

THE RELATIONSHIP BETWEEN THE
CONSERVATION OF CERTAIN
MELODIC MATERIALS AND
STANDARD PIAGETIAN TASKS

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ABSTRACT

THE RELATIONSHIP BETWEEN THE CONSERVATION OF CERTAIN MELODIC MATERIALS AND STANDARD PIAGETIAN TASKS

By

Gloria Miller Bettinson

The purpose of this investigation was to determine whether one pattern of musical cognitive development was compatible with the cognitive developmental pattern as theorized by Piaget. The determining criterion was Piaget's conservation principle as it applied to the development of musical thought. The element chosen to assess musical conservation was melody.

For the experimental sample, twenty-eight seven-year-old subjects were chosen from seven-year-old students enrolled in an elementary school in Mount Pleasant, Michigan.

The procedures involved the individual administration of two tests to each of the subjects in the sample. One test, a standardized conservation test,¹ measured a subject's ability to conserve Piagetian tasks involving physical properties. The other test, a ten-item listening test developed by this researcher, measured a subject's performance on melodic conservation tasks. Each test consisted of two sections: a behavior section in which the subject gave a "yes" or "no" response, and an explanation section in which the subject

justified his behavior response. The tests were administered on two consecutive days. Half of the subjects received the Piagetian conservation test on the first day of testing; the other subjects received the melodic conservation test on the first day. The procedures were reversed on the second day.

Implementation and data collection took place during May 1974. The scores collected from the Piagetian and melodic conservation tests were analyzed by a Pearson product-moment correlation coefficient. Based on the results of the Piagetian conservation test, the subjects were categorized into two groups--high and low conservers. The melodic conservation performance of the two conservation groups was then analyzed by an F Test and an analysis of variance for repeated measures.

A t Test was computed between the melodic conservation performance of the first and second graders.

Results of the analyses yielded the following major findings:

1. No significant relationship exists between a seven-year-old child's level of ability to conserve standard Piagetian tasks and to conserve melodic tasks
2. The difference between total mean scores on the melodic conservation test of the two Piagetian conservation ability groups was not significant

3. The performance of the two Piagetian conservation ability groups on the five individual measures of the melodic conservation test did not vary significantly
4. Second graders did not perform significantly better on the melodic conservation test than did the first graders
5. Augmentation caused the greatest interference with melodic conservation

¹Concept Assessment Kit: Conservation, San Diego, California: Educational and Industrial Testing Service, 1968.

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To Chuck--who has always given me
support in both my personal
and educational endeavors

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CHAPTER I

THE PROBLEM

There has been continued emphasis on elementary school teaching which is based on psychological principles of learning, especially those which relate to the cognitive domain. Knowledge of the way in which young children learn, think, and reason is especially important as an educator plans effective instructional strategies. Likewise, an understanding of how children learn, think, and reason about music is equally important in the development of meaningful learning experiences.

Even though there are various ways in which children experience and interact with music, cognitive reactions to music are the basis for the development of a musical intellect. In music learning, perceptual and conceptual behaviors are both classified as cognition.¹ Although there is an interdependence between perception and conception, the underlying processes for each behavior differ.

Cognitive perception consists of simple awareness of sound through the senses, such as hearing sound or seeing

¹Robert Sidnell, Building Instructional Programs in Music Education (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1973), p. 46.

sound performed.² Since music is an aural art, it is evident that musical learning experiences begin with and are dependent upon aural perception.

Perception of sound leads to cognitive conceptualization as the mind operates on the sound and organizes what is being heard. From such organization, an individual verbalizes and reasons about the musical concepts which he perceives. The development and recognition of this intellectual process is important in music education because the pattern of perceiving, organizing, and conceptualizing plays an important role in the elementary school musical activities of listening, performing, and creating.

Statement of the Problem

Jean Piaget, the Swiss developmental psychologist, has presented an educational theory that cognitive stages develop in a particular pattern in all children. The purpose of this investigation is to determine whether one pattern of musical cognitive development is consonant with the cognitive developmental pattern as theorized by Piaget. The determining criterion is Piaget's conservation principle as it applies to the development of musical thought.

Specifically, this study has a twofold purpose. First, to determine whether there is a relationship between ability levels of seven-year-old children to conserve

²Ibid., p. 74.

standard, visually presented Piagetian tasks and ability levels to conserve melodic, aurally presented tasks. Secondly, to determine whether the melodic performance levels of high performance Piagetian conservers varies from the melodic performance levels of the low performance Piagetian conservers.

Piagetian stage theory and musical conservation became of interest to this researcher during a Seminar in Music Learning. Examination of research concerning the application of Piagetian concepts to music learning led to a pilot study conducted by this researcher. The unanswered questions resulting from the pilot study led to the formulation of this study.

Assumptions of the Study

The theoretical basis of this investigation is founded on the assumption that Piaget's theory of cognitive stages, as it relates to conservation, represents a realistic state of growth which will be displayed in a sample of seven-year-old children. Since Piaget claims that the ability to conserve is manifested in average children of this age, it is assumed that the majority of children in a sample will display some degree of ability to conserve Piagetian tasks.

This study also assumes that the measures selected to assess the children's abilities to conserve standard Piagetian tasks will discriminate conservation levels among the children tested. The music test is also assumed to be a

valid means of determining abilities to conserve melodic tasks.

Definition of Terms

The following definitions are specific to this study and were formulated through a review and analysis of the theory and materials used in this study.

Operation

An operation is a psychological term consisting of four characteristics: (1) it is an action which can be carried out in thought; (2) it is reversible, i.e., it can take place in one direction or in the opposite direction; (3) it always supposes some conservation; and (4) every operation is related to a system of operations.³

Conservation

This term as used by Piaget means an awareness of the "constant invariant in a system of transformations."⁴ In the music conservation test, the constant invariant is melody, and the melodic transformations are produced by rhythm, augmentation, transposition, and timbre.

For this study, the constant invariants in the four Piagetian tasks are: (1) number, transformed by spatial

³Jean Piaget, Genetic Epistemology, trans. Wolfe Mays (New York: Columbia University Press, 1970), p. 21-22.

⁴Jean Piaget and Barbel Inhelder, The Psychology of the Child, trans. Helen Weaver (New York: Basic Books, Inc., 1969), p. 96.

displacement; (2) substance, transformed by changing shape; (3) continuous quantity, transformed by pouring water into a differently shaped container; and (4) weight, transformed by changing shape.

High Conservers and Low Conservers

High conservers are defined as those subjects whose scores on the conservation test of standard Piagetian tasks place above the median score. Those subjects whose scores fall below the median score are categorized as low conservers.

Melody

A melody in the music conservation test consists of a succession of six or seven tones. The term "tune" is used with the subjects in substitution for the term melody. The concept of tunes going "up and down" is employed, based on Mursell's statement that very young children, as well as older children who are not very musical, conceive of melody as a total contour of tonal movement, rather than as a sequence of tones.⁵

Rhythm

The rhythm is defined as the pattern of the melody's stresses, duration of tones, and pauses.

⁵James Mursell, The Psychology of Music (New York: W. W. Norton and Company, Inc., 1937), p. 101.

Augmentation

Augmentation is the presentation of a melody in doubled durational values.

Transposition

Transposition is the presentation of a melody that is sounded at another pitch level.

Timbre

Timbre is the perceived difference in tone quality among tones of the same pitch when produced on various instruments.

Placebo

Placebo is the exact repetition of a melody.

Basic Hypotheses of the Study

A review of the literature on Piagetian stage theory, his principle of conservation, and research relating to the application of Piagetian concepts to music learning has led to the following general hypotheses which are tested in the study. These hypotheses are stated in statistical form in Chapter III.

1. There will be a relationship between a child's ability to conserve melodic tasks and his ability to conserve standard Piagetian tasks
2. There will be a difference between the abilities of the high Piagetian conservers to conserve melodic tasks and

the abilities of the low Piagetian conservers to conserve melodic tasks

3. There will be a difference in the performance of the high and low conservers on each of the five individual measures of the melodic conservation test

Limitations of the Study

This study is limited in that correlations cannot establish cause-and-effect relationships between the variables correlated. As a result, there is no indication as to which variable influences which, or even whether either variable is influencing the other one directly.

This study is also limited by the sensitivity of the measuring instruments that were used to determine the conservation abilities of the children. The characteristics of the sample, the environment for testing, and scheduling procedures also produced limitations. The abilities of this researcher to devise and implement the research procedures were also limiting.

Overview

Chapter II of this study includes a general review and discussion of the research relevant to this investigation. Sample characteristics, procedures, instrumentation, and data collection and analysis are considered in Chapter III. In

Chapter IV, the statistical and descriptive findings of the study are presented and discussed. Chapter V includes the conclusions of this study and a description of the implications.

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of related literature is organized under three main headings: (1) Piaget's Stages of Cognitive Development; (2) Piaget's Principle of Conservation; and (3) Research Relating to the Application of Piaget's Concepts to Music Learning. Research findings in these areas provided the bases for the research hypotheses of this study.

Piaget's Stages of Cognitive Development

Piaget's theory regarding the intellectual growth of children has evolved from more than forty years of study and research. As a result of his belief that perception and conception do not progress in the same pattern during a child's development, Piaget theorizes that cognitive stages exist in the realm of intellectual, not perceptual, development.¹

Each of Piaget's four major stages of intellectual development is associated with an approximate age span.

¹Joachim Wohlwill, "From Perception to Inference: A Dimension of Cognitive Development." First Monograph of the Society for Research in Child Development, in Cognitive Development in Children (Chicago: The University of Chicago Press, 1970), p. 78.

However, the average age at which the stages occur may vary with the individual as the result of determining factors. Four of these are: maturation, experience with the environment, social transmission (linguistic or educational transmission), and equilibration or self-regulation.² Hereditary potential is another possible factor which may influence the age variations in Piaget's stages of intellectual development.³

Piaget was less concerned with the ages associated with the stages than with the order of the stages. He discovered that intellectual growth develops in an invariant succession of stages in all children, regardless of age. During each stage, the child has a characteristic way of looking at and thinking about the world that is unique and different from that of an adult. According to Piaget, the behavioral changes which occur between stages are primarily those of speed in responding, awareness of results, and the ability to perform operations at higher levels.⁴

Piaget has labeled these stages in terms of the major cognitive task that each seems to accomplish: (I) Sensorimotor, categorized as mastery of concrete objects; (II) Preoperational,

²Jean Piaget, "Development and Learning," In Piaget Rediscovered: A Report on the Conference on Cognitive Studies and Curriculum Development, ed. Richard E. Ripple and Verne N. Rockcastle (New York: Cornell University, 1964), p. 10.

³J. Mc V. Hunt, Intelligence and Experience (New York: The Ronald Press Company, 1961), p. 256.

⁴Harold W. Stevenson, "Piaget, Behavior Theory, and Intelligence," First Monograph of the Society for Research in Child Development, in Cognitive Development in Children (Chicago: The University of Chicago Press, 1970), p. 101.

mastery of symbols; (III) Concrete Operational, mastery of classes, relations, and numbers; and (IV) Formal Operational, mastery of thought.⁵

Because this study is concerned with seven-year-old children, the preoperational stage (ages two to seven) and the concrete operational stage (ages seven to eleven) will be summarized.

Preoperational Stage

When Piaget labels the second stage of cognitive development as preoperational, he does so because the child is unable to perform operations, or thought out actions. The preoperational child's thought is often based on intuition and his thoughts are egocentered.⁶ The egocentric child centers on his own personal perspective and experiences. The young school child often attributes to objects and to other people the same experiences, perceptions, and thoughts that he has.⁷ As a result of these patterns of thought, the child does not have the mental ability to perform operations and he is unable to conserve.

The last two years of the preoperational stage are a period of gradual growth into the concrete operational stage.

⁵Richard Evans, Jean Piaget: The Man and His Ideas (New York: E. P. Dutton and Co., 1973), p. xxxix.

⁶Ibid., p. 87.

⁷Leonore Boehm, "Exploring Children's Thinking," in Readings in Learning and Human Abilities, ed. Richard E. Ripple (New York: Harper and Row Publishers, 1964), p. 90.

During this time, the child becomes more and more reliant on thought rather than on perception. Piaget has concluded that at around age seven, the average child develops the ability to use logical operations in his thought patterns.⁸ The child, when dependent on thought and logic, is able to perform an operation referred to by Piaget as conservation. According to Wohlwill, "when a child attains conservation, he is ready to enter a qualitatively new stage of mental development. . ."⁹ This new stage, concrete operational, is Piaget's third stage of cognitive development that encompasses the ages of seven to eleven years.

Concrete Operational Stage

In labeling the third stage as concrete operational, Piaget indicates that the operations performed relate to objects, to groups of objects, to the relations between objects, and to the counting of objects.¹⁰ Another definition of this stage indicates these operations as those which deal with actual tangible, visible materials and objects.¹¹

⁸Martin D.S. Braine, "Piaget on Reasoning: A Methodological Critique and Alternative Proposals," First Monograph of the Society for Research in Child Development, "in Cognitive Development in Children (Chicago: The University of Chicago Press, 1970), p. 33.

⁹Joachim Wohlwill, "The Mystery of the Prelogical Child," in Readings in Developmental Psychology Today (Del Mar, California: Communications/Research/Machines, Inc.), p. 17.

¹⁰Piaget and Inhelder, The Psychology of the Child, p. 132.

¹¹Christian H. Ayisi, Performance of Ghanaian Children on Some Piagetian Conservation Tasks (Research Report, University of Cape Coast, July, 1972), p. 8.

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Another writer, Wallace, refers to concrete objects as only those objects which can be handled or imagined in concrete form.¹²

Piaget's Principle of Conservation

One of Piaget's principles which has been of particular interest to psychologists and educators is that of conservation. As defined by Piaget, conservation is the awareness of the "constant invariant in a system of transformations."¹³ Conservation makes it possible for the child to concentrate on logical relationships rather than on perceptual qualities. Thought becomes dominant over the child's perceptions and activities.

An important aspect of conservation is reversibility of which there are two forms: reversibility by inversion, and reversibility by reciprocity or compensation. Reversibility by inversion is simply an opposite operation. Compensation involves a reciprocate or compensatory relationship. During the process of conservation, the thought transformations "become reversible and account both for the changes in their compensated variations and for the constant implied by reversibility."¹⁴

¹²J. G. Wallace, Concept Growth and the Education of the Child (New York: New York University Press, 1965), p. 55.

¹³Piaget and Inhelder, The Psychology of the Child, p. 96.

¹⁴Ibid., p. 98.

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Piaget insists on the importance of reversibility as an essential characteristic of logical thinking which leads to conservation.¹⁵ He also emphasizes that reversibility is "the most clearly defined characteristic of mature thought or intelligence."¹⁶ Piaget and his colleague, Barbel Inhelder, have found that during the concrete operational stage, the child can generally achieve either one or the other of the forms of reversibility. Usually both types of reversibility are not realized until the formal operational stage, which occurs approximately at age eleven.¹⁷

Through his research, Piaget discovered that as a child mentally develops from the preoperational stage to the concrete operational stage, he gradually progresses through four stages of conservation. The initial stage is marked by an absence of conservation and extends to approximately age six. In this stage, the child does not have the capacity for conservation because his thoughts are centered. Centration, as Evans defines it, is a focusing upon "one particular aspect or dimension of a stimulus array at a time. . . other relevant

¹⁵Daniel E. Berlyne, "Comments on Relations Between Piaget's Theory and S - R Theory," First Monograph of the Society for Research in Child Development, in Cognitive Development in Children (Chicago: The University of Chicago Press, 1970), p. 20.

¹⁶Hunt, p. 202.

¹⁷Barbel Inhelder, "Some Aspects of Piaget's Genetic Approach to Cognition," First Monograph of the Society for Research in Child Development, in Cognitive Development in Children (Chicago: The University of Chicago Press, 1970), p. 20.

dimensions are overlooked and neglected."¹⁸ In the initial stage, the child is often misled by the appearance of a stimulus. As a result, the child fixes on the more prominent characteristic that he perceives and therefore is unable to conserve. Because it is difficult for the child to conceive of objects in terms of their multiple characteristics, it is difficult for the preoperational child to reason about the whole and the parts.¹⁹

The second stage of conservation, which begins around age six, is an oscillatory stage. In this transitional stage, the child oscillates between what he thinks is right and what he actually sees. There is evidence of "perceptual compromise" in which there is mutual interaction between perception and thought.²⁰

The third stage of conservation is categorized as one in which the compensatory roles of perception and thought begin to be suspected. This suspicion leads to the fourth stage of conservation in which there is certainty of absolute conservation by the child, despite the perceptual transformations.²¹ The average child has the capacity for exact conservation at age seven or eight.²²

¹⁸Evans, p. 87.

¹⁹Jean Piaget, Logic and Psychology, trans. W. Mays and F. Whitehead (Manchester, England: Manchester University Press, 1953), p. 5.

²⁰Wohlwill, "From Perception to Inference," p. 83.

²¹Ibid., p. 84.

²²Piaget and Inhelder, The Psychology of the Child, p. 47.

Other writers, Brearley and Hitchfield, define three stages of conservation in terms of children's reactions to specific test situations. During the initial stage, in which there is an absence of conservation, children cannot answer the questions because they do not understand the task or the principles involved. If they do give an answer, they often indicate that they are not thinking at the adult level.²³

During the second, or oscillatory, stage of conservation, the children's answers to test questions are sometimes correct and sometimes incorrect. When the final stage of conservation is reached, children's responses are described as quick and confident. The children are also able to justify logically and support their replies which is the primary characteristic of conservation.²⁴

In other studies which employed the Concept Assessment Kit: Conservation, researchers found that conservation is related to other individual characteristics, such as school achievement, vocabulary, mental age, and personality characteristics.²⁵ In a study correlating grades which were given

²³Molly Brearley and Elizabeth Hitchfield, A Teacher's Guide to Reading Piaget (London: Routledge and Kegan Paul, 1966), p. 3.

²⁴Ibid., p. 9.

²⁵Marcel L. Goldschmid and Peter M. Bentler, Manual to Concept Assessment Kit: Conservation (San Diego, California: Educational and Industrial Testing Service, 1968), p. 4.

in various school subjects with conservation test scores, as measured by the Concept Assessment Kit, music grades in a sample of seven-year-old children had a positive correlation of .11 with conservation test scores. The music grade correlation was the second lowest of all correlations; handwriting (.08) was the lowest.²⁶ It should be emphasized that this study was one that correlated a classroom music grade with a conservation test score of Piagetian tasks; it was not a study of music conservation.

In summary, it is emphasized that:

One of the most important phases in a child's development is the transition from a prelogical to logical mode of thought. . . conservation not only signals this cognitive change, but also represents a crucial attribute in and of itself.²⁷

Research Relating to the Application of Piaget's Concepts to Music Learning

To date, there have been only two research studies²⁸ in the field of music that assess the application of Piaget's theories to music education. Marilyn Pflederer, who theorized that conservation is one theory of mental development which can be applied to musical development, studied the responses of eight five-year-old children and eight eight-year-old children to musical tasks employing the Piagetian principle of

²⁶Ibid., p. 13.

²⁷Ibid., p. 4.

²⁸Pflederer and Larsen

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conservation. Her tasks were devised to study the rational nature of musical development as manifested in a child's ability to conserve meter, tone, and rhythm.²⁹

In the Pfloderer study, each task was preceded by a narrative with make-believe characterizations. The musical tasks were not solely intended to determine a child's immediate aural perception. Rather they were an attempt to ascertain how a child thinks about what he is hearing.³⁰ Pfloderer concluded that the stages from non-conservation to absolute conservation could be observed in the thought responses of the subjects to the musical tasks.³¹ Because of the narrative factor, one can speculate that the responses may have reflected conservation of narratives rather than conservation of musical materials.

Pfloderer developed "five conservation laws in the development of musical concepts," which were modeled after Piaget's conservation laws. Her first law is identity, defined as the recognition of repetitions of a theme when played by a different instrument or when presented in a sequence. Metrical groupings is the second law which includes the ability to conserve meter even though the note values are

²⁹Marilyn Pfloderer, "The Responses of Children to Musical Tasks Embodying Piaget's Principle of Conservation," Journal of Research in Music Education 12 (Winter 1964): 255.

³⁰Marilyn Pfloderer, "A Study of the Conservation of Tonal and Rhythmic Patterns in Elementary School Children," California Journal of Educational Research 17 (March 1966): 56.

³¹Ibid., p. 54.

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distributed differently within measures. Discrimination between different meters is also included in the second law. The third law, augmentation and diminution, involves the ability to conserve melody when it is presented twice as fast or twice as slow as the original.³²

Transposition, Pfloderer's fourth musical conservation law, is one which includes the ability to recognize a melody when transposed, if the intervals remain the same. The final law is inversion, or the ability to realize that a harmonic triad remains the same whether in root position, or in an inverted position.³³

In a U.S.O.E. Project, also dealing with music conservation, Zimmerman³⁴ concluded that conservation of meter and rhythm were more difficult than conservation of tonal patterns. Change of instrument, tempo, and harmony did not interfere with conservation as much as change of rhythm pattern, inversion, and mode. Zimmerman also found that a "plateau" in music conservation skills was reached by the fourth grade,³⁵ assumed by this researcher to be approximately ages nine or ten.

³²Marilyn Pfloderer, "Conservation Laws Applied to the Development of Musical Intelligence," Journal of Research in Music Education 15 (Fall 1967): 221-222.

³³Ibid., p. 222.

³⁴As a result of marriage during the time span of the review of literature, Marilyn Pfloderer and Marilyn Zimmerman refer to the same person

³⁵Marilyn Zimmerman, "Percept and Concept: Implications of Piaget," Music Educators Journal 56 (February 1970): 147.

A parallel to Pfloderer's study of the transition of musical thought from preoperational to concrete operational is that by Robert L. Larsen which dealt with the transition of musical thought from concrete to formal operational. Although it was not a study of conservation, Larsen studied cognitive reasoning as it applied to the melodic permutations of inversion, retrograde, and retrograde inversion. Larsen's subjects were children from three levels: eight third-graders (early concrete); eight fifth-graders (mid to late concrete); and eight seventh-graders (early formal operational).

The four tasks included in the Larsen study involved the aural ordering of five resonator bells to achieve the permutations. Larsen concluded from his study that the ordering portions of the musical tasks required concrete operational thought for their solution.³⁶ Only the older subjects accepted the three permutations as a valid means of achieving melodic variation, a result which supported Larsen's hypothesis that melodic permutation was an example requiring formal operational structures for their conceptualization.³⁷

To this researcher, the procedures employed by Larsen appear to be analogous to those used by Piaget. Larsen's subjects were actively manipulating sound through the ordering tasks, which emphasizes Piaget's belief that children must

³⁶Ronald L. Larsen, "Levels of Conceptual Development in Melodic Permutation Concepts Based on Piaget's Theory," Journal of Research in Music Education 21 (Fall 1973): 262.

³⁷Ibid., p. 257.

manipulate objects themselves for understanding, rather than watch someone manipulate the objects before them.³⁸ This method seems to categorize Larsen's tasks as "concrete!"

In an attempt to determine the musical conservation abilities of pre-Kindergarten through fifth grade children, a pilot study was conducted by this researcher in February 1974. The ages of the seventy-four subjects in the sample ranged from four years old to eleven years old.

The procedures used in the pilot study were similar to those used during the melodic conservation test in this study, except that only behavior responses were involved. The test consisted of ten randomly ordered tasks which included two tasks for each of the five measures: placebo, transposition, augmentation, timbre, and rhythm. Although the tasks used in the pilot study were similar to the tasks used in this study, they have not been exactly replicated.

The elementary school subjects in the pilot study were classified into groups for analysis purposes: preoperational, which included ages four through seven, and concrete operational, which consisted of eight- through eleven-year-old subjects. Based on the results, it was concluded that there was no difference between the abilities of the subjects in the two groups to conserve melodic tasks.

³⁸ Jean Piaget, Foreword to Piaget in the Classroom, ed. Milton Schwebel and Jane Raph (New York: Basic Books, Inc., 1973), p. ix.

Summary

This chapter included a review of literature which concerned the Piagetian stages of intellectual development with an emphasis on the preoperational and concrete operational stages. A review of material relevant to Piaget's principle of conservation points out its importance to childhood mental development. Literature relating to the application of Piagetian concepts to music learning indicates that the increased interest in Piaget in the United States during the last two decades has produced an interest in applying Piagetian theories to the field of music education.

CHAPTER III

TECHNIQUES AND PROCEDURES

In this chapter, the design of the study and information relevant to sample selection and characteristics, implementation procedures, instrumentation and data collection, statistical hypotheses, and data analysis techniques will be discussed.

Sample Selection and Characteristics

The population of this study sample included all seven-year-old students living within the Kinney Elementary School district in Mount Pleasant, Michigan. The cultural setting of the school-community is one whose population is relatively stable and racially homogeneous. One percent of the students in the public school system consists of Blacks and Orientals. Students of Spanish origin make up two percent of the population, while three percent are Indian.

The community is socio-economically categorized as middle-class and is one where the citizens generally support the value of public school education. The schools and the total community are influenced by the proximity of Central Michigan University.

According to the principal of Kinney School, the children in the school consistently perform at approximately the fiftieth percentile on standardized measures. He also related that music instruction in the elementary grades consists of two, fifteen-minute sessions per week during the first semester, and one, twenty-five minute session per week during the second semester for the first grade children. Second graders receive musical instruction once a week for twenty-five minutes per session. It is not until the third grade that students have music classes twice a week for a total of fifty minutes per week. No formal music instruction by a specialized music teacher is provided in the Kindergarten.¹

The selected sample was randomly drawn from the cumulative records of four lower elementary classrooms. Included in the sample were eleven subjects from one first grade class, eight from the other first grade, seven subjects from the second grade, and five students from a second/third grade combined classroom. Although there are three Indians and three Spanish speaking students enrolled at Kinney, all the subjects in the sample were white.

During the course of the study, the mortality rate totaled two subjects in the first grade and one subject in the second grade, which resulted in a final sample of twenty-eight, consisting of twelve boys and sixteen girls.

¹Interview with William Walters, Principal of Kinney Elementary School, Mount Pleasant, Michigan, 8 May 1974.

Attrition was the result of absenteeism on the second day of testing.

Research Design and Procedures

The correlational design of this study is a direct result of a pilot study conducted by this researcher. The latter led to the development of a relationship study as one means of determining whether there was any degree of commonality between a child's level of ability to conserve Piagetian tasks and his ability to conserve melodic tasks.

The procedures of the present study involved two specific steps which took place on two consecutive days. Both steps were administered to each of the twenty-eight subjects by this researcher. Fourteen of the subjects received the first step on the first day of testing, while the other fourteen subjects were given the second step on the first day. On the following day, the procedures were reversed.

The first step of the procedures focused on each subject's ability to conserve traditional Piagetian tasks. Each subject was presented with four tasks which were administered in a different order to each subject. The results from these tasks were used for the correlational study between the subject's ability to conserve melody and to conserve Piagetian tasks. Scores were also used for classifying the subjects into two groups, based on levels of conservation, in order to analyze the data obtained in the second step of the procedures.

The second step of the procedures, modeled after tasks used in the pilot study, tested the subjects on their ability to conserve music. Because elementary listening experiences involve both program and absolute music, these procedures were designed to evaluate how well a child is able to aurally perceive and conserve pure sound. Pfladerer-style narratives were eliminated in order to establish a relationship between the music and the child, rather than between the music and the story. Therefore, music was used to evoke the response, not literature.²

The musical element used to measure music conservation was melody, because "the earliest experience of the child which deserves to be called musical in any determinate sense is melodic."³ Melody was also chosen because of Zimmerman's conclusion that conservation of tonal patterns proved to be less difficult than conservation of rhythmic patterns.⁴

Instrumentation and Data Collection

Piagetian Conservation Test

The standardized procedures of the Educational and Industrial Testing Service Concept Assessment Kit:

²Sister Theresa DiRocco, "The Child and The Aesthetics of Music," Music Educators Journal 55 (April 1969): 35.

³Mursell, p. 100.

⁴Zimmerman, p. 147.

Conservation were used as a means of evaluating a subject's ability to conserve traditional Piagetian tasks. To allow for the attention spans of seven-year-old children, four tasks were randomly chosen from the six tasks of "Form A" of the conservation assessment test. The tasks were: (1) number; (2) substance; (3) continuous quantity; and (4) weight. The Kuder-Richardson 20 internal consistency reliability coefficients for the above tasks are as follows: number, .86, continuous quantity, .80, substance, .81, and weight, .76.⁵

For the task involving conservation of number, subjects viewed six red chips in a straight line and six white chips parallel to the red chips. The white chips were then spread out and the subjects were asked if there were as many red chips as white chips, or if there were more of one kind than of the other.

A subject's ability to conserve substance was determined if he realized that there was the same amount of play doh in Ball B when it was rolled into a hot dog as there was in Ball A which was equal to Ball B before B's transformation.

The task which measured conservation of continuous quantity consisted of pouring water from one of a pair of equally filled glasses into a large, flat dish. The subject was then questioned whether there was now as much or more water in the flat dish, in an attempt to determine if the flat displacement of the water would interfere with conservation.

⁵Goldschmid and Bentler, p. 11.

Conservation of weight was measured by the subject's ability to perceive that Ball B of play doh, which weighed the same as Ball A, still weighed the same as Ball A when Ball B was flattened into a pancake.

The subjects were administered both the behavior section of the test which classified their responses as either correct or incorrect, and the explanation section in which the subject justified the response which he gave to the behavior section. The amount of testing time of the Piagetian tasks did not exceed six minutes.

For purposes of the correlational study, the total number of correct behavior and explanation responses was the subject's score. The highest possible score was eight. For the analysis of variance, the total score on the Piagetian conservation test was used to classify the subjects into a high conserver group and a low conserver group.

Melodic Conservation Test

In order to evaluate a subject's ability to conserve melody, a ten item listening test was composed and tape recorded.⁶ For each of the ten items, there was a possible correct score of two, one point each for behavior responses and explanation responses, with a total correct score of twenty. The Kuder-Richardson 20 internal consistency

⁶See Appendix A, p. 63-64.

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reliability coefficient for the twenty item test was .687. The ten item behavior section of the test yielded a .689 reliability coefficient, and the ten item explanation section yielded a reliability coefficient of .634. The correlation coefficient between the behavior section and the explanation section was .19.

The total testing time of the melodic ^Conservation test was approximately ten minutes, which included a brief orientation to acquaint the subject with the nature of the tasks. The concept of how melodies go up and down was discussed by using examples. Following the discussion, a sample task, a phrase from "This Old Man," transformed by rhythm, was presented vocally by means of a cassette^S tape recording. Prior to actual testing, the subject was allowed to ask questions concerning the procedures.

In addition to two tasks in which there was an exact repetition of the stimulus (placebo), the melodic conservation test consisted of two tasks for each of the four melodic transformations: transposition, timbre, augmentation, and rhythm. These tasks were based on the conservation laws of musical development as proposed by Pfloderer.⁷

One of the two tasks for the placebo items, as well as the four melodic transformations, was a six or seven tone melody which was assumed to be familiar to a seven-year-old

⁷Pfloderer, "Conservation Laws Applied to the Development of Musical Intelligence," p. 221.

child. The examples were phrases from "Mary Had A Little Lamb," "Old MacDonald," "Yankee Doodle," "Twinkle, Twinkle Little Star," and "My Country, 'Tis of Thee." The other tasks for each of the four transformations and the placebo item were unfamiliar six or seven tone melodies composed by this researcher.

The ten melodic tasks were randomly ordered on a tape recording. All music conservation tasks were either played on the piano or sung by a soprano, except those tasks which were transformed by timbre. A violin, trombone, clarinet, and an Orff xylophone were the media of performance for the timbre tasks.

The melodic conservation test tape consisted of: (1) an announcement of "Listen," (2) followed by the aural presentation of the first melody, (3) followed by a three-second interval of silence before (4) the melody was repeated with its transformation or no transformation, and (5) an announcer question, "Do the tunes go up and down in the same way?" The tape recording was then stopped, during which time the subject relayed his answer and was asked for an explanation of his answer. The same sequence was repeated for each of the remaining tasks. By manipulating the test tape recording, the subjects were presented with the melodic tasks in different sequences.

Statistical Hypotheses to be Tested

The following hypotheses are stated in the null form. The instrument used for data collection is specified.

1. There will be no significant relationship between a subject's ability to conserve melody, as measured by scores on the melodic conservation test, and his ability to conserve physical properties, as measured by scores on the Piagetian conservation test
2. There will be no significant difference between the total mean score of the group of high conservers, as measured by scores on the melodic conservation test, and the total mean score of the group of low conservers, as measured by scores on the melodic conservation test
3. There will be no significant difference between the mean scores of the high conservers on the individual tasks, as measured by scores on the melodic conservation test, and the mean scores of the low conservers on the individual tasks, as measured by scores on the melodic conservation test

Analysis of Data

The data collected from the melodic conservation test and the Piagetian conservation test were key punched into cards which were analyzed via the Michigan State University CDC 6500.

The Pearson product-moment coefficient correlation or "r" was computed to determine the mutual variability between a subject's performance on melodic tasks and Piagetian tasks. Assumptions required for testing the significance of

"r" are that the sample must have been obtained by random sampling, and that X and Y are each normally distributed and linearly related. The data from the two conservation tests met these requirements, except that the distribution of the Piagetian conservation test scores was negatively skewed.

Hypothesis 2 was tested by a Student-Fisher t Test and a Snedecor-Fisher F Test. For these tests, samples are assumed to be random and the means are assumed to be uncorrelated. The assumptions for these two statistical tests were met.

An analysis of variance for repeated measures was computed to test the third hypothesis. Assumptions underlying the analysis of variance are that the population from which the sample was drawn is normally distributed, that there is homogeneity of variance, and that the subjects have been randomly selected. The data which were collected from the melodic conservation test met the requirements for an analysis of variance.

The level of probability for each test of significance was set at .05.

Summary

This chapter contained a description of the sample selection and procedures of the study. Attention was also given to instrumentation and data collection. The statistical hypotheses were stated in the null form and the methods which were employed to test these hypotheses were discussed.

CHAPTER IV

REPORT OF FINDINGS

The presented findings consist of analyses of the test results and the relationship between the scores on the two tests. The performances of the high conservers versus the low conservers on the melodic test, as well as the performance of the first graders versus the second graders on the melodic test, are also presented and discussed.

The mean correct scores on the five measures of the melodic test are presented, and an analysis of variance for repeated measures, based on the results of the high and low conservers on the melodic measures, is included. The correlations between the order of presentation of the two tests are also tabled and discussed.

Following the presentation of findings is a summary of the hypothesis testing.

Presentation and Discussion of Findings

A low correlation coefficient (Table 1) between the twenty-eight seven-year-old subjects' abilities to conserve standard Piagetian tasks and to conserve melodic tasks indicates that only four percent of the variance in the two

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measures is common to both. The correlation of .214, although positive, proved to be statistically not significant. This may have been the result of the sample size, as well as a reflection of the inconsistencies between the subjects' scores on the two tests. Three subjects who scored highest (8) on the Piagetian tasks also scored highest on the melodic tasks (13), but one subject who scored highest on the Piagetian tasks scored the lowest (1) on the melodic tasks. One subject who was a non-conserver (0) of Piagetian tasks scored second highest (11) on the melodic tasks.

TABLE 1
RELATIONSHIP BETWEEN CONSERVATION OF
PIAGETIAN AND MELODIC TASKS

Variable	1.	2.
1. Piagetian Tasks	1.00	
2. Melodic Tasks	.214*	1.00

*
p = .30

The results of the melodic conservation test (Table 2) indicate that the overall mean correct score was low. The subjects were able to respond correctly to only approximately thirty-seven percent of the twenty items included on the test. The low mean is assumed to be the result of the low scoring on the explanation section of the test which comprised half of the test items and produced a mean of 1.28. A relatively

low standard deviation and a range of five on the explanation section reflect the low variance among the students in their ability to verbalize why they thought that the tunes went up and down in the same way. Throughout the behavior and explanation sections, the subjects had the option of answering "I don't know." The majority of the subjects used this option during the explanation section.

TABLE 2
SUMMARY TABLE FOR MELODIC TEST

	Total Tasks	Mean ^a	Mean of Boys ^b	Mean of Girls ^c	Standard Deviation
Behavior Responses	10	6.10	6.25	5.94	2.43
Explanation Responses	10	1.28	1.66	1.00	1.53
Total Test Responses	20	7.39	7.91	7.00	3.07

^aN = 28

^bN = 12

^cN = 16

Although the actual verbal explanations were not coded and analyzed, an item analysis of the percentages of correct responses to the explanation section shows that the subjects were more able to explain correctly the placebo and timbre tasks than the augmentation, rhythm, and transposition tasks. None of the subjects were able to provide an explanation of

a task which involved an unfamiliar tune transposed down a whole step.

An analysis of the behavior section of the melodic conservation test indicates that the subjects were able to respond correctly to sixty percent of the tasks. The heterogeneity of the group is shown by the range of nine in a total of ten items and a standard deviation of 2.43. Placebo, timbre, and rhythm tasks had a higher percentage of correct behavior responses than did the transposition and augmentation tasks, as shown by an item analysis.

In the three analyses of the melodic conservation test, the boys were able to respond correctly to slightly more tasks than the girls. In the sample, there were seven first grade and five second grade boys, and ten first grade and six second grade girls.

TABLE 3
T TEST BETWEEN FIRST AND SECOND GRADERS ON
MELODIC CONSERVATION TEST

	Mean	Mean of Boys	Mean of Girls	Standard Deviation	t	p
First Graders	6.59	6.14	6.90	2.24	1.84	.08
Second Graders	8.64	10.40	7.17	3.43		

Although the mean score of the eleven second grade subjects was higher than the mean score of the seventeen first

grade subjects, a t test (Table 3) was applied and no significant difference was shown between the means of the children in the two grades. The ranges were equal (10) for the subjects in the two grades, but the standard deviation for the second graders was considerably higher than that of the first graders. The mean of the second grade boys indicates that they were able to respond correctly to slightly over half of the twenty test items, which was three more correct responses than the overall mean of 7.39 on the melodic conservation test.

A low correlation coefficient (.19) between the explanation section and the behavior section of the melodic conservation test indicates that the two sections probably measured different abilities. The mean of the behavior section was indicative of the fact that the subjects were attempting to give a "yes" or "no" answer, although the high range and standard deviation imply a heterogeneous group.

It is interesting to note that the melodic conservation tasks which were constructed of familiar tunes produced a mean of 3.07, while the tasks of unfamiliar tunes produced a mean of 3.14. Many of the children indicated that they knew the tunes that they had heard during the testing. Possibly a centering on familiarity caused some interference with conservation.

The results of the Piagetian conservation test (Table 4) indicate that the seven-year-old subjects were not only able to respond correctly to tasks, but were able to explain their responses as well. In all but four cases, the subjects were

able to provide a justification for their reasoning. The ranges in the three analyses of the test were from zero to all correct, indicating that there was some degree of variance among the seven-year-old subjects in the ability to conserve standard Piagetian tasks. There was little difference between the performance of the two sexes on this test.

TABLE 4
SUMMARY TABLE FOR PIAGETIAN TEST

	Total Tasks	Mean ^a	Mean of Boys ^b	Mean of Girls ^c	Standard Deviation
Behavior Responses	4	2.75	2.75	2.75	1.43
Explanation Responses	4	2.61	2.66	2.56	1.47
Total Test Responses	8	5.36	5.42	5.31	2.93

^aN = 28

^bN = 12

^cN = 16

In an attempt to determine whether there was test sequence interaction, a Pearson product-moment correlation coefficient was computed. No correlation was found between the scores of the fifteen subjects who were tested on musical conservation on the first day of testing and on Piagetian conservation on the second day. The scores of the thirteen subjects who had the Piagetian test on the first day and the melodic test on the second day produced a statistically

insignificant correlation coefficient of .32 (Table 5). One can speculate that the difference between the correlation coefficients may be due to the structure of the two groups. The group which had the melodic test first and the Piagetian test second consisted of eleven first graders and four second graders, while the opposite group consisted of an almost equal ratio of first graders (six) and second graders (seven).

TABLE 5
CORRELATIONS BETWEEN ORDER OF
PRESENTATION OF TESTS

Music - Piagetian	Piagetian - Music
.00	.33

Based on the results of the Piagetian conservation test, the twenty-eight subjects were divided into two groups of conservers to determine whether a subject's ability to conserve musical tasks is affected by his ability to conserve Piagetian conservation tasks. Those subjects who scored correctly on six or more tasks on the Piagetian test were categorized as high conservers, and those who responded correctly to less than six tasks were considered as low conservers. This categorization caused sixteen subjects to be included in the high conserver group and twelve subjects in the low conserver group. To provide for equal cells for the analysis of variance for repeated measures, a random sample

of twelve subjects was selected from the sixteen subjects who qualified as high conservers. The final sample of twelve high conservers consisted of three first graders and nine second graders. One second grader and eleven first graders were included in the group of twelve low conservers. An equal ratio of girls and boys were in both groups.

TABLE 6
F TEST OF HIGH AND LOW CONSERVERS
ON MELODIC TEST

	Mean ^a	Mean of Boys ^b	Mean of Girls ^c	Standard Deviation	F	p
Low						
Conservers	6.83	6.50	7.16	3.54	2.37	.08
High						
Conservers	8.58	9.33	7.83	2.30		

^aN = 12

^bN = 6

^cN = 6

As indicated in Table 6, the mean score of the high conservers of Piagetian tasks was higher than that of the low conservers of Piagetian tasks on the twenty item melodic conservation test. A Fisher-Student t Test for equality of means and a Snedecor-Fisher F Test for equality of variances indicate that there is no significant difference between the two groups in their abilities to conserve melodic tasks. The

girls in the low conserver group performed better than the boys, while the boys in the high conserver group scored higher than did the girls in the group. The heterogeneity of both groups is indicated by the ranges and standard deviations. Although the range for the low conservers (8) was less than that for the high conservers (12), the standard deviation for the low conservers was greater.

Table 7 indicates that on each of the individual melodic measures, except rhythm, the performance of the high conservers was higher than that of the low conservers. The differences between the means of the individual measures of the groups was statistically not significant, as indicated by an analysis of variance as presented in Table 8. This insignificance may have been the result of the sample size, and the discrete scores which could be either zero, one, or two correct.

TABLE 7
MEAN CORRECT SCORES ON MELODIC MEASURES

	Placebo	Trans- position	Timbre	Augmen- tation	Rhythm
Low Conservers	1.33	1.08	1.16	.66	1.25
High Conservers	1.66	1.33	1.50	1.41	1.25

Although the two groups scored similarly on the rhythmically transformed tasks, rhythm was the highest interferer of conservation for the high conservers, while it was the second highest scoring task for the low conservers. After rhythm, transposition, augmentation, timbre, and placebo tasks followed in order of diminishing difficulty for the high conservers. The two tasks involving augmentation produced the highest amount of interference for the low conservers, followed in decreasing order of interference by transposition, timbre, rhythm, and placebo tasks.

In comparing the mean correct scores of the group of the twenty-eight subjects in the sample on the individual melodic measures, augmentation (1.00) was the highest interferer, followed by transposition (1.14), timbre and rhythm (1.21), and placebo (1.54).

The mean scores of the placebo items for both high and low conservers indicate that there was evidence of placebo reactors in both groups of subjects. Four, or one-third of the twelve highconservers reacted to one or both of the placebo tasks, while seven, or 58.3 percent of the twelve low conservers incorrectly responded to one or both of the placebo items. Forty-two percent of the twenty-eight subjects in the sample reacted to placebo items.

TABLE 8
ANALYSIS OF VARIANCE FOR REPEATED MEASURES
ON MELODIC TEST

Source	df	Sums of Squares	Mean Square	F	p
Between	1	3.333	3.333	3.038	.095
Within	22	24.133	1.096		
Measures	4	2.716	.679	1.681	.161
Conservation Groups by Measures	4	1.750	.437	1.083	.370
Measures by Subjects within Groups	88	35.533	.403		
Total	119	67.466			

A two-way analysis of variance for repeated measures (Table 8) indicates that the mean scores and the variances for both low and high conservers on the individual melodic measures did not differ significantly from one to another. There was no interaction between the individual measures and the two conservation groups, indicating that the gains of the means from the low to high conservers were consistent.

Summary of Hypothesis Testing

The findings resulting from the data analysis have led to the following statements regarding the rejection

of the null hypotheses.

- | | | |
|----|--|--------------|
| 1. | There will be no significant relationship between conservation of physical properties and conservation of melody | Not Rejected |
| 2. | There will be no significant difference between the two groups on the total mean scores on the melodic test | Not Rejected |
| 3. | There will be no significant difference between the two groups on the individual measures on the melodic test | Not Rejected |

Summary

The findings of this study indicate quite clearly that the levels of ability to conserve visually presented tasks are not equal to the levels of ability to conserve aurally presented tasks for seven-year-old children. Regardless of how well a child performs on Piagetian tasks, this performance does not presumably affect his ability to conserve melodic tasks.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The purpose of this investigation was to determine whether a certain aspect of musical cognitive development is compatible with Piaget's theory of cognitive development. Answers to these questions were sought: (1) Will there be a relationship between a seven-year-old child's level of ability to conserve melodic tasks and his level of ability to conserve standard Piagetian tasks? (2) Will the scores on the melodic tasks of those subjects who are high Piagetian conservers vary from the scores on the melodic tasks of those subjects who are low Piagetian conservers? (3) Which melodic transformation will interfere most often with a high conserver's ability to conserve melody and with a low conserver's ability to conserve melody?

For the experimental sample, twenty-eight subjects were randomly chosen from seven-year-old children who were enrolled at Kinney Elementary School in Mount Pleasant, Michigan.

Two tests were individually administered to each of the subjects in the sample. One test, a standardized conservation test, measured a subject's ability to conserve Piagetian tasks involving physical properties; the other,

a listening test developed by this researcher, measured a subject's performance on melodic conservation tasks.

The hypotheses tested concerned: (1) the relationship between a subject's ability to conserve Piagetian tasks and melodic tasks; (2) the difference between total mean scores of the high and low conservers on melodic tasks; and (3) the difference between the means of the two conservation groups on each of the five specific measures on the melodic test.

Implementation and data collection took place over a two-day period during May 1974. The data were analyzed by t and F tests, Pearson product-moment correlation coefficients, and an analysis of variance for repeated measures.

Conclusions of the Study

As a result of the data obtained from the correlational study, it may be concluded that there is no significant relationship between a seven-year-old child's level of ability to conserve standard Piagetian tasks and his level of ability to conserve melodic tasks. The results from the Piagetian test seem to indicate that some of the seven-year-old subjects were in the preoperational stage, while others may have advanced into the concrete operational stage. This finding supports Piaget's conclusion that age seven is generally the pivotal point of entry into the concrete operational stage.

Four subjects were non-conservers of Piagetian tasks, which indicates that centration was the dominant force in their reasoning. Since ten subjects were exact conservers of Piagetian tasks, one can assume that the remaining fourteen were in the oscillatory or suspective stages of conservation. These fourteen had inconsistent responses that also reflected some degree of centration.

In contrast to the conservation stages that were manifested in the Piagetian test results, there were no exact conservers of melodic tasks. It can be concluded that the subjects, in respect to their musical conservation abilities, could be classified as non-conservers or oscillatory conservers. This assumption is based on Piaget's statement that a cognitive problem is not solved until seventy-five percent of the children of a certain age respond correctly.¹ The percentages of correct responses to each melodic task, provided by an item analysis of the twenty item test, indicate that only the placebo items reached a percentage of or over seventy-five. Since there was no conservation involved in the placebo items, it is assumed that the melodic tasks were not exactly conserved.

One reason for the contrasting differences in the levels of visual conservation and aural conservation may be found in a study which is quoted by Piaget in The Mechanisms of

¹Piaget, Piaget Rediscovered, p. 31.

Perception:

The perception of sounds and of music implies the intervention of a whole series of perceptual activities (including decentring, relating, transporting, transposing, etc.), in the absence of any exploratory movements of the ear comparable to those of functional significance in visual perceptual activity.²

Piaget's implication has application to this research: the mental process involved in aural perception may be much more complex than in visual perception. During the transformation process of the Piagetian conservation tasks, the concrete objects could be explored with the eye. However, after one hearing during the melodic conservation test, the ear had the full responsibility of transporting the melodies to the mind. The mind was then required to take over the processing of the stimuli without any added exploration.

Because young children's mental structures are not yet developed to cope with a particular cognitive problem in a logical manner, children are often unable to conserve.³ If the mental processes involved in aural perception are indeed more complex than those in visual perception, one can assume that the levels of conservation of musical tasks will be unequal to the levels of conservation of visual tasks. This will be true as long as the mental structures of children are not sufficiently developed to cope with the added mental processes involved in aural perception.

²Jean Piaget, The Mechanisms of Perception, trans. G. N. Seagrim (London: Routledge and Kegan Paul, 1969), p. 189.

³Ronald L. Larsen and Charles G. Boody, "Some Implications for Music Education in the Work of Jean Piaget," Journal of Research in Music Education 19 (Spring 1971): 36.

In reality, the main task of the melodic conservation test was the organization of musical stimuli into patterns of ups-and-downs and the discrimination between the original and transformed tunes each with patterns of ups-and-downs. According to Mursell, musical organization depends upon the mind rather than on the ear. Mursell states:

We do not merely receive stimuli through our ears. We organize them into patterns and relationships because of the operations of our minds. And what we actually hear is not the sensations imposed upon us from the outside but the organized patterns derived from the actions of the mind upon the data from without. This crucial fact, that we hear mentally created patterns rather than imposed sensations--that the mind selects and organizes and gives shape to what we hear--is the foundation of all musical organization. . . .⁴

Mursell further states that:

For music depends essentially not on the stimuli which reach the external ear, nor even upon the responses which the structures of the inner ear make to those stimuli, but rather upon the organizing and transforming operations of the mind upon them.⁵

Mursell's emphasis on the mind as the organizer of musical sounds is related to Piaget's belief that conservation depends upon the logical operations of the mind. Petzold, in a study of auditory perception in elementary children, also confirms this viewpoint: that a musical understanding of what is being heard is a result of thinking.⁶

⁴Mursell, p. 50.

⁵Ibid., p. 51.

⁶Robert George Petzold, Development of Auditory Perception of Musical Sounds by Children in the First Six Grades, Cooperative Research Project, No. 766 (University of Wisconsin, 1960), p. 111.

Piaget's observations are based on how a child thinks rather than on what a child thinks. Since Piaget's stages are descriptive of cognitive development, which signifies perception, remembering, imagining, judging, and most importantly, reasoning, the qualitative information derived from the child is more valuable to Piaget than quantitative information.⁷ Therefore, the results of the explanation section of the melodic conservation test, which is qualitative information, must be carefully considered. Fourteen of the twenty-eight subjects were unable to provide explanations for their behavior responses to melodic tasks. Thus, the criterion for conservation--reasoning--was not evident in the sample of seven-year-old children.

Limited intellectual experiences in aurally perceiving and understanding the basic concepts of music during the first and second years of formal school music instruction may explain the absence of musical reasoning abilities. Petzold states that aural understanding, "which is a reflection of accurate auditory perception, results from. . . judgments made independently by the child and based upon his understanding of basic musical concepts."⁸ Pfloderer believes that once a framework of rhythmic, melodic, and harmonic concepts is built, this solid conceptual framework will permit an

⁷Larsen and Boody, p. 35.

⁸Petzold, p. 111.

individual to reason about the basic concepts of music.⁹ It can be concluded that the children in the first and second grades in this sample have not sufficiently built a framework of aural understanding. This framework is needed before an individual is capable of reasoning about the stimuli which he is hearing.

Another prerequisite for reasoning ability may be a knowledge of verbal labels for musical sounds. Without a grasp of necessary musical terminology, it would be impossible for an individual to intelligently verbalize about musical stimuli. Therefore, confusion regarding appropriate labels may have been another reason for a seven-year-old child's lack of reasoning abilities on the melodic conservation test.

In addition to the foregoing conclusions, the low scoring on the melodic conservation test may also be a result of the length of the test. The total testing time was approximately ten to twelve minutes including the orientation session. There was observable restlessness in many of the subjects' reactions to the quiet session of concentrated listening. Some subjects asked how much longer the test would take. This was strikingly different from the attitudes of the subjects during the Piagetian test, which was shorter and involved very active viewing of the manipulations of the concrete objects. The comments after the Piagetian test were often, "Oh is that all" and "That was fun."

⁹Pflederer, "A Study of the Conservation of Tonal and Rhythmic Patterns in Elementary School Children," p. 54.

As a result of the analysis of the performance of high Piagetian conservers and low Piagetian conservers on the melodic test, it may be concluded that a subject's ability to conserve musical tasks is not presumably affected by his ability to perform on Piagetian conservation tasks. The differences between the total mean scores of the two conservation groups on the melodic test, as well as the differences between the means on the five individual melodic measures, remained insignificant.

Even though there were no significant differences in the means, the tasks which caused the most interference for each group varied. Rhythm was the greatest interferer of melodic conservation for the high conservers. This finding supports Zimmerman's conclusion that change of rhythm pattern, inversion, and mode often interfere with conservation more than change of instrument, tempo, and harmony.¹⁰ In contrast to the high conservers' reactions to rhythmic tasks, the low conservers achieved the second highest mean scores on the rhythmic tasks. Augmentation was the highest interferer for the low conservers.

According to Piaget, one of the main factors influencing the age at which a child enters or departs from a cognitive stage of development is social transmission, which includes educational transmission.¹¹ Organized experiences

¹⁰Zimmerman, p. 147.

¹¹Piaget, Piaget Rediscovered, p. 10.

with aural perception, transmitted by music education, play an important role in facilitating aural understanding. Petzold concluded that "the musically experienced child has a decided advantage in responding to the auditory presentations of musical material."¹² Therefore, musical experience, which indicates educational transmission, results in increased aural understanding.

Zimmerman's study of five-, seven-, nine-, eleven-, and thirteen-year-old subjects found that performance on music conservation tasks got progressively better from the younger to the older children.¹³ Thus, it appears that age and grade level, which connote added educational transmission, play an important role in conservation.

The researchers who established the norms of the Concept Assessment Kit: Conservation, found that with age there was a gradual increase in mean performance. This increase in performance with increasing age "reflects children's increased capacity in understanding the concept of conservation."¹⁴ In other words, the increase in performance is the result of increased educational transmission.

In his research of children's aural perception in the first six elementary grades, Petzold concluded that age or

¹²Petzold, p. 109.

¹³Zimmerman, p. 147.

¹⁴Goldschmid and Bentler, p. 14.

grade level "implies a musical growth and maturity which is directly related to competence in the auditory perception of the melodic element of music."¹⁵ He found that mean correct scores increased in each successive grade level, which also connotes increased educational transmission.

Research findings indicate that age or grade level is an important factor in both aural perception and conservation abilities. An additional year of educational transmission may be one of the reasons that the high conserver group, which included nine second graders and three first graders, scored somewhat higher than the low conserver group, which was composed predominantly of first graders. The lack of a significant difference between the performance of the two conservation groups, as well as the lack of a significant difference between the performance of the first graders and the second graders on the melodic test, may have been a result of the proximity of the two grades. The noticeable differences found in the research projects conducted by Petzold, Zimmerman, and the researchers of the Concept Assessment Kit may have been the result of the six or seven year age spans between the youngest and oldest subjects.

In summary, the major conclusion of this study is that the pattern of cognitive development in music does not follow the same pattern as that presented by Piaget.

¹⁵Petzold, p. 62.

Implications of the Study

Piaget's stages of cognitive development are the result of many years of researching the intellectual growth of young children. Reasoning patterns, as reflected by conservation abilities, give educators an indication of the cognitive stage in which a child is developing. The teacher who has a knowledge of the characteristic thought patterns in each of Piaget's stages is able to determine what may be expected of a child. This knowledge will result in the facilitation of planning instructional sequences as well as determining prerequisite learning necessary for new learning experiences. Therefore, the main implication of this study is that Piagetian stage theory can provide valuable insight into appropriate instructional sequencing and curriculum development for music education.

Music educators as well as classroom teachers must identify and be aware of musical intellectual abilities as children progress through stages of musical growth. This study implies that music educators cannot assume that a child's level of intellectual ability in the realm of aural perception is the same as that child's level of ability to perform tasks which are based on visual perception. Just as there are different levels of conceptual abilities shown in a normal elementary classroom, there will be obvious levels of perceptual and conceptual abilities in the music classroom. Once these differences are taken into account, more sound and effective music learning will take place.

More effective music learning will also result when the teacher is aware that the ages of Piagetian cognitive development do not correspond to the ages of musical cognitive development. Because of age differences, an implication which can be drawn from this study is that the content of initial musical instruction should be compatible with the characteristic thought patterns associated with Piaget's first stage of cognitive development, the sensorimotor stage. Piaget and Inhelder state that during the sensorimotor stage, "the child constructs all the cognitive substructures that will serve as a point of departure for later perceptive and intellectual development."¹⁶ Therefore, it is during this stage that a conceptual foundation can be laid for further musical intellectual development.

In an attempt to formulate psychologically sound sequences of musical instruction, one should disregard the physical ages associated with the sensorimotor stage (from birth to age two), and focus on the stage's characteristic abilities and thought levels. One can speculate that a young school child's first formal exposure to music learning is similar to that of exposure to the novel and unfamiliar in the early sensorimotor years.

Exceptions to this approach may be used with those who are more advanced musically as a result of experience or

¹⁶Piaget and Inhelder, The Psychology of the Child, p. 3.

interaction with their environment, which according to Piaget is one of the influencing factors in stage development and acceleration.¹⁷ Those children who have had experience and interaction with an intellectual musical environment previous to the first music learning experiences in school may have progressed into a higher stage. Examples of this student type may be those who have studied music privately, or those who have been exposed to an intellectual musical environment. In contrast are those who have been exposed to music solely for enjoyment and expression in settings such as Sunday Schools, nursery schools, and in the home. One can assume that the majority of early elementary children in public school music classes will not have had previous intellectual knowledge of music before the onset of formal music learning experiences.

Piaget found that during the latter substages of the sensorimotor stage, imitation is a characteristic activity.¹⁸ At this time, the young child imitates what he hears, such as the bark of a dog or spoken sounds as his linguistic abilities develop. It is clear that these imitative tendencies can play a vital role in initial music learning. Therefore, during an early acquaintance with children in a music class, the music teacher may try to determine the extent of pitch awareness in a child by using pitch echo matching games, rhymes, and songs.

¹⁷Piaget, Piaget Rediscovered, p. 10.

¹⁸Evans, p. 21.

Another way imitation is used is through initial song learning by the rote method, which involves a child's imitation of what he hears the teacher sing. Fostering a child's ability to imitate musical sound correctly is a step toward the important goal of the development of accurate aural perception, discrimination, and understanding in each child.

Imitation is tied directly to another concept which is equally evident in the last part of the sensorimotor stage. Piaget found that the sensorimotor child begins to establish relationships between similar and dissimilar objects.¹⁹ A corresponding musical activity might be the discovery of the relationship between the pitches which the child sang and those which the teacher sang. Another activity, apart from self-production of vocal sound, might include listening to two pitches on a melodic instrument in an attempt to determine whether the two pitches are similar or dissimilar. The child may be led to discover relationships between dissimilar pitches, such as whether one pitch is higher or lower, or louder or softer than the other.

Imitation and discrimination also lead to typical pre-operational stage activities such as imaginative play, questioning, experimenting, and increased listening.²⁰ Assuming

¹⁹Jean Piaget and Barbel Inhelder, The Early Growth of Logic in the Child: Classification and Seriation, trans. E. A. Lunzer, and D. Papert (New York: Harper and Row Publishers, 1964), p. 5.

²⁰Brearley and Hitchfield, p. 167.

that a creative mind implies an imaginative mind, creative experiences can be an important avenue through which young children can come into contact with music. It may be that the melodic concepts of high and low, up and down, and same and different can be realized through creativity and imagination.

A typical preoperational questioning activity implies that there will be inquisitiveness on the part of the child. One way to satisfy this inquisitiveness may be through counter-questioning by the teacher concerning what the child thinks the answer might be. Rather than being told something by the teacher, the child may learn more by trying to problem-solve on his own. The teacher's role in questioning could be similar to that of Piaget's clinical method which he calls "the art of questioning."²¹ Thought patterns expressed by the child through questioning and answering may reveal to the teacher how much a child is able to assimilate and how logically he is able to reason.

A third preoperational activity, experimenting, becomes equally important in early musical instruction. Through a child's self-discovery in experimentation, more meaningful learning may take place. For example, experimenting with sound through the use of melodic instruments may further foster a child's recognition of the basic concepts of melody.

²¹Ibid., p. x.

As a child's mental structures continue to develop, earlier experiences with discriminating with two isolated pitches will lead to an ability for more complex discrimination between three or more pitches. Emphasis may be placed on aural discrimination of the contours of pitch sequences so that the child can indicate whether the pitches move in a similar or dissimilar fashion. Early introduction to pitch sequencing should consist of non-rhythmic melodic sequences since the preoperational child usually can relinquish only one object or event at a time.²² This implies that a child probably can relinquish only one musical attribute at a time. If the focus is on melody, the addition of a rhythmic element may only add unnecessary confusion at this stage. Following increased experiences with similar and dissimilar non-rhythmic sequences, the element of rhythm may be added. Such increased interaction with music through varied and organized activities will continue to build the conceptual framework necessary for a child's ability to reason intellectually about the basic elements of melody.

Since this study applied to aural melodic conservation, the implications presented relate to melodic concepts. However, organized activities with each of the other four elements of music--rhythm, harmony, form, and color--will also need to be carried out to the same extent. It is only after a solid

²²Piaget, Logic and Psychology, p. 5.

aural conceptual framework of the five elements of music is established that a child will be able to reason about music and thus, conserve.

Implications for Further Research

One of the most important questions to which further research can be directed concerns the determination of the age at which children are able to conserve aurally. Because beginning music instruction must be related to sensorimotor abilities and because music instruction ordinarily begins at approximately age five or six, it is likely that conservation abilities may not be realized until the late elementary years.

Limited time for concentrated musical instruction may also hamper a child's progression from stage to stage. Therefore, research to determine aural conservation abilities of children who are receiving musical instruction for more than twenty-five minutes per week would also be valuable for both curriculum and scheduling in elementary music programs.

Because children learn verbal labels for sounds that they hear in everyday experiences, such as the sounds of animals, machinery, and persons, it appears that children are also capable of learning the correct labels for musical sounds and events. Research is needed to determine if, following a teaching emphasis on correct musical vocabulary, verbal reasoning abilities are more outstanding.

It is hoped that the present study will encourage other music educators to investigate the application of Jean Piaget's contributions to the field of education.

APPENDIX A:
MELODIC CONSERVATION TEST

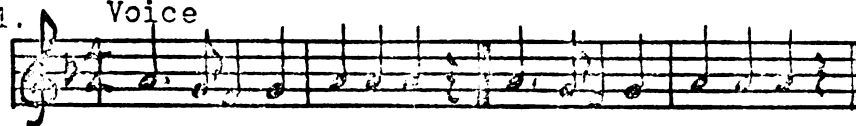
APPENDIX A:
MELODIC CONSERVATION TEST

TRIAL

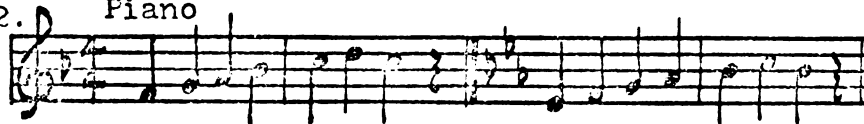
Voice



1. Voice



2. Piano



3. Voice



4. Clarinet

Xylophone



5. Piano

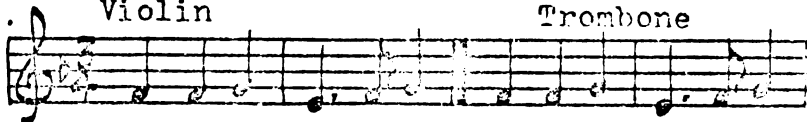


6. Voice



7. Violin

Trombone



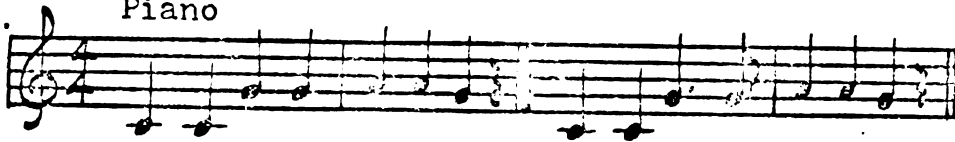
8. Piano



9. Voice



10. Piano



APPENDIX B:

ITEM ANALYSIS OF MELODIC CONSERVATION TEST

APPENDIX B:
ITEM ANALYSIS OF MELODIC CONSERVATION TEST

Item	Index of Difficulty	Index of Discrimination	Point Biserial Correlation
1.	18	29	.3391
2.	86	0	.0145
3.	39	57	.4444
4.	100	0	Undefined
5.	50	72	.5094
6.	93	0	-.0361
7.	39	71	.5414
8.	75	86	.7181
9.	46	28	.3588
10.	89	14	.2612
11.	57	57	.4377
12.	96	0	.0387
13.	39	86	.6142
14.	79	71	.6537
15.	25	29	.3214
16.	64	72	.5951
17.	36	42	.4185
18.	93	-14	-.1741
19.	39	57	.3716
20.	96	14	.1664

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