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Date May 23 1978

MUSICAL ABILITY AND CREATIVITY

A STUDY OF RELATIONSHIP

by

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ABSTRACT

The problem of this study was to determine the relationship between musical ability and creativity of elementary school children at the fourth grade level. The testing instruments used were the Music Achievement Test 1 by Richard Colwell and the Test of Creative Potential by Ralph Hoepfner and Judith Hemenway. Statistical tests were used to determine whether there were significant differences in pupils' scores in the categories of sex, laterality, whether they had had private instruction on a musical instrument, or whether their parents played musical instruments. Five complete classes were selected for the sample population. Ninety-eight pupils took at least one test and eighty-nine pupils took both tests.

By computing the Pearson product moment correlation coefficient, a significant, positive relationship was found between musical ability and creativity. No significant differences were found within the categories in the test of musical ability. In the test of creativity, it was found that right-handed girls scored significantly higher than right-handed boys, that pupils who had had private instruction on a musical instrument scored significantly higher than pupils who had not had private instruction on a musical instrument, and that pupils who had at least one parent who played a musical instrument scored significantly higher than pupils who did not have at least one parent who played a musical instrument.

A review of literature revealed an important connection between musical ability and creativity in that both are functions mainly of the right hemisphere of the brain, along with other types of intuitive and inspirational processes. The results of this investigation suggest that a deeper involvement with music, such as might be the case with private music lessons or with having parents who played musical instruments, could provide for more activity in the right hemisphere of the brain through aesthetic appreciation, thereby causing a pupil to be better equipped to function creatively.

Chapter 1

INTRODUCTION

The testing movement which began during the last century and grew substantially during the first half of the twentieth century was greeted with mixed emotions in the field of music. Some regarded it as an aid in solving some difficult problems such as how to decide who should have the benefit of music instruction and who should not. However, clear cut answers were hard to come by, perhaps even more so in the field of music than in other disciplines. Although controversy often replaced whatever enthusiasm was first present, this did not deter the giving of tests of musical ability, nor did it inhibit other investigations. There is a sizable body of literature which describes a variety of studies and various investigations as to the relationship between musicality and other traits such as race, religious background, national group, sex, intelligence, and personality characteristics.[1]

More recently, creativity has been a subject of research and study. In the field of education, comparisons have been made between creativity and intelligence. Results of those tests were related to

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[1]Paul R. Lehman, Tests and Measurements in Music, (Englewood-Cliffs, New Jersey: Prentice Hall, Inc. 1968), p. 10.

other facets of a child's personality such as self-image, teacher-student relationships, adjustment with peers, and school achievement. There is also a large body of literature dealing with those relationships. Very little work has been recorded exploring the relationship between musical ability and creativity. There would seem to be a connection between them, and yet they are separate abilities too. Perhaps the most significant similarity between the two traits is that both are basically functions of the right hemisphere of the brain.[2]

Standardized tests are available for testing both musical ability and creativity. Many of these tests have drawbacks, and there are complaints about nearly all that have been published so far in both fields. The most one can hope for in a particular testing situation is the opportunity to use the best possible choice. In spite of the fact that the perfect test has not been invented, there is much to be learned from any measurement, and generally even a poor test will give more information about students than no test at all.

Statement of the Problem

The problem of this study was to determine the relationship

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[2]Robert Ornstein, "Two Sides of the Brain," The Psychology of Consciousness, (New York: Viking Press, 1972), pp. 67-68; see also Ornstein, The Mind Field, (New York: Grossman Publishers, 1976), p.31.

between musical ability and creativity as measured by standardized tests of elementary school children at the fourth grade level. In addition, comparisons were made between scores of boys and scores of girls, between right-handed children and left-handed children, between those who had had private lessons on a musical instrument and those who had not had private lessons on a musical instrument, and between those whose parents played musical instruments and those whose parents did not play musical instruments.

Application and Contribution to Educational Theory

The purpose of all evaluation and measurement is to aid learning. Planning educational programs which will be meaningful depends at every stage upon a knowledge of the group for whom the program is intended. It is not possible to predict success of anything without some reliable information as to the ability level of the pupils involved. The fields of both music and creativity contribute substantially to improving the quality of life. If either one can aid in strengthening the other, that could also be beneficial.

We are now engaged in what is commonly called the energy crisis. This has been going on for a period of over five years, and it appears likely that it will be with us for some time to come. In 1977 we had an added problem in the form of a water shortage -- also of critical proportions, though temporary. In June at the University of Oregon

commencement, Oregon Governor Bob Straub told the graduates, "How you deal with scarcity ... will be the truth for your time."[3]

There is another kind of scarcity that can exist --- our creative potential. Because creativity starts in the very young and, unfortunately, often ends there, it is a matter that should be of great concern to all educators. In a very real sense, our survival in the future will depend on our ability to help each new generation realize its creative potential.[4] More than ever before, our urgent need is not merely learning -- not the simple acquisition of factual knowledge -- but rather the ability to use knowledge in constructive, diverse ways. There is need for people to be innovative and so our children should be taught to be innovative.[5]

Developing creative potential in our children fulfills a dual need. On the one side is the practical value of providing for the continued existence of the human race on this planet through problem solving -- no small task. On the other side is the alternative of

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[3] Oregon Today, July, 1977, The University of Oregon.

[4] E. Paul Torrance, "The Creative Potential of Children in the Space Age," Education and the Creative Potential, (University of Minnesota Press, 1963), p. 3.

[5] Torrance, p. 3; see also Donald MacKinnon, "Creativity: A Multi-faceted Phenomenon," Creativity, ed. John D. Roslansky, (Amsterdam: North Holland Publishing Company, 1970), p. 30.

what happens to creative energies when they are not channeled in positive, constructive ways. This is also a practical consideration. When creativity is stifled in children, either by parents, teachers, or anyone, it usually does not drop to zero. Rather it becomes a minus and develops into a negative force in their personalities. Creativity normally exists in all people but in different amounts. In the classroom, creativity is difficult for most teachers to deal with because it is unpredictable; therefore, teachers sometimes discourage it. There is typically an estrangement between highly creative youngsters and their teachers.[6] Details of some literature on this subject will appear in Chapter 2.

Consider this statement, "I believe there is little question that prolonged enforced repression of a person's creative needs may lead to actual breakdown of personality. Stifling the creative impulse cuts at the very roots of satisfaction in living and ultimately creates overwhelming paralyzing tension."[7] Even in the case of a person whose creativity is totally smothered for some reason or other, with proper nurturing, it can be revived at almost any age.[8]

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[6]Torrance, p. 9.

[7]Ibid., p. 12.

[8]Ibid.

To say that our choice will be whether to split atoms or personalities might seem extreme, but the possibility is real. Brahms once said that if Beethoven had not been musical, he might have turned out to be a great criminal.[9]

General Questions Answered

The investigator attempted to answer the following questions:

1. What is the relationship between musical ability and creativity?

2. What is the difference between right-handed pupils and left-handed pupils in musical ability and creativity?

3. How many of the pupils tested are left-handed?

4. In the performance of pupils in tests of musical ability and creativity, is there a significant difference between those who have had private music instruction and those who have not had private music instructions?

5. What proportion of the pupils tested have had private music instruction?

6. In the performance of pupils in tests of musical ability and creativity, is there a significant difference between those pupils

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[9]"Would-be Artists May Turn to Crime," Sidney Harris, (The Billings Gazette, October 4, 1976).

whose parents play musical instruments and those whose parents do not play musical instruments?

7. What proportion of the pupils tested have at least one parent who plays a musical instrument?

General Procedure

There were three procedures followed in solving the problems of this study. First, there was a review of literature dealing with musical ability and creativity to provide some insight into the nature of those two abilities, the ways in which they affect life, and the ways in which our culture develops and nurtures those two abilities. Secondly, the investigator administered separate tests of musical ability and creativity. No names were put on the papers, but each pupil was asked to give information about himself as to sex, laterality, whether he had ever had private lessons on a musical instrument, and whether at least one of his parents played a musical instrument. The third procedure was an analysis of the data. Group norms were established and the relationship between musical ability and creativity was computed.

Limitations and Delimitations

The problem of this study was limited as follows:

1. Each testing instrument had to be short enough to be completed within thirty minutes, including time for handing out and

collecting papers, giving instructions, answering questions, and completing the test.

2. All testing had to take place during the regular period for music.

The problem of this study was delimited as follows:

1. The pupils at the fourth grade level only in public schools in Bozeman, Montana were studied.

2. Five classes containing a total of 100 pupils participated. These classes were not randomly selected, but they represented the total number of fourth grade pupils in two Bozeman elementary schools who were available for testing by the investigator.

3. Only those pupils present on both testing days were included in the computation of the Pearson r, but pupils present on either day were included in the computations of the t-tests for independent samples.

4. All tests were administered and scored by the investigator.

Definition of Terms

Musical aptitude refers to innate potential or capacity for musical achievement -- qualities which allow for the development of musical skills. Musical achievement refers to the mastery of a particular musical skill or body of knowledge. "Musical ability can include both aptitude and achievement and can be demonstrated by

behavior in a musical situation such as performance, composition, or by showing factual knowledge."[10]

Distinctions are sometimes made between creativity as seen in a work of art such as a painting or a musical composition and creativity of the practical kind involving discovery or invention. All creativity involves some type of problem solving, and the creative accomplishment, no matter how large or small, represents a particular piece of insight or intuition on the part of the creator. The act of creating can be an art in itself, but it must be followed up with diligence and often much labor before it can become a finished work.

Summary

The problems of coping with the stresses and strains of modern living, not to mention the equally serious problems in nature, will be a major concern for all people in the years to come. For educators this is both a personal and a professional interest since they hold the reins of the young, who can be nurtured to become problem solvers. If the young are not nurtured to become problem solvers,

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[10]William E. Whybrew, Measurement and Evaluation in Music, (Dubuque, Iowa: Wm. C. Brown Company Publishers, 1971), p. 89

they have the possibility of becoming problem makers.

The fields of both creativity and music have a connection with this. Creativity is important in problem solving, and music could be important in aiding creativity. To those who truly love music, this must sound like a cold, understated simplification. However, those lucky ones would not need a statistical study to convince them of the value of music.

Chapter 2

REVIEW OF RELATED LITERATURE

The literature reviewed deals generally with the categories of musical ability, creativity, and material describing various tests. In addition there are sources which discuss the importance of music to man and his development, particularly with regard to how this affects the education of children.

The relationship between musical ability and creativity can be viewed as a mathematical relation based on tests, but it can also be considered from the standpoint of the way in which music affects creative accomplishment and the way in which creativity affects musical accomplishment. These last two possibilities will also be explored in this chapter.

Musical Ability

The origin of musical ability, as well as the nature of it, has been a subject of controversy for much of this century. As with all special abilities, musical ability does not exist as an absolute value, but different people are born with diverse degrees of it. Musical ability is normally distributed in the population, and the tendency is that if both parents are musically talented, their

children are almost certain to be talented.[11] If only one parent is talented, the children will usually be talented, but if neither parent is talented, their children will be less talented than they.[12] There are a few notable exceptions to this, such as Rubenstein, Schnabel, and Toscanini, but the importance of heredity cannot be overlooked. In addition to heredity, however, is the profound effect of early home environment. It is reasonable to assume that a musically stimulating home will help a talented child make the most of his musical ability.[13]

Accepted authorities in education such as Bruner, Piaget, and Montessori stress the great importance of preschool training to the development and ultimate level of intelligence. Such is also the case for musical aptitude. According to Gordon, "Level of musical aptitude is influenced greatly by early exposure to music, but after the fourth grade or so, 'ultimate' musical aptitude is well defined and impervious to practice and training."[14]

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[11]"The Source of Musical Aptitude," Edwin Gordon, Music Educators Journal, IX, 9 (April, 1971), p. 35.

[12]Ibid.

[13]Rosamund Shuter, The Psychology of Musical Ability, (London: Methuen & Co., Lts., 1968), p. 149.

[14]Gordon, op. cit., p. 36.

Musical aptitude is considered to be the potential or capacity for musical achievement. Musical talent and musicality could also have this meaning. All three suggest the potential for achievement in musical learning but are not necessarily affected by that learning. Musical ability, on the other hand, refers to musical powers, whether native or acquired, and can be demonstrated by performance, composition, or some response to a musical situation.[15]

One definition of musical aptitude is the "...ability to retain, recognize, and reproduce a short musical phrase."[16] That is what is tested in a studio in even the shortest informal test by a music teacher. There is considerable disagreement as to whether musical aptitude is a collection of separate abilities which are not dependent on one another or whether it is one ability containing several properties but greater than the sum of those parts -- a gestalt. It is extremely difficult to design a music test that will measure only aptitude as it is almost impossible to separate aptitude from achievement. Heredity and environment influence both qualities and are interrelated in complex ways.

> Not only is it now accepted that achievement affects the measurement of aptitude, but it now appears that

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[15]Whybrew, op. cit., p. 89.

[16]Lehman, op. cit., p. 7.

> achievement can be an excellent indicator of aptitude... A test designed to measure how much students have learned is called an achievement test although the results may depend partially on aptitude, while a test developed to select talented students is called an aptitude test even though the results may depend partially on training....[17]

Musical tests date back to Ancient Greece, but more recently there has been a tendency to distrust tests and regard them as useless for measuring anything except the nonmusical part of music.[18] Psychologists began to show interest in the nature of musical talent toward the end of the last century.[19]

The first standardized musical aptitude test, Measures of Musical Talents, designed by Carl Seashore and first published in 1919, is composed of six subtests: pitch, intensity, rhythm, time, timbre, and tonal memory. This test follows the atomistic theory of musical ability -- that is, that musical ability is composed of a mosaic of individual abilities.[20] Even so, Seashore cautioned those giving the test that no evaluation should be made except one based on the total score. This test has been revised several times.

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[17] Ibid.

[18] Richard Colwell, The Evaluation of Music Teaching and Learning," (Englewood-Cliffs, New Jersey: Prentice-Hall, Inc., 1950), p. 71.

[19] Whybrew, loc. cit.

[20] "Conservation Laws Applied to the Development of Musical Intelligence," Marilyn Pflederer, Journal of Research in Musical Education, (XV, 3, Fall, 1967), p. 216.

After Seashore there appeared many other music tests including Kwalwasser-Dykema, Tilson Gretsch, Whistler-Thorpe, Gaston, Drake, Wing, and Gordon, some of which contributed substantially to the understanding of musical ability. Due to the high costs involved, there have been few new tests that have been standardized since 1945 and none since the Gordon Musical Aptitude Profile published in 1965. Some of these, Gordon and Wing, for example, follow the theory of one general factor for musical ability.[21]

Those tests specifically called musical achievement tests include the Beach, Kwalwasser-Ruch, Providence, Kotick-Torgerson, Snyder-Knuth, Aliferis, and Colwell. Most of these tests stress knowledge of musical notation but so also do some musical aptitude tests. The Drake test is called a test of aptitude, but it could be that it overemphasizes musical achievement.

The main dimensions of musical aptitude may be classified as rhythmic, tonal, and aesthetic-interpretive. Some of the attributes which are measured in many of the above inventories include the ability to detect small differences in pitch, power to retain and recognize melodies and chords, ability to distinguish between intervals of different sizes, rhythmic sensitivity, ability to identify

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[21]Lehman, op. cit., p. 48.

the components of chords, and the ability to discriminate purity of intervals or the degree of consonance. Absolute pitch was mentioned as a possible necessary trait in the early stages of test development, but this was not included in any of the final batteries, partly because it is so difficult to test.[22] One thing that is not directly included in any test, but which cannot be ignored, is the importance of intelligence in any type of musical learning.[23] Musicians as a group have a high level of intelligence. The correlation between intelligence and musical achievement is higher than between intelligence and musical aptitude.[24]

Some of the reasons for testing for musical aptitude are outlined by Lehman as follows: (1) to identify and encourage students with musical talent who might otherwise go unnoticed, (2) to enable a teacher to set realistic goals for the untalented but eager student, challenging but not frustrating him, (3) to help in advising students as to which instrument and which activities would be best, (4) to provide objective information for the student considering a career

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[22]Whybrew, op. cit., p. 90.

[23]Ibid., p. 108. See also Hazel Martha Stanton, Measures of Musical Talent, (University of Iowa, 1935), p. 91.

[24]Edwin Gordon, The Psychology of Music Teaching, (Englewood-Cliffs, New Jersey: Prentice-Hall, 1971), p. 31.

in music, (5) to discover learning difficulties -- to diagnose sensory or perceptual weaknesses that otherwise might go unnoticed, (6) for ability grouping, (7) for assignment of instruments where there is competition for school-owned instruments, (8) for studies of musical talent -- the extent and distribution of it, and (9) for psychological studies -- as an aid in learning relationships between musical talent and intelligence and other traits.[25]

The ultimate purpose of teaching music in school is aesthetic appreciation, but music teaching must still set up goals and skills through which these aesthetic experiences can be realized. Evaluation is necessary in order to determine how well these goals have been met and is intended as an aid in the learning process rather than to find fault. The purpose of tests is to provide knowledge about students.

It is important to have a close tie between objectives and evaluation, and ideally the objectives should include even the method of evaluation. One reason for this is that education is now big business, and more and more people are wanting to know what is happening to their tax dollars and to demand proof of results.[26] Even though education is expensive, there is no question but what it

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[25]Lehman, op. cit., p. 9.

[26]Colwell, op. cit., p. 12.

is necessary for this nation or any nation or any culture if it is to survive. Both the government and private industry need many skilled, creative persons, and increased demands are placed on students.[27] With so much pressure to justify teaching and learning, evaluation becomes a necessary source of authority and a standard by which to compare the good with the not-so-good. Even though the tools for evaluation might be limited, more intelligent decisions are made when the tools are used than when they are not.[28] Colwell says, "Evaluation is unimportant only when learning in unimportant."[29]

Evaluating the affective domain is a very difficult problem because this would include such individual values as opinion, belief, attitude, interest, and appreciation. Many people have a hard time being honest in answering such questions, and the tendency is to give answers which are known to be desired. The unique contribution of music in education is in fostering aesthetic sensitivity, and the basic essential of an aesthetic response is value. This brings up the question of whether the schools should indoctrinate or assume neutrality. Indoctrination would destroy initiative and freedom of creative thought, but doing nothing might result in the loss of

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[27]Ibid., p. 13.

[28]Ibid.

[29]Ibid., p. 25.

those beliefs on which society depends. It is true that beliefs and values are a personal matter and should not be structured by the school. Yet the properties of civilization are not to be reinvented with each generation but are to be saved and passed on, all the while discarding the mediocre and the outmoded.[30]

Creativity

During the 1950's, interest in creativity increased dramatically, and the attitude toward it changed from what it had been before that time.[31] The world had seemed too rigid, and the need for freedom became a slogan. It was fashionable to be unconventional, uninhibited, and undisciplined, and people reminded one another to unwind and stay loose. The big question in studying the nature of creative behavior and the creative process is just how much freedom can be a help and when does it get in the way. In other words, how loose can a person stay before falling apart, and how tight can he be before freezing up?[32]

Two areas in research on creativity are the "creative potential"

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[30]Ibid., p. 125.

[31]"Creative Behavior: A Delicate Balance," Sidney J. Parnes and Angelo Biondi, The Journal of Creative Behavior, (IX, 3, 1975), p. 149.

[32]Ibid., p. 152.

and the "creative performance." What a person brings because of his personality structure would be part of his potential, and what he actually produces would be his performance.[33] It is difficult to fully understand the creative process, but there are in existence standardized tests, some of which are easily scored, which have contributed to general understanding of the subject.

A great deal can be learned about the creativity of a person by his answers to simple questions about himself. How he spends his time, how he views his environment, his attitudes, his motivations, his interests, his values, and other personality traits that predispose him to think creatively can be learned from biographical information. Independence, self-confidence, and a habit of nonconformity all contribute to innovativeness. Usually a creative person is highly energetic, spontaneous, adventuresome, and willing to take risks and to make mistakes.[34]

An understanding of the creative personality is an essential aspect of the understanding of creativity. A creative person is not an ordinary person who happens to have a special talent, but rather

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[33] Ibid.

[34] "In Frumious Pursuit of the Creative Person," Gary A. Davis, The Journal of Creative Behavior, (IX, 2, 2nd Q., 1975), p. 78.

he is a completely different kind of person. First of all, he is different from other people in the way he perceives a situation in the world around him. He must be able to recognize a problem in order to have any intuition as to how to go about solving it. A happy-go-lucky person who is always easy-going and generally satisfied with everything will not be creative because he is not aware of the need for change. Therefore a creative person at the very least is a person with some kind of trouble because he is disturbed about something. The more creative a person is, the more likely he is in trouble because his ideas are troublesome.[35] He is also alone with his problem because he is the only person who has this particular idea or who perceives the problem in this special way. One explanation for beginning is, "The first task then for one who is going to solve a problem creatively is to make a sufficient analysis of the complex situation, narrowing down and simplifying it until the crucial difficulty of the task is isolated."[36]

To achieve the highest level of psychological well-being in

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[35]Calvin W. Taylor, Climate for Creativity, (New York: Pergamon Press, 1972), p. 10

[36]Donald W. MacKinnon, "Creativity: A Multi-faceted Phenomenon," Creativity, ed. John D. Roslansky, (Amsterdam: North-Holland Publishing Co., 1970), p. 22.

students, educational systems should stress both creative and intellectual abilities. One goal of educational systems might be to raise students to the level of independence so that, in a real sense, they no longer need the school. Consider this: "The ultimate goal of every curriculum should be a facilitation of the natural striving of each student toward his highest potential level of uniqueness, autonomy, and self-fulfillment."[37]

Guilford says that the more creative individual is more self-confident, independent, and less sociable than others.[38] Although there is a positive correlation between creativity and mental health, occasionally creative people have exhibited various forms of bizarre behavior.[39] Because these occurrences are so dramatic, such as the writer leaving his family or the musician turning to celibacy, they are viewed as being typical of creative behavior rather than as a form of imbalance which they are.[40] Involved in all productive

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[37]"Creativity and Intelligence: Research Implications for Equal Emphasis in High School," Vernon J. Damm, Exceptional Children, (April, 1970), p. 565.

[38]"Measurement and Creativity," J. P. Guilford, Theory into Practice, (V, 4, October, 1966), p. 166.

[39]Damn, op. cit., p. 567.

[40]Parnes and Biondi, op.cit., p. 151.

creativity is a "delicate balance." Parnes and Biondi say there is a balance between contemplating and acting. For example, "...when we are ready to act, we stop taking in ideas. If a body cell grows unbridled, it becomes cancerous. When ideas grow unbridled, perhaps they also become cancerous."[41]

Parnes and Biondi go on to say that it is not the uniqueness of an idea that is the most important thing but rather its relevance. A word of caution is, "There is a huge difference between the conception of an idea and its application just as there is a huge difference between the conception of a human being and the birth of a baby. Too many conceptions can result in not enough nurture. Too many ideas can result in little development and action."[42]

There is a tendency toward reflection rather than action in some creative people. This has been measured on the Meyer-Briggs Type Indicator in which creative performers scored higher for the types of introvert (vs. extrovert) and intuition (vs. sensation).[43] On scales from Catell's "Sixteen Personality Factors Questionnaire," creative scientists tend to be more emotionally stable, self-assertive

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[41]Ibid., p. 153.

[42]Ibid.

[43]Guilford, op. cit., p. 186.

and dominant, restrained or resurgent, radically inclined and self-sufficient. Apparently creative performance is related to certain intellectual abilities, but traditional intelligence tests do not discriminate between more or less creative. Divergent productive abilities are distinct from memory abilities and there is a big difference between having information in one's memory and being able to retrieve it on demand to use in a new situation. Also, we tend to forget the long hours of hard work that are so necessary for any bright idea to be even noticeable. The fact that creative people are also hard workers is lost.[44]

Here is an explanation of some of the separate attributes involved in creativity:

> Our knowledge of intellectual abilities potentially most relevant for the assessment of creative disposition has come almost entirely through factor analysis. These abilities have been recognized as belonging to a few categories: fluency, flexibility, and elaboration. Fluency is a matter of facility with which an individual retrieves information from his personal information store. One kind of fluency has to do with producing a variety of unitary thoughts or ideas and is known as 'ideational fluency.' A typical test in this category asks the examinee to list members of a class specified by giving two or three of its characteristics, such as all those things which are both spherical and edible.[45]

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[44] A. H. Maslow, "A Holistic Approach to Creativity," Climate for Creativity, ed. Calvin W. Taylor, p. 288.

[45] Guilford, op. cit., p. 188.

Flexibility is the basis of originality, ingenuity, and inventiveness.[46]

Much of the emphasis of traditional education has been on rote learning of facts for their own sake and unrelated to other facts.[47] Learning facts is undoubtedly valuable and is often required in the real world, but this process does not aid in the development of intuition and seems to actually inhibit it. Sometimes it is advisable to retreat from facts in order to see things in a larger perspective and in relation to more aspects of the larger context.[48]

Also necessary for the truly creative person is that what he creates is aesthetically pleasing to him.[49] MacKinnon goes on to say, "The aesthetic viewpoint permeates the work of the creative person and should be nurtured in teaching of all skills, disciplines, and professions if creativity is to be nurtured."[50]

Instructional materials involving planned sequences of creative thinking activities are used to stimulate children in the awareness

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[46]Ibid.

[47]MacKinnon, op. cit., p. 30.

[48]Ibid., p. 31.

[49]Ibid.

[50]Ibid.

of nature and in the value of creative achievement.[51] Whether creativity can actually be taught is difficult to determine. According to Torrance, "One cannot produce creativity, only nurture it."[52] Allowing an environment to exist in which students have freedom to experiment and grow in an informal type of organization would appear to be beneficial to creativity.

In addition to the product developed, or perhaps of even more importance, is the process of creating, which has a beauty of its own. "It is not the thing done or made which is beautiful, but the doing. If we appreciate the thing, it is because we relive the heady freedom of making it."[53]

There is a need to nurture the process of creating; however, there is also a need to nurture human endeavor at all levels and to foster and encourage good mental health. The full development of the whole person that would help one move in the direction of greater psychological health and fuller humanness is essential.[54] One area which is rarely (or never) free of problems is the area of

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[51] E. Paul Torrance, "Group Dynamics and Creative Functioning," Climate for Creativity, p. 75.

[52] Ibid.

[53] Jacob Bronowsky,"The Creative Process," Creativity, p. 5.

[54] Maslow, loc. cit.

interpersonal relations. This situation can be crucial for one who is in a management type position and who must have some control over others.[55] Even many ordinary human situations beg for creative handling. The problems that mothers have with children in the supermarket or deciding what to do with extra guests at Christmas time in an already crowded house are examples of this.

Another thing that is indispensible for the creative person is courage. All persons have an unconscious as well as a conscious side of their personalities. Half of their personality is kept hidden, and they give expression to only a limited part of themselves. In this way, they are living something like a half-life.[56] A creative person, however, has the courage to experience the opposite sides of himself and attempts to reconcile them. MacKinnon ends by saying:

> If my assessment of the creative person is correct, our task as educators, whether we be parents or professors, is not so much to teach creativity as it is to encourage our charges by ourselves being those creative persons in whom the opposites of our nature have been reconciled, creative persons with whom they can identify. Thus we each would become an educator in the original meaning of the word -- one who brings forth or educes from another that which exists as a potentiality within him through being an example of that which is desired.[57]

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[55] J. P. Guilford, "Creativity in Interpersonal Relations," Climate for Creativity, p. 63.

[56] MacKinnon, op. cit., p. 31.

[57] Ibid., p. 32.

Music and Creativity

Assessing a student's creative abilities is important to the total understanding of that person and this is especially true in regard to a student in music. Many music students are creative individuals, and greater educational accomplishments can be realized by a more complete understanding of the traits of creative people.[58] Teachers should be able to distinguish between independence and unruliness and between individuality and rebelliousness. Moore reminds us that the behavior of a highly creative student might have its source in independence of thought rather than in malice.[59] It is often difficult for a teacher to deal with creative students as they tend to diverge from stereotyped meanings and move away from the model set by the teacher.

Since creative students tend to score lower in I.Q. tests than the school average even though they achieve at a superior level in academic subjects, a person with a high I.Q. and also high creativity could be rated as having a lower I.Q. than he actually possesses.[60]

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[58] "What Gestalt Psychology Says to the Choral Conductor," Ray Moore, Music Educators Journal, (LV, 4, Dec., 1968), p. 38.

[59] Ibid.

[60] "The Relationship of Intelligence and Creativity," Ray Moore, The Journal of Research in Music Education, (XIV, 4, Winter, 1966), p. 243.

This could be caused by his tendency to look for divergent meanings, thereby being tempted by the possibility of several different responses.

A creative child is capable of greater accomplishment than an average child, and, if he is to profit from his elementary school experiences, it is important that he be encouraged to behave creatively, to exercise his self-direction, and to achieve as well as he can.[61]

If a teacher can accept his own humanness and have the courage to expose himself, he might be able to understand the nature of his students. The teacher's main responsibility is not to separate the creative child from those who are not creative, but rather to encourage the creativity that is basic in all children.[62] A worthwhile objective would be to encourage children to believe in themselves fully and to the limits of their abilities. In Benson's words, "The creative child could be any child."[63]

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[61]"The Music Education of the Gifted," William C. Hartschorn, Music Educators Journal, (LIV, 6, Feb., 1968), p. 76.

[62]"The Creative Child Could Be Any Child," Warren Benson, Music Educators Journal, (LIX, 8, April 1973), p. 40.

[63]Ibid., p. 38.

Music in Education

Use of contemporary music to inspire creative activities in children was tried during the 1960's and was found to be highly successful. Up to that time, contemporary music was not commonly taught in public schools as it was thought that the sounds would be unpleasing to young children. Such was not the case at all, and the children accepted new tonalities and new uses of rhythms much more easily than older generations.[64] Some of the activities used were creative interpretations of songs and dances, explorations with rhythm instruments, and composition of simple songs. Improvisation could become an important means of identifying and fostering creative and musical talent.[65]

There are many things which determine the musical responsiveness of children, but musical ability probably plays a large part. The function of music in the schools is not to separate those who are truly talented from those who are not but to give each child a chance to develop his own musical intelligence.[66] Creative teaching skills

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[65]"Experience in Musical Creativity: Contemporary Music Project for Creativity in Music Education," Music Educators National Conference, Norman Dello Joio, Chairman, 1963-1969., p. 42.

[65]Ibid., p. 43.

[66]Brian Brocklehurst, Response to Music, (London: Routledge & Kegan Paul, 1971), p. 40.

are needed to awaken each child's creative powers.[67] Often the natural musical inventiveness of young children has long been ignored or neglected, which eventually causes their creativity to be stifled. According to Brocklehurst, "The creative approach to music making provides the most natural setting for exploring and experimenting with the basic raw materials of music....Creative work can influence the development of musical judgment, taste and discrimination and stimulate creative activity in other subjects."[68]

The Orff instruments have contributed much to encouraging musical creativity in the classroom as they are easy to introduce and are readily accepted by students of all ages. However, in referring to these instruments, Brocklehurst warns, "...it requires considerable sophistication on the part of the teacher if continuous development is to be achieved and spontaneity maintained."[69] Many kinds of rhythm instruments can be made by hand in the classroom from materials readily available at home such as cardboard or wooden containers, egg cups, cans, coconut shells, kitchen utensils, flower pots, bottles and pine bars.[70]

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[67]Ibid., p. 100.

[68]Ibid., p. 103

[69]Ibid., p. 102.

[70]Ibid., p. 103.

Music in Life

Throughout the ages, music has exercised a profound influence on the life of man. In Ancient Greece, music was considered essential in education because of its influence on character building. Another aspect of music is its role in emotional development. Kodaly declared it to be as much a necessity as air, and Ruskin ranked it with food, shelter, and clothing as one of the "four necessities of life."[71]

> Life, like art, is characterized by a constant flux and adjustment to environment: disequalibrium-equalibrium, ebb-flow, tension-release, stimulus-response, need-fulfillment. Thus from any natural or artistic phenomenon such as discord-resolution in music, which reflect the stress-release pattern of man's ordinary experience, he derives aesthetic pleasure.[72]

For anyone who becomes linguistically or emotionally handicapped, music can be a valuable substitute for verbal communication. Sometimes an emotionally disturbed child can be reached through music when he cannot or will not respond to any other stimulus. Brocklehurst explains that, "An autistic child can be reached through music because of its non-verbal character, its deep penetrability, and by the fact that it is so difficult to erect a defense mechanism against its effects. We are able to draw from music according to our

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[71]Ibid., p. 5.

[72]Ibid.

intellectual and emotional needs."[73]

In addition, music can be a vital socializing force as it provides opportunities to share experiences through group activities. Children learn social competence, cooperation, consideration, responsibility, self-control, and self-discipline in addition to gaining an improved self-image.[74] All persons who react to music are musical in varying degrees and are influenced in various ways.[75]

According to Scott:

> Each specific type of music has exercised a pronounced effect on history, on morals, and on culture; that music... is a more potent force in the moulding of character than religious creeds, precepts or moral philosophies; for although these latter show the desirability of certain qualities, it is music which facilitates their acquisition.[76]

Music has influenced rulers and important leaders throughout history. Kings and princes had court musicians who could present programs on little more than a moment's notice. Wherever there was a great variety of musical styles, the general quality of life was relatively free and uncomplicated. Where musical styles were limited,

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[73]Ibid., p. 6.

[74]Ibid., p. 8.

[75]Cyril Scott, Music, Its Secret Influence Throughout the Ages, (London: The Aquarian Press, 1969), p. 17.

[76]Ibid.

as in China for example, tradition and custom prevailed.[77] According to Scott, "Innovation in musical style has invariably been followed by an innovation in politics and morals. In the case of Egypt and Greece, the decline of music was followed by the complete decline of the Egyptian and Grecian civilizations themselves."[78]

Brain Hemispheric Functions

For over a hundred years, medical science has gathered knowledge and experience about the hemispheric functions in the brain of man. For most people, the left hemisphere was recognized as the seat of the faculty of expression while the right hemisphere was recognized as possibly the home of perception.[79] It is now generally accepted that for nearly all right-handed people and for some left-handed ones, the left hemisphere of the brain is responsible for sequential, analytic, logical thinking -- especially mathematical and verbal.[80] The right hemisphere for these people is intuitive and introspective, and it is responsible for their orientation in space, artistic

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[77] Ibid.

[78] Ibid., p. 43.

[79] Robert Ornstein, The Psychology of Consciousness, (New York: The Viking Press, 1972), p. 53.

[80] "Who Knows Where Music Lurks in the Mind of Man?" Thomas Regelsky, Music Educators Journal, (63, 9, May, 1977), p. 31.

endeavors, crafts, body image, recognition of faces, and music and musical behavior. Response is simultaneous. For approximately half of the left-handed people, the reverse of hemispheric function is true.[81] Two different types of people -- two characters -- seem to exist within one person. One character is verbal and logical -- a grammarian, scientist, logician, mathematician - committed to correct proof. The other one is the artist, craftsman, dancer, and dreamer. Each hemisphere of the brain is capable of many functions; both sides participate in many activities, but for most people the two hemispheres tend to specialize. Brain damage in young children often results in the development of language on the right side, thereby causing them to be left-handed. Approximately five per cent of the population are left-handed.[82] Left-handers are less consistent in specialization. Some have reversed specialization of hemispheres and some are mixed. Much has been learned about hemispheric function by the study of people whose brains have been damaged by accident or illness and from surgery performed on them. Damage to the left hemisphere can destroy language ability. Injury to the right side can cause loss of spatial awareness, musical ability, recognition of

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[81] Ornstein, op. cit., p. 51.

[82] Ibid.

other people or an awareness of one's own body. For a long time, people thought that the left side was the "major" one because it controlled speech and the right side was the "minor" one. Actually both sides are major. If a person is a musician or a craftsman, damage to the left side would not necessarily be crippling, but damage to the right side would destroy a career.[83]

Understanding the two hemispheres of the brain can help us to recognize the duality of our own consciousness. This duality is referred to in literature as reason and passion or mind and intuition. There are moments in each of our lives when our intellect suggests one course and our feelings suggest another.[84] It is this polarity and the integrations of these two modes of consciousness, the complementary workings of the intellect and the intuition, which underlie our highest achievements.[85] The more noticeable half of our consciousness is the verbal-logical scientist part. The other mode, although less logical and clear, is important for creativity. Einstein called this "combinatory play."[86] The two modes are complementary

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[83]Ibid., p. 56.

[84]Ibid., p. 59.

[85]Ibid., p. 64.

[86]Ibid.

operations to each other, not opposite. Complete human consciousness involved polarity and integration of the two modes just as a complete day includes daylight and darkness.[87]

Unfortunately, the American custom of overemphasizing the left hemisphere is a detriment to the whole person as it tends to minimize and atrophy the peculiar nature of consciousness and mental functioning that is distinctly the result of right-hemisphere thinking.[88] Our educational system caters mainly to the practical kinds of intellect which often causes neglect of the creative, artistic, intuitive half of a child. Regelski reminds us that we should pay attention to what is happening to our young people who are the products of our schooling:

> Their need to turn to drugs, to meditation and other Oriental and mystical traditions, to the hyperevangelism of the radical "Jesus freaks," or to music (played less for listening than to shut out reality, to induce a trance, or to move to) -- all these are primary evidence that something is wrong. They are all, not coincidentally, right-hemisphere activities. So daily, by these behaviors and especially misbehaviors (e.g., so-called discipline problems), there is a rebellion against a feelingless society, a crying out, a plea for recognition of their need to feel "whole."[89]

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[87] Ibid., p. 67

[88] Regelsky, op. cit., p. 32.

[89] Ibid., p. 33.

The largest part of musical functioning is the property of the right hemisphere with its holistic ability, and that is another reason why the teaching of music is so important. Since music causes activity in the right hemisphere, it brings life to the other half of the brain and literally educates the other half of the child.

Some types of verbal knowledge can contribute to music perception, provided that it stimulates selective attention necessary to purer musical thinking. Still and all, as Regelski says, "There is nothing that one can say to equal the direct exposure to music."[90]

Summary

Various aspects of musical ability and creativity, as well as methods for assessing those two traits, have attracted attention from scholars, educators, and the general public. Information and observation aided in understanding the origin and development of musical ability and creativity and the various ways in which they overlap and interact.

Studies of hemispheric function of the human brain suggest an important connection between musical ability and creativity in that both are in large measure right-brain functions. While educational systems have stressed the accumulation of facts and verbal and

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[90]Ibid., p. 35.

mathematical abilities, which are left-brain functions, as being necessary for the survival of our civilizations, neglect can be seen in regard to some aspects of human fulfillment, such as the development of intuition, inspiration, and other right-brain functions.

Chapter 3

PROCEDURE

Introduction

Studying the relationship between musical ability and creativity was approached through the administration of standardized tests of the two abilities and a correlation of the results. In addition, statistical tests were performed to determine whether there was a significant difference in the test performance between boys and girls, between right-handed pupils and left-handed pupils, between those pupils who had had private instruction on a musical instrument and those pupils who had not had private instruction on a musical instrument, and between those pupils whose parents played a musical instrument and those pupils whose parents did not play a musical instrument. This chapter will define the population, and the procedure for testing will be explained. There will also be a description of the instruments which were used and the statistical method for analyzing the data.

Population and Sampling Procedure

The population consisted of all fourth grade pupils enrolled in regular classes in the public schools of Bozeman, Montana. The sample consisted of five complete classes containing a total of 100 pupils. On the actual testing days, there were some pupils

absent, and, as a result, the total number taking both tests was eighty-nine. Five pupils took only the creativity test, and four pupils took only the music test. Two pupils in one class were excused from both tests. The total number of pupils taking at least one test was ninety-eight.

All testing took place during the regular period for music, which was thirty minutes in length, on two days, one week apart, for each class. All testing and scoring was done by the investigator, but in some classrooms, the classroom teachers helped in proctoring.

Categories

The two variables were scores in tests of musical ability and creativity. The categories were boys and girls, right-handed pupils and left-handed pupils, right-handed boys, left-handed boys, right-handed girls, left-handed girls, those pupils who had had private music instruction and those pupils who had not had private music instruction, and those pupils who had at least one parent who played a musical instrument and those pupils who did not have at least one parent who played a musical instrument.

Method of Collecting Data

The two testing instruments used in this investigation were the Test of Creative Potential (TCP) Form A by Ralph Hoepfner and Judith Hemenway and the Music Achievement Test 1 (MAT) by Richard

Colwell.

The TCP has the advantage of being a short, reliable, easily scored test of general creative potential that can be used with all ages of children beginning at the second grade level and going up through adults. The scoring guide helps to eliminate subjectivity by being clear and concise and can be used easily by teachers, clerks, and others not specifically trained in the use of this test. Another important advantage of this test, and a necessity in the present situation, is that it is designed to be administered within a thirty-minute time period.

The factors of creativity which TCP attempts to assess are fluency, flexibility, originality, and elaboration. Most tests of creative potential, including the Torrance Test of Creative Thinking, also assess those factors. The unique quality of the TCP is that all factors are combined in one scale.

There are three subtests in the TCP. The first subtest is a verbal one. The examinee is given four short, common words which are within the sight-reading vocabulary of the typical fourth grader. He is asked to write as many words as he possibly can which mean the same as the given word. Each given word has at least five distinctly different categories of meanings with the end result of each given word having at least one hundred possible synonyms, including all categories. Using as many different meanings as possible, in

addition to the total number of words for each meaning, would award extra points to the examinee. Fluency is assessed by the total number of appropriate words the examinee can include. The number of different categories of meanings would assess flexibility, and an extra point would be given for each different category in addition to the point for each individual word within the category.

The second subtest is a figural test of creative potential in which the examinee is asked to decorate pictures in as many different ways as possible. Artistic ability is not assessed; only the variety and the complexity of the design and pictorial elements of the decorative elaboration are scored. Each area of the picture is assessed separately. The separate scores are then added for the total score in elaboration.

The last subtest, license plate words, is a symbolic or literal test of creative potential. The examinee is given three letters in each item and is asked to make as many words as he can by using the three letters. The only stipulations are that all three letters must appear in each word and that the letters must appear in the order given. This test scores for fluency, the number of acceptable words the examinee can create, and originality, the number of unusual or complicated words in which the given letters are not obvious. Originality would include any correct responses in which the given letters are not next to each other as well as words which contain

more than eight letters.

Studies have been made of the reliability of TCP. Tests of inter-scorer realibility of forms A and B for three different age levels range from an r of .942 to an r of .989. Internal-consistency reliability of both forms with five age levels range from an r_{tt} of .46 to an r_{tt} of .84. In a test-retest reliability study using Form A and then B, the correlation coefficient was .621 and in the reverse situation it was .668.

In a study of validity in which the correlation coefficient between the TCP and IQ scores was computed, it was found by the editors that scores on the TCP were not determined by IQ status.

According to Hemenway and Hoepfner, an additional approach to validity assessment of TCP involved a pre- and posttest in a special class of third grade students in which the instructional program stressed creative thinking. For sixteen students in the class, the pretest mean was 41.38 and the posttest mean was 57.81. The t-test for signficiance of improvement was 3.580, significant beyond the .01 level.

The Musical Achievement Test 1 (MAT) by Richard Colwell was used to assess musical ability. This test measures how well pupils can hear and identify musical pitches, intervals, and whether the music moves in two's or three's. Although these skills are critical, they represent only a part of musicality. This test is short enough

to be given in a thirty-minute time period, yet it has enough variety to provide considerable information about students' musical ability and progress. It is not related to any specific music textbook series, but it is intended for use with students who do have a regular school music program. There are no items involving performance or factual knowledge, and no reading of notation is involved. All responses are based on sounds heard on a recording.

The pitch discrimination section tests the students' ability to determine which musical tone is higher or lower. This basic musical skill is measured by the use of two subtests. In the first subtest, two tones are heard and the examinee must decide if the second tone is higher, lower, or the same as the first tone. In the second subtest, the examinee must determine which of three tones is the lowest.

Part 2 of MAT is interval discrimination -- recognition of distance between pitches. Interval discrimination is related to pitch discrimination, but it is also a separate musical ability. This test does not require the knowledge of absolute intervals such as thirds and fifths, but merely whether tones are separated by a scale step or by a leap. In the first subtest of this part, three tones are heard in each item. The examinee must decide if all tones are related by step as in a scale or if there is a leap, or skip, between any two consecutive tones. The second subtest is composed

of complete phrases from folk songs and art music. The pupil must decide if the music moves generally by step or generally by leap.

Part 3 of MAT measures ability to discriminate between meter that is in two and meter that is in three. This test consists of fifteen phrases, each taken from familiar songs.

Reliability and validity are explained as follows:

> Criterion-related validity was obtained by using teacher ratings of student ability. A correlation of .92 is reported between test scores and ratings based on the top and bottom 20% of the class. For predictive validity one study gives a correlation of .65 between test scores and performance ratings a year later.
> Reliability of Test 1 is .94 computed by split-half.[91]

Tests were hand scored using a template.

Method of Organizing Data

Data from the tests are reported in eight tables showing the mean for each group, number, standard deviation, range, difference between means, the computed t value and the P. One graph each for musical ability and creativity shows means in each of the categories: boy-girl, right-handed - left-handed, private music lessons - no private music lessons, parents played musical instruments - parents did not play musical instruments.

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[91]Richard Colwell, The Evaluation of Music Teaching and Learning, (Englewood-Cliffs, New Jersey: Prentice-Hall, Inc., 1970), p. 149.

The relationship between the two variables, musical ability and creativity, as revealed in the tests, was computed using the Pearson product moment correlation coefficient and is reported in the narrative description. Pupil scores in each category are grouped according to high, medium, and low and are also reported in narrative description.

Statistical Hypotheses

The null hypotheses (each signified by H_o) and the alternate hypotheses (each signified by H_1) for this investigation are as follows:

(1) H_o: There is no significant relationship between musical ability and creativity as measured by the standardized tests and administered to the sample population as described above.

H_1: There is a significant relationship.

(2) H_o: There is no significant difference between the scores of boys and the scores of girls in the test of musical ability.

H_1: There is a significant difference.

(3) H_o: There is no significant difference between the scores of boys and the scores of girls in the test of creativity.

H_1: There is a significant difference.

(4) H_o: There is no significant difference between the scores of right-handed pupils and the scores of left-handed pupils in the

test of musical ability.

H_1: There is a significant difference.

(5) H_o: There is no significant difference between the scores of right-handed pupils and the scores of left-handed pupils in the test of creativity

H_1: There is a signficant difference.

(6) H_o: There is no significant difference between the scores of right-handed boys and the scores of left-handed boys in the test of musical ability.

H_1: There is a significant difference.

(7) H_o: There is no significant difference between the scores of right-handed girls and the scores of left-handed girls in the test of musical ability.

H_1: There is a signficant difference.

(8) H_o: There is no significant difference between the scores of right-handed boys and the scores of left-handed boys in the test of creativity.

H_1: There is a significant difference.

(9) H_o: There is no significant difference between the scores of right-handed girls and the scores of left-handed girls in the test of creativity.

H_1: There is a significant difference.

(10) H_o: There is no significant difference between the scores of right-handed boys and the scores of right-handed girls in the test of musical ability.

H_1: There is a significant difference.

(11) H_o: There is no significant difference between the scores of right-handed boys and the scores of right-handed girls in the test of creativity.

H_1: There is a significant difference.

(12) H_o: There is no significant difference between the scores of left-handed boys and the scores of left-handed girls in the test of musical ability.

H_1: There is a significant difference.

(13) H_o: There is no significant difference between the scores of left-handed boys and the scores of left-handed girls in the test of creativity.

H_1: There is a significant difference.

(14) H_o: There is no significant difference in the test of musical ability between the scores of those pupils who have had private instruction on a musical instrument and the scores of those pupils who have not had private instruction on a musical instrument.

H_1: There is a significant difference.

(15) H_o: There is no significant difference in the test of

creativity between the scores of those pupils who have had private instruction on a musical instrument and the scores of those pupils who have not had private instruction on a musical instrument.

H_1: There is a significant difference.

(16) H_o: There is no significant difference in the test of musical ability between the scores of those pupils who have at least one parent who plays a musical instrument and those pupils who do not have at least one parent who plays a musical instrument.

H_1: There is a significant difference.

(17) H_o: There is no significant difference in the test of creativity between the scores of those pupils who have at least one parent who plays a musical instrument and those pupils who do not have at least one parent who plays a musical instrument.

H_1: There is a significant difference.

Analysis of Data

Descriptive. The mean was the measure of central tendency for both tests. The standard deviation was used to measure variability. Separate means and standard deviations were computed for boys, girls, right-handed pupils, left-handed pupils, right-handed boys, left-handed boys, right-handed girls, left-handed girls, those pupils who had had private lessons on a musical instrument, those pupils who had not had private lessons on a musical instrument, those pupils who had

at least one parent who played a musical instrument, and those pupils who did not have at least one parent who played a musical instrument. Scores were grouped in thirds for each test.

Relationships. The Pearson product moment r was used to determine the relationship between musical ability and creativity.

Testing Hypotheses. The t-test was used to determine the significance of the correlation coefficient. The t-test for independent samples was used to determine whether there was a significant difference between the scores of various categories within each test.

Level of Significance. The level of alpha used was .05.

Precautions Taken for Accuracy

All scoring was done by hand and each test was double checked for accuracy. All statistical tests were run on the computer at Montana State University.

Summary

A test for musical ability and a test for creativity were administered to eighty-nine fourth grade pupils in music classes in the Bozeman public schools out of a possible sample of one hundred pupils. Each test required thirty minutes of test time. Due to absences and other reasons, five pupils took the creativity test only and four pupils took the music test only. Two pupils did not take either test. Ninety-eight pupils took at least one test.

Scores were grouped in thirds for each test. Further groupings were made on the basis of sex, laterality, whether they had had private music instruction, and whether their parents played a musical instrument.

The Pearson product moment correlation coefficient was computed to determine whether there was a signficant relationship between the two abilities tested in this investigation. That statistic was tested using the t-test for the significance of the correlation coefficient.

The t-test for independent samples was performed to determine if there was a significant difference between scores for boys and scores for girls, between scores for right-handed pupils and scores for left-handed pupils, between scores for pupils who had had private music instruction and scores for pupils who had not had private music instruction, and between scores for pupils who had at least one parent who played a musical instrument and scores for pupils who did not have at least one parent who played a musical instrument.

Chapter 4

FINDINGS

This chapter presents the results obtained from the investigation described in Chapter 3. Each hypothesis is restated. Every one except the first is accompanied by a table or tables to show the data plus a narrative description.

Five fourth grade classes containing one hundred pupils were tested for creativity and musical ability. Eighty-nine pupils took both tests. Five pupils took the creativity test only. Four pupils took the musical ability test only. Two pupils did not take either test. Ninety-eight pupils took at least one test. Before taking the creativity test, the pupils were asked to write on their papers answers to the following questions:

(1) Are you a boy or a girl?

(2) Are you right-handed or left-handed?

(3) Have you ever taken private lessons on a musical instrument?

(4) Does either of your parents play a musical instrument?

Some of the pupils did not provide the above information. Among those who did, there was a total of 82 right-handed pupils and 10 left-handed pupils. Over one-third of the pupils had had private lessons on a musical instrument. Over half of them had at least one parent who played a musical instrument.

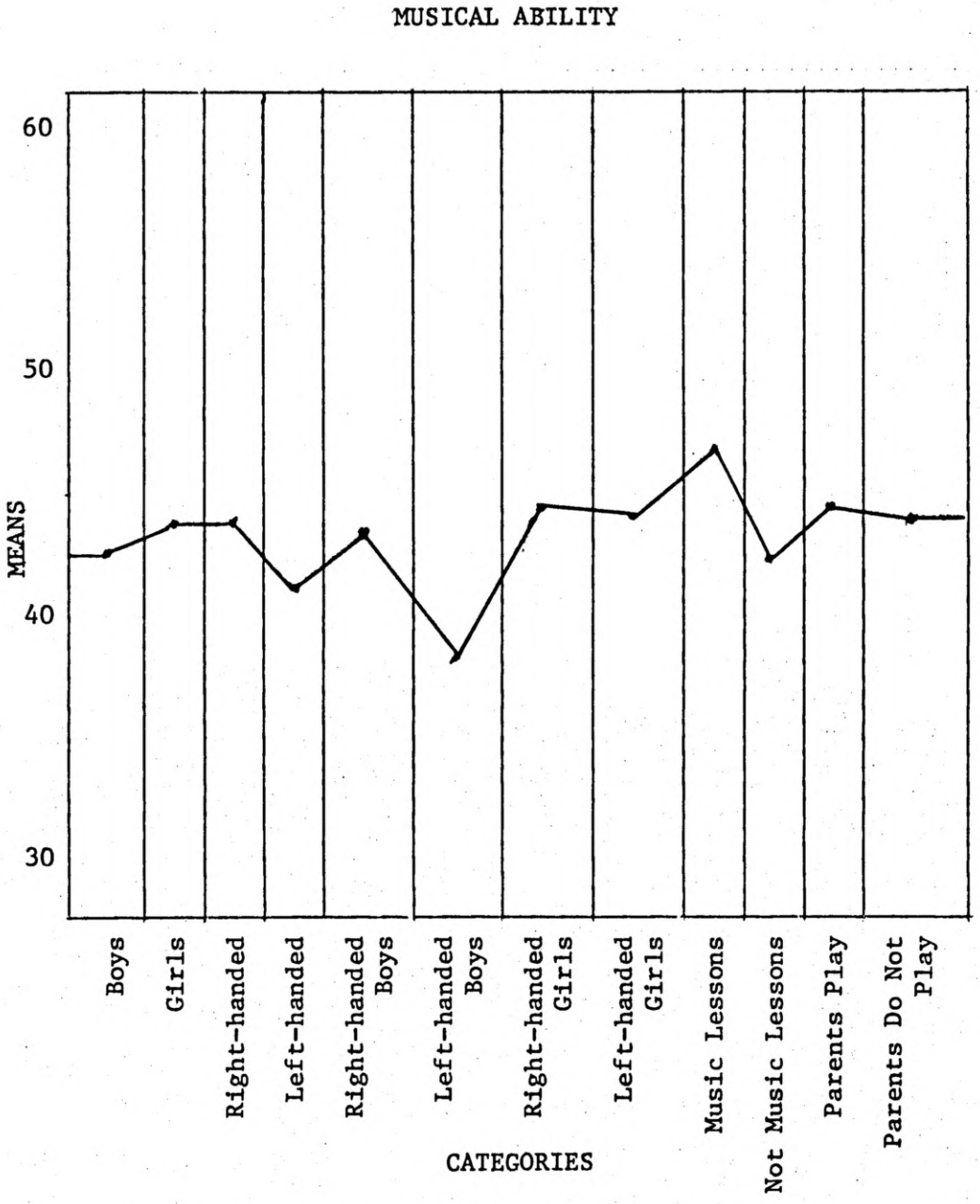
In the creativity test, the seven highest scores and the seven lowest scores were earned by girls.

The highest score in the musical ability test was earned by a left-handed girl who had had private music lessons and who had at least one parent who played a musical instrument. There were four perfect scores in the first section of the musical ability test -- testing ability to answer whether the second tone was higher or lower or the same as the first tone. The highest score in the second section -- testing ability to discriminate between steps and leaps -- was 20, out of a possible score of 28 points. The third section -- meter discrimination -- had 30 possible points, and there were two scores of 28, which would have been just one wrong since each example in that section was worth two points.

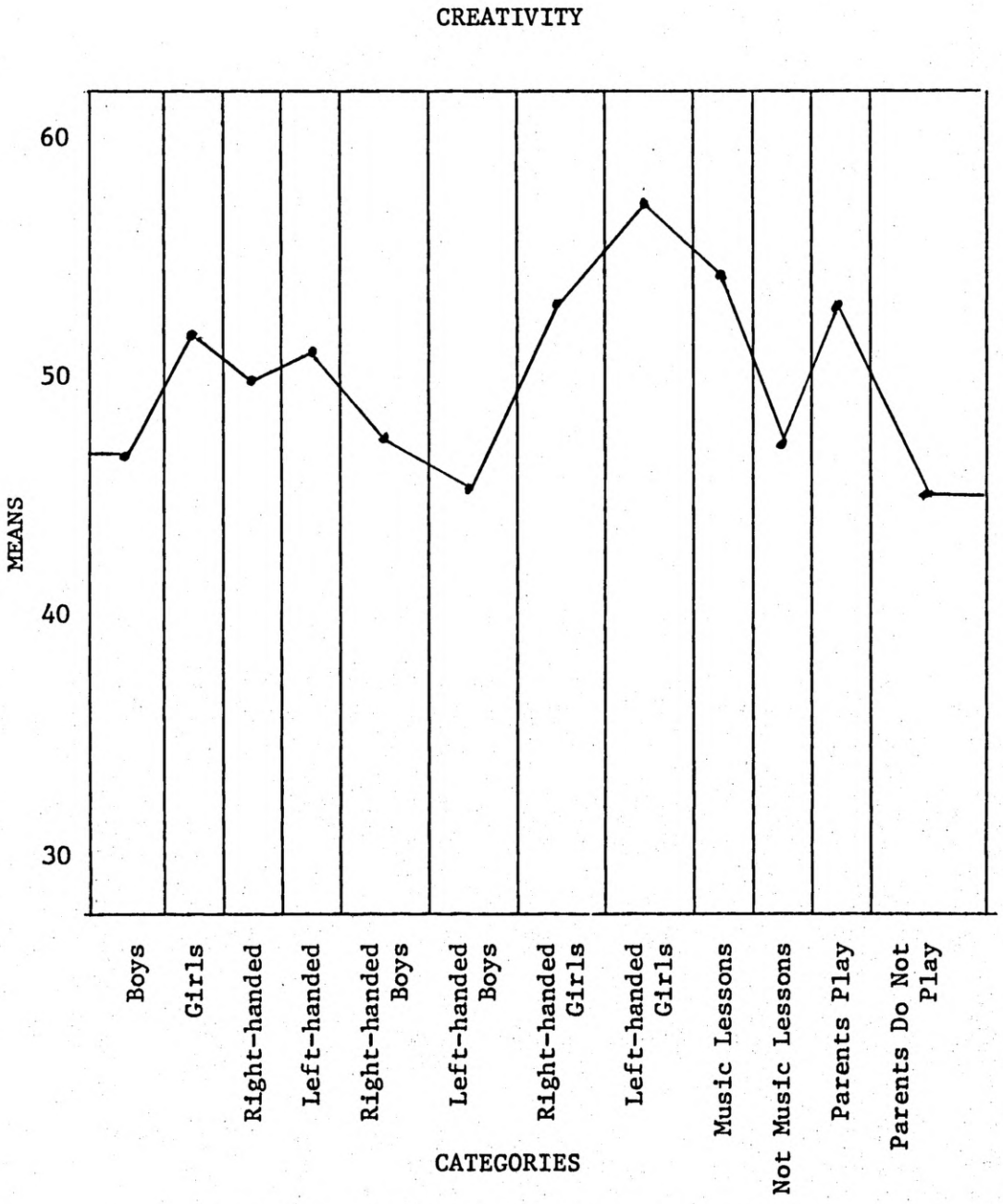
The first hypothesis is accompanied by two graphs to show means for the different categories in the two tests.

The first null hypothesis states that there is no significant relationship between musical ability and creativity as measured by scores in standardized tests and administered to the sample population as described above. The alternative hypothesis states that there is a significant relationship.

The mean of scores on the music test out of a possible total of 83 points was 42.79. The mean of scores on the creativity test was



Graph 1. Means of Musical Ability Categories



Graph 2. Means of Creativity Categories

48.71. There is no exact limit to the creativity scores, but the norms go only as high as 112 points at the twelfth grade level.

The relationship between the two scores for the 89 pupils taking both tests was computed by using the Pearson product moment correlation coefficient (r). This revealed an r of .2449. Using the t-test for the significance of the correlation coefficient, the critical value in Table F (Control Values of the Correlation Coefficient) at an alpha level of .05 for a two-tailed test (df=80) is .217.[92] Since the computed value of r turned out to be higher than the critical value, the null hypothesis was rejected, and the alternate hypothesis which states that there is a significant relationship was accepted.

It can be seen from Graph 1 that the highest mean in the music test (45.09) was that of pupils who had had private instruction on a musical instrument. The lowest mean (38.2) was that of left-handed boys. The highest mean in the creativity test (56.2) was that of left-handed girls. The lowest mean (44.28) was that of pupils who did not have at least one parent who played a musical instrument.

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[92]George A. Ferguson, Statistical Analysis in Psychology and Education, (New York: McGraw Hill Book Company, 1976), p. 494.

Table 1

Musical Ability and Creativity - Boys and Girls

	BOYS				GIRLS						
	$\bar{X}$	N	S	R	$\bar{X}$	N	S	R	MD	t	P
Music Ability	42.4	43	8.547	26-58	43.32	50	10.83	20-70	.9247	.4517	.6525
Creativity	46.13	45	9.07	32-67	51.3	50	15.38	17-83	5.167	1.966	.05233

Table 2

Musical Ability and Creativity - Right-handed and Left-handed

	RIGHT-HANDED				LEFT-HANDED						
	$\bar{X}$	N	S	R	$\bar{X}$	N	S	R	MD	t	P
Music Ability	43.32	77	9.088	20-61	40.9	10	12.51	27-70	2.424	.7585	.4502
Creativity	49.3	82	12.51	17-83	50.5	10	15.59	26-72	1.195	.2777	.7819

In the table used to display statistical information, the P refers to probability and was taken from the computer printout for each test. In this investigation, any t-test with a P equal or less than .05 was considered significant. In other words, the results would be significant in 95 cases out of 100 (by subtracting .05 from 1.00). The letters MD refer to the difference between the means.

The second null hypothesis states that there is no signficant difference between the scores of boys and the scores of girls in a test of musical ability. Table 1 shows that the mean on the test for musical ability for boys was 42.4 with a standard deviation of 8.547 and a range of 26-58. The mean on the test for musical ability for girls was 43.32 with a standard deviation of 10.83 and a range of 20-70. The computed t value was .4517 and the P was .65, which means it would be significant in approximately 35 cases out of 100. According to Table B[93] the critical value of t at an alpha level of .05 (df=90) is 1.99. Therefore, the null hypothesis which states that there is no significant difference between scores of boys and scores of girls in a test of musical ability was accepted.

In dividing the music scores into three groups (high, middle,

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[93]Ibid., p. 487.

low), the range of scores is shown by the following:

High	48-70 (31 pupils)
Middle	39-47 (32 pupils)
Low	20-38 (30 pupils)

Figure 1. Range of Musical Ability Scores

The number in each group divided by sex is as follows:

	Boys	Girls
High	13	18
Middle	13	19
Low	17	13
Total	43	50

Figure 2. Musical Ability

The third null hypothesis states that there is no significant difference between the scores of boys and the scores of girls in a test of creativity. The information in Table 1 shows that the mean for boys was 46.13 with a standard deviation of 9.07 and a range of 32-67. The mean for girls was 51.3 with a standard deviation of 15.38 and a range of 17-83. It is worth noting that the standard deviation for girls is over six points more than the standard deviation for boys which shows that in creativity there is greater variability in the girls' scores than in the boys' scores.

The computed t value was 1.966 and the P was .05233 which means that it would be significant in slightly fewer than 95 out of 100. According to Table B, the critical value of t at an alpha level of .05 (df=90) is 1.99. Therefore, the null hypothesis which states that there is no significant difference between scores of boys and scores of girls in a test of creativity was accepted. A comparison of the means reveals that the mean for girls was 5.167 higher than the mean for boys.

Dividing the scores into three groups (high, middle, low) produced the following:

High	55-83 (31 pupils)
Middle	44-54 (32 pupils)
Low	17-43 (32 pupils)
Total	95

Figure 3. Range of Creativity Scores

The number in each group divided by sex is as follows:

	Boys	Girls
High	8	23
Middle	20	12
Low	17	15
Total	45	50

Figure 4. Creativity

This shows that there were many more girls than boys in the high group and more boys than girls in the middle group. There were approximately the same number of boys as there were girls in the low group. The girls scored more in the high group and in the low group than in the middle group.

The fourth null hypothesis states that there is no significant difference between the scores of right-handed pupils and the scores of left-handed pupils in a test of musical ability. The alternate hypothesis states that there is a significant difference.

Table 2 shows that the mean for right-handed pupils in the test of musical ability was 43.32 with a standard deviation of 9.088 and a range of 20-61. The mean for left-handed pupils was 40.90 with a standard deviation of 12.51 and a range of 27-70. The computed t value was .7585 and the P was .4502, which means that one could expect a significant difference in only 55 cases out of 100. According to Table B, the critical value of t at an alpha level of .05 for 90 degrees of freedom (df) would be 1.99. Therefore, the null hypothesis which states that there is no significant difference between the scores of right-handed pupils and the scores of left-handed pupils in a test of musical ability was accepted.

Separating the scores into groups of high, middle, and low shows the following:

	Right-handed	Left-handed
High	29	1
Middle	26	5
Low	22	4
Total	77	10

Figure 5. Musical Ability

The fifth null hypothesis states that there is no significant difference between the scores of right-handed pupils and the scores of left-handed pupils in a test of creativity. The alternate hypothesis states that there is a significant difference.

Table 2 shows that the mean for right-handed pupils in the test of creativity was 49.3 with a standard deviation of 12.51 and a range of 17-83. The mean for left-handed pupils was 50.5 with a standard deviation of 15.59 and a range of 26-72. The computed t value was .2777 and the P was .7819 which means that one could expect a significant difference in only 22 cases out of 100. The critical value of t at an alpha level of .05 would be 1.99. Therefore, the null hypothesis which states that there is no significant difference between the scores of right-handed pupils and the scores of left-handed pupils in a test of creativity was accepted.

Separating the creativity scores for right-handed pupils and left-handed pupils into high, middle, and low reveals the following:

	Right-handed	Left-handed
High	26	5
Middle	31	1
Low	25	4
Total	82	10

Figure 6. Creativity

In the test of creativity, it can be readily seen that the distribution of scores for the left-handed pupils is bi-modal with only one score within the middle range.

The sixth null hypothesis states that there is no significant difference between the scores of right-handed boys and those of left-handed boys in the test of musical ability. The alternate hypothesis states that there is a significant difference.

Table 3 shows that the mean for right-handed boys in the test of musical ability was 43.03 with a standard deviation of 8.536 and a range of 26-58. The mean for left-handed boys was 38.20 with a standard deviation of 9.418 and a range of 27-47. The computed t value was 1.174 and the P was .2473 which means that one could expect a significant difference in approximately 75 cases out of 100. Since the computed t value was less than the critical t value at .05 alpha level given in Table B (2.021, df=40), the null hypothesis which states that there is no significant difference between the scores of

Table 3

Musical Ability and Creativity - Right-handed Boys and Left-handed Boys

	RIGHT-HANDED BOYS				LEFT-HANDED BOYS						
	$\bar{X}$	N	S	R	$\bar{X}$	N	S	R	MD	t	P
Music Ability	43.03	37	8.536	26-58	38.20	5	9.418	27-47	4.827	1.174	.2473
Creativity	46.3	40	8.745	32-67	44.8	5	12.54	33-63	1.5	.345	.7317

Table 4

Musical Ability and Creativity - Right-handed Girls and Left-handed Girls

	RIGHT-HANDED GIRLS				LEFT-HANDED GIRLS						
	$\bar{X}$	N	S	R	$\bar{X}$	N	S	R	MD	t	P
Music Ability	43.52	40	9.735	20-61	43.60	5	15.66	31-70	.07512	.01518	.988
Creativity	52.12	42	14.84	17-83	56.20	5	17.56	26-72	4.081	.5713	.5706

right-handed boys and those of left-handed boys in the test of musical ability was accepted.

	Right-handed Boys	Left-handed Boys
High	13	0
Middle	10	3
Low	15	2
Total	38	5

Figure 7. Musical Ability

Figure 7 shows that more right-handed boys scored in the high group than in either the middle group or low group. More left-handed boys scored in the middle group than in the low group. No left-handed boys scored in the high group.

The seventh null hypothesis states that there is no significant difference between the scores of right-handed girls and those of left-handed girls in a test of musical ability. The alternate hypothesis states that there is a significant difference.

Table 4 shows that the mean for right-handed girls in the test of musical ability was 43.52 with a standard deviation of 9.735 and a range of 20-61. The mean for left-handed girls was 43.60 with a standard deviation of 15.66 and a range of 31-70. The computed t value was .01518 with a P of .988. This means that one could expect

a significant difference between the scores of right-handed girls and the scores of left-handed girls in a test of musical ability in slightly more than one case out of a hundred. Therefore, the null hypothesis which states that there is no significant difference between right-handed girls and left-handed girls in a test of musical ability was accepted.

	Right-handed Girls	Left-handed Girls
High	14	1
Middle	16	2
Low	10	2
Total	40	5

Figure 8. Musical Ability

Figure 8 shows that more right-handed girls scored in the middle group than in either the high group or the low group. Only one left-handed girl scored in the high group. That happened to be the highest score on the test.

The eighth null hypothesis states that there is no significant difference between the scores of right-handed boys and those of left-handed boys in the test of creativity. The alternate hypothesis states that there is a significant difference.

Table 3 shows that the mean for right-handed boys was 46.3 with

a standard deviation of 8.745 and a range of 32 to 67. The mean for left-handed boys was 44.8 with a standard deviation of 12.54 and a range of 33-63. The computed t value was .345 and the P was .7367. This means that, based on these findings, one could expect a significant difference between right-handed boys and left-handed boys in a test of creativity in fewer than 27 cases out of 100. Therefore, the null hypothesis which states that there is no signficant difference between the scores of right-handed boys and the scores of left-handed boys in a test of creativity was accepted.

	Right-handed Boys	Left-handed Boys
High	7	1
Middle	19	1
Low	14	3
Total	40	5

Figure 9. Creativity

Figure 9 shows that more right-handed boys scored in the middle group than in either the high group or the low group. More left-handed boys scored in the low group than in the high group and the middle group together.

The ninth null hypothesis states that there is no significant difference between the scores of right-handed girls and the scores

of left-handed girls in a test of creativity. The alternate hypothesis states that there is a significant difference.

Table 4 shows that the mean for right-handed girls in the creativity test was 52.12 with a standard deviation of 14.84 and a range of 17-83. The mean for left-handed girls was 56.20 with a standard deviation of 17.56 and a range of 26-72. The computed t value was .5713 and the P was .5706. This means that, based on these findings, one could expect to find a significant difference between the scores of right-handed girls and the scores of left-handed girls in a test of creativity in 43 cases out of 100, and the null hypothesis which states that there is no significant difference between the scores of right-handed girls and the scores of left-handed girls in a test of creativity was accepted.

	Right-handed Girls	Left-handed Girls
High	19	4
Middle	12	0
Low	14	1
Total	45	5

Figure 10. Creativity

Figure 10 shows that more right-handed girls and left-handed girls scored in the high group than in either the middle group or the

low group.

The tenth null hypothesis states that there is no significant difference between the scores of right-handed boys and the scores of right-handed girls in a test of musical ability. The alternate hypothesis states that there is a significant difference. Table 5 shows that the mean for right-handed boys in the test of musical ability was 43.11 with a standard deviation of 8.462 and a range of 26-58. The mean for right-handed girls was 43.64 with a standard deviation of 9.834 and a range of 20-61. The difference between the means was .5329. The computed t value was .2526 and the P was .8013. This means that, based on these findings, one could expect a significant difference between the scores of right-handed boys and the scores of right-handed girls in a test of musical ability in approximately 20 cases out of 100. Therefore, the null hypothesis which states that there is no significant difference between the scores of right-handed boys and the scores of right-handed girls in a test of musical ability was accepted.

	Right-handed Boys	Right-handed Girls
High	14	13
Middle	11	16
Low	12	10
Total	37	39

Figure 11. Musical Ability

Table 5

Musical Ability and Creativity - Right-handed Boys and Right-handed Girls

	RIGHT-HANDED BOYS				RIGHT-HANDED GIRLS						
	$\bar{X}$	N	S	R	$\bar{X}$	N	S	R	MD	t	P
Musical Ability	43.11	37	8.462	26-58	43.64	39	9.834	20-61	.5329	.2526	.8013
Creativity	46.3	40	8.745	32-67	52.12	42	14.84	17-83	5.819	2.15	.0346

Table 6

Musical Ability and Creativity - Left-handed Boys and Left-handed Girls

	LEFT-HANDED BOYS				LEFT-HANDED GIRLS						
	$\bar{X}$	N	S	R	$\bar{X}$	N	S	R	MD	t	P
Musical Ability	38.2	5	9.418	27-47	43.6	5	15.66	31-70	5.4	.6607	.5274
Creativity	44.8	5	12.54	33-63	56.2	5	17.56	26-72	11.40	1.182	.2713

Figure 11 shows that more right-handed boys scored in the high group than in either the middle group or the low group. More right-handed girls scored in the middle group than in either the high group or the low group.

The eleventh null hypothesis states that there is no significant difference between the scores of right-handed boys and the scores of right-handed girls in a test of creativity. The alternate hypothesis states that there is a significant difference.

Table 5 shows that the mean for right-handed boys in the test of creativity was 46.3 with a standard deviation of 8.745 and a range of 32-67. The mean for right-handed girls was 52.12 with a standard deviation of 14.84 and a range of 17-83. The computed t value was 2.15 and the P was .0346. This means that, based on these findings, one could expect to find a significant difference between the scores of right-handed boys and the scores of right-handed girls in a test of creativity in nearly 97 cases out of 100. Therefore, the null hypothesis which states that there is no significant difference between the scores of right-handed boys and the scores of right-handed girls in a test of creativity was rejected. The alternate hypothesis which states that there is a significant difference was accepted. It can be seen that the mean for right-handed girls is 5.819 points higher than that for right-handed boys.

	Right-handed Boys	Right-handed Girls
High	7	19
Middle	19	12
Low	14	11
Total	40	42

Figure 12. Creativity

Figure 12 shows that more right-handed girls scored in the high group than right-handed boys.

The twelfth null hypothesis states that there is no significant difference between the scores of left-handed boys and the scores of left-handed girls in a test of musical ability. The alternate hypothesis states that there is a significant difference.

Table 6 shows that the mean for left-handed boys was 38.2 with a standard deviation of 9.418 and a range of 27-47. The mean for left-handed girls was 43.6 with a standard deviation of 15,66 and a range of 31-70. The computed t value was .6607 and the P was .5274. This means that, based on these findings, one could expect to find a significant difference in slightly less than half of the cases or 47 out of 100. Therefore, the null hypothesis which states that there is no significant difference between the scores of left-handed boys and those of left-handed girls in a test of musical ability was accepted.

	Left-handed Boys	Left-handed Girls
High	0	1
Middle	3	2
Low	2	2
Total	5	5

Figure 13. Musical Ability

Figure 13 shows that only one left-handed girl scored in the high group. All left-handed boys' scores were in the middle and low groups.

The thirteenth null hypothesis states that there is no significant difference between the scores of left-handed boys and the scores of left-handed girls in a test of creativity. The alternate hypothesis states that there is a significant difference.

Table 6 shows that the mean for left-handed boys was 44.8 with a standard deviation of 12.54 and a range of 33-63. The mean for left-handed girls was 56.2 with a standard deviation of 17.56 and a range of 26-72. The computed t value was 1.182 and the P was .2713. This means that, based on these findings, one could expect a significant difference in approximately 73 cases out of 100. Therefore, the null hypothesis which states that there is no significant difference between the scores of left-handed boys and the scores of left-handed girls in a test of creativity was accepted.

	Left-handed Boys	Left-handed Girls
High	1	4
Middle	1	0
Low	3	1
Total	5	5

Figure 14. Creativity

Figure 14 shows that more left-handed boys scored in the low group than in the high and middle groups together. One left-handed girl scored in the low group and all the other left-handed girls scored in the high group.

The fourteenth null hypothesis states that there is no significant difference in a test of musical ability between the scores of pupils who have had private instruction on a musical instrument and the scores of pupils who have not had private lessons on a musical instrument. The alternate hypothesis states that there is a significant difference.

Table 7 shows that the mean for pupils who have had private lessons on a musical instrument was 45.09 with a standard deviation of 10.26 and a range of 28-70. The mean for pupils who have not had private lessons on a musical instrument was 41.68 with a standard deviation of 9.407 and a range of 20-61. The computed t value was 1.619 and the P was .109. This means that, based on these findings,

Table 7

Musical Ability and Creativity - Yes Private Lessons and No Private Lessons

	YES PRIVATE LESSONS				NO PRIVATE LESSONS						
	$\overline{X}$	N	S	R	$\overline{X}$	N	S	R	MD	t	P
Musical Ability	45.09	33	10.26	28-70	41.68	60	9.407	20-61	3.408	1.619	.109
Creativity	53.08	36	12.74	24-74	46.27	59	12.55	17-83	6.812	2.552	.01234

Table 8

Musical Ability and Creativity - Parents Play and Parents Do Not Play

	PARENTS PLAY				PARENTS DO NOT PLAY						
	$\overline{X}$	N	S	R	$\overline{X}$	N	S	R	MD	t	P
Musical Ability	43.52	56	9.582	20-70	43.26	35	10.01	21-59	.2606	.1241	.9015
Creativity	51.77	61	12.67	21-83	44.28	32	12.08	17-67	7.489	2.751	.00718

one could expect to find a significant difference in approximately 89 cases out of 100. Therefore, the null hypothesis which states that there is no significant difference in a test of musical ability between the scores of pupils who have had private instruction on a musical instrument and the scores of pupils who have not had private instruction on a musical instrument was accepted.

By grouping the scores into three groups (high, middle, low), the following illustration shows that more students who have had private lessons scored in the high group than in either the middle group or the low group:

	Private Lessons Yes	Private Lessons No
High	14	17
Middle	11	21
Low	8	22
Total	33	60

Figure 15. Musical Ability

The fifteenth null hypothesis states that there is no signficant difference in the scores in a creativity test between pupils who have had private instruction on a musical instrument and pupils who have not had private instruction on a musical instrument. The alternate hypothesis states that there is a significant difference.

Table 7 shows that the mean for pupils who have had private music lessons was 53.08 with a standard deviation of 12.74 and a range of 24-74. The mean for pupils who have not had private music lessons was 46.27 with a standard deviation of 12.55 and a range of 17-83. The computed t value was 2.552 with a P of .01234. This means that, based on these findings, in nearly 99 cases out of 100, one could expect to find a significant difference in a creativity test between the scores of pupils who have had private music lessons and the scores of pupils who have not had private music lessons. It can be seen in Table 7 that the mean for those pupils who have had private music lessons was 6.812 points higher than the mean for pupils who have not had private music lessons. Therefore, the null hypothesis which states that there is no significiant difference in scores on a creativity test between pupils who have had private lessons on a musical instrument and those who have not had private lessons on a musical instrument was rejected. The alternate hypothesis which states that there is a significant difference was accepted.

Separating the scores of pupils who have had private music lessons into three groups (high, middle, low) produced the following table:

	Private Lessons Yes	Private Lessons No
High	18	13
Middle	10	22
Low	8	24
Total	36	59

Figure 16. Creativity Test

The above illustration shows that more pupils who have had private music lessons scored in the high group than in the middle and low groups.

The sixteenth null hypothesis states that there is no significant difference in a test of musical ability between the scores of pupils who have at least one parent who plays a musical instrument and the scores of pupils who do not have at least one parent who plays a musical instrument. The alternate hypothesis states that there is a significant difference.

Table 8 shows that the mean for pupils who have at least one parent who plays a musical instrument was 43.52 with a standard deviation of 9.582 and a range of 20-70. The mean for pupils who do not have at least one parent who plays a musical instrument was 43.26 with a standard deviation of 10.01 and a range of 21-59. The computed t value was .1241 and the P was .9015. This means that, based on these findings, one could expect to find a significant

difference in a test of musical ability between the scores of pupils who have at least one parent who plays a musical instrument and the scores of pupils who do not have at least one parent who plays a musical instrument in only ten cases out of a hundred. Therefore, the null hypothesis which states that there is no significant difference in a test of musical ability between scores of pupils who have at least one parent who plays a musical instrument and scores of pupils who do not have at least one parent who plays a musical instrument was accepted.

Separating the scores of pupils who have at least one parent who plays a musical instrument into three groups (high, middle, low) produced the following:

	Parents Play	Parents Do Not Play
High	18	13
Middle	21	11
Low	17	11
Total	56	35

Figure 17. Musical Ability Test

The above illustration shows that more pupils who have at least one parent who plays a musical instrument scored in the middle group than in either the high group or the low group.

The seventeenth null hypothesis states that there is no

significant difference in a creativity test between the scores of pupils who have at least one parent who plays a musical instrument and the scores of pupils who do not have at least one parent who plays a musical instrument. The alternate hypothesis states that there is a significant difference.

Table 8 shows that the mean for pupils who have at least one parent who plays a musical instrument was 51.77 with a standard deviation of 12.67 and a range of 21 to 83. The mean for pupils who do not have at least one parent who plays a musical instrument was 44.28 with a standard deviation of 12.08 and a range of 17 to 67. The computed t value was 2.751 and the P was .00718. This means that, based on these findings, one could expect to find a significant difference in a creativity test between the scores of pupils who have at least one parent who plays a musical instrument and the scores of pupils who do not have at least one parent who plays a musical instrument in more than 99 cases out of 100. Therefore, the null hypothesis which states that there is no signficant difference was rejected and the alternate hypothesis which states that there is a signficant difference was accepted. It can be seen in Table 8 that the mean for pupils who have at least one parent who plays a musical instrument was 7.489 points higher than the mean for pupils who do not have at least one parent who plays a musical instrument.

Placing the scores of pupils who have at least one parent who

plays a musical instrument into three groups (high, middle, low) produced the following:

	Parents Play	Parents Do Not Play
High	24	7
Middle	22	9
Low	15	16
Total	61	32

Figure 18. Creativity Test

The above illustration shows that among pupils whose parents played musical instruments, more pupils had scores that placed them in the high group than in either the middle or the low group.

Summary

Separate tests of musical ability and creativity were administered to five fourth grade classes in Bozeman Public Schools. Eighty-nine pupils took both tests; five pupils took the creativity test only; four pupils took the music test only; two pupils did not take either test; ninety-eight pupils took at least one test.

Statistical tests were performed to determine the relationship between the two variables and whether there were significant differences between the categories of each variable. These categories were: boys and girls; right-handed pupils and left-handed pupils;

right-handed boys, left-handed boys, right-handed girls, and left-handed girls; those pupils who had had private music instruction and those pupils who had not had private music instruction; and those pupils who had at least one parent who played a musical instrument and those pupils who did not have at least one parent who played a musical instrument.

Based on the findings of this investigation, a significant, positive relationship was found between musical ability and creativity.

No significant differences were found between the various categories in the test of musical ability; however, the test of creativity produced evidence of three significant differences. These differences were as follows:

(1) In the test of creativity, a significant difference was found between the scores of right-handed boys and the scores of right-handed girls. Right-handed girls scored significantly higher.

(2) In the test of creativity, a significant difference was found between the scores of pupils who had had private instruction on a musical instrument and the scores of pupils who had not had private instruction on a musical instrument. Pupils who had had private instruction on a musical instrument scored significantly higher.

(3) In the test of creativity, a significant difference was found between the scores of pupils who had at least one parent who

played a musical instrument and the scores of pupils who did not have at least one parent who played a musical instrument. Pupils who had at least one parent who played a musical instrument scored significantly higher.

The alpha level of significance in each statistical test was .05.

The highest mean in the music test was that of pupils who had had private instruction on a musical instrument, and the lowest mean was that of left-handed boys. The highest mean in the creativity test was that of left-handed girls and the lowest mean was that of pupils who did not have at least one parent who played a musical instrument.

Chapter 5

SUMMARY AND RECOMMENDATIONS

Introduction

Someone has made the comment that if we do not do everything possible to help each child in our educational system develop his maximum potential, we are guilty of wasting a valuable natural resource. It was with that spirit that this study was conducted.

The ultimate goal of all measurement in education is to gain knowledge about students. It is not always possible to find out how they learn, but to find out what they have learned, or could have learned, would seem to be a step in the right direction.

Summary

The nature and source of musical ability has been a subject of debate for quite a long time. The current view of the source of it is that musical talent is largely inherited but that the quality of musical exposure at an early age has a marked effect on this. The early months and years play a large part in developing musicality, but after the age of eight or nine, it is fairly stable and musical exposure does not affect musical aptitude.

Creativity is inherent in all people to some degree; however, the magnitude of it has a wide range. Some young children are highly creative and all are more creative at certain ages than at others.

They tend to stay on a general increase in creative ability unless something happens to change the direction of their development. Even in the case of a person whose creativity is totally smothered for some reason or other, with the proper nurturing, it can be revived at almost any age. It is not possible to teach creativity, but it can definitely be encouraged and studies show that classrooms which are geared to develop each child to his best creative potential do produce impressive results. On the other hand, placing children in a restrictive, inhibiting kind of atmosphere can cause various kinds of emotional problems and can lead to a breakdown of personality.

The problem of this study was to determine the relationship between musical ability and creativity. Many studies have been conducted to determine the relationship of each of these abilities to various other qualities and achievements, but very little research has been recorded dealing with musical ability and creativity together. It turns out that there is a significant, positive relationship between musical ability and creativity.

Other aspects of this investigation have turned out to be of equal value or perhaps of greater value than that simple, cold fact of correlation. A review of literature revealed information about the functions of the right and left hemispheres of the brain, and the most important thing about that is that both musical ability and

creativity are in large part right-brain functions. For over a hundred years it has been recognized that for nearly all people, the left hemisphere handles verbal and mathematical processes and other types of logical reasoning. It was felt that all things emotional, inspirational, and intuitive were processed in the right hemisphere, but it has been only within the last decade that sufficient evidence has been able to support this attitude with facts. It is also now recognized that the aesthetic appreciation of music is a right hemisphere function, as are also some other musical attributes such as pitch recognition. Joan Hall's research paper dealing with the hemispheric functions of the brain presents much information on this.[94]

To solve the problems of this study, five complete fourth grade classes in the Bozeman elementary schools were tested for musical ability and creativity, using the Music Achievement Test by Richard Colwell and the Test of Creative Potential by Ralph Hoepfner and Judith Hemenway. Testing took place during the regular period for music. A total of eighty-nine pupils took both tests. Five pupils took the creativity test only and four pupils took the music test only. Two pupils did not take either test. The total number of pupils in the five classes was one hundred.

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[94]"Brain Hemisphere Functions: New Implications for Musical Aptitude Testing," Ada Joan Hall, unpublished professional paper for Master of Education degree, Montana State University, Bozeman, Montana, Dec. 1977.

In the present investigation, before taking the creativity test, pupils were asked to write down information about themselves as to sex, laterality, whether they had had private music lessons and whether either of their parents played a musical instrument. In the five classes, ten pupils (five boys and five girls) were left-handed. This number is disproportionately high -- probably twice as many as one would expect. It is possible that some of the left-handers were actually brain damaged right-handers who switched to the left hand out of necessity. The presence of some very low scores among them would seem to reinforce this.

Over one-third of the pupils tested had had private lessons on a musical instrument and many of them scored well above average on the creativity test. This produced statistical evidence that there is a significant difference in creativity in nearly 99 cases out of 100 between pupils who have had private music lessons and those who have not. This would seem to lend weight to the theory that music literally develops the other half of the child, which is the right hemisphere of the brain, and this aids in the simultaneous, intuitive kind of thinking necessary for creativity.

Over one-half of the pupils tested had at least one parent who played a musical instrument. These pupils also scored above average on the creativity test, and this produced evidence that a significant difference in creativity can be expected in at least 99 cases out of

100 from those who have at least one parent who plays a musical instrument. The lowest mean score in the creativity test was that of pupils who did not have at least one parent who played a musical instrument.

There is a significant difference in the creativity test between the scores of right-handed boys and the scores of right-handed girls. The mean for right-handed girls was 5.819 points higher than the mean for right-handed boys.

Recommendations

Further study would seem to be worthwhile with new data or perhaps even further study with the same data. For example, the left-handers are not really shown for their uniqueness. There was only one left-hand score in the middle group of the creativity test with most scores at the extremes, yet in the statistical tests they were not measured as being significantly different from the right-handers. Perhaps a more powerful statistical test would better capture their relative importance.

No significant differences were found in comparing data within the categories for the musical ability test. In this particular testing situation, test scores were not affected significantly by sex, laterality, private music instruction, or whether parents played musical instruments. The importance of having parents who played

musical instruments was based on the assumption that if parents play, the children will listen and will therefore be exposed to more music, especially at an early age when children spend more time at home. In this situation, that fact was not given relative importance. Standards were not established as to how much or how well the parents needed to play to be considered of significant importance. Pupils were given affirmative answers to questions like, "Well, my father used to play the violin, but he doesn't have it any more so shall I say he plays a musical instrument?". Perhaps in a future test, this could be considered again, but with some refinements in order to better determine the effects of musical performance in the home on the musical ability of children.

No attempt was made in this study to reconcile the difference in development between boys and girls at the particular age level under consideration. Fourth grade girls are expected to be more advanced than fourth grade boys, and that could explain the statistical evidence showing a significant difference between the scores of right-handed boys and right-handed girls in the creativity test. The right-handed girls scored higher than the right-handed boys.

Conclusions

There is no such explanation, however, for the fact that in the creativity test pupils who have had private music instruction scored

significantly higher than pupils who have not had private music instruction. The connection between private music instruction and higher creativity test scores is undoubtedly in the fact that aesthetic appreciation of music is a right brain function. The right brain also provides for intuition and inspiration, both of which are needed for creativity. The suggestion is that pupils who have had private music lessons, which would involve deeper exposure to music, have developed more keenly the right hemisphere of the brain and are therefore better equipped to think creatively.

Significance was also found in the creativity test scores of pupils who had at least one parent who played a musical instrument. In this investigation, those pupils who had at least one parent who played a musical instrument scored significantly higher than those pupils who did not have at least one parent who played a musical instrument. This could be caused by the fact that a parent playing a musical instrument in the home would help a child develop music appreciation, a right brain-hemisphere function, as mentioned above. Another explanation could be in a personality difference between people who play musical instruments and people who do not play musical instruments. It could be that playing a musical instrument would help one to be more flexible, outgoing, and well-adjusted, all of which would contribute to providing an environment conducive to creativity. For whatever reason, however, there seems to be no doubt

that, based on the findings of this investigation, parents with a musical background can be expected to nurture creativity in their children.

Many things have been said in this study and elsewhere about the ways in which music can affect the quality of life and learning, but the one who said this, said it best, "Music is not merely something that aids life; music <u>is</u> life!"

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APPENDIX

October 17, 1977

Dear Parents:

I am a graduate student in education at Montana State University, and I am also completing requirements for K-12 certification in Music. At the present time, I am a student teacher in elementary music with Mrs. Phyllis Ihly.

In partial fulfillment for the requirements for a Master's degree, I will be completing a professional project. This will be a study of the relationship between musical aptitude and creativity. As part of this, I would like to test fourth grade pupils in creative and musical abilities. Mrs. Ihly has recommended this testing, which will take two days, and it has been cleared through the administration and teachers.

Tests will be administered during the regular period for music. Names will not be on the papers, but information will be requested as to sex, handedness, whether the examinee has ever had private music lessons, and whether either of his parents plays a musical instrument.

Your fourth grade child's class will be among those tested, and I hope that this will be all right with you. If, for any reason, you do not wish to have your child tested, please send a note to his teacher tomorrow (October 18).

Sincerely yours,

Elizabeth de Sa e Silva