, a mean gain of four points in eleven weeks can be interpreted as suggesting that tonal training may improve PMMA Tonal scores. The correlation between pre-test and post-test administrations of the Tonal subtest was .72, an indication that the relative standing of children on the test remained the same, despite the increased test score mean. Thus the tonal training used in the study might have caused an increase in tonal developmental aptitude, but it did not, as has been found previously, cause the tonal aptitudes of the children to fluctuate.

Because the discrimination techniques included both constant and varied "irrelevant" dimensions of tonal patterns, it seems reasonable to suggest that if a significant difference had been found between the two groups, the difference could have been attributed to the teacher's presentation of the tonal patterns in either context, that is,

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<sup>8</sup> DeCarbo, pp. 53-80.

with or without "irrelevant" differences. That no difference was found between the Tonal scores of children who were given discrimination techniques and those children who were not, fails to contradict the interpretation that discrimination techniques have no influence on the children's "same" and "different" judgments. Further, the fundamental assumption ". . . that the concept of same/different is a basic concept in all types of learning, and can be utilized effectively in music learning . . ." is open to question.<sup>9</sup>

#### "Same" and "Different"

It was not until 1970 that researchers began to study the child's use of relational terms. At that time Donaldson and Wales wrote:<sup>10</sup>

The making of comparative judgements seems to be pervasive in thinking, yet the acquisition of the ability to comprehend terms that are relational . . . in that they imply comparison across space or across time-- has, until now, been the object of very little direct inquiry, in spite of the fact that they have figured in crucial ways in much cognitive research.

Since that time, psychologists and linguists interested in the relationship between cognition and language have investigated the developmental semantics of relational

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<sup>9</sup> DeCarbo, p. 16.

<sup>10</sup> Donaldson and Wales, p. 237.

terms, including "same" and "different."<sup>11</sup> The purpose of those studies was to establish a theory of how young children develop an understanding of the meaning of relational terms.<sup>12</sup> An adequate theory has not yet been established.<sup>13</sup> A fundamental difficulty arises when inferences are made about the child's understanding of words on the basis of the child's use of those words in experimental contexts.<sup>14</sup> Unfortunately, the designs of the studies have been inadequate for making generalizations about the child's understanding of relational terms. Numerous studies have been undertaken to investigate the child's knowledge and use of the terms "same" and "different" in specific contexts.<sup>15</sup> Although specific procedures differ

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<sup>11</sup> Relational terms include, but are not limited to, word pairs such as long-short, more-less, and same-different.

<sup>12</sup> See, for example, Eve V. Clark, "What's in a Word? On the Child's Acquisition of Semantics in His First Language," in Cognitive Development and the Acquisition of Language, ed. T. Moore (New York: Academic Press, 1973) pp. 65-110.

<sup>13</sup> Meredith M. Richards, "Sorting Out What's in a Word From What's Not: Evaluating Clark's Semantic Features Acquisition Theory," Journal of Experimental Child Psychology, 27 (1979), pp. 1-47.

<sup>14</sup> Sam Glucksberg, Anne Hay, and Joseph Danks, "Word Utterance in Context: Young Children Do Not Confuse the Meanings of 'Same' and 'Different'," Child Development, 47 (1976), pp. 737-741.

<sup>15</sup> In addition to the studies cited in footnote 5 of Chapter One, see Nobutaka Matsumura, "The Development of Language and Class Concepts in the 'Difference From a Pair Task': With the Class Negation Task and the Equivalence Task," Japanese Journal of Psychology, 51 (1981), pp. 301-309; Roger A. Webb, Mary Ellen Oliveri, and Lynda