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The relationship of musical experience, musical aptitude, self concept, age, and academic achievement to the musical problem solving abilities of high school students

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Case Western Reserve University, 1992

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THE RELATIONSHIP OF MUSICAL EXPERIENCE, MUSICAL APTITUDE, 
SELF CONCEPT, AGE, AND ACADEMIC ACHIEVEMENT TO THE 
MUSICAL PROBLEM SOLVING ABILITIES OF HIGH SCHOOL STUDENTS

by

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Submitted in partial fulfillment of the requirements for the Degree of Doctor 
of Philosophy

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THE RELATIONSHIP OF MUSICAL EXPERIENCE, MUSICAL APTITUDE, SELF CONCEPT, AGE, AND ACADEMIC ACHIEVEMENT TO THE MUSICAL PROBLEM SOLVING ABILITIES OF HIGH SCHOOL STUDENTS

Abstract

by

RANDOLPH PHILIP LAYCOCK

The purpose of this study was to determine whether significant relationships exist between the musical characteristics of original compositions produced by high school students, aged 15 to 18 and those students' musical experience, musical aptitude, self-concept as musicians, age, and academic achievement. The compositions were viewed as a form of musical problem solving. The musical characteristics used as dependent variables were tonality, meter, motive, length, replication, phrasing, complexity, originality, and cohesiveness. The independent variables were measures of students' musical experience, musical aptitude, self-concept as musicians, age, and academic achievement as measured by grade point average.

The subjects were 56 high school students from a suburban Cleveland, Ohio, high school. Each subject was given a maximum of twenty minutes to compose a melody on an acoustic piano. The compositions were tape recorded and then analyzed by the researcher and rated by two independent judges. The results of the analyses and ratings were correlated with the results of the measures of students' musical experience, musical aptitude, self-concept as musicians, age, and academic achievement.
The results of the correlations showed there to be strong relationships between musical experience and self-concept as musicians and the musical characteristics of the students' original compositions. Musical aptitude, age, and academic achievement were also related to the musical characteristics of students' original compositions, but to a lesser degree.
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# TABLE OF CONTENTS

ABSTRACT........................................................................................................... ii

ACKNOWLEDGEMENTS................................................................................ iv

TABLE OF CONTENTS....................................................................................... v

LIST OF TABLES................................................................................................ v i i

LIST OF MUSICAL EXAMPLES......................................................................... ix

Chapter

1. STATEMENT OF PURPOSE........................................................................... 1

   Introduction.................................................................................................... 1
   Definitions of Creativity............................................................................... 7
   Creativity Related to Problem Solving......................................................... 9
   Creativity and Music Education................................................................. 11
   Factors That May Affect Musical Problem Solving..................................... 14
   Purpose and Procedures............................................................................ 17
   Research Questions..................................................................................... 17
      Null Hypotheses..................................................................................... 19
   Delimitation of Study................................................................................ 26

2. REVIEW OF LITERATURE............................................................................. 27

   Literature Review of Student Variables.................................................... 28
      Musical Experience................................................................................ 28
      Musical Aptitude.................................................................................. 30
      Self-Concept......................................................................................... 33
      Academic Achievement........................................................................ 37
   Relationships Among Student Variables............................................... 39
   Literature Review of Creativity................................................................. 42
      Product Analysis.................................................................................... 42
      Process Analysis................................................................................... 47
   Relationship of Musical Creativity to Other Student Variables................. 49

3. PROCEDURE FOR DATA COLLECTION....................................................... 54

   Description of School................................................................................ 54
   Description of Music Program................................................................... 55
   Procedure for Sample Selection............................................................... 55
   Testing Administration Procedures......................................................... 57
      Music Aptitude Profile......................................................................... 57
Self-Esteem of Music Ability ........................................... 59
Researcher Generated Questionnaire .............................. 60
Test Setting ................................................................ 61
Composition Sessions .................................................. 61
Method of Composition Collection ................................. 62
Audio Tape Procedures ................................................. 62
Procedural Restrictions ................................................ 64
Analysis of Audio Tapes .................................................. 65
Criteria for Measurement .............................................. 65
Tonality ........................................................................ 66
Meter ........................................................................... 67
Motive .......................................................................... 68
Phrase ................................................................. .......................... 69
Originality ................................................................. 70
Cohesiveness .............................................................. 70
Replication ................................................................. 71
Complexity ................................................................. 71
Length ........................................................................... 72
Definitions .................................................................... 72
Judging Procedures ....................................................... 75
Statistical Treatment of Data ......................................... 76
Summary of Procedures .................................................. 77

4. ANALYSIS OF DATA .......................................................... 79

Relationship Among Independent Variables .................... 79
Musical Experience ....................................................... 81
Musical Aptitude ......................................................... 83
Self-Concept .............................................................. 84
Age ........................................................................... 85
Academic Achievement .................................................. 85
Relationship Among Dependent Variables ....................... 85
Descriptive Statistics and Musical Examples
of the Dependent Variables .......................................... 89
Tonality ........................................................................ 89
Meter .......................................................................... 90
Cohesiveness .............................................................. 91
Originality ................................................................. 92
Complexity ................................................................. 93
Motivic Activity .......................................................... 96
Repeated Melodic Motives ............................................. 97
Developed Melodic Motives .......................................... 98
Repeated Rhythmic Motives ......................................... 98
Developed Rhythmic Motives ....................................... 99
Phrasing ................................................................. 99
Replication ................................................................. 101
Length ................................................................. 101
Statistical Analysis of Student Variables ......................... 102
Musical Experience ....................................................... 102
5. SUMMARY AND IMPLICATIONS FOR TEACHING AND RESEARCH

Summary of Major Findings................................................. 117
Musical Experience.......................................................... 117
Musical Aptitude.............................................................. 119
Self-Concept........................................................................ 121
Age....................................................................................... 122
Academic Achievement......................................................... 123
Shortcomings of the Present Research..................................... 124
Implications for Teaching...................................................... 126
Implications for Research...................................................... 129

APPENDICES........................................................................... 131

Appendix A-Letter of Permission and Cover Letter.................... 131
Appendix B-Student Questionnaire........................................... 132
Appendix C-Self-Esteem of Music Ability Questionnaire.............. 133
Appendix D-Judges Rating Form.............................................. 136

REFERENCES....................................................................... 137
LIST OF TABLES

1. Intercorrelations of Independent Variables ........................................ 80
2. Percentage of Sample Participating in Each
   Specific Experience or Category ..................................................... 82
3. Descriptive Statistics for Independent Variables ............................... 84
4. Intercorrelations of Dependent Variables ........................................ 86
5. Descriptive Statistics and Interjudge Reliability of
   Dependent Variables .................................................................. 88
6. Correlation of Student Musical Experiences with Musical
   Characteristics of Original Compositions ....................................... 103
7. Correlation of Student Musical Aptitude with Musical
   Characteristics of Original Compositions ....................................... 107
8. Correlation of Student Self-Concept as a Musician with
   Musical Characteristics of Original Compositions .......................... 110
9. Correlation of Student Age with Musical Characteristics
   of Original Compositions ................................................................. 113
10. Correlation of Student Academic Achievement with
    Musical Characteristics of Original Compositions ........................... 115
# List of Musical Examples

1. Vicky's Composition .......................................................... 90
2. Laura's Composition .......................................................... 90
3. Brian's Composition .......................................................... 91
4. Kerry's Composition .......................................................... 92
5. Sue's Composition ............................................................. 93
6. Shannon's Composition ....................................................... 94
7. Colleen's Composition ......................................................... 95
8. Angie's Composition ........................................................... 95
9. Kim's Composition ............................................................. 96
10. Sue's Composition ............................................................. 97
11. Lisa's Composition ............................................................ 98
12. Robin's Composition .......................................................... 98
13. Ellen's Composition ........................................................... 99
14. Jen's Composition ............................................................. 100
15. Kevin's Composition .......................................................... 100
CHAPTER 1

INTRODUCTION

Authorities in the mainstream of education psychology have long recognized that specific higher order thinking skills are needed in the process of applying knowledge toward problem solving (Bruner, 1960; Gagne, 1966). These skills are common to scientists, statesmen, artists, or anyone facing complex problems with no immediate solutions. Problem solving is an important facet of human mental capability and is subject to considerable theoretical and experimental research. It is also viewed by educators as an ability that can be nurtured and developed in the pedagogical process (Eisner, 1987; Morgan, 1987).

Aside from the measurement of general intelligence, the identification of specific intellectual skills that contribute to problem solving has been a relatively recent phenomenon. Through the research of numerous individuals, most notably Guilford (1971) and Torrance (1963), creativity has been linked to specific mental abilities that facilitate problem solving, regardless of the context.

Though research investigating the various relationships of mental characteristics and problem solving has been notable, there has continued to be an overall neglect of implementation of curricula based on higher order thinking skills. Studies and critiques aimed at assessing the state of public education have focused national attention on the need to develop higher order thinking skills or problem solving abilities in students. One such critique by Adler (1982) recommends a curriculum design of three basic areas: 1) the acquisition of knowledge, 2) insight into value and worth, and 3)
development of critical thinking skills. He states that these curricular goals can be nurtured by the performance, creation, and discussion of and listening to art works.

The National Endowment for the Arts' (1988) report on arts education suggests that creativity is actually being repressed in schools. It states that the majority of the adult population in the United States is generally illiterate in arts education. According to the report, most of the funding for arts programs in the schools goes to the performance media in order to satisfy parental and community desires for entertainment. While this circumstance is not completely antithetic toward creativity, it does devitalize higher order thinking skills such as creative problem solving.

A Gallup Poll cited in the same NEA (1988) report showed that Americans, in general, thought of schools primarily as job training institutions and that the primary function of arts education was entertainment. The poll also pointed out that the respondents had the view that the basic educational skills of reading, writing, and arithmetic, were the focus of curricular design rather than a means to achieve higher order thinking skills.

A National Association of Educational Progress (1981) study specifically mentions the dilemma in music education. It states that students knew less about music in 1979 than they did only 8 years earlier. Higher education is also cited as not requiring any competency in the arts as a basis for admission. As a result, few students in the public school setting are given any incentive to take arts courses as a means of developing problem solving abilities.

Austin (1990) points out that music is largely elective beyond the elementary years, and information compiled by the National Center for Educational Statistics points to very low enrollments in high school music courses over the past 15 years. Steinel
(1988) found similar results that show a dramatic reduction in the numbers of students participating in music as their secondary years progress. His figures showed that in the 1986-87 school year, 9% of all U.S. juniors and seniors enrolled in general music courses, 12% in choral music courses, and 14% in instrumental courses.

In the broader history of American education, the foundations of critical thinking in curriculum design is a phenomenon of the twentieth century. Noted by Dewey (1933) was a pioneer of the concept of reflective thinking and the use of scientific method in problem solving. Kilpatrick (1918) envisioned schools as places that would teach investigative methods and the confirmation of truth rather than truth itself. In such schools children would learn how to think and not what to think. Bruner (1960) saw that the relationship between the structure and methodology of science were inseparable. He contended that problem solving in any area was similar to scientific inquiry. Bloom (1956) expected that students would acquire generalized techniques for dealing with new problems by applying the knowledge received from classroom solutions to classic problems.

According to these views, the ability to think creatively, to solve problems that have multiple solutions, and to imagine and conceive novel ideas should be the basis of all curricular design. Unfortunately, curricula at the present time are influenced by philosophies that seek out agendas with common standards. Eisner (1987) points out that children increasingly are taught that correct answers are easily accessible and singular in nature. Similarly, students' learning is often measured by having them answer one of four or five alternatives to multiple-choice questions. In reality, life's problems generally have more than one solution and require judgment and compromise.
The arts, ironically, a field of thinking that has much to offer in developing students' creativity, is the most neglected in public education. Gardner (1990) writes that the problem is not lack of resources but a lack of will and misguided values. His view is that children need to produce, perceive, and reflect. The arts are models of work that do emphasize creation of coherent structure, encourage multiple solutions to problems, prize innovation, and depend upon the use of sensibility. The idea is not to exclude the more rigid forms of learning, but to include the arts and their inherent vehicles of problem solving and critical thinking skills in every child's educational experience. Without them, their ability to participate in the legacies of their culture will be severely handicapped.

Researchers and educators have explored the teaching of music and musical development by focusing on the ability of subjects to complete tasks according to objectively determined standards (Regelski, 1981; Serafine, 1980). Alternative to this approach is to look at subjects' performances on tasks that require musical thinking skills. Musical problem solving projects in which individual creativity is stressed should be as much a part of academic study as literary creative exercises (Creston, 1971). One type of musical task that uses creative thinking is composition. In examining and analyzing the musical creations of students, researchers may begin to comprehend what children know about music and how that knowledge is applied (Kratus, 1985). Studies done by various authors concerning the exploration and conceptualization of the other fine arts is long-standing (Brittain, 1979; Goodenough & Harris, 1950; Lindfors, 1980; Prevel, 1979). It seems logical, then, that the development of an understanding of creative developmental abilities will better equip educators to organize competent music instruction.
Creative music problems are needed to enhance a music curriculum that generally is lacking in problem solving tasks. Goodlad (1984) cites two major reservations regarding the conduct of arts programs in the schools that he studied: 1) the degree to which arts classes appear to be dominated by the ambience of English, math, and other academic subjects, i. e., following the rules, finding one right answer, practicing the lower cognitive skills, and 2) arts programs' lack of opportunities for individual expression and artistic creativity.

Advocacy for creative thinking in music and other fields is regarded as primary by some authors. Riemer (1985) states that education has traded the understanding about the dynamic system that constitutes human life for outlines, facts, and figures. Benson (1973) writes that when students engage in creative musical activities, they experience a direct identification between their work and ideas and those of the master composers. Loane's (1984) research shows that pupils are able to use sophisticated constructs of musical composition such as form, tension, phrasing, and tone painting, even if these elements are stumbled upon by accident.

Creativity in music enables students to understand the constructs of composition by exploring the sounds used to solve such musical problems. Schwadron (1969) writes that the understanding of the processes of musical composition can be enhanced by experimenting and exploring the characteristics of sound. Fowler (1966) states that when sounds are organized creatively, perception leads to an acknowledgment of certain concepts in sound and then to an understanding of those concepts.

DeLorenzo (1989) defines a creative music problem as a situation requiring the student to use aural imagination, insight, and judgment to fashion sounds into music. Indications from her study suggest that students need as much experience in ways of
thinking about music as in the actual act of making music. In order to expand the
creative thinking aspects of children and the resultant decision making required to solve
musical problems, students need many exploratory experiences.

Kratus (1990) writes that creative activities can be a way to introduce students to
the basic skills and knowledge of music. He points to such elements as melody,
rhythm, timbre, and such principles as repetition, contrast, and unity, as characteristics
to be included in creative exercises. Likewise, as students become more adept at
composing, their understanding of elements and organizational constructs increases.
The understanding of composition is increased, but more importantly, the skills of
critical thinking are enhanced.

There needs to be a greater percentage of the total time spent in formal education
on creative activities. Continued research focusing on creative problem solving may
help guide the efforts of music educators to incorporate creative activities into the music
class. The output of creativity research is presently quite meager, however, when
compared to research based upon music history or performance. Many contributors to
the field of creativity have cited the lack of studies, especially in the area of students' original compositions (Kratus, 1985, 1989; Schmidt & Sinor, 1986; Webster, 1987). Sloboda (1985) believes the result of this deficiency to be the lack of understanding among educators of composition as a musical process, thereby continuing the
justification of performance as the only basis for curricular design.

Continued research concentrating on the understanding of musical problem
solving may help educators organize and utilize creative music activities, such as
composition, more effectively. The need for change in music curricula focusing on
creativity is essential. The possibilities of such change will improve if decisions to implement creative musical activities are founded on solid research.

**Definitions of Creativity**

Most researchers agree that creativity can allude to a person, process, or product. If applied to a person, creativity refers to an individual's potential to create. Guilford (1968) identified four factors common to creative individuals in his research with the visual arts. 1) Fluency refers to the ability of the person to produce a number of appropriate responses during a limited time frame. 2) Flexibility is the ability to produce different types of responses. 3) Originality refers to the degree to which the responses produced are unusual or different. 4) Elaboration is the ability to extend or enhance a simple idea. This set of intellectual abilities is included in Guilford's structure-of-intellect model as divergent production operations. Guilford (1968) and Torrance (1974, 1981) developed measures to assess individuals' potential for creativity in each of these areas.

The creative process refers to the method through which the person develops a product. It is a method of problem solving where the problem is unclear and the solution is obscure (Hayes, 1981). Newell, Simon, and Shaw (1963) analyzed the creative process in their four-point criteria of creative thinking as using thinking processes that are unconventional in the modification and rejection of prior ideas.

In the visual arts, Getzels and Csikszentmihalyi (1976) describe the process of working with an ill-defined problem. It consists of examining the available elements prior to and during the creative process and it results in a redefining of the initial problem. Perkins (1981) describes the creative process as the selecting of original and
valuable properties from an infinite number of possible choices. He states that creating is different from ordinary processes due to the presence of four fundamental stages unique to the creative process: 1) planning - the production of a plan for a product instead of the immediate production of the product, 2) abstracting - the ability to generate new ideas from parts of the work being produced or from other sources, 3) undoing - the willingness to take apart what has already been constructed, and 4) means into ends - the process becomes an end in itself.

A creative product is that work which contains or exhibits some degree of originality or value. Originality is defined as the newness of a product or the degree to which it differs from other products of its type. Value refers to the worth of the product in relation to other products of the same type (Rothenberg & Hausman, 1976). Characteristics of the creative products can be examined to determine the creativity of the persons who make them. Webster (1983) studied children's musical products, their improvisations and compositions, as a means of measuring their creative potential in music.

In summary, creativity is usually considered a characteristic relating to a person, process, or product. The qualities of a creative person include certain thinking processes and personality traits. The creative process usually results in a creative product and includes an examination and manipulation of the elements. Creative products have the qualities of originality and value. These products are related to an original problems but not necessarily predictable as to their final form.
Creativity Related to Problem-Solving

Torrance (1967) writes that if creativity is to be viewed scientifically, it must be defined so as to permit objective observation and measurement. He defines creativity as the process of becoming sensitive to problems and deficiencies, identifying the difficulty, searching for solutions, testing and retesting hypotheses, and finally, communicating the results. Creativity is not something achieved by one breakthrough episode. Perkins (1987) describes creativity as a regular production of original and appropriate solutions to problems.

Implicit in the goals of education is the application of pedagogical knowledge in the solving of real problems (Morgan, 1987). This process is often referred to as problem solving. It is viewed by many as an ability that can be nurtured and developed in the pedagogical process and, thus, is worthy of special classroom attention (Adler, 1982; Bloom, 1956; Morgan, 1987).

Bruner (1960) and Gagne (1966) have recognized that there are specific intellectual tools, skills, and inherited abilities that are instrumental in the process of applying knowledge to problem solving. These tools are universal in any field of endeavor to anyone faced with solving complex situations for which the solutions are not immediately recognizable.

In selecting an appropriate creative task to undertake, Hennesy and Amabile (1988) postulate that there are three requirements that must be met. First, the task must be one that leads to some clearly observable product, which can be made available to appropriate judges for assessment. Second, the task should be open-ended enough to permit considerable flexibility and novelty in responses. Third, since it is desirable in
social-psychological research that individual differences on performances of the task not be too large, it should not rely heavily on special skills.

Solutions to problems are based on past experience (Weisberg, 1988). Individuals initiate work on a problem based on a match between that problem and their present knowledge. The solutions, also, come about in an evolution, as the mind gradually moves away from conception through completion. This assumes that creative products begin with the individual using personal experience as a basis for approaching the problem.

Dewey (1933) provided one of the earliest descriptions of problem solving in the field of education that is still regarded as useful and mutually acceptable to differing philosophical orientations. He proposed a five step sequence of creativity, in which can be seen the essential features of many models of creative problem solving: 1) a felt difficulty, 2) definition and clarification, 3) suggestion of possible solutions, 4) hypothesized results of possible solutions, and 5) further observation leading to acceptance or rejection.

Prior to Dewey’s research, Wallas (1926) described creative problem solving in these stages: 1) preparation, in which problem identification occurs, and the problem is investigated in various ways; 2) incubation, which is a subconscious stage during which the person internalizes information; 3) illumination, in which the creator suddenly sees a possible solution, and 4) verification, in which applications of the solution are tested.

From these models have come the more modern proposals in the research of Guilford (1971) and Torrance (1967), mentioned above. It can be seen that creativity has been investigated by studying certain innate characteristics of individuals, as well as
the processes emphasized by these individuals. This concern with processes and characteristics has resulted in significant progress in training individuals in creative problem solving skills (Davis, 1971). Business and industry have adopted these techniques to deal with the many complex problems of today’s financial and developmental problems (Osborn, 1963). It remains for the educators to adopt a curriculum centered on the ideas of creative problem solving (Adler, 1982).

**Creativity in Music Education**

Because creativity is important to humanity, the development of a creative curriculum should be an appropriate goal for education. The benefits provided by such creative activities are certainly worthwhile to the individual engaged in the activity. Including activities in the curriculum that require a creative procedure to produce a creative product are certainly justified (Riemer, 1989; Torrence, 1988).

Reinhardt (1990) writes the most appropriate benefits of the inclusion of creative tasks in music curricula are 1) direct experience with the elements of music, 2) production of a unique musical product, 3) development of musical thinking processes and abilities, and 4) engagement in a process that is rewarding in itself, because musical creative activities contain the possibility for discovery of musical self-expression.

Sherman (1971a, 1971b, 1971c) comments on the value of direct experience with the materials of music that creative activities allow. He says that such activities provide a means of "knowing" music instead of "knowing about" music. When one knows about music, that knowledge is expressed verbally. When one knows music, that knowledge must be expressed by creating music, since only non-verbal means are capable of expressing this type of understanding. Knowing is achieved when the
learner works with objects and ideas in ways requiring the exercise of evaluation and
judgment (Sherman, 1971a).

Webster (1987) points out the four characteristics prevalent in present literature
that are worth considering as premises for creativity: 1) an emphasis on the role of
musical imagination, 2) theoretical modeling of the creative process, 3) new approaches
to the measurement of creative aptitude, and 4) systematic observation of creative
behavior.

Musical imagination, or the ability to imagine sound, is critical to the divergent
thinking tasks required to arrive at meaningful sound, that is, a new composition. The
model of the creative process illustrates musical problem-solving from inception to
conclusion. Production intention is the goal of the process. This can be compositional,
performance, or analytical in origin. With intention established, the creator must rely
on a set of skills necessary for the thinking process to begin. These are designated
enabling skills and include musical aptitudes such as the ability to recognize tonal and
rhythmic patterns and syntax. Enabling conditions involve the personal non-musical
attributes that allow the thinking process to flourish. They include such things as
motivation, environment, and personality attributes. Central to the model is the creative
thinking process with its stages of preparation, incubation, verification, and
illumination.

Creative musical activities require the learner to work with the musical elements
and their governing principles. If the activity is composition, the resulting product will
reflect the choices made by the learner (Sherman, 1971b).

Riener (1989) equates the effect of creating and experiencing art on the
affective aspect of the individual to the effect of reading and writing on intellectual
reasoning. Creating art helps the individual to organize and internalize the feeling or emotional aspects of the individual's life (p.33).

Music teachers report that creative activities offer challenges in which the process itself is a reward. Benson (1973) states that learning to translate one's own musical ideas into music by manipulating the musical elements is of equal importance to the creation of a musical product. Fowler (1966) suggests that learning occurs when students can apply knowledge to a new situation.

Kratus (1990) recommends a creative music curriculum based on the three components of creativity. He suggests that creative product goals should stress the production of unique musical products by direct manipulation of the elements of music; creative person objectives should develop those qualities common to creative persons such as fluency, originality, elaboration, and flexibility; and creative process objectives should emphasize student participation in the creative musical process.

Given the importance of including creative musical activities in curriculum development, the nurturing of music creativity is an appropriate goal for music education. The inclusion in an educational program of musical activities that enrich the individual's musical creative ability by engaging in the musical creative process to produce a musically creative product is justified and recommended (Benson, 1973; Sherman, 1971a, 1971b; Torrence, 1988).

Creative activities, such as musical composition, are still the exception in the majority of music education programs for a number of reasons. Attention on accountability and the back-to-basics movement of the 1970's and 1980's have caused increasing emphasis on objectively and quantitatively measured subject matter (Eisner, 1987; Riemer, 1985). Creative activities require more preparation (Holderreid, 1969).
and a less structured procedure (Leonard & House, 1972) than other activities. They are often presented by those with little practical experience in working with creativity in the classroom (Regelski, 1981).

Since creative tasks usually produce differing results and no one answer is correct, the evaluation process can be difficult and time consuming (Kratus, 1990; Regelski, 1989; Webster, 1990). Teacher training programs are lacking in the skill requirements to facilitate creative activities in the classroom (Sherman, 1971; Webster, 1990).

Information concerning the outcome of student participation in creative activities is of great importance when considering recent recommendation for curriculum development. Kratus (1990) recommends a process for including creative activities in the music curriculum based on long-term goals regarding the three aspects of creativity: person, process and product. Reimer (1989) recommends that creative activities be included as a means of achieving learning in the general music curriculum and recommends the development and implementation of a separate composition curriculum. The chances of success for such recommendations will improve if the decision to implement such changes in the curriculum are based upon the results of individual research projects in creativity.

**Factors That May Affect Musical Problem Solving**

Problem solving is an ability that is possessed by all human beings (Ernst, 1968). Yet, there are a variety of factors that may influence students' ability to do musical problem solving activities. These factors include musical experience, musical aptitude, students' self-concept as musicians, age, and academic achievement.
Musical experience, whether curricular or outside-of-school, is considered a basic predictor of music achievement. A number of researchers have used music experience to investigate the relationships between this characteristic and musical achievement (Ainsworth, 1970; Harrison, 1990; Pembrook and Taylor, 1986; Seals, 1989). In most cases, researchers found that music achievement increased with additional musical experiences. Morgan (1987) has written on the relationship between musical achievement, in the form of musical performance, and problem solving. According to his research, success in musical problem solving appears to be strongly connected to measures of musical achievement. From his research, it can also be inferred that musical problem solving is, indeed, another form of musical achievement. Therefore, much research investigating relationships between musical experience, musical aptitude, and achievement is relevant to the importance of this research; and the inclusion of both musical experience and musical aptitude as variables in this research is germane to the study of musical problem solving.

Musical aptitude is defined as the potential to learn music. Researchers have long used musical aptitude to examine subjects' abilities to do musical problem solving tasks (Colwell, 1963; Hedden, 1982; Rainbow, 1965). Aptitude is usually obtained by the use of a test designed to measure a person's success in an activity for which he or she is not yet trained. Aptitude can also be defined as the ability to think divergently, or to create a number of responses to a problem. Gorder (1976) and Webster (1979, 1983, 1987, 1989) suggest that success in creative problem solving is dependent upon the ability to think divergently. Since there are many correct responses to composing music, the presence of aptitude would be a valuable characteristic to measure in this research.
Self-concept as a musician is the perception that an individual has of himself or herself as it relates to music. Researchers of self-concept and self-esteem have shown that students with a high regard for themselves and their work tend to excel in all matters of problem solving (Nolin & VanderArk, 1977; VanderArk, Nolin, & Newmann, 1980). Students with high self-concept also tend to have higher levels of motivation to do musical projects (Chandler, Chiarella, & Auria, 1986), and higher scores on music achievement tests (Austin, 1988b). Self-concept should, therefore, be an important characteristic in the measurement of successful musical problem solving.

The age of the subjects of this study reflected the normal ranges of high school aged children, 15 to 18 years. As in most studies in which a range of ages is investigated, the assumption is that older students would be more adept at musical composition given their extra years, experience, and development. In studies of younger children, Kratus (1985, 1989) found age differences in children's compositions. Yet, it is not possible to assume the same outcome using high school subjects, given the dearth of studies involving subjects 15 to 18 years of age. Therefore, the relationship of musical problem solving to age seemed appropriate to investigate.

Many researchers have investigated the relationship of academic achievement to creativity and have found positive associations between these two characteristics (Feldman, Treffinger, & Elias, 1970; Getzels & Jackson, 1962; Torrence, 1966; Yamamoto, 1964). There are also a number of studies in which there has been no significant relationship found between academic achievement and creative problem solving (Allioti & Blanton, 1973; Cacha, 1976; Edward & Tyler, 1965). Given the
solving, the inclusion of this variable as an integral part of this research seemed appropriate.

**Purpose and Procedures**

Implicit in any discussion of problem-solving is the fact that choices are made about how to problem solve, and that such choices result in varying degrees of accomplishment. Such choices may be determined by the degree of certain attributes present in each subject at the time of testing. Five such attributes that influence success of musical problem-solving tasks are musical experience, music aptitude, self-concept as a musician, age, and academic achievement. The purpose of this research was to determine whether relationships existed between the musical characteristics of original compositions produced by high school students, aged 15 to 18, and students' musical experience, musical aptitude, self-concept as musicians, age, and academic achievement. Composing was viewed in this study as a form of musical problem-solving. The dependent variables were ratings of subjects' creative use of the musical characteristics of tonality, meter, motive, length of composition, replication, phrasing, complexity, originality, and cohesiveness. The independent variables were measures of students' music experience, music aptitude, self-concept as musicians, age, and academic achievement as measured by grade point average.

**Research Questions**

Five specific questions were addressed in the study with the hope that answers to these questions would provide evidence as to the specific relationship between the students' musical compositions and the selected variables. The questions were 1) Is
there a relationship between in-school and out-of-school music experience and the musical characteristics of high school students' music compositions? 2) Is there a relationship between music aptitude and the musical characteristics of high school students' music compositions? 3) Is there a relationship between self-concept as a musician and the musical characteristics of high school students' music compositions? 4) Is there a relationship between age and the musical characteristics of high school students' music compositions? 5) Is there a relationship between academic achievement and the musical characteristics of high school students' music compositions?

Fifty-eight students, aged 15 to 18, participated in the study. Subjects were given approximately 20 minutes to rehearse and compose an original melody on an acoustic upright piano, after a brief period of experimentation. Subjects were then asked to play their songs twice, and both performances of their songs were recorded.

Analysis of the songs was undertaken by the researcher and two independent judges. Criteria used to evaluate the songs were derived from a review of literature on musical problem solving. Two rhythmic, two melodic, and four complexity characteristics were examined, as well as the variables of tonality, meter, cohesiveness, originality, phrasing, and replication. The specific musical characteristics examined are described in detail in Chapter 4. Since the statistical purpose of this study was to seek possible relationships among student characteristics and the characteristics of the composed melodies, the Pearson Product-Moment correlation was used to examine the data and answer the research questions.

In Chapter 2 a review of the methodologies and results of selected research is given. Chapter 3 explains the research procedures used, including a description of the research setting, task procedures, instructions, method of analysis, and statistical
procedures. Chapter 4 describes the results of the study. A summary of results and implications for music teaching and research are given in Chapter 5.

**Null Hypotheses**

1a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of tonality in subjects' compositions.

2a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of meter in subjects' compositions.

3a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of cohesiveness in subjects' compositions.

4a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of originality in subjects' compositions.

5a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of pitch in subjects' compositions.

6a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of duration of notes in subjects' compositions.
7a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of contour of line in subjects' compositions.

8a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of dynamics in subjects' compositions.

9a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the presence of repeated melodic patterns in subjects' compositions.

10a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the presence of developed melodic patterns in subjects' compositions.

11a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the presence of repeated rhythmic patterns in subjects' compositions.

12a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the presence of developed rhythmic patterns in subjects' compositions.

13a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of phrasing.

14a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of subjects' ability to replicate their compositions.
1b) There is no significant correlation between high school students' music aptitude and ratings of the use of tonality in subjects' compositions.

2b) There is no significant correlation between high school students' music aptitude and ratings of the use of meter in subjects' compositions.

3b) There is no significant correlation between high school students' music aptitude and ratings of the use of cohesiveness in subjects' compositions.

4b) There is no significant correlation between high school students' music aptitude and ratings of the use of originality in subjects' compositions.

5b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of pitch in subjects' compositions.

6b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of duration of notes in subjects' compositions.

7b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of contour of line in subjects' compositions.

8b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of dynamics in subjects' compositions.

9b) There is no significant correlation between high school students' music aptitude and ratings of the presence of repeated melodic patterns in subjects' compositions.

10b) There is no significant correlation between high school students' music aptitude and ratings of the presence of developed melodic patterns in subjects' compositions.
11b) There is no significant correlation between high school students' music aptitude and ratings of the presence of repeated rhythmic patterns in subjects' compositions.

12b) There is no significant correlation between high school students' music aptitude and ratings of the presence of developed rhythmic patterns in subjects' compositions.

13b) There is no significant correlation between high school students' music aptitude and ratings of the use of phrasing.

14b) There is no significant correlation between high school students' music aptitude and ratings of subjects' ability to replicate their compositions.

1c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of tonality in subjects' compositions.

2c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of meter in subjects' compositions.

3c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of cohesiveness in subjects' compositions.

4c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of originality in subjects' compositions.

5c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of pitch in subjects' compositions.

6c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of duration of notes in subjects' compositions.
7c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of contour of line in subjects' compositions.

8c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of dynamics in subjects' compositions.

9c) There is no significant correlation between high school students' self-concept as a musician and ratings of the presence of repeated melodic patterns in subjects' compositions.

10c) There is no significant correlation between high school students' self-concept as a musician and ratings of the presence of developed melodic patterns in subjects' compositions.

11c) There is no significant correlation between high school students' self-concept as a musician and ratings of the presence of repeated rhythmic patterns in subjects' compositions.

12c) There is no significant correlation between high school students' self-concept as a musician and ratings of the presence of developed rhythmic patterns in subjects' compositions.

13c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of phrasing.

14c) There is no significant correlation between high school students' self-concept as a musician and ratings of subjects' ability to replicate their compositions.

1d) There is no significant correlation between high school students' age and ratings of the use of tonality in subjects' compositions.
2d) There is no significant correlation between high school students' age and ratings of the use of meter in subjects' compositions.

3d) There is no significant correlation between high school students' age and ratings of the use of cohesiveness in subjects' compositions.

4d) There is no significant correlation between high school students' age and ratings of the use of originality in subjects' compositions.

5d) There is no significant correlation between high school students' age and ratings of the use of complexity of pitch in subjects' compositions.

6d) There is no significant correlation between high school students' age and ratings of the use of complexity of duration of notes in subjects' compositions.

7d) There is no significant correlation between high school students' age and ratings of the use of complexity of contour of line in subjects' compositions.

8d) There is no significant correlation between high school students' age and ratings of the use of complexity of dynamics in subjects' compositions.

9d) There is no significant correlation between high school students' age and ratings of the presence of repeated melodic patterns in subjects' compositions.

10d) There is no significant correlation between high school students' age and ratings of the presence of developed melodic patterns in subjects' compositions.

11d) There is no significant correlation between high school students' age and ratings of the presence of repeated rhythmic patterns in subjects' compositions.

12d) There is no significant correlation between high school students' age and ratings of the presence of developed rhythmic patterns in subjects' compositions.

13d) There is no significant correlation between high school students' age and ratings of the use of phrasing.
14d) There is no significant correlation between high school students' age and ratings of subjects' ability to replicate their compositions.

1e) There is no significant correlation between high school students' academic achievement and ratings of the use of tonality in subjects' compositions.

2e) There is no significant correlation between high school students' academic achievement and ratings of the use of meter in subjects' compositions.

3e) There is no significant correlation between high school students' academic achievement and ratings of the use of cohesiveness in subjects' compositions.

4e) There is no significant correlation between high school students' academic achievement and ratings of the use of originality in subjects' compositions.

5e) There is no significant correlation between high school students' academic achievement and ratings of the use of complexity of pitch in subjects' compositions.

6e) There is no significant correlation between high school students' academic achievement and ratings of the use of complexity of duration of notes in subjects' compositions.

7e) There is no significant correlation between high school students' academic achievement and ratings of the use of complexity of contour of line in subjects' compositions.

8e) There is no significant correlation between high school students' academic achievement and ratings of the use of complexity of dynamics in subjects' compositions.

9e) There is no significant correlation between high school students' academic achievement and ratings of the presence of repeated melodic patterns in subjects' compositions.
10e) There is no significant correlation between high school students' academic achievement and ratings of the presence of developed melodic patterns in subjects' compositions.

11e) There is no significant correlation between high school students' academic achievement and ratings of the presence of repeated rhythmic patterns in subjects' compositions.

12e) There is no significant correlation between high school students' academic achievement and ratings of the presence of developed rhythmic patterns in subjects' compositions.

13e) There is no significant correlation between high school students' academic achievement and ratings of the use of phrasing.

14e) There is no significant correlation between high school students' academic achievement and ratings of subjects' ability to replicate their compositions.

**Delimitations of the Study**

This study was delimited to an examination of compositions created by students during a brief experimental period of 20 minutes. It must be assumed, therefore, that there was little or no incubation, which is the time allotted for internalization of the problem as prescribed by Wallas (1926).

Secondly, this research was designed to use only the white keys of a two octave range of a keyboard in the musical problem solving task. These restrictions, which are consistent with other creativity research (Kratus, 1985; Reinhardt, 1990; Torrance, 1966; Webster, 1987), were intended to keep students focused on the task and prevent them from losing interest.
CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter begins with a discussion of the relevant research involving the five independent variables in this study: musical experience, music aptitude, self-concept as a musician, age, and academic achievement. The discussion of studies using the independent variables is followed by a discussion of studies that explore interrelationships among the variables, that is, research investigating a relationship between two or more of the independent variables.

As Chapter 1 established, creative activities play an important role in learning problem solving tasks. Therefore, a review of the use of creativity in music education is presented to provide the necessary education context. Although creative products are the goal of this study, certain process methods or findings are relevant to the outcome, and have been included for the benefit of teachers using creative activities with their students. These studies provide models for the evaluation of students' creative tasks in this study.

This chapter closes with a review of the studies that examine the relationship of the five independent variables to creative problem solving in music. It should be noted that the variable of age is discussed in the context of each study that is presented. Its importance to the present research is indicated by the fact that few studies in musical creativity examine children ages 15 to 18. Therefore, the results of studies cited using problem solving tasks involving younger children may not generalize to a population of high school aged students.
Literature Review of Student Variables

Musical Experience

Musical experience, whether in or out of the school setting, appears to have a significant relationship to individuals' music achievement skills. Colwell (1963) found that piano training as a predictor of music achievement was significant for both vocal and instrumental students in grades 5-12. Colwell's study was divided into three parts, the first of which examined 5th and 6th grade students' musical experiences, both in and outside the classroom. Part two looked at 7th through 9th grade music experiences, and part three examined high school students. All three levels received different testing instruments to measure musical skills and experiences. In most cases, those students whose background included a wide variety of musical experiences were superior in achievement, even when the total time spent on music was the same. Students who participated only in vocal work were significantly lower in academic grade average, I. Q., music aptitude, grade given in music class, and attitude toward music, than those with multiple musical experiences. Increases in the means for academic grade average, I. Q., musical aptitude, music class grades, and attitude toward music were higher for instrumental students, higher yet for students with piano-choral experience, and highest for students with instrumental-piano background. In the school system in which his testing took place, Colwell found that piano-instrumentalists had an average I. Q. of 123, compared to the general school population I. Q. of 100.

In a study of prospective college music majors, Pembrook and Taylor (1986) examined relationships between scores on a melodic discrimination test and musical background variables including ensemble experience, theory and history instruction, as
well as private lessons. They found that skill in music increased not only with additional experiences in a given area, but also with a diversity of experiences. Harrison (1990) concluded that measures of music experience, especially the instances of piano study, principal instrument or multiple instrument study, are better predictors of musical achievement than music aptitude in a study of college freshman music theory classes. She investigated the relationship between general ability, as indicated by scores on the Scholastic Aptitude Test (1987), musical aptitude, as indicated by scores on tests of the experimental college version of the Music Aptitude Profile (CMAP) (Schleuter, 1978), and pre-college musical experience, including private study and ensemble experience.

Sloboda (1985) suggests that some aspect of musical skill may be acquired through interaction with a musical environment from a very early age. It exists in the execution of some culturally specific action with respect to musical sounds. Yet, this aptitudinal skill is constructed from a base of innate abilities and tendencies. The shared set of primitive capacities present at birth are then combined with a set of experiences that the culture provides as children grow. Enculturation is also typified by lack of instruction. Innate abilities and enculturation may then combine with training to produce various subgroups within the culture. Training involves a conscious effort on the part of the person concerned with the specific aim of becoming more accomplished. It is the means of acquiring specific skills which build on the base of enculturation and leads to performers and composers of high quality. At certain ages, musical training and the ability to learn about aspects of music varies greatly from person to person. Thus, even with a common exposure to, and involvement in music, there may be large differences in the abilities of students to listen to and appreciate music. Composing music, which is a skill that requires large amounts of formal training, may come easier
to a student with a vast listening or performance background. Likewise, a student who possesses the capacity, or aptitude, to develop these skills above those of his/her peers, is more likely to make rapid progress, once some type of formal training is begun.

In his model of creative thinking, Webster (1987) refers to experience as an enabling condition, that is, a variable in creative thinking that nurtures creative growth. Specifically, musical experience can be characterized as part of musical environment. The variety of experiences help define the creator's working conditions and enable the thinking processes to flourish.

The results of these studies suggest that the inclusion of the variable of experience is appropriate to a study concerning high-school-aged students.

Music Aptitude

Music aptitude is defined as a person's potential to learn music. Tests of music aptitude determine the probability of a person's success in an activity in which he or she is not yet trained. Such tests include the *Seashore Measure of Musical Talents* (Seashore, 1960), the *Wing Standardized Tests of Musical Intelligence* (Wing, 1961), the Bentley *Measures of Musical Abilities* (Bentley, 1966a), and the *Musical Aptitude Profile* (Gordon, 1965). Each of these instruments measures the potential to learn music by testing subjects' abilities to discriminate between various aspects of melody, rhythm, harmony, and sensitivity.

Webster (1987) defines aptitude as an enabling skill, that is, the convergent thinking ability to recognize rhythmic and tonal patterns, as well as divergent thinking abilities, such as originality, flexibility, and extensiveness. Webster points out that these traits are largely innate. The capacity for variety in solutions to problem solving
tasks, in this case musical composition, may depend heavily on the ability to abstract ideas from experiences, which is, again, determined by aptitude.

In Norton's (1980) research, the relationships among music aptitude, I. Q., and auditory memory in elementary aged children were examined. She found that auditory memory was significantly related to music aptitude, I. Q., and the interaction of those two variables. The importance of these findings to the present study is that music aptitude is apparently a prominent factor in predicting the ability to sing, play, or compose music from an abstract musical idea.

Gordon's (1965) Music Aptitude Profile has been used extensively to measure potential for success in music performance and music listening. It seems reasonable to assume that it may be a predictor of success in music composition as a form of music achievement. Two such studies found significant relationships between music aptitude and music achievement. Fosha (1964) and Terrell (1964) examined the relationship between music aptitude and musical performance in similar procedures. Subjects were students ranging from elementary to high school age, who were members of select performing ensembles. They were administered MAP, whereupon they were given short melodies to study. They were then given class instruction in the performance of their melodies. After sufficient time to learn the music, the performances of the melodies were tape recorded and then evaluated by three independent judges. The ratings of the judges were correlated with the students' composite scores on MAP. The results of both studies showed that there were substantial significant relationships between performance of the melodies and predictive scores on MAP. Gordon (1988) writes that it is not possible to construct a test of music aptitude that is totally independent of music achievement.
There is a body of research that seeks to define music aptitude in a more non-traditional sense. Gorder (1976) and Webster (1979, 1983, 1987, 1989) have sought to include musical creativity in the definition of music aptitude. Creativity in this body of research is typified by the ability to think divergently, that is, to create a number of possible "correct" responses to a problem, and includes the constructs of fluency (the number of responses to a problem), flexibility (the differing types of responses), originality (the novelty of responses), and elaboration (the extended content of responses). These constructs are extremely important as variables in a project in which composition is the final product and solution the problem solving task. Since composition does not result in one correct answer, divergent thinking is crucial.

This body of research is also pertinent from the standpoint of the population sample in the present study. Gorder's (1976) and Webster's (1979) research are some of the few samples of research that analyze high-school-aged students' creative behavior. Webster asked students to do three separate sets of activities: composition, analysis, and improvisation. Of the three activities, the composition task was the most structured and most pertinent to this research. Students were asked to create a short music phrase for triangle and some other instrument or voice. A total of six different phrases had to be generated. Then, students were asked to generate a theme and variation format using the original tune from the first activity. Finally, a longer, more complete work for any number of instruments was to be composed, using a phrase from the first activity. Webster found that creative ability was positively related to the ability to internally imagine musical sounds. He also noted that subjects' age, grade level, or performance medium had no significant relationship to any of the three creative behaviors investigated.
Gorder (1976) developed a test, Measures of Musical Divergent Production, to determine musical creativity. The test included four subtests and provides scores for fluency, flexibility, elaboration, and originality. Subjects were asked to improvise as many phrases as possible based on information given by the test administrator. Gorder also hypothesized a fifth ability, musical quality, which was defined as phrases or ideas that appeal to musicians' musical sensitivities. Musical quality was a more global construct in contrast to the four specific divergent production abilities. Originality, a construct used by both Webster (1979) and Gorder (1976), was used in the present study as one characteristic of students' performance of the assigned task of music composition.

To summarize, the development of music aptitude testing has been a prominent component in educational research. There has more recently been a movement among researchers to include in the definition of music aptitude the ability to think divergently in order to create unique solutions to musical problem solving tasks (Gorder, 1976; Webster, 1979, 1983, 1987, 1989).

These studies illustrate the importance of music aptitude in determining certain aspects of students' potential to learn music. Measurement of music aptitude can be used in conjunction with other variables to assess certain musical characteristics of the developing child. The results of this research should illuminate the importance of musical aptitude in the development of students' ability to do problem solving tasks.

**Self-Concept**

Self-concept is defined as the perception that an individual has of himself (Greenberg, 1970). It refers to the ways in which an individual "sees" himself and feels about himself. Greenberg writes that there is a growing realization among
educators that self-concept is an important attribute and one of the keys to understanding the behavior of any person. Bloom (1976) notes that very young students show little variation in academic self-concept, despite differing records of achievement. However, by grade four, different self-perceptions emerge and continue to grow increasingly resistant to change as the years progress.

There is a constant flow of perception between the student and the continuum of experiences involved in the process of learning music at school. The learner perceives, interprets, resists, or rejects what is taught in music in light of his own experience (Greenberg, 1970). New musical experiences and discoveries are assimilated and integrated into the student's self-concept in music during the normal course of development. In an attempt to maintain a self-picture, students accept and incorporate that which is friendly to his/her self-system, and avoid or reject that which is threatening. Therefore, musical instruction must aim at the self-concept as well as the musicianship of the student.

Austin (1990) states that circumventing the vicious cycle of self-denigration among young people could lend itself to a rebound in music involvement and cultural literacy. According to Austin's (1988a) research, a number of students are forced from school music programs by curricular, parental, peer and scholastic pressures, poor student-teacher relations, and loss of interest, which all lead to a negative self-image in music.

A notable study by VanderArk, Nolin, and Newmann (1980) shows that self-esteem scores of junior-high-aged students accounted for a significant amount of variance in predicting attitudes toward classroom music experience beyond what could be accounted for by social status, gender, or age. Self-esteem was measured by the
Musical Attitude Inventory (Nolin, 1977) and the Coopersmith (1967) Self-Esteem Inventory.

Similarly, Nolin and VanderArk (1977) found that junior-high-aged students participating in band and choir had significantly higher self-concept, as measured by the Coopersmith Self Esteem Inventory (1967), than did non-music students. The authors focused on children in grades 3 to 6 and sought to discover any differences between genders and levels of self esteem in predicting attitudes toward musical activities. The Coopersmith Self-Esteem Inventory (1967) and the Musical Attitude Inventory (Nolin, 1973) were given to several thousand students. The MAI is a questionnaire test in which the four possible answers range from "strong like" to "strong dislike" in response to the music teacher's regular classroom activities. The reliability of MAI was reported as .81. The evidence in the study suggested that self-esteem accounted for a significant amount of variance in predicting attitudes toward classroom music experiences beyond what could be accounted for by age, gender or social status.

These studies have contributed to the body of literature pertinent to general measures of self-concept. Positive measures of music self-concept have been linked to higher levels of motivation in music (Chandler, Chiarella, & Auria, 1986), higher scores on music achievement measures (Austin 1988b), and enhanced music attitude, interest, and involvement (Schmitt 1979; Svengalis 1978).

In a more subject specific domain, Schmitt (1979) and Svengalis (1978) devised valid scales that focused on self-concept as a music-related construct. Svengalis specifically studied music attitude and tried to provide possible reasons for a decline in positive attitude as grade level increased, and why this decline was more prevalent in males than females. Her subjects were 393 males from intact third through sixth grade classes. She developed and tested a measure of musical self-concept, the
Self-Concept in Music scale (SCIM). Students were asked to answer "yes" or "no" to 36 different items of self-appraisal and parental perception of the student. One point was awarded for each yes answer, with a high score indicating a positive self-concept. Musical background was assessed by another instrument devised by Svengalis (1978). Each of the 28 items on this test was, again, awarded 1 point for an affirmative answer, with a higher score being indicative of a strong experiential background in music outside of school. Svengalis found a significant negative relationship between self-concept in music and increased grade level. She also found a significant positive relationship between background in music and self-concept in music.

Schmitt (1979) developed and tested a measure of Self Esteem of Music Ability (SEMA), which she administered to children aged 10 to 15. The measure is in the form of a questionnaire that consists of a series of statements about current and future behaviors that are associated with a level of music ability. There are also questions regarding behaviors of parents, teachers, and friends, which the student answers concerning the perceptions of musical ability of each student. The students were asked to evaluate themselves in relation to the statements and to report information on any honors and/or musical activities. They also wrote paragraphs describing their opinions of their own musical abilities. The paragraphs were rated on a scale from 1 to 10 by a jury of knowledgeable counselors of self-esteem. Interjudge reliability ranged from .76 to .86. The correlation between SEMA scores and participation in musical activities was .60. Fifty percent of honors students (e.g., those students who played first chair or received blue ribbons) had scores in the upper quartile. A test-retest reliability study using a paired t-test resulted in a coefficient of .91. Factor analysis revealed heavy factor loadings related to self confidence, musical skills and abilities, and feelings of acceptance by parents, teachers, and peers.
These studies illustrate the evidence linking high self-concept to higher motivation, higher musical achievement, and enhanced involvement in music. The affects of self-concept on the musical variables of the students' original compositions, therefore, should be dramatic.

**Academic Achievement**

Research into the importance of academic achievement has a long history, and there have been numerous studies outside the arts to investigate creativity's relationship to intelligence and achievement. (For the purposes of this research, academic achievement was defined as grade point average.) Feldhusen, Treffinger, and Elias (1970), Getzels and Jackson (1962), Torrance (1966), and Yamamoto (1964) have reported positive associations between intelligence and/or academic achievement and creativity. Although some researchers have found a relation between these measures, other researchers such as Aliotti and Blanton (1973), Cachia (1976), and Edwards and Tyler (1965) found no such relation to exist. Kemp (1981a), in a psychological study of personality traits, cites several researchers who have reported an absence of any consistent relationship between musical achievement and intelligence (Bentley, 1966; Seashore, 1938; Wing, 1948). But results of his research support more recent claims to positive relationships made by Taylor (1973) and Phillips (1976).

Gardner (1990) calls into question the idea of intelligence as being a simple, single entity that can be measured with multiple choice test. Gardner's (1982) work at Harvard University, called Project Zero, has pointed toward a theory that postulates that strengths in one area would not necessarily be predictors of strengths in other areas. Intelligence is an ability to solve problems or fashion products that are valued in a given culture, according to Gardner. This takes the focus away from what is
important in American schools to a much broader question of what it takes to be an
effective member of a community in a given culture. Creativity, therefore, is not a
single trait, and, if basing the definition of a musically intelligent person on this
definition, people will not be creative universally. They may be creative in any number
of domains. Based on these ideas, traditional forms of measurement of intelligence are
irrelevant.

Eisner (1987) is also critical of the traditional view of academic achievement.
He states:

I wish to portray a concept of mind, of thinking, of
intelligence that is not restricted to language. Any limited
view of intellect will penalize students whose aptitudes reside
outside its boundaries. If schools aim at cultivating intellect,
those whose aptitudes lie in forms of thinking that are
excluded from the accepted concept of intellect will also be
excluded from a place in our educational sun (p. 25).

Rainbow (1965) found that moderately positive correlations existed between
academic intelligence and pitch discrimination, tonal memory, rhythm, replication, and
music aptitude. The study was established to investigate the constructs of music
aptitude as measured by a number of music aptitude tests.

Norton (1980) examined the relationship between music aptitude, I. Q., and
auditory conservation. Her results indicated that intelligence and music aptitude were
highly predictive of auditory conservation, and that intelligence, as measured by
subjects' I. Q., was significantly related to children's performance of musical tasks.

Harrison (1990) found that the best predictors of achievement in freshman
music theory are measures of academic achievement. She found that knowledge of
students' SAT scores and high school GPA could be used by instructors to identify
students who might benefit from tutorial assistance.

Hamann, Bourassa, and Aderman (1991) designed a study to assess the
differences in creativity of high school students by gender, academic achievement, or
by varying degrees of participation in the arts. The sample included 144 high school students who were given the Guilford and Guilford (1980) Consequences Form A-1 to assess their ability to think creatively. Subjects with many units of arts experiences were found to have significantly higher mean creativity scores than did the subjects with few arts experiences. Subjects with high creativity scores tended to have the highest academic achievement scores.

Tarratus (1964), on the other hand, found no significant correlation between creativity scores and academic success in college aged music students. His findings were the result of correlating measures of general divergent thinking skills with measures of general intelligence, musical knowledge, and musical skills. In addition, Roderick (1965) found the ability to think creatively was not necessarily related to general scholastic ability among college music majors. This study examined relationships between general creative thinking ability and musical divergent thinking skills of music and non-music majors.

To summarize, through the study of creativity in general and in specific discipline areas such as music, drama, visual art, and theatre, researchers have found that varying degrees of association may exist between creativity, intelligence and achievement. However, there is no consensus on this issue.

**Relationships Among Student Variables**

If the level of musical experience, musical aptitude, self-concept, age, and academic achievement are significant factors in the success of musical problem solving tasks such as composition, certain relationships between these specific student variables are likely to exist. Studies that explore these relationships are pertinent to this research.
Rainbow (1965) found positive relationships between music experience and music achievement at the high school and elementary level, but not at the junior high level. He suggests that many extra-musical variables, such as interest in music, home enrichment, and socio-economic status may influence aptitude and achievement scores. Elementary, junior high and high school subjects were chosen for his research. Home enrichment, socio-economic status, musical training and interest in music outside of the education setting were found to contribute significantly to the variance in music aptitude in students at the high school level. This research may be helpful to educators who are interested in the determination of more accurate aptitude levels of students in an evaluative setting.

Kehrberg (1984) examined the relationship between selected out-of-school factors and five musical characteristics: aptitude, general music achievement, attitude towards music, level of music participation, and school music achievement. He sought to answer such questions as what out-of-school factors relate to in-school music participation, and to what extent these outside activities contribute to school music achievement, attitude and aptitude. He used a series of tests including Gordon's (1965) *Music Aptitude Profile* and Colwell's (1970) *Music Achievement Test* to achieve aptitude and achievement profiles. To measure attitude, he used the Mueller (1934) Oregon Scale of Attitude Toward Music. The subjects for this research were students in grades 4 through 12 from a small rural community. He defined school participation as those activities eliciting participation of students in elective school music activities. These findings were rated using a scale with 1 indicating no participation and 5 indicating participation in all elective performing groups. Kehrberg formulated 16 conclusions. Those that are the most pertinent to this study are as follows: 1) Music aptitude was a potent predictor of general music achievement among grade school
students. 2) Music aptitude, home music environment, outside music experience, and the degree of in school music participation were strong predictors of general music achievement among high school students. 3) Self-appraisal of overall music ability was predictive of general music achievement among high school students. 4) The results were inconclusive as to the relationship between music aptitude and out-of-school factors. 5) School music participants may have had a richer home musical environment that nonparticipants. 6) School music participants had a more positive attitude toward school music activities than do non-participants. 7) The self-appraisals of music skills and ability were strongly related to the level of school music participation in musical activities. 8) Aptitude and musical experience of any kind were highly predictive of general music achievement in high school students. Self-concept, as measured by a student self appraisal of ability and achievement, seemed to be positively correlated as well.

Hedden (1982) researched the relative magnitudes of academic achievement, attitude toward and self-concept in music, musical background, and gender, as predictors of music achievement among fifth and sixth grade students. The instrument used to measure self-concept was Svegalis's (1978) Self-Concept in Music Scale. Hedden found that attitude and self-concept were significant predictors of music achievement, although the effects of academic achievement and self-concept in music on music achievement were mixed. According to Hedden's research, this may have been due to viewing of attitude and self-concept as synonymous by the subjects. Academic achievement was the best single predictor of music achievement at both grade levels and schools.

Austin (1990) administered Schmitt's (1979) SEMA scale and a self-devised background questionnaire in which data was gathered concerning grade, gender, and
degree of music participation in and out of school. He found music self esteem to be positively and significantly correlated with years of participation in either school or non-school music activities. Students with higher scores did tend to participate in greater numbers of music activities.

In summary, if relationships can be inferred between music aptitude, music experience, self-concept, academic achievement, and music achievement in form of composition, a positive correlation may exist between those variables and the act of creative problem solving found in the present research. If so, this study will add to the advocacy of using creative problem solving in the classroom.

**Literature Review of Creativity**

Creativity research has focused on the person, the process or the product of the creative effort. The subject of this study is primarily product oriented, and as such, the review of literature is concerned with that branch of creativity research. Studies of creative products involve analysis of the end result of a creative act. Findings often center on the nature of the musical characteristics as a clue to mental processes (Webster 1990). A few pertinent process-oriented studies are mentioned, as well, due to their relevance to this research.

**Product Analysis**

Research studies of creative products emphasize the result of the problem solving task and discuss the contributions that manipulated variables make toward finished products. Doig's research (1941, 1942a, 1942b) is seminal concerning product analysis of children's music. This research was initiated before any researcher-established framework for studying creativity in music was formulated. Doig was
interested in how children composed music before they received formal training in composition. She used groups of children aged 6 to 16 in her studies. Each age group composed music. The children in the study were enrolled in weekly music classes at the Cleveland Museum of Art, and the songs were created in a structured classroom setting. The songs were composed using a group procedure in which volunteers sang ideas for phrases, and the rest of the class voted on which suggestions to use. Each of Doig's three published articles deals with a different compositional problem given to the children. In the first study (1941), each age group was to compose music to the tune of one of two Christmas carols suggested by Doig. In the second study (1942a), classes composed words and music on a given topic. The third study (1942b), required solutions to three compositional problems. First, classes aged 8 to 11 were asked to change a melody make of quarter notes and eighth notes into a "skipping melody" (Doig 1942, p. 242). Secondly, groups aged 8 to 16 were asked to write a melody using dotted rhythms and to complete a given musical phrase. Thirdly, 8- to 10-year-olds were asked to compose a march or a waltz. The songs were notated by Doig, then analyzed in rhythmic, melodic, and structural terms. Musical characteristics such as intervals, phrase structure, key, and range, as well as examples of the children's music were presented in all three studies.

Doig's study revealed several interesting conclusions. 1) Most of the groups in the study preferred to compose songs in duple meter. 2) Older children were more consistent in meter throughout their composition than were younger children. 3) All songs but one were composed in a major tonality. 4) Older children's compositions all had a cadential feeling with phrases ending on the tonic. 5) Older children tended to use regular phrases in the melodies composed for a given text.
Although general conclusions were drawn about developmental patterns across age groups, the results were difficult to interpret, given that the music was constructed by groups of students rather than individuals. Doig also used no independent judging, and therefore, her own evaluation of the songs may have influenced the outcome. Still, this research represents an early attempt to develop, analyze, and identify creative musical products.

Ainsworth (1970) developed a one-year course of creative study for 16-year-olds of lower achievement skills and intelligence for application in British public schools with the purpose of examining the nature of creativity by giving children a chance to create music for themselves. Eight schools participated in the research with four or five pupils selected at random from each school to use the trial course. He sought to teach pupils to compose a melody by having them make informed decisions about musical material that required manipulation in some way. In this way, the amount of actual composition, as opposed to exploration or improvisation, could be measured. Ainsworth viewed the task of creating a melody musical creativity as a process of making informed decisions. The decisions chosen involved accepting some material and rejecting other material. Acceptance of certain ideas was based upon the subject's previous musical experience, ability, and musical aptitude. Pupils were asked to make up a tune of any length using keyboard instruments provided (xylophone or glockenspiel), to indicate when they finished, and to play the melody twice to indicate the ability to replicate, which is crucial to music composition. The entire composition was taped and later notated. Music ability was assessed by administering the Bentley (1959) Measure of Musical Abilities, plus various rhythmic tests. Ainsworth also administered a questionnaire concerning home life and interests and obtained standard intelligence scores. Results indicated problems in performance of the melodies,
possibly due to some pupils' lack of experience or ability at playing the instruments. Other results indicated that students with high degree of ability, experience, or aptitude possessed an internalized notion of melody, which led to more cohesive compositions as well as requiring less time in experimentation. The majority of the finished products indicated a wide variance in the time spent in experimentation and the degree to which replication was achieved.

As children grow and develop, the interaction between their genetic inheritance and their environment (home, school and society) becomes increasingly crucial. In their observational research, Swanwick and Tillman (1986) postulate that children over 14 years of age regard music to be a form of personal expression. The authors believe that, among children of this age, there is a conscious effort to adhere to stylistic principles underlying the chosen means of composition. There is a beginning of aesthetic speculation and possibility of creating new ideas. Musical composition may be based around whole-tone scales, serialism, electronic music, or other general principles of consciously organized groups of musical material. Often, students will feel a need to write and talk about the processes that went into the generation of the composition.

Swanwick and Tillman's theory is illustrated by a spiral helix of growth between conformity and creativity. The underlying principle in this spiral theory is that there is constant movement back and forth between conformity and creativity. Even when adults encounter a new thought, style, or instrument, they vacillate between conforming and creating.

Everyday observation shows that young people's thinking develops as they grow older. This research proposed a musical developmental sequence based on the psychological concepts of conformity and creativity. Assuming such development
exists, the age factor of the present research should prove significant in comparing the properties of the compositions through the sequence of students' ages in this present research.

Kratus (1985) conducted research on the musical characteristics of children's compositional products. Using 80 children aged 5 to 13, from various school settings, he examined the developmental nature of children's original compositions. Rhythmic and melodic patterns, motives, and phrase characteristics of music of 5-, 7-, 11-, and 13-year-olds were studied. After a period of experimentation, each subject was asked to create a song on a hand-held, electronic keyboard. Restrictions were placed on the creations in that the melody had to begin with the pattern C-D-E, and that only white keys were to be used. Kratus reasoned that although restrictions might stifle creativity, some sort of framework was needed for initiating the task and for helping to structure meaningful assessment, and to give the subjects a better understanding of tonal center. Such an approach is consistent with many tasks designed by professional teachers who work with children. According to Regelski (1981), allowing students too much free choice can result in students wasting time or losing interest. He believes that until students become familiar with the nature and operation of a basic musical activity, it is best to limit the choices.

Kratus's (1985) subjects were given 10 to 12 minutes to complete the melodies. At the end of the time period, the melodies were tape recorded. Each subject was asked to perform his/her melody twice in order to determine the degree of replication. In this way composition products could be measured. Analysis of the data involved assessment of task variables such as replication of the melodies, length of the melody, as well as 21 music content variables related to rhythm, melody, motive and phrase. A mixture of rating scales and dichotomous scales was used. In variables that demanded
subjective scoring, two independent judges were used to rate pertinent data. Interjudge reliability ranged from .55 to .88. The results demonstrated significant developmental differences on ratings of tempo stability, metric strength, tonal stability, and finality, melodic motive development and rhythmic motive repetition.

These studies have had significant influence on product research in creativity. The musical characteristics that were analyzed in the Kratus study and the developmental sequence postulated by Swanwick and Tillman form the foundation for the analysis of the student generated compositions in the present research.

Process Analysis

Process centered studies, while not the main focus of this review, contain information that is pertinent to this research. These studies tell researchers and educators about certain aspects of students' problem solving abilities. Although the studies cited used elementary-aged students as subjects, the procedures used have value for the execution of this research. Process studies examine the creative act itself and seek to analyze the stages of composition beginning with musical conception and ending with elaboration and refinement of the creative work in its final form (Bennet, 1976).

The purpose of Kratus's (1989) study was to examine the various aspects of composition process by children of different ages, genders, and abilities. Subjects aged 7, 9, and 11 composed melodies on an electronic keyboard. The results of the study were described in two parts. The first part described differences in the use of time during the compositional process by age and gender, and the second part examined relationships the components of the process used in the production of the melodies and the quality of those melodies. Kratus found that the older the subject, the more
prevailing development and repetition became in the compositional process. If this relationship is found to be significant in high school aged subjects' original compositions, it would provide more evidence to substantiate increased development of motivic structure and greater ability to replicate with age.

Specific compositional strategies, such as linear movement, changing pitch and rhythmic patterns, and repetition, are paramount to research in creativity. Kratus (1990) details such strategies that are used by children. Sixty subjects, aged 7, 9, and 11, were randomly selected from a population of a suburban elementary school. Children with formal keyboard or compositional training were omitted from the study. The children were given 10 minutes to make up a song and perform it twice. The song was then taped for later analysis. The degree of success was judged by two independent musicians on the basis of craftsmanship and replication. The degree of success in both of these parameters was determined by using rating scales. Craftsmanship rating of 7 meant that the song formed a cohesive unit and used melodic and rhythmic patterns in interesting ways. If a song was rated 1, there was no recognizable structure. Replication rating 7 meant that the repetition was the same as the original and a rating of 1 meant that there was no relation to the first playing. Success was then determined by summing the combined ratings of both judges for both criteria. Interjudge reliability for the combined ratings was .88. The ten songs achieving a 24-28 on combined ratings were designated most successful, and the ten with 4-7 ratings were designated least successful. These 20 songs and their corresponding 10-minute composing period were then taped. Three other judges determined which of several compositional strategies, such as changing note patterns, skip or stepwise movement, or changing rhythmic patterns, were present in each of the
five 2 minute intervals of the composing period. The mean percentage of agreement between the three judges was 80.3%.

Using this method of analysis, certain patterns or strategies emerged for both ability levels. High ability subjects employed a wide range of strategies, compared to their low ability counterparts, who tended to stay on one track in their solutions. Kratus suggested that future research could investigate differences attributed to musical achievement or aptitude. Perhaps children transfer, as Kratus says, some non-musical problem solving experience to their composing of melodies. He also raised the possibility of educating the lower ability subjects in the more successful strategies of the higher ability subjects. In using craftsmanship and replication, Kratus has shown another type of dichotomy in creative problem solving among student subjects. High ability tended to indicate multi-level strategies.

Although the results of this research tell educators about certain aspects of children's problem solving abilities in music, they do not answer questions about the same processes involving high school students.

**Relationship of Music Creativity to Other Student Variables**

Research studies in which creative problem solving is correlated with musical experience, musical aptitude, self-concept, age, and academic achievement are pertinent to the present research. Gorder (1980) constructed of a test of musical creativity to examine the divergent production abilities of musical fluency, flexibility, originality, elaboration, and quality in school instrumental music students. The sample population was 40 high school and 40 junior high aged children, randomly chosen from various music departments. The test, Measures of Musical Divergent Production, was based on models used in the Guilford (1971) and Torrance (1966) tests, which are measures
of the divergent production abilities of fluency, flexibility, elaboration and originality. Gorder's test was scored for the number of improvised phrases produced (fluency), shifts of musical content (flexibility), varied use of musical content (elaboration), rarely used content (originality), and musical appeal. "Musical appeal" was defined by Gorder as an idea or phrase that appeals to musicians' musical sensitivities. Test-retest reliability ranged from .70 to .90 with split halves coefficients ranging from .69 to .88. Interjudge reliability ranged from .50 to .90.

Webster (1979) sought to define musical creativity in terms of the divergent thinking skills of fluency, flexibility, elaboration, and originality. He used 77 high school musicians to complete tasks in composition, analysis, and improvisation. The students were all performing ensemble members, but had no formal training in composition. Musical achievement was measured using the Colwell (1970) *Music Achievement Tests*, and the Torrance (1974) *Tests of Critical Thinking*.

Each of the three criteria measures was divided into several creative activities. The composition activity was comprised of three sections. The first began by asking the individual to create a short phrase of music for triangle and some other instrument or voice. The second section required the subjects to compose a simple theme and variation form, taking the melody from the original phrase of activity one. The final section required the individual to create a longer, more complex work for as many instruments as desired. Any phrase from the first activity could be used as a basis for the extended composition.

The three activities associated with the analysis section began by asking the individual to make as many imaginative and original statements as possible about the structure and design of a given melody. The second activity asked the individual to study two given duets and to then suggest interesting similarities and differences
between them. Such aspects as form, melodic motion, rhythmic patterns and cadences were to be discussed. In activity three, an entire twelve-tone composition for bells and voice was studied. A list of observations was started and the subjects were required to finish it by making his/her own observations.

The improvisational session consisted of four activities. Activity one served as a warm-up session for what followed, to adjust students to the free responses involved. Activity two solicited free responses to a given rhythmic stimulus, and then a melodic stimulus. Activity three began by asking the student to listen to and then play "Twinkle, Twinkle, Little Star" without error. Then the student was to play the melody four more times. The first time in the original and then three improvised treatments. Bells, drums, and claves were used in this activity. The final activity asked the individual to compose an original melody on the bells. Then, he/she was to 1) create an improvised solo on the melody, 2) create a transition to "Twinkle," and 3) finish with a transition back to his/her own tune. This could be done with any available instruments.

Subjects could use any type of notational system. Students who scored high on the musical achievement measures tended to score high on all three criteria measures of Webster's research (composition, analysis, and improvisation). Age, grade, and performance medium appeared to have no significant relationship to creative ability. According to Webster (1979), it may be that those with some musical background tend to do well on tasks of musical creativity.

Seals (1989) analyzed melodic compositions of children in grades 3, 5, and 7. She evaluated the compositions and correlated the melodic compositional abilities with the independent variables of grade, gender, musical training and experience, attitude, and self-concept regarding musical composition. The data were analyzed to determine whether or not these independent variables and were significant predictors of
compositional ability. A total of 48 students from 3rd, 5th, and 7th grade were randomly chosen to create a single line composition for piano utilizing a designated two octave pitch range. All compositions were recorded. Attitude and self-concept on compositional ability were assessed using a questionnaire answered by the students' parents. Musical analyses were conducted by using the Seals Music Composition Analysis format, a compositional rating scale, consisting of ten content areas which included tonality, meter, pitch range, pitch set, tempo, tempo variation, dynamics, duration, rhythmic structure, and modes of attack. Results showed strong similarities in all three grade levels in areas of tonality, meter, tempo variations, dynamics, modes of attack, pitch, rhythmic units, and duration. Differences were noted in tempo, pitch range, and pitch set. Melodic compositional ability was assessed by three judges who rated each composition according to eight predetermined evaluative criteria. Results show that compositional ability increased with grade level for both genders. Using Pearson Product-Moment correlation analyses, compositional abilities and grade level and music training and experience revealed significant positive relationships. Analyses of variance indicated significant main effects of grade level and musical training on compositional ability. Grade level and musical training were also significant predictors of compositional ability as measured using stepwise multiple regression analysis. This research indicated that age and experience, as measured by music training are significant predictors of compositional ability, and that gender appeared to have minimal influence on the problem solving task as set forth by Seals.

The research findings from the studies cited indicate possible relationships of music experience, musical aptitude, self-concept as a musician, age, and academic achievement to musical problem solving tasks. The subjects of most studies have been students in the elementary or junior high grades involved in general music. The
subjects for this research were high-school-aged children, some of whom had had no musical instruction since 7th grade, and many of whom had never had private musical training. Webster (1990) states that the selection process for creativity research is often limited to talented or gifted students. The results of such research often confuse performance ability, high scores on traditional musical aptitude tests, and high general intelligence with ability to think creatively in music. The findings of the resulting relationships in this study should prove to be of some significance in the continuing development of creativity theory.

Research that lends insight into the nature of creative musical problem solving provides important information about higher-order thinking skills in music. Whatever the form of inquiry, creativity in music needs to be subjected to continual research to assist music specialists in the development of curricular exercises that have real learning value for their students (DeLorenzo, 1989).
CHAPTER 3

PROCEDURE FOR DATA COLLECTION

This chapter presents an explanation of the data collection procedures used in the research, including a description of the subjects who participated in the study and the demographic description of their school. It also includes a description of the testing administration and procedures used in determining musical experience, musical aptitudes, self-concept as a musician, age, and academic achievement of the subjects. The description of the research setting is included to illustrate the method used to collect subjects' compositions. Finally, this section includes descriptions of procedures for analyzing subjects' compositions and statistical procedures used in rendering conclusions.

Description of the School

The research project was conducted in its entirety at Valley Forge High School, Parma Heights, Ohio. The school is a 4-year public high school with a total enrollment of approximately 1500 students. Valley Forge is situated in a mainly middle class, predominately Caucasian, blue-collar community in the southern suburban area of Cleveland, Ohio. Many of the students are second or third generation Americans of Eastern European descent. The scores of state sponsored proficiency tests indicate the general student population to be above average in academic achievement. The majority of those who continue on to higher education score in the upper one-third of the American College Test and the Scholastic Aptitude Test.
Description of School Music Program

The music program in the Parma City School district attempts to provide a number of required and elective musical experiences to students of all ages. General music is required of all students through the eighth grade. Optional orchestra, vocal, and band programs begin in the fourth grade and culminate with varied instrumental and vocal performance groups at the high school level. High school music appreciation and history are included within a team-taught humanities program. At the time of this study, there were approximately 350 students, or 23% of the high school’s student body involved in the music curriculum in some fashion. The researcher is an orchestra, band, and humanities teacher at Valley Forge High School and has been associated with the Parma school system for 14 years.

Procedures for Sample Selection

The subjects for this study constituted a representative sample from the general student population at Valley Forge High School. The researcher went to the counseling departments of each grade level to solicit the assistance of the counselors in selecting a representative sample of students for the study. The research project was explained to each counselor with emphasis placed on the fact that the sample population was to be as representative of each age within the entire student body. It was deemed advisable by the researcher to involve the counselors in the selection process of the test sample, because they knew more about each student’s schedule and availability to participate in the project. A large pool of students was selected to begin the study. Through the process of involving the counselors, time was saved by eliminating students whose class schedules or work constraints made it impossible to complete the experiment. Those who could not participate were then, in turn, replaced with other students from
the pool. In this manner a total of 63 students were selected to begin the testing process.

A cover letter and permission slip were given to the participants 2 weeks prior to commencement of the testing. The cover letter explained that the project had the approval and support of the principal, assistant principal, and the guidance department, and asked for the parents' cooperation and approval. The bottom portion of the cover letter was to be signed by a parent or guardian and returned to the school. The letter of permission identified the researcher as a doctoral candidate at Case Western Reserve University, as well as a faculty member of Valley Forge High School. A brief description of the study and a promise of confidentiality concerning the students' compositions and test results were included. Students were also asked to provide information about their musical experience, age, and free time during the school day in which individual composition time could be arranged. A copy of the letter of permission and cover letter appear in Appendix A.

The permission forms were returned to the researcher at the school. Of the 63 students originally selected, permission forms were returned by 60 students. Of these 60 students, 2 did not complete the testing procedure and 2 more subjects produced inappropriate compositions, that is, they were clearly not original in any form. (One used the folk song, "Aura Lee," and the other used the Christmas carol, "Joy to the World.") The sample, therefore, contained 56 subjects. The ages of the entire sample ranged from 15 years, 1 month to 18 years, 8 months.

The study was designed to examine the abilities of each of four age groups within the high school, ages 15, 15, 17, and 18. From the descriptive information received, the mean age of each group was 15 years, 5 months; 16 years, 5 months; 17 years, 3 months; and 18 years, 5 months, respectively. Also, information concerning
prior musical experience in the form of music lessons was obtained from the
permission form. Of the 56 subjects, approximately 41% had some type of music
instruction, past or present, and 11 subjects (19.6% of the sample) had taken music
lessons of some form for at least one year's duration. Whether these lessons were
current or occurred some time in past was not pertinent to this study. A table of all
descriptive information on the subjects appears in Chapter 4.

**Testing Administration Procedures**

In order to achieve the purpose of this study, measures of music experience,
music aptitudes, and self-concept as musicians, age, and academic achievement had to
be obtained from the subjects. The preliminary steps of the research were conducted by
administering the *Music Aptitude Profile* (Gordon, 1965) and a self-concept document
that incorporated the Self Esteem of Music Ability (SEMA) questionnaire (Schmitt,
1979). Specific questions pertinent to in-school or out-of-school music experience,
age, and academic achievement for each subject were asked in a researcher-generated
questionnaire (Appendix B).

**The Musical Aptitude Profile**

Aptitude tests are used in research to identify students' potential for
performance in a specific area or type of behavior (Borg & Gall, 1983). It is in this
regard that a measure of music aptitude was necessary for this research.

Edwin Gordon (1967) created one of the most comprehensive measures of
music aptitude in the music education literature, the *Music Aptitude Profile* (MAP).
The test manual is thorough and contains norms for grades 4 through 12. The manual
includes extensive reliability and validity information and a detailed history of the
development of MAP. The concepts of sensitivity to musical alteration and embellishment as well as preference are included in the MAP battery. As in all tests of musical aptitude, the test taker must make many musical judgments that are general enough to preclude the necessity of musical training. This fact makes this battery of tests ideal for the population of the present research.

MAP contains three major divisions: Tonal Imagery, Rhythm Imagery, and Musical Sensitivity. Tonal Imagery has subdivisions of Melody and Harmony. Tempo and Meter are subdivisions of Rhythm Imagery, and Musical Sensitivity includes subdivisions of Phrasing, Balance, and Style. Scores are determined for the entire battery, each major division, and each subdivision. Orchestral string instruments produce the stimuli.

The Melody subtest requires subjects to indicate whether the second phrase of each set of 40 pairs of phrases is an embellishment of the first or a different phrase entirely. The subject must decide whether removal of added tones would leave the second phrase like the first or different from it. The paired phrases are of equal length.

The Harmony subtest of the Tonal Imagery section also requires a "same" or "different" judgment in 40 items. Each item pair contains a melody line performed on violin, and a lower harmony line performed on cello. The subject must indicate whether the second lower line is the same as or different from the first lower line. The upper voice remains the same throughout.

In the 40-pair Tempo subtest, the subject is supposed to respond "different" if the second phrase has an ending in which the tempo increases or decreases in relation to the first phrase. If the tempo does not change, the subject responds "same."
The Meter subtest requires another same or different judgment for 40 pairs of phrases. The different judgment is selected if there is a perception of meter change in the second of the two phrases.

The Musical Sensitivity section is divided into three subtests examining phrasing, balance, and style. The violin performs 30 items for each of the subtests. This, also, is a test of musical preference, based on presumed musical acculturation. The Phrasing subtest is a more subjective exercise, which requires the test taker to determine which of 30 paired phrasing items is "better." The subjects' musical preference is the determining factor as to which of the items in the pair is "better." The Balance test requires judging whether the first or the second member of each pair has the "better" ending. In the Style test, the paired excerpts differ in tempo, and the subject is to indicate a preference for the first or the second version.

Gordon reported numerous split-halves reliability figures for the composite MAP scores ranging from a low of .90 for the fourth grade to a high of .96 for the eleventh grade. Validity was based on correlations with teacher estimates of talent, performance, and achievement scores in music.

All items in the tests require dichotomous decisions, that is, something is either the same or not; one version is better than the other. There is also a "don't know" option, which subjects are instructed to use if they are unsure of the correct answer. According to Boyle and Radocy (1987), this procedure enhances test reliability.

**Self Esteem of Music Ability**

Borg and Gall (1983) define self-concept as a set of feelings that each person has of his/her own self. Coopersmith (1976), Leonard and House (1972), and Thomas
(1973) cite self-esteem as an important determinant of school performance and, as such, it was examined in this research.

Schmitt (1979) developed and tested the Self Esteem of Music Ability questionnaire (SEMA). This measure consists of a series of statements about the respondent's current and future musical behaviors. The questionnaire was devised from a series of three checklists and administered to 481 children aged 12-15. Schools chosen for the study were varied in affluency, size and affiliation (public and private), from both Minnesota and Illinois. Students used in the study came from vocal, instrumental and general music classes. The questionnaire also asks for information regarding behaviors of parents, teachers, and friends concerning their perceptions of the musical ability of the respondent. Students are asked to evaluate themselves in relation to the statements and to report information on any honors and/or musical activities. According to Schmitt, interjudge reliability of the measure ranged from .76 to .86. It is also interesting to note that Schmitt found the correlation between SEMA scores and participation in musical activities was .60. Test-retest reliability was reported as .91. The SEMA questionnaire appears in Appendix C.

Researcher Generated Questionnaire

The researcher questionnaire (Appendix B) required each subject to give information about his/her music experience, age, and academic achievement. Information concerning private lessons, instruments played, or musical organizations in which each subject was involved, whether in or outside of the school day, subjects' age, and grade point average was gathered from these questions. The questionnaire asked for information, in part, based on Schmitt's (1979) initial work in developing questions for the SEMA measure, defined above. Grade, age, and date of birth were
asked in preliminary questions. These, along with musical experience questions and overall grade averages, concluded the questionnaire given prior to the SEMA battery of questions.

**Test Setting**

The administration of the tests cited above, which were given prior to the individual student composition tasks, took place in group format during the first 2 weeks of May, 1991. For ease in testing administration and to better facilitate the testing evaluation procedure, the researcher divided the overall subject population into two testing groups. Group 1 was comprised of all 15 and 16 year olds. Group 2 was all 17 and 18 year olds.

All test administrations took place in the instrumental music room at Valley Forge High School during the school day. These sessions were administered by the researcher. With help from the guidance department, the students were released from class for testing. Given the length of *MAP*, three testing sessions were needed to complete all three subtests for each group. SEMA and researcher generated questionnaire were given at the first test session along with Part 1 (Tonal Imagery) of *MAP*. The six testing times were staggered throughout the 2-week period so as not to interrupt the same classes each time. Each testing session was approximately the length of one academic period, 55 minutes.

**Composition Sessions**

When the final testing session for each group was completed, all students registered with the researcher for an individual 20-minute period in which the actual
composition procedure was to take place. All individual times were to coincide with a lunch period or other free time to keep interruptions of other classes at a minimum. Composition sessions took place between May 15 and June 15, 1991, and were conducted within the music department practice facility at Valley Forge High School. This facility consists of eight separate practice rooms each with an upright piano. Two such rooms and pianos were used for this phase of the study. Each room was equipped with a tuned upright piano, piano bench, and cassette tape recorder. A large clock was placed in the hallway between the two rooms to facilitate student awareness of their time allotment. Each room had a window facing out into the hallway, but no sound could escape to interfere with concentration, because the rooms were soundproof and had a hallway between them.

**Method of Composition Collection**

**Audio Taping Procedures**

The students were asked to create an original composition. As with any creative act, time was required for experimentation, generation of new ideas, and synthesis into a creative product. The students were given a maximum of 20 minutes and minimum of 10 minutes to create an original composition. A time limit of 20 minutes was placed on each student's exploratory time for reasons found in prior research and for practical reasons. Kratus (1986) allowed his subjects 10 minutes to compose a song. Two of the reasons he gave for setting a time limit were 1) the time limit ensured a degree of consistency among the subjects for the amount of time spent composing, and 2) the composing had to be completed during the subjects' regular music class time. Reinhardt (1990) set a maximum time limit of 10 minutes for all compositional periods
in her study for similar reasons. In a study that examined improvisation, Freundlich (1978) noted that the length of improvisation sessions varied around a mean of 5 minutes with the subjects' interest and enthusiasm for the assigned task. This evidence points toward keeping the time on task as economical as possible. In the studies cited above, subjects were much younger than the present study's population. Therefore, it was deemed appropriate to keep a limit on compositional time but lengthen it to a maximum of 20 minutes, with a minimum of 10 minutes.

When the student entered the practice room, the researcher explained that the student had a maximum of 20 minutes to complete the musical composition. At least 10 minutes of the allotted time had to be used. The only other occasion for the researcher to be in the room before the compositions were ready for taping was to advise the students that their composing time was almost over. The students' compositions were to be melodic only, with no harmony required. Use of one-finger technique was regarded as satisfactory. There was no length requirement for the compositions and the students were warned that they would have to play their compositions twice. The starting note was middle C, and was indicated by a sticker saying "start here." The students were instructed to use white keys only. Upon completion of the compositions, the researcher would enter the room. He asked if the student was ready to perform and would then turn on the tape. The researcher assigned each student an identification number and stated "first time" to indicate on the tape that this was the subject's first attempt at his/her composition. A second playing of the composition was required to enable judges to evaluate subjects' ability to replicate their compositions. This is consistent with the Kratus (1985) observation that replication is a sign of internalizing the composition and not mere improvisation at the keyboard. When the
subject was ready, the researcher said "second time" and then the composition was repeated and taped again.

The compositions were taped instead of notated by the students, because a large number of students were not well acquainted with notation. Sherman (1971) warns that when a student tries to invent notation, he soon has to face the problem of communication and the functions and limitations of notation. Taping was also crucial in saving time both in the creation and analysis of the melodies. Two Wollensack Model 880 cassette tape recorders were used with a Sony HF 90 normal bias cassette tape in each recorder. All recording was done by the researcher. While the students performed their songs, the researcher left the practice room, so as not to create any atmosphere of tension, especially for those with little keyboard experience.

**Procedural Restrictions**

The compositions were to be only monophonic in nature as melody was the element of each composition to be studied and analyzed. The researcher indicated in the directions for composition, issued before each composing session, that a one-finger method of composing would suffice for this study. There were a number of students who, having had previous keyboard experience, used chord progressions, utilizing both hands. In most cases, when questioned about their procedure, they expressed a need to hear some type of harmony, or they simply forgot what the directions had required. This did not hinder the analysis of melodic content.

The other prominent restrictions placed on the composing process were the 20-minute time limit, the range of notes available, and the starting pitch. Middle C was to be the starting pitch with a usable range of one octave either side of that note. All compositions were to be diatonic in nature, using only the white keys of the two-octave
range. Kratus (1986) limited his subjects to the use of the white keys, citing the need to provide some guidance and structure for the creative process. It was believed that limiting the subjects to the use of the white keys would allow the subjects a variety of choices for musical material, and still help the inexperienced subjects avoid the technical problems encountered with the use of the chromatic scale of the standard keyboard. This was thought to be extremely useful for the present research, given the very limited time restraints and inexperience of the subjects in composition.

Time used by the students for completion of the compositions varied widely within the 20-minute time frame. Although no systematic feedback was designed into the compositional process, the researcher was always available for any possible question that might arise during the compositional process, and was always positive with responses to each student's endeavor upon completion of the task. No students required help and there were no other deviations in the procedures by the students.

Analysis of Audio Tapes

Criteria for Measurement

Composition in this study was defined as the students' ability to create an original melody. Evaluation of these creative products required a method of rating designed to assess the contents of the taped compositions. As content, the creative use of tonality, meter, cohesiveness, originality, complexity (as it related to pitch, duration, contour, and dynamics), motive, and phrasing were regarded as valid criteria, because these elements could be controlled by the students.

There is no standard system for evaluating musical characteristics of students' original melodies, or for developing a set of constructs, operational definitions, and rating scales for song analysis. The constructs for this study were developed using the
studies done by Kratus (1985) and Webster (1979). This was done prior to the collection of the subjects' melodies. The songs were then analyzed by the researcher and two independent judges, using the set of definitions and rating scales developed. Finally, the data resulting from the song analysis were examined statistically and musically.

The basic aspects of music are rhythm and pitch (Gardner, 1983; Gordon, 1971; Radocy & Boyle, 1979). The characteristics of the compositions to be studied in this research that were related to rhythm were meter, duration of notes, and rhythmic motive. The characteristics of the compositions to be studied that were related to melody include tonality, melodic motive, and phrase. These characteristics are universal for musical composition. Lerdahl and Jackendoff (1983) define musical universals as the principals available to experienced listeners as means for organizing music structure. In effect, they function similarly for all types of music and all experienced listeners.

**Tonality**

According to many researchers, tonality is the single most important quality in providing structure to the melodic aspect of music (Gordon, 1971; Meyer, 1956). Jacob (1955) states that melodic material is what determines the character and individual personality of a musical composition. Tonal center and closure are important elements to the physical completion of the melody as well as of great psychological satisfaction to both the composer and listener. Krumhansl (1982) writes that tonality and scales are powerful psychological structures that play an important role in the comprehension and enjoyment of music. In melodic terms, tonal organization or a scale establishes a system of order and, thus, of finality. "Tonality is probably the most important single facet of any style in Western music" (Meyer, 1956, p. 115).
Subjects' understanding of tonality was evaluated by rating the tonal strength of each composition. The operational definition, derived from Kratus's (1985) research, defines tonality as the degree to which the composition conveys a specific key center. Kratus used tonality as a specific characteristic to evaluate the original songs of children ages 5 to 13. Since subjects were restricted to the use of only the white keys of the keyboard and told to start their songs on middle C, the choices of tonal relationships and key centers was clearly limited. Therefore, no evaluation of which tonality subjects used was made. Tonality was defined in the present study as "the degree to which the composition conveys the specific key center."

Meter

Rhythmic constructs are indispensable to music. Many authors write of the importance of rhythm to music in that it is the organizational aspect of all the other musical elements (Copland, 1975; Cooper & Meyer, 1960; Meyer, 1956; Sessions, 1950). Jacob (1955) defines rhythm as a pattern of note duration and temporal interval duration.

The aspect of rhythm used as a construct in this research is meter. Sherman (1971) considers meter and rhythm the overriding concerns of the composer. It is the means of inflection, establishing the character and shape of the music idea. Operationally, meter was defined as "the degree to which the composition conveys a regularly occurring set of accented and unaccented beats." Kratus (1985) refers to this analysis as metric strength. He uses this characteristic to determine the degree of the perceived meter within the children's original compositions (p. 94).
Motive

The importance of motivic development to the understanding of music has been underscored by several authors (Gordon, 1971; Levy, 1969; Pike, 1971). These authors describe motives as the patterns that constitute the significant tonal and rhythmic experience through which meaning is given to music. Motivic development succeeds when the composer is able to engage the listener with the precise meaning intended by the composition (Copland, 1950; Sessions, 1950). The use of melodic motives is not only a powerful means of achieving structural unity and contrast, but it also reflects the composer's ability to think in larger structural units. Davidson and Welsh (1988) used the ability to think in a motivic framework, rather than a note by note process, as a criteria for successful compositions by college-aged students. In using independent judges for analysis of melodies, they found that the more sophisticated the strategies used in composition, the more likely the judges would consider the melodies successful. In this research, both rhythmic and melodic motives are analyzed.

To distinguish motives from phrases, this research format uses the model from the Kratus (1985) research. The definition states that motives constitute "two to five notes that form a distinct pattern" (p. 101). Motives in this research were categorized as melodic or rhythmic, and their use was categorized as repeated or developed. Motive use was rated by counting the number of times patterns were repeated or developed. A repeated melodic motive such as A-B-C, A-B-C, A-B-C would be given a rating of 3, because the pattern was repeated 3 times. A developed melodic motive might be sequential (A-B-C, B-C-D, C-D-E) or have some other minor note changes. This example would have been counted as 3 developed melodic motives because it was
sequenced 3 times. These melodic alterations assumed that the basic rhythm remained
the same while the melody changed slightly.

Rhythmic motivic development was judged similarly, that is, a rhythmic
pattern that was repeated was counted as many times as it occurred (e.g., -\_\_\_, -\_\_\_, -\_\_\_ = 3). The rhythm of the pattern had to be altered in some way to qualify as being
developed. Changing duration or meter in the same basic melody was an example of
rhythmic motivic development, and, with every change, was counted as 1 developed
rhythmic motive. It was likewise assumed that these small rhythmic changes in the
motive occurred while the melody remained the same. The task, then, in evaluating
motives, was to count the number of repeated and developed melodic and rhythmic
motives within the composition.

Phrase

The use of phrases was the final syntactic construct analyzed in the subjects' original compositions. Melodies must have careful phrasing and articulation,
establishing the character and shape of the melody (Cone, 1968; Lasker, 1971). It was
assumed that the ability to organize and develop phrasing within the composition
represented a greater understanding of musical composition than did the ability to only
manipulate motives (Kratus, 1985). Again, Kratus's research was used to define a
phrase for this research. It is defined as "a section of music structured to convey a total
or partial sense of completeness." To investigate phrase use as a unifying element in
the subjects' original compositions, the type of relationship among phrases was
examined. A composition rated a 1 in phrasing if there were no discernable phrases. It
rated a 2 if phrases merely existed; a 3 if phrases had some relationship to each other.
The composition rated a 4 if all phrases were related to each other.
Originality

Creative task characteristics are more difficult to define. They are related to the manner in which the entire composition reflects creative thinking, rather than the musical characteristics of the songs (Kratus, 1985). Kratus's work was seminal in the development of constructs related to composing task characteristics, and it is from his research (Kratus, 1989, 1990) that criteria for creative task variables originated for this research. The creative task variables examined in this research were originality, cohesiveness, replication, and complexity.

Webster (1977, 1979) was one of the first researchers to study the original compositions and improvisations of high school students. He defined originality as exhibiting something unique to the norm for the population within which the creator works. From Webster's work on creativity, the researcher defined originality as "the degree of uniqueness of the composition." Originality required arriving at unique ideas and the scale used to measure originality ranged from 7, which represented something entirely new to the norm for the population of the experiment, to 1, which represented either no uniqueness or similarity to a known song.

Cohesiveness

In characterizing the compositional strategies used by children that were 7, 9, and 11 years of age, Kratus (1990) referred to the characteristic of cohesiveness as craftsmanship. It is the degree to which the melody holds together or makes logical musical sense. In measuring cohesiveness, each composition was examined to determine the degree to which it retained a logical form throughout. Davidson and Welsh (1988) compared composing strategies of college music majors with 2 years training to first year music students. Their findings showed that the more experienced
students were better able to produce a coherent melody by thinking more logically about formal aspects of the melody as a whole. Beginners were more likely to work on a note-by-note basis with little regard for overall shape or direction of their projects.

Kratus (1990) had independent judges rate compositions for craftsmanship. A song had exceptional craftsmanship if it displayed cohesion and melodic and rhythmic interest throughout.

From these examples, a definition of cohesiveness was formulated to refer to "the degree to which the entire composition formed an organized whole." A 7 meant that the entire melody had a logical form, phrasing, and closure, and a 1 meant that the melody sounded random, with no organization whatsoever.

Replication

Replication is the ability to reproduce a composed song (Kratus, 1985). This characteristic was important to note since it represented the degree to which a subject was able to compose, practice, and retain a specific song in memory. Kratus (1989) states that a composition reflects closure on a compositional problem. "If one cannot replicate an original melody, then it can be inferred that there is no closure and the music does not exist as a composed product" (p. 8). Replication, therefore, was defined as "the degree of similarity between the replication and the original performance of the melody."

Complexity

Complexity, while generally thought of as a subjective construct, was determined by the objective characteristics of pitch, contour, dynamic, and durational change within the melody. Barron (1973) says the criterion of technical or ideational complexity is defined as the extent to which the product forces a new way of looking at
things, or something that introduces significant change or modification. Complexity was defined as "the degree of variation in pitch, duration, contour, and dynamics of the melody." A complex melody rated a 7 on each of these characteristics by being very involved, with many changes; while lack of complexity, rated 1, was characterized by uniformity throughout the composition in all of these areas.

Length

In the context of this research, length was determined by the duration of the song in clock time. That is, each song was timed by stopwatch for the actual time at took to perform. Kratus (1985) reports that song length, in and of itself, cannot be used as an indicator of the composer's musical understanding of music. As with his study, some of the longer songs may be viewed as musical "babbling" (p. 123). Kratus defines this attribute as a loosely structured musical wandering with no consciously organized form. How long a subject's song was may have been determined by his/her interpretation of directions for the compositional task. In short, the length of the song should not be construed as a qualitative characteristic. It was viewed as an important characteristic by the researcher to illustrate the extensiveness of subjects' compositions.

Definitions

Based on the review of literature for students characteristics in creative tasks, the researcher developed the following definitions and rating scales which were used to as the basis for analysis of the original compositions.

Tonality - the degree to which the composition conveys a specific key center.
7 - Strong sense of tonal center throughout the melody.

1 - No sense of key center at any point.

Meter - degree to which the composition conveys a regularly occurring set of accented and unaccented beats.

7 - Meter is clear throughout the composition.

1 - No sense of metric organization of any kind.

Cohesiveness - the degree to which the entire composition forms an organized whole.

7 - The entire melody has a logical form, phrasing, and closure.

1 - The melody is entirely random, with no degree of organization.

Originality - the degree of uniqueness of the composition.

7 - Something entirely new to the norm for the population of the experiment.

1 - No uniqueness, similarities to a known song.

Complexity - the degree of variation in a) pitch, b) duration, c) contour, and d) dynamics.

PITCH

7 - Very involved, many changes in pitch.

1 - Uniformity in pitch.

DURATION

7 - Very involved, many changes in duration.

1 - Uniformity in duration.
CONTOUR

7 - Very involved, many changes in contour.
1 - Uniformity in contour.

DYNAMICS

7 - Very involved, many changes in dynamics.
1 - Uniformity in dynamics.

Replication - the degree of similarity between the replication and the original.

7 - Perfect replication of the composition.
1 - No replication of any part of the composition.

In the cases of motive and phrase, the judgments included both descriptive and quantitative elements.

Motive - two or more notes that form a distinct pattern. The motives will be analyzed in terms of melodic and rhythmic content.

Melodic motive - two or more pitches that form a distinct pitch pattern.

Rhythmic motive - two or more durations that form a distinct durational pattern.

Motives are judged according to the number of times patterns are repeated or developed. An identically recurring motive (repeated) should be counted as many times as it is repeated (e.g., A-B-C, A-B-C, A-B-C = 3). A developed melodic motive might be sequential (A-B-C, B-C-D, C-D-E) or have some other minor note changes. This would be counted as 3 developed melodic motives, since it is sequenced 3 times. These melodic differences assume that the basic rhythm will remain the same while the melody will change slightly.
Rhythmic motivic development should be judged in a similar manner, that is, a rhythm pattern that is repeated should be counted as many times as it occurs, (e.g., - - -, - - -, - - _ = 3). It must be altered in some way to qualify as being developed. Changing duration or meter in the same basic melody would be an example of rhythmic motivic development, and would be counted as 1 for every developed rhythmic pattern. This assumes that these small rhythmic changes in the motive occur while the melody remains the same. The task, then, is simply to count the number of repeated and developed melodic and rhythmic motives within the composition.

Phrase - a section of music structured to convey a total or partial sense of completeness.

Compositions are categorized as having phrases that a) clearly relate to each other in all cases, b) sometimes relate to each other, c) simply exist, or d) are nonexistent. These are indicated by a scale ranging from 4 to 1, and the following definitions guided the judging of the phrases:

4 - All phrases have relationship to each other
3 - Some phrases have relationship to each other
2 - Phrasing exists
1 - No discernable phrasing exists

Judging Procedures

These specific student variables were independently judged by a university professor of music education, and a fellow doctoral candidate, also a professor, who teaches at a local community college. The judges were selected on the basis of their interest in the study, availability, and their expert ability to discern creative behavior as it pertained to musical composition.
After receiving a 30 minute training period, including an explanation of the evaluative criteria, definitions, evaluation form, and listening to selected tapings of compositions, each judge numerically rated randomly ordered student compositions. The rating form (Appendix D) provided spaces for the judges to rate numerically the students' compositions on a scale of 1 to 7 for each criteria (except motive and phrasing), with 1 showing the least evidence of each criteria, and 7 showing the most. Motive required a numerical count of the number of repeated melodic, developed melodic, repeated rhythmic, and developed rhythmic patterns present, and phrasing was rated using a 1 to 4 scale.

The judges worked on the ratings of each of the compositions for a period of one month. There was no limit to the number of times the judges could listen to and evaluate the compositions. Afterward, the judges reported that some of the characteristics examined, particularly complexity and motivic development, were difficult to evaluate. This may have been due to ambiguity within the definitions or to the different approaches to the listening and evaluative process of each of the judges.

The reliability of each of the rating scale measures was found using the Pearson Product Moment correlation formula with the mean of the judges' scores. The characteristic of length of the compositions was computed by the researcher.

**Statistical Treatment of the Data**

The analyses conducted by the researcher and the independent judges resulted in a large amount of information about the students and their musical compositions. Certain statistical procedures were used to organize and analyze the information gained during the course of the research project. Since the purpose of this study was to find whether relationships existed among the student characteristics of musical experience,
musical aptitude, musical self-concept, age, and academic achievement, and the musical characteristics of the composed melodies, the Pearson Product Moment correlation was used.

Specifically there were five research questions asked. The first question asked if there were relationships between in-school and out-of-school music experience and the musical characteristics of high school students' music compositions. This question was examined by correlating the students' responses to a researcher-generated questionnaire about music experience and the mean of the judges' ratings for the musical characteristics of each student's composition. The second and third questions examined the relationships between music aptitude and self-concept, respectively, and the musical characteristics of the compositions. They were examined by correlating the test scores from the Music Aptitude Profile (MAP) (Gordon, 1965) and the responses to the Self Esteem of Music Ability (SEMA) (Schmitt, 1979) with the mean of the judges' ratings for the musical characteristics. The fourth question asked if there was a relationship between age and the musical compositions of the students. This was examined by correlating the student ages with the mean of the judges' ratings for the musical characteristics. The final question asked if there was a relationship between academic achievement and the musical compositions of the students. This was examined by correlating students' grade point averages with the mean of the judges' ratings for the musical characteristics.

**Summary of Procedures**

In summary, the compositions of 56 high school subjects, ages 15 to 18, were collected. The researcher chose a representative sample selected from the general population of a high school. The research process began with acquiring a measure of
each student’s musical experience, musical aptitude, self-concept as a musician, age, and academic achievement by using a researcher generated questionnaire, the *Music Aptitude Profile* (Gordon, 1965), the Self-Esteem of Music Ability (Schmitt, 1979), and the students’ grade point average, respectively. The subjects were then given a maximum of 20 minutes to compose a melody at the piano. They were given a starting pitch and diatonic range restrictions. When the subjects were finished composing their melodies, the researcher asked each subject to perform and then repeat their composition as well as possible. The melodies were tape recorded for analysis and independently judged by two music educators. The mean of the judges’ ratings of each of the musical characteristics was correlated with the student variables of music experience, music aptitude, self-concept as a musician, age, and academic achievement using the Pearson Product Moment correlation.
CHAPTER 4

ANALYSIS OF DATA

The purpose of this chapter is to describe the results of the analysis explained in Chapter 3. The first part of the chapter presents the descriptive data on the musical aspects of the compositions and the student characteristics. The second part of this chapter describes the statistical analysis of the data as evidence to accept or reject the null hypotheses.

For each of the musical characteristics analyzed, an example from a subject's composition is given to illustrate the most prevalent use of the characteristic, as well as an example illustrating the least prevalent use of the characteristic. It should be mentioned that all musical examples illustrated in Chapter 4 were transcribed by the researcher and, in some cases, rhythmic and metric characteristics were approximated due to lack of precision by the subjects. The results of the statistical analysis is presented in a series of correlation matrices. The level of significance for these analyses was set at .05. The results of the statistical analysis provided information needed to answer the research questions posed in Chapter 1.

Relationships Among the Independent Variables

The correlations between the independent variables of musical experience, musical aptitude, self-concept, age, and academic achievement are shown in Table 1.
### TABLE 1
INTERCORRELATIONS OF INDEPENDENT VARIABLES

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<th>Ch Choir</th>
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<th>Other</th>
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<td>.30*</td>
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<td>.11</td>
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*p<.05, **p<.01, ***p<.001
TABLE 1-Continued

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<td>.24</td>
<td>.15</td>
<td>.30*</td>
<td>.16</td>
<td>.16</td>
<td>1</td>
</tr>
<tr>
<td>GPA</td>
<td>.31</td>
<td>.38**</td>
<td>.20</td>
<td>.33</td>
<td>.12</td>
<td>.35**</td>
<td>1</td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001

Musical Experience

Subjects’ musical experience was measured by having each subject answer questions pertaining to his/her background on a questionnaire. One point was given for the presence of any of the experiences listed on the questionnaire. The total number of experiences was obtained by then adding up the number of experiences. For example, a subject in both band and church choir would have a total experience score of 2. Table 2 illustrates the percentage of students in the sample that participated in curricular musical activities. There were very few students in the sample that participated in orchestra or church choir, which may account for the lack of significant correlations with those musical variables.

According to Table 1, the experience of band was significantly correlated to all aspects of aptitude as measured by MAP and it is significantly correlated at the .001 level to self-concept. Orchestra experience had no significant correlation to any of the
other variables, and choir had significant correlation to self-concept, only. Church choir was significantly correlated to self-concept, whereas other outside-of-school experiences had no significant correlation to any of the other independent variables. Private lessons as a musical experience was highly correlated with all other independent variables except GPA. When looking at musical experiences in totality, significant relationships were found with age, MAP Tonal, MAP Sensitivity, MAP Composite, self-concept, as well as with the other individual experiences. This would indicate that musical experience was significantly correlated with self-concept as a musician, age, and aptitude among the subjects in this study.

**TABLE 2**

PERCENTAGE OF SAMPLE PARTICIPATING IN EACH SPECIFIC EXPERIENCE OR CATEGORY

<table>
<thead>
<tr>
<th>Experience</th>
<th>Percentage of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band</td>
<td>22.4</td>
</tr>
<tr>
<td>Orchestra</td>
<td>5.2</td>
</tr>
<tr>
<td>Choir</td>
<td>41.4</td>
</tr>
<tr>
<td>Church Choir</td>
<td>17.2</td>
</tr>
<tr>
<td>Private Lessons</td>
<td>19.0</td>
</tr>
<tr>
<td>Other Outside Experience</td>
<td>13.8</td>
</tr>
</tbody>
</table>
Musical Aptitude

Musical aptitude was obtained by administering the *Music Aptitude Profile* (Gordon, 1965) to all students prior to the act of composition. Table 3 shows the means, standard deviations, and reliabilities for self-concept as a musician, as measured by the Schmitt (1979) SEMA, for MAP scores of the students, age, and academic achievement, as measured by the students' GPA. The reliabilities found in the present study are very similar to the reliabilities published in the MAP manual, Tonal .90, Rhythm .86, Sensitivity .87, Composite .95 (Gordon, 1988).

According to Table 1, the composite scores correlated with the subtest scores at high levels. Band, lessons, total experience, and self-concept all were significantly correlated with musical aptitude as measured by MAP. Age was correlated with the tonal subtest and the composite scores of MAP. Academic achievement, as measured by grade point average, was correlated with the tonal and rhythmic subtests, as well as with the composite scores.
TABLE 3

DESCRIPTIVE STATISTICS FOR INDEPENDENT VARIABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S. D.</th>
<th>Reliability*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Concept</td>
<td>109.33</td>
<td>29.63</td>
<td>.93</td>
</tr>
<tr>
<td>Aptitude Tonal</td>
<td>54.84</td>
<td>13.55</td>
<td>.89</td>
</tr>
<tr>
<td>Aptitude Rhy</td>
<td>66.12</td>
<td>8.91</td>
<td>.87</td>
</tr>
<tr>
<td>Aptitude Sen</td>
<td>63.40</td>
<td>10.25</td>
<td>.85</td>
</tr>
<tr>
<td>Aptitude Comp</td>
<td>184.37</td>
<td>29.31</td>
<td>.95</td>
</tr>
<tr>
<td>Age</td>
<td>16.46</td>
<td>1.10</td>
<td>--</td>
</tr>
<tr>
<td>GPA</td>
<td>3.49</td>
<td>.71</td>
<td>--</td>
</tr>
</tbody>
</table>

*SPLIT-halves reliability enhanced by Spearman-Brown Prophecy Formula.

Self-Concept

Self-concept was obtained by administering the Self-Esteem of Music Ability (Schmitt, 1979) to the subjects prior to the act of composition. Reliability for SEMA, was obtained by, again, doing split-halves reliability procedures on subjects answers and then adjusting the findings using the Spearman-Brown Prophecy Formula (Table 3). The published reliability for self-concept as a musician was .91 for the SEMA questionnaire (Schmitt, 1979). The reliability of SEMA in this research compared favorably to the published reliability. Self-concept was found to be highly correlated to all facets of MAP, band, private lessons, and total musical experience. It was not correlated to age or academic achievement.
Age

The ages of the subjects were determined by asking for the month and year of birth on the questionnaire. The mean of the sample population is recorded in Table 3. Age correlated positively with the tonal subtest and the composite scores of MAP. Age was also highly correlated with GPA, private lessons, and total musical experience.

Academic Achievement

Academic achievement was obtained by asking the subjects to list their present grade point average within a certain range, A to B, B to C, and so forth. Subjects with a grade point average between A and B were coded with the number 4. Those whose grade point average was B to C were coded 3, C to D were coded 2, and D to E were coded 1. A sample of 20 students' records was checked by the researcher to assure that the ranges for grade point average that the students gave were accurate. According to Table 1, grade point was significantly correlated with age, tonal and rhythmic aptitude subtest scores, as well the composite aptitude scores. It is interesting to note that there is little relationship between GPA and musical experience or self-concept as a musician.

Relationships Among Dependent Variables

The relationships among the dependent variables that were investigated are shown in Table 4. The dependent variables are made up of the entire list of musical characteristics that were examined by the independent judges.
# TABLE 4

INTERCORRELATION OF DEPENDENT VARIABLES

<table>
<thead>
<tr>
<th></th>
<th>Ton</th>
<th>Met</th>
<th>Coh</th>
<th>Orig</th>
<th>CoP</th>
<th>CoD</th>
<th>CoC</th>
<th>Co Dy</th>
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<tbody>
<tr>
<td>Tonality</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Meter</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>.87***</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Original</td>
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<td>.72***</td>
<td>.74***</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Comp Pit</td>
<td>.37**</td>
<td>.44***</td>
<td>.40**</td>
<td>.58***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comp Dur</td>
<td>.57***</td>
<td>.53***</td>
<td>.55***</td>
<td>.58***</td>
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<td>.74***</td>
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<td>Comp Dyn</td>
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<td>.26</td>
<td>.26</td>
<td>.36**</td>
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<tr>
<td>Rep Mel</td>
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<td>.08</td>
<td>-.05</td>
<td>.10</td>
<td>.10</td>
<td>.16</td>
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<td>.24</td>
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<tr>
<td>Dev Mel</td>
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<td>.25</td>
<td>.22</td>
<td>.36**</td>
<td>.48***</td>
<td>.50***</td>
<td>.32*</td>
<td>.14</td>
</tr>
<tr>
<td>Rep Rhy</td>
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<td>.06</td>
<td>-.08</td>
<td>.05</td>
<td>.07</td>
<td>.25</td>
<td>.18</td>
<td>.30*</td>
</tr>
<tr>
<td>Dev Rhy</td>
<td>.29*</td>
<td>.28*</td>
<td>.21</td>
<td>.40**</td>
<td>.33*</td>
<td>.38*</td>
<td>.26</td>
<td>.21</td>
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<tr>
<td>Phrasing</td>
<td>.69***</td>
<td>.70***</td>
<td>.73***</td>
<td>.67***</td>
<td>.43**</td>
<td>.60***</td>
<td>.36**</td>
<td>.40**</td>
</tr>
<tr>
<td>Length</td>
<td>-.04</td>
<td>-.08</td>
<td>-.22</td>
<td>.08</td>
<td>.08</td>
<td>.13</td>
<td>.25</td>
<td>.42**</td>
</tr>
<tr>
<td>Replicate</td>
<td>.62***</td>
<td>.62***</td>
<td>.69***</td>
<td>.51***</td>
<td>.11</td>
<td>.31*</td>
<td>.05</td>
<td>.06</td>
</tr>
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</table>

*p<.05, **p<.01, ***p<.001
<table>
<thead>
<tr>
<th>Rep Mel</th>
<th>Dev Mel</th>
<th>Rep Rhy</th>
<th>Dev Rhy</th>
<th>Phrase</th>
<th>Len</th>
<th>Repl</th>
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</thead>
<tbody>
<tr>
<td>Rep Mel</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dev Mel</td>
<td>.33*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rep Rhy</td>
<td>.88***</td>
<td>.41**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dev Rhy</td>
<td>.44***</td>
<td>.43***</td>
<td>.38**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phrasing</td>
<td>.30*</td>
<td>.40**</td>
<td>.25</td>
<td>.35**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>.73***</td>
<td>.23</td>
<td>.76***</td>
<td>.41**</td>
<td>.08</td>
<td>1</td>
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<tr>
<td>Replicate</td>
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<td>-.01</td>
<td>-.09</td>
<td>.02</td>
<td>.46***</td>
<td>.29*</td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001

The analysis of the figures revealed high correlations between the variables of tonality, meter, cohesiveness, phrasing, and complexity of pitch and duration. This may indicate that these variables are measuring similar characteristics. Perhaps the judges heard these characteristics as binding qualities of a unified composition. For example, phrasing was significantly correlated with every other variable except rhythmic motives, indicating that phrasing was considered by the judges as being related to many other aspects of a unified composition. It is interesting that the repeated motivic characteristics have little correlation with the other variables. The developmental motivic characteristics do correlate significantly with originality and the complexity characteristics, indicating a certain relationship among these variables.
TABLE 5

DESCRIPTIVE STATISTICS AND INTERJUDGE RELIABILITY OF DEPENDENT VARIABLES

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>Rel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonality</td>
<td>4.32</td>
<td>1.88</td>
<td>.87</td>
</tr>
<tr>
<td>Meter</td>
<td>4.11</td>
<td>1.87</td>
<td>.83</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>3.95</td>
<td>1.91</td>
<td>.85</td>
</tr>
<tr>
<td>Originality</td>
<td>3.39</td>
<td>1.54</td>
<td>.63</td>
</tr>
<tr>
<td>Complexity Pitch</td>
<td>3.44</td>
<td>1.40</td>
<td>.69</td>
</tr>
<tr>
<td>Complexity Duration</td>
<td>2.87</td>
<td>1.25</td>
<td>.64</td>
</tr>
<tr>
<td>Complexity Contour</td>
<td>3.44</td>
<td>1.14</td>
<td>.53</td>
</tr>
<tr>
<td>Complexity Dynamics</td>
<td>1.77</td>
<td>0.64</td>
<td>.16</td>
</tr>
<tr>
<td>Repeated Melodic Motives</td>
<td>3.22</td>
<td>4.53</td>
<td>.97</td>
</tr>
<tr>
<td>Developed Melodic Motives</td>
<td>1.91</td>
<td>1.72</td>
<td>.83</td>
</tr>
<tr>
<td>Repeated Rhythmic Motives</td>
<td>4.55</td>
<td>4.85</td>
<td>.84</td>
</tr>
<tr>
<td>Developed Rhythmic Motives</td>
<td>0.80</td>
<td>1.06</td>
<td>.71</td>
</tr>
<tr>
<td>Phrasing</td>
<td>2.54</td>
<td>0.96</td>
<td>.69</td>
</tr>
<tr>
<td>Replication</td>
<td>5.00</td>
<td>1.72</td>
<td>.69</td>
</tr>
<tr>
<td>Length (in seconds)</td>
<td>35.00</td>
<td>40.13</td>
<td>--</td>
</tr>
</tbody>
</table>
Descriptive Statistics and Musical Examples of the Dependent Variables

Subjects' use of the musical charateristics was investigated by examining judges' ratings of the dependent variables. In order to more fully understand the rating scales used in the research, the operational definitions and ratings scale are given here, as well as musical examples of the range of each musical characteristic rated by the judges. Table 5 presents the mean of the judges ratings, standard deviations, and interjudge reliabilities of the musical (dependent) variables of the original compositions.

Tonality

Subjects' use of tonality was investigated by examining judges' ratings of tonality. The operational definition and rating scale given the judges for tonality is as follows:

- **Tonality** - the degree to which the composition conveys a specific key center.
- **7** - Strong sense of tonal center throughout the melody.
- **1** - No sense of key center at any point.

The interjudge reliability for ratings of tonality was .87. The reliability for this variable was considered acceptable for this research. According to the ratings presented in Table 5, the tonal strength of the compositions was close to the theoretical mean at 4.32 out of a possible 7. Examples 1 and 2 illustrate compositions that received the highest and the lowest ratings for tonality. Example 1 is Vicky's composition which was rated 7 by the judges for tonality. Here, the highlighting of the
C major triad and the strong emphasis on C throughout the composition provide a clear tonal center.

Example 1. Vicky's composition

Example 2 is an illustration of what the judges perceived to be a rating of 1 for tonality, that being a composition in which little sense of tonality exists. In this example there is no reference to C after the initial starting note.

Example 2. Laura's composition.

Meter

Meter was defined as the degree to which the composition conveyed a regularly occurring set of accented and unaccented beats. The rating scale for meter is as follows:

7 - Meter is clear throughout the composition.

1 - No sense of metric organization of any kind.

According to the mean of the judges ratings, metric strength for the sample population was 4.11. This was near the theoretical mean. The interjudge reliability was .83, again, acceptable for the research.
Vicky's composition (Example 1) shows a clear sense of metric organization throughout. On the other hand, Brian's composition (Example 3) was rated a 1 for metric strength. It was deemed to have no sense of metric organization of any kind.


Cohesiveness

Cohesiveness was defined as the degree to which the entire composition formed an organized whole. The rating scale used by the judges for cohesiveness is as follows:

7 - The entire melody has a logical form, phrasing, and closure.
1 - The melody is entirely random, with no degree of organization.

According to Table 5, the mean was near the middle of the 7-point range at 3.95. Reliability was quite high at .85. The judges chose Vicky's song, Example 1, as having logical form, phrasing, and closure throughout, therefore, a rating of 7 was given for this characteristic as well. Example 3 illustrates a composition that received a rating of 1 for cohesiveness. There is no phrasing or logical form found anywhere in this melodic line. The melodic line does not have any definite melodic or rhythmic pattern to hold it together.
Originality

To determine the degree to which the subjects' compositions were unique, ratings of originality were examined. Judges evaluated the compositions' originality using the following operational definition and rating scale:

Originality - the degree of uniqueness of the composition.

- 7 - Something entirely new to the norm for the population of the experiment.
- 1 - No uniqueness, similarities to a known song.

According to the table, originality centered near the average part of the scale at 3.39. The interjudge reliability was lower that the previously mentioned variables at .63. Example 4 was rated a 7 by the judges, indicating something entirely new to the norm for the population of the experiment. The composition is fashioned nicely using both duple and triple meter and a change of register at the end.


Example 5 was given a 1 rating for originality by the judges. Here, the composition merely follows a scale downward with little variation.
Example 5. Sue's composition.

Complexity

Complexity was a difficult characteristic to rate for the judges. Complexity was indicated by the degree of the variation in the pitch, durational values of the notes, contour of the line, and range of dynamics. The ratings used in the analysis are as follows:

Pitch

7 - Very involved, many changes in pitch.
1 - Uniformity in pitch.

Duration

7 - Very involved, many changes in duration.
1 - Uniformity in duration.

Contour

7 - Very involved, many changes in contour.
1 - Uniformity in contour.

Dynamics

7 - Very involved, many changes in dynamics.
1 - Uniformity in dynamics.
The interjudge reliabilities for the four aspects of complexity that were examined ranged from .69 for pitch complexity, to .16 for dynamic complexity, the lowest of all reliabilities. Mean ratings were 3.44 for pitch complexity, 2.87 for durational complexity, 3.44 for contour complexity, and 1.77 for dynamic complexity. Dynamics had a very low standard deviation (0.64), which indicated that there was little variability in the use of this characteristic. It should be noted that the low variability for dynamic complexity probably affected the reliability of the rating of this characteristic.

The first three variables are illustrated below. Examples of complexity of dynamics are not shown, because the judges found little variability among the compositions for this characteristic. It may be that, due to the nature of the piano, the judges had difficulty hearing dynamic contrast. Also, dynamic contrast may not have been a serious concern to the subjects, since many of them were not familiar with the action or touch of the keyboard.

Example 6 shows a high rating for complexity of pitch with numerous changes in the pitch. The composer used the entire allotted range of the keyboard.

A low rating for pitch complexity is shown in Example 7. The composer's use of narrow range and emphasis on the repeated C illustrates the uniformity of pitch.

Example 7. Colleens' composition.

Durational complexity was characterized by numbers of changes in the durational values of the notes. Example 4 rated a 7 for durational complexity and Example 8 illustrates complete uniformity in duration, rating a 1. Kerry (Example 4) uses a number of different durational values throughout her composition. Angie's composition (Example 8) consists entirely of notes of equal duration.

Example 8. Angie's composition.

Complexity of contour was the degree to which the contour or line of the melody varied. A rating of 7 meant there were many changes while a 1 indicated uniformity, once again. It should be noted that the reliability for contour complexity was a rather low .53, indicating this may have been a difficult characteristic for the
judges to agree upon. Example 9 shows a high rating for contour. Kim uses many skips in the melodic line, which rated her highly.


Example 2 illustrates a low rating in complexity of contour. The range of the melody reaches the interval of only a fifth.

Motivic Activity

Motives were defined as two or more notes or rhythmic durations that form distinct pitch or durational patterns. To rate the compositions for motivic activity, the judges merely enumerated repeated melodic, developed melodic, repeated rhythmic, and developed rhythmic patterns. The reliability statistics for motivic activity were quite high, repeated melodic motives .97, developed melodic motives .83, repeated rhythmic motives .84, and developed rhythmic motives .71. According to the mean ratings, repeated melodic and rhythmic patterns (3.22 and 4.55) occurred more frequently than developed melodic and rhythmic patterns (1.91 and 0.80). It is interesting that the standard deviations of three out of four of these characteristics were
larger than the mean. This indicates high variability in the use of repeated melodic, repeated rhythmic, and developed rhythmic patterns, according to the judges. For example, one student repeated the same melodic pattern 20 times while another had no repeated patterns of any kind.

Repeated Melodic Motives

Example 10 shows great use of repeated melodic motives. The mean of the judges rating for this example was 18.5. The first motive, repeated 10 times, used a quarter note triadic figure followed by the chord which was outlined by that triadic figure. The second motive started with a triplet and descended through the interval of a third, ending on quarter notes. This motive was repeated 18 times. Measure 1 is the first motive. Measure 2 is the second motive.

Example 10. Sue's composition.

The judges found no use of repeated melodic motives in Example 9.
Developed Melodic Motives

Example 11 shows the development of a melody from one basic motive. This composition had one of the best set of developed melodic motives in the sample population. The first measure is the motive that recurs in different tonal levels throughout the composition.

Example 11. Lisa's composition.

The next example was judged to have no developed melodic motive. The composition is a short illustration of a through-composed piece.

Example 12. Robin's composition.

Repeated Rhythmic Motives

Example 10 is a fine example of repeating a rhythmic motive throughout a composition. The judges found 10 repeated rhythmic motives in this composition.
Colleen's composition (Example 7) is an example of no repeated rhythmic motives in a composition.

**Developed Rhythmic Motives**

Example 13 starts with a basic quarter note-eighth note rhythm and develops it throughout the composition. This composition made the most frequent use of developed rhythmic motives, as rated by the judges. The first two measures develop into the third measure, and then into the fourth. This example illustrates the rhythmic motives used in the composition.

![Musical notation](image)

Example 13. Ellen's motives.

**Phrasing**

Phrasing was defined as a section of the music structured to convey a total or partial sense of completeness. Compositions were categorized by the judges as follows:

4-All phrases have relationship to each other
3-Some phrases have relationship to each other
2-Phrasing exists
1-No discernable phrasing exists
Phrasing characteristics were near the theoretical mean, according to the mean of the judges ratings (2.54). This indicates that the average subject used phrases that had some relationship to each other. Phrasing had a reliability of .69.

One of the most highly rated compositions, according to the judges, was Jen's composition, Example 14. It received a rating of 4 in phrasing.


The next example is a composition of great length, but no discernable phrasing. It received a rating of 1 from the judges for phrasing. The composition jumps from one end of the required range to the other with no logical form.


Replication

Replication achieved the highest mean rating (5.0). This indicates that the average student's ability to reproduce his or her composition was quite good. The reliability of replication was .69, according to the judges. The definition used by the judges along with the rating scale are as follows:

Replication - the degree of similarity between the replication and the original.

7 - Perfect replication of the composition.
1 - No replication of any part of the composition.

Length

Length of the compositions was measured in actual clock time once the subjects began their compositions. The mean time of the compositions for the sample population was 35 seconds.

The reader should note that many of the original compositions submitted by the students were rated quite high for some of the musical characteristics and rated quite
low for others. There were many compositions that were rated between the extremes of the ranges for each of the musical characteristics.

**Statistical Analysis of Student Characteristics**

**Music Experience**

To answer the research questions posed in Chapter 1, the independent variables of musical experience, musical aptitude, self-concept as a musician, age, and academic achievement were correlated with the dependent variables of tonality, meter, cohesiveness, originality, complexity of pitch, complexity of duration, complexity of contour, complexity of dynamics, repeated melodic motives, developed melodic motives, repeated rhythmic motives, developed rhythmic motives, phrasing, replication, and length.

Research question one asked if there was a relationship between in-school and out-of-school music experience and the musical characteristics of high school students' musical compositions. These data were analyzed in two ways. One analysis subdivided musical experience into all the various types of in-school and out-of-school musical opportunities available to the students and correlated each to the musical characteristics of their compositions. In the analysis, experience in a musical activity was coded 1, and no experience was coded 0. The second analysis used the sum of all musical experiences each student possessed as the independent variable and correlated the musical characteristics to this statistic. For example, a student in both band and orchestra was coded 2. Given the number of subjects (N=54), a correlation of .27 or greater indicated significance at the .05 level.
Table 6 shows the correlation of student musical experiences with the musical characteristics of the original compositions. When analyzed separately, the characteristic of private music lessons was significantly correlated to 10 of the musical characteristics of the original compositions.
characteristics including tonality, meter cohesiveness, originality, complexity of pitch, duration, and contour, developed melodic motives, phrasing, and replication. The significant correlations among the musical experiences was then ordered as follows: band was correlated with 8 dependent variables: tonality, meter, cohesiveness, originality, complexity of pitch and duration, phrasing and replication; choir correlated with 7 dependent variables: meter, cohesiveness, originality complexity of pitch, developed melodic motives, developed rhythmic motives, and phrasing; orchestra correlated with 2: complexity of pitch and duration, church choir with 2: complexity of pitch and contour, and other outside experiences with 2: originality and length (Table 6).

When correlating musical experience as the sum of all in-school and out-of-school experiences, which is a more comprehensive indicator of experience, 10 of the 15 musical characteristics had significant relationships with experience, and, therefore, many of the null hypotheses were rejected.

According to these findings, the following null hypotheses were rejected:

1a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of tonality in subjects' compositions.

2a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of meter in subjects' compositions.

3a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of cohesiveness in subjects' compositions.
4a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of originality in subjects' compositions.

5a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of pitch in subjects' compositions.

6a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of duration in subjects' compositions.

7a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of complexity of contour in subjects' compositions.

10a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of developed melodic patterns in subjects' compositions.

13a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the use of phrasing.

14a) There is no significant correlation between high school students' in-school and out-of-school musical experience and ratings of the subjects' ability to replicate their compositions.

When looking at the various categories of experience separately, significant relationships may have been affected by the relative number students participating in each activity. For example, the relatively few significant correlations with orchestra experience may be because the small number of orchestra subjects in the sample
happened to compose low rated compositions. This non-significance may not be representative of orchestra experience in general. Table 2, which appears earlier in this chapter, indicates the percentage of the sample population that participated in each specific organization or category.

Band, choir, private lessons, and overall musical experience were strongly correlated to the musical characteristics of tonality, meter, cohesiveness, originality, phrasing and replication (Table 6). Non-significant correlations between experience and complexity of contour and dynamics may be accounted for by the low reliability of these two musical characteristics.

All motivic characteristics had high interjudge reliability (Table 5). Low correlations between experience and the motivic characteristics suggest that these characteristics, which are more event-specific, are not related to experience. Whereas, the other variables are more global and are related to experience.

According to the statistics of this sample population, though, there is little significant correlation between experience and motivic development or repetition. The evidence tends to show that the degree to which patterns were used was simply not related to musical experience in the subjects. One significant correlation that bears remark is the degree of melodic motivic development, which was significantly correlated with both choir and overall experience.
TABLE 7

CORRELATION OF STUDENT MUSICAL APPTITUDE WITH MUSICAL CHARACTERISTICS OF ORIGINAL COMPOSITIONS

<table>
<thead>
<tr>
<th></th>
<th>MAP Tonal</th>
<th>MAP Rhythm</th>
<th>MAP Sens.</th>
<th>MAP Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonality</td>
<td>.42**</td>
<td>.26</td>
<td>.21</td>
<td>.35**</td>
</tr>
<tr>
<td>Meter</td>
<td>.44***</td>
<td>.29*</td>
<td>.29*</td>
<td>.40**</td>
</tr>
<tr>
<td>Cohesive</td>
<td>.46***</td>
<td>.33*</td>
<td>.28*</td>
<td>.41**</td>
</tr>
<tr>
<td>Originality</td>
<td>.47***</td>
<td>.37**</td>
<td>.28*</td>
<td>.43**</td>
</tr>
<tr>
<td>Comp. Pitch</td>
<td>.28*</td>
<td>.10</td>
<td>.13</td>
<td>.21</td>
</tr>
<tr>
<td>Comp. Dur.</td>
<td>.30*</td>
<td>.26</td>
<td>.26</td>
<td>.31*</td>
</tr>
<tr>
<td>Comp. Contour</td>
<td>.31*</td>
<td>.13</td>
<td>.10</td>
<td>.22</td>
</tr>
<tr>
<td>Comp. Dyn.</td>
<td>.26</td>
<td>-.09</td>
<td>.01</td>
<td>.10</td>
</tr>
<tr>
<td>Rep. Mel.</td>
<td>.00</td>
<td>.00</td>
<td>.11</td>
<td>.04</td>
</tr>
<tr>
<td>Dev. Mel.</td>
<td>.31*</td>
<td>.20</td>
<td>.26</td>
<td>.30*</td>
</tr>
<tr>
<td>Rep. Rhy.</td>
<td>-.06</td>
<td>-.03</td>
<td>.03</td>
<td>-.03</td>
</tr>
<tr>
<td>Dev. Rhy.</td>
<td>.16</td>
<td>.04</td>
<td>.11</td>
<td>.12</td>
</tr>
<tr>
<td>Phrasing</td>
<td>.45***</td>
<td>.32*</td>
<td>.37**</td>
<td>.43**</td>
</tr>
<tr>
<td>Replication</td>
<td>.31*</td>
<td>.32*</td>
<td>.37**</td>
<td>.34*</td>
</tr>
<tr>
<td>Length</td>
<td>.05</td>
<td>.05</td>
<td>.07</td>
<td>.06</td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001
Musical Aptitude

Research question two asked if there was a significant relationship between music aptitude and the musical characteristics of high school students' musical compositions. Table 7 shows correlations between the Music Aptitude Profile tonal, rhythmic, sensitivity, and composite scores and the musical characteristics of the students' compositions.

The following null hypotheses were rejected, when considering the MAP composite score as the measure of music aptitude:

1b) There is no significant correlation between high school students' music aptitude and ratings of the use of tonality in subjects' compositions.

2b) There is no significant correlation between high school students' music aptitude and ratings of the use of meter in subjects' compositions.

3b) There is no significant correlation between high school students' music aptitude and ratings of the use of cohesiveness in subjects' compositions.

4b) There is no significant correlation between high school students' music aptitude and ratings of the use of originality in subjects' compositions.

5b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of pitch in subjects' compositions.

6b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of duration in subjects' compositions.

7b) There is no significant correlation between high school students' music aptitude and ratings of the use of complexity of contour in subjects' compositions.

13b) There is no significant correlation between high school students' music aptitude and ratings of the use of phrasing.
14b) There is no significant correlation between high school students' music aptitude and ratings of the subjects' ability to replicate their compositions.

These statistics suggest that high school students with high musical aptitude, as measured by the Music Aptitude Profile, are likely to achieve high ratings on such musical problem solving tasks as composing. There was a significant correlation between the tonal, metric, and phrasal aspects of the original compositions and the MAP scores. Specifically, this indicates that students with high aptitude scores are more likely to achieve tonal, metric, and phrasal structure in their compositions.

MAP also relies on the students' ability to remember differences between two playings of a short melody. Those who displayed the ability to discriminate between the two playings tended to replicate their own songs more successfully.

Cohesiveness and originality were highly correlated with aptitude. It may be that the characteristics of cohesiveness and originality in the compositions were easily apparent to the judges and typical of students with high scores on MAP.

One notable aspect of these correlation figures can be observed by scanning vertically through the dependent variables. Complexity and motivic characteristics showed no significant relationship to the MAP rhythmic or sensitivity sections. However, tonal aptitude was significantly correlated with complexity of pitch, contour, and duration, and was also significantly related to developed melodic motives. It must be observed that the MAP tonal section was significantly correlated with a large number of the musical variables.

By correlating the MAP composite scores with the musical characteristics, it was shown that aptitude, indeed, was significantly related to musical achievement in the form of composition.
TABLE 8
CORRELATION OF STUDENT SELF-CONCEPT AS A MUSICIAN WITH MUSICAL CHARACTERISTICS OF ORIGINAL COMPOSITIONS

<table>
<thead>
<tr>
<th>SEMA Scores</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonality</td>
<td>.41**</td>
</tr>
<tr>
<td>Meter</td>
<td>.53***</td>
</tr>
<tr>
<td>Cohesive</td>
<td>.49***</td>
</tr>
<tr>
<td>Originality</td>
<td>.62***</td>
</tr>
<tr>
<td>Comp. Pit.</td>
<td>.50***</td>
</tr>
<tr>
<td>Comp. Dur.</td>
<td>.57***</td>
</tr>
<tr>
<td>Comp. Cont.</td>
<td>.31*</td>
</tr>
<tr>
<td>Comp. Dyn.</td>
<td>.31*</td>
</tr>
<tr>
<td>Rep. Mel.</td>
<td>.18</td>
</tr>
<tr>
<td>Dev. Mel.</td>
<td>.53***</td>
</tr>
<tr>
<td>Rep. Rhy.</td>
<td>.19</td>
</tr>
<tr>
<td>Dev. Rhy.</td>
<td>.37**</td>
</tr>
<tr>
<td>Phrasing</td>
<td>.54***</td>
</tr>
<tr>
<td>Replication</td>
<td>.29*</td>
</tr>
<tr>
<td>Length</td>
<td>.13</td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001

Self-Concept as a Musician

Research question three asked if there was a significant relationship between self-concept as a musician and the musical characteristics of high school students'
compositions. Table 8 shows the correlations between student self-concept as a musician, as calculated by the Self-Esteem of Music Ability (Schmitt, 1979) and a researcher generated questionnaire, and the musical characteristics of the student compositions.

The following null hypotheses related to self-concept as a musician were rejected:

1c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of tonality in subjects' compositions.

2c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of meter in subjects' compositions.

3c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of cohesiveness in subjects' compositions.

4c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of originality in subjects' compositions.

5c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of pitch in subjects' compositions.

6c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of duration in subjects' compositions.

7c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of contour in subjects' compositions.
8c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of complexity of dynamics in subjects' compositions.

10c) There is no significant correlation between high school students' self-concept as a musician and ratings of the presence of developed melodic patterns in subjects' compositions.

12c) There is no significant correlation between high school students' self-concept as a musician and ratings of the presence of developed rhythmic patterns in subjects' compositions.

13c) There is no significant correlation between high school students' self-concept as a musician and ratings of the use of phrasing.

14c) There is no significant correlation between high school students' self-concept as a musician and ratings of the subjects' ability to replicate their compositions.

The most striking property of these results is the large number of significant relationships. Furthermore, over half of the 12 musical characteristics that were significantly correlated with self-concept were significant at the .001 level. Repeated melodic motives and repeated rhythmic motives were the two dependent variables that were not significantly correlated. It could be that to repeat a motive does not require a high level of self-concept as a musician.

These data provide strong evidence that self-concept is significantly related to musical problem-solving.
### TABLE 9

**CORRELATION OF STUDENT AGE WITH MUSICAL CHARACTERISTICS OF ORIGINAL COMPOSITIONS**

<table>
<thead>
<tr>
<th>Student Age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonality</td>
<td>.25</td>
</tr>
<tr>
<td>Meter</td>
<td>.15</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>.17</td>
</tr>
<tr>
<td>Originality</td>
<td>.38**</td>
</tr>
<tr>
<td>Comp. Pit.</td>
<td>.36**</td>
</tr>
<tr>
<td>Comp. Dur.</td>
<td>.37**</td>
</tr>
<tr>
<td>Comp. Cont.</td>
<td>.53***</td>
</tr>
<tr>
<td>Comp. Dyn.</td>
<td>.24</td>
</tr>
<tr>
<td>Rep. Mel.</td>
<td>.03</td>
</tr>
<tr>
<td>Dev. Mel.</td>
<td>.16</td>
</tr>
<tr>
<td>Rep. Rhy.</td>
<td>-.02</td>
</tr>
<tr>
<td>Dev. Rhy.</td>
<td>.15</td>
</tr>
<tr>
<td>Phrasing</td>
<td>.28*</td>
</tr>
<tr>
<td>Replication</td>
<td>.00</td>
</tr>
<tr>
<td>Length</td>
<td>.23</td>
</tr>
</tbody>
</table>

* p<.05, ** p<.01, *** p<.001

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Research question four asked if there was a significant relationship between age and the musical characteristics of high school students' musical compositions. Table 9
shows the correlations between age the musical characteristics of the students’ compositions.

The following null hypotheses were rejected:

4d) There is no significant correlation between high school students' age and ratings of the use of originality in subjects' compositions.

5d) There is no significant correlation between high school students' age and ratings of the use of complexity of pitch in subjects' compositions.

6d) There is no significant correlation between high school students' age and ratings of the use of complexity of duration in subjects' compositions.

7d) There is no significant correlation between high school students' age and ratings of the use of complexity of contour in subjects' compositions.

13d) There is no significant correlation between high school students' age and ratings of the use of phrasing.

The variable of age was significantly correlated with 5 musical variables. There were significant relationships between age and originality, complexity of pitch, complexity of duration, and complexity of contour, and phrasing. It may be that age is a factor in composing a more complex and original piece of music. Phrasing is the other significantly related musical variable. Its significant, but rather low correlation coefficient, may indicate a spurious relationship, suggesting that significance might be absent with a different population of 15 to 18 year olds. It is also interesting to note that complexity was not related to MAP rhythmic aptitude and musical sensitivity but it was related to age.

According to the statistics, the variables of tonality, meter, cohesiveness, and all motivic characteristics are not significantly related to age, with this particular age group.
TABLE 10
CORRELATION OF STUDENT ACADEMIC ACHIEVEMENT WITH MUSICAL CHARACTERISTICS OF ORIGINAL COMPOSITIONS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonality</td>
<td>.25</td>
</tr>
<tr>
<td>Meter</td>
<td>.25</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>.22</td>
</tr>
<tr>
<td>Originality</td>
<td>.22</td>
</tr>
<tr>
<td>Complexity Pitch</td>
<td>.15</td>
</tr>
<tr>
<td>Complexity Duration</td>
<td>.22</td>
</tr>
<tr>
<td>Complexity Contour</td>
<td>.27*</td>
</tr>
<tr>
<td>Complexity Dynamics</td>
<td>.07</td>
</tr>
<tr>
<td>Repeated Melodic</td>
<td>.01</td>
</tr>
<tr>
<td>Developed Melodic</td>
<td>.00</td>
</tr>
<tr>
<td>Repeated Rhythmic</td>
<td>-.04</td>
</tr>
<tr>
<td>Developed Rhythmic</td>
<td>.06</td>
</tr>
<tr>
<td>Phrasing</td>
<td>.32*</td>
</tr>
<tr>
<td>Length</td>
<td>.05</td>
</tr>
<tr>
<td>Replication</td>
<td>.15</td>
</tr>
</tbody>
</table>

*p<.05

Academic Achievement

Research question five asked if there was a significant relationship between academic achievement and the musical characteristics of high school students' musical
compositions. Table 10 shows the correlations between academic achievement as measured by students' grade point average and the musical characteristics of the students' compositions.

The following null hypotheses were rejected:

7e) There is no significant correlation between high school students' academic achievement and ratings of the use of complexity of contour in subjects' compositions.

13e) There is no significant correlation between high school students' academic achievement and ratings of the use of phrasing in subjects' compositions.

Academic achievement, as measured by students' grade point averages, did not appear to be a major factor in musical problem-solving in this research. The implication is that students can display highly rated musical characteristics in their compositions without the benefit of high academic achievement.
CHAPTER 5

SUMMARY AND IMPLICATIONS FOR TEACHING AND RESEARCH

The purpose of this study was to determine whether significant relationships exist between the characteristics of musical experience, musical aptitude, musical self-concept, age, and academic achievement of high school students and the musical characteristics of their original compositions. The analysis of the results, presented in Chapter 4, gave a descriptive account of the correlations and selected compositions.

The final chapter of this dissertation begins with a summary of the major findings. This is followed by an analysis of the methodological problems encountered in the study. The chapter concludes with discussions of the implications of this study for teachers and researchers.

Summary of Major Findings

Of the five student characteristics studied, subjects' self-concept as musicians was the variable most frequently correlated with the musical characteristics of the original compositions. Of the 14 musical variables analyzed, 12 were significantly correlated with self-concept, followed by experience with 10 significant correlations, aptitude with 8, age with 5, and academic achievement with 2. In the next section, each student variable is discussed separately.

Musical Experience

Webster (1979) suggests that those persons with some musical background tend to do well on tasks of musical creativity. According to the results of the study, the
characteristic of experience was positively correlated with the following musical variables: tonality, meter, cohesiveness, originality, complexity of pitch, complexity of duration, and complexity of contour, developed melodic motives, phrasing, and replication. This implied that students who had some type of musical experience (i.e., private lessons, ensemble experiences, church or other outside-of-school activity) were likely to have demonstrated a more successful creative product in this research. Therefore, the results indicated by the analysis of the effects of music experience on students' original compositions support the conclusions drawn by Harrison (1990) and Weisberg (1988), who found that solutions to problems are based on past experience in general and, specifically, that measures of musical experience better predict success in music problem-solving than do measures of music aptitude. The evidence also supported the belief that a wide variety of musical experiences tend to increase student achievement on musical tasks (Colwell, 1963; Pembroke & Taylor, 1986). Dynamic complexity, repeating motives, and developed rhythmic motives were the only non-significant variables with musical experience. All other characteristics were positively correlated with musical experience.

Experience in private lessons, band, and choir had the most numerous significant correlations with the musical characteristics. The relatively few significant correlations related to orchestra and church choir experience may be due to the fact that few subjects in this study participated in those activities. It may be that those few subjects' efforts may not have been representative of orchestra or church choir participants in general.
Musical Aptitude

The results of this study suggest that there was an important relationship between music aptitude and the musical characteristics of students' original compositions. The investigation of musical aptitude revealed several differences among tonal aptitude, rhythmic aptitude, and musical sensitivity, as measured by the Music Aptitude Profile. Tonal aptitude was positively correlated with all variables except the repeated motive variables, dynamic complexity, and developed rhythmic motives. Subjects with high tonal aptitude, therefore, tended to use tonality, meter, originality, phrasing, replication, and complexity more successfully than did subjects with low tonal aptitude.

Rhythm aptitude, interestingly, was not significantly correlated with repeated or developed rhythmic motives. It was correlated with metric strength. Complexity and motivic variables were not significantly correlated with rhythm aptitude. However, the results indicated that subjects with high rhythm aptitude tended to compose music with more cohesiveness and originality, and clearer phrasing. In addition, they were more able to replicate their compositions. The findings of this research concerning aptitude in its various forms tend to support the research of Norton (1980) and Kehrberg (1984), who found significant relationships between music aptitude and auditory memory, exposure to variety of music, and musical training, although Norton's study involved primary school-aged children and included only testing measures of musical aptitude and auditory memory. Kehrberg's study was more global, including subjects in grades 4 through 12, and the setting was rural. It may be that effects of maturation would change the results of either study in relation to the present research. Yet, the significant relationship of music aptitude and the exposure to musical experiences on
students test performances remains an important result for the relationship of music aptitude and experience to musical problem solving.

The results of the present study tend to refute the findings of Schmidt and Sinor (1986), Swanner (1985), and Webster (1987), all of whom found few relationships between music aptitude and creativity. In the research of Schmidt and Sinor, though, the testing sample included only 2nd graders and used the Webster (1983) Measures of Creative Thinking in Music as a measure of creativity. These factors could have contributed to the discrepancies in the findings. Gordon's (1977) Primary Measures of Music Audiation was used to measure musical aptitude as well.

The results are also contrary to Swanner (1985), who found no significant relationship between creativity and music aptitude as measured by the Gordon (PMMA), and the Webster PMMA-II. Her sample population was 3rd grade students.

Webster (1987) found no significant relationship between aptitude and creativity, either. His study examined the divergent thinking skills of 6 to 9 year olds on 10 scored tasks. These creative tasks were divided into three parts to include exercises in exploration, application, and synthesis. These tasks involved musical improvisation and composition. The difference in age group, instruments used, and perhaps the sample itself, may have contributed to the differences in the findings in all of these studies. For example, Webster's test population came from an elementary school on the east side of Cleveland, which has a very different make-up from the west side, where the present research took place. Perhaps the differences can be explained by the maturation and enculturation that would normally occur with older children.

Musical sensitivity was significantly related to meter, cohesiveness, originality, phrasing and replication ratings. The compositions judged to be more original and
cohesive tended to be composed by subjects with higher musical sensitivity. These findings support the research done by Gorder (1976) and Webster (1979) on divergent thinking and its inclusion as an appropriate measure of musical aptitude.

The composite scores for aptitude showed that this student characteristic as measured by the *Music Aptitude Profile*, was a good predictor of musical problem-solving ability. Composite scores were significantly related to ratings of tonality, meter, cohesiveness, originality, complexity of duration, melodic motivic development, phrasing and replication. This indicated that compositions with high marks on these musical characteristics tended to come from students with higher music aptitude.

Self-Concept

According to the analysis presented in Chapter 4, there were, indeed, significant relationships between students' self-concept as musicians and the majority of the music characteristics of the students' compositions. This finding suggests that the better the student feels about himself or herself as a musician, the more student's original composition will display the musical qualities analyzed in this study. This finding supports the work of Austin (1990), Greenberg (1970), Hedden (1982), Schmitt (1979), Svengalis (1978), and VanderArk, Nolin, and Neumann (1980). Their research concluded that self-concept was an important indicator in the success of musical achievement in both non-musicians and musicians.

Both Schmitt and Svengalis developed tests to indicate the levels of importance of self-concept, while VanderArk, Nolin, and Neumann found that participation in music groups had a positive effect on students' self-concept. Although theirs was a longitudinal study of students in the 3rd through 6th grades, the evidence points toward
a positive relationship between self-concept and music achievement. Austin's (1990) research used the measure of self-concept developed by Schmitt (1979), and achieved the same results as the present research. Greenberg's (1970) empirical study was done with singers and involved elementary-aged students, yet, he found that improving the self-concept of the individual increased the music achievement of the majority of the students involved in private voice lessons.

Parallels can, again, be drawn between performance and composition as examples of musical achievement and, therefore, musical problem solving, and its relationship to self-concept, as indicated by the results of the present research. In fact, 7 out of 12 of the musical characteristics correlated significantly with self-concept at the .001 level. The students who regarded themselves more positively as musicians tended to compose music with higher ratings in originality (.62), meter (.53), tonality (.41), phrasing (.54), cohesiveness (.49), and were better able to replicate their songs (.29), than those with lower self-concept. Students who had high self-concept as musicians also showed similar results in ratings of complexity and motivic development. All four components of complexity, pitch (.50), duration (.57), contour (.31), and dynamics (.31), were positively correlated to self-concept. The developmental aspects of motive, both melodic (.53) and rhythmic (.37), were also positively correlated with self-concept. There was no evidence to suggest that the use of repeating rhythmic or melodic motives is related to positive self-concept as a musician.

Age

Age, as it related to the musical characteristics of students' original compositions, had few significant correlations with the musical characteristics of the
original compositions that were investigated. Only in the qualities of originality, complexity, and phrasing, was age significantly correlated. This study does support Doig’s (1942) results showing older children more consistent in meter and phrasing in original compositions.

Yet, the paucity of significant correlations suggests that 15 to 18 year olds may be at a developmental plateau in regard to the other dependent variables in the study. This finding supports Webster’s (1979) research that age or grade level had little relationship to creative behavior, and tends to refute Seals’s (1989) and Kratus’s (1985) findings indicating that age is a significant predictor of compositional ability. Conversely, the findings might have indicated that the strength of all other musical variables examined in this study was comparable in all ages of the test population. These findings could also be the result of the incomplete randomness of the test population.

**Academic Achievement**

The final independent variable investigated was academic achievement as measured by students’ grade point average. Academic achievement is occasionally used as an indicator of general intelligence in research (Kehrberg, 1984). Students were asked to give their overall grade point within a range, which was recorded by the researcher. Only two musical characteristics correlated significantly with this student characteristic, contour complexity (.27) and phrasing (.32). Although these correlations were significant, they were fairly low. This implied that high academic achievement need not be a criterion for successful creative musical problem-solving. This result tended to refute Hedden’s (1982) finding that academic achievement was the
best single predictor of music achievement, although his subjects were elementary students, exclusively.

This evidence supported the research done on general creativity and academic achievement done by Aliotti and Blanton (1973), Cacha (1976), Edwards and Tyler (1965), and Kemp (1981a), all of whom reported the absence of any consistent relationship between musical achievement and academic achievement. It also supported Eisner's (1987) view that creativity and other non-traditional measurements of aptitude are more indicative of intelligence than popular tests of general achievement, as well as Gardner's (1990) belief that traditional multiple choice tests are not the embodiment of the measurement of intelligence. It was also supportive of Webster's (1990) view that much research in creativity tends to confuse general intelligence with the ability to think creatively in music.

**Shortcomings of Present Study**

The results of this study were based on two assumptions: 1) the judges' ratings accurately described the musical characteristics of the subjects' songs, and 2) that the subjects' understanding of musical elements was reflected in their compositions. The relatively low interjudge reliability for some of the song characteristics called into question the first assumption. Students' knowledge of musical problem-solving may not have been reflected in what they did. This cast doubt on the second assumption.

Interjudge reliability coefficients for the dependent variables ranged from .16 to .96, with the lowest being complexity of dynamics (.16), followed by complexity of contour (.53). Little variability among subjects on some characteristics, such as dynamic complexity, accounted for some of the low figures. More researcher
involvement with judges evaluating practice songs may have enhanced interjudge reliability for other characteristics. Also, the judges felt some definitions and rating scales needed further clarification. For example, the various categories of complexity used the ratings were too vague. Pitch, contour, and duration were all interpreted differently by the judges and needed verbal explanation by the researcher. Still, low reliability figures may have been the result of the highly subjective nature of the rating procedure. Evaluating the structure and substance of students' compositions requires much personal interpretation and application of operational definitions. Substantial agreement, although achieved on some of the more objective criteria, such as repeated melodic and rhythmic motives, may not have been possible for all variables. The low reliability figures were further evidence that external, independent evaluation of the songs, without researcher influence, was essential. For example, a researcher looking for specific differences in the use of meter might be more open to hearing metric strength from a student with higher rhythmic aptitude than one with lower aptitude. Using qualified, independent judges did not eliminate the subjectivity involved, but did reduce the likelihood of self-fulfilling results.

Another problem with the study was the method of song collection. Although subjects were not required to use notation in any form there could have been differences between subjects' intentions and their actions. Kratus (1991) refers to this phenomenon as the degree of intentionality, which he defines as the amount of correspondence between intention of a musical action and the ultimate carrying out of the action. It cannot be assumed that because the composer's final product was flawed or did not receive a high rating, that the composer's understanding of his product was flawed. Playing the piano, which required pressing a certain sequence of keys for the
right durations, with the proper pressure, in order to transform an idea into audible music, was a formidable task. According to Kratus (1991), more time spent in the composing process affects the intentionality of the finished product. The more time given to refinement of the composition through repetition and rehearsing, the more likely will the outcome equate to the intentionality. Although time was given for rehearsing and composing, it was likely that some subjects forgot the sequence of notes they wished to use. Others perhaps found the instrument too unfamiliar or cumbersome to develop their musical ideas effectively.

Kratus (1985) pointed out that all studies measuring mental abilities by covert means have similar problems of reliability and validity. Therefore, understanding these limitations, the results reported here should be considered tentative. Studies involving high school students using different research techniques, sample populations, and demographics, should be done to support or refute the conclusions drawn by this research.

**Implications for Teaching**

Creative musical activities require the learner to work with the musical elements and their governing principles (Sherman, 1971b). Based on the research of others cited in this work, the inclusion in an educational program of musical activities that enrich the individual's musical creative ability by engaging in the creative process to produce a musically creative product is justified and recommended (Benson, 1973; Torrence, 1988).

This research emphasized the importance of compositional activities as an aid to creative thinking. This exercise could lead to a shift toward student-centered activities
and away from the traditional teacher-centered activities of practicing lower cognitive skills indicative of many general music classes. Students could come to understand the process of composition through the organization, experimentation, and revision of sounds. This hopefully would lead to more logical, divergent thinking as well as a greater appreciation of the musical composition processes of the masters (Benson, 1973).

Musical problem solving tasks would give arts programs an opportunity for individual expression and artistic creativity (Goodlad, 1984). Any limiting of the concepts of creative thinking penalizes students whose aptitudes might lie outside of the normal concepts of teaching and of practice (Eisner, 1987).

Pedagogical goals should be sequenced for student compositions that lead to the understanding of the elemental aspects of music. More subjective goals such as originality, cohesiveness, and complexity could then be established as the abilities of divergent thinking are enhanced. Kratus (1990) explains how goals can be sequenced by steadily increasing the number of elements or principles in a product objective. These objectives can be personalized to assist each student through individual deficiencies in syntax or creative thinking.

The results of this study have implications for the implementation of musical problem solving tasks into high school curricula. It should be realized from this research that all high-school-aged children can do individual composition projects without formal, theoretical knowledge or prior composition experience. It might be more productive to structure composition sessions into a two-track format. One track could be for those students with musical experience, the other could be for the non-experienced students. Based upon the strong relationship of musical experience to the
musical characteristics of students' original compositions, it is possible that the experience of private music lessons, specifically, could contribute to better results on tasks of creative musical problem solving, and that increased participation in musical activities, in general, could improve students' abilities at composing.

According to the results of this study, a musical aptitude test might be a satisfactory method of identification of those students who would tend to do the best on compositional tasks. For a melodic compositional task such as the one used in this research, the MAP tonal test, specifically, would be the most accurate measure of assessment of aptitude, based upon its strong relationship to the musical characteristics of the students' compositions.

Teachers should be aware of the positive influences that high self-concept as a musician has on students, as evidenced by its strong significant relationship to most of the musical variables in this study. Students feel a sense of accomplishment, given an opportunity to create something musically unique. The students are involved in a process that involves the discovery of musical self-expression which can lead to a willingness to work for recognition and intrinsic motivation (Austin, 1990). Testing the level of self-concept might help educators identify students for whom individualized help in problem solving would be beneficial, based upon its strong relationship to the musical characteristics of the students' compositions. Though not directly related to the research, it is possible that participation in musical activities would act to raise the musical self-concept of high school students.

Based on the relationship of age and the musical characteristics of the original compositions, high school students' age need not be a consideration in the
establishment of a class or session in musical problem solving. It is possible that classes of mixed age groups could be beneficial.

It seems clear from the results of this research that students, irrespective of their academic ability, can be creative and can be successful in musical problem solving tasks. Therefore, academic achievement need not be considered in devising tracking systems or class structures.

It might be advisable to give some directions limiting the duration of students' original compositions. Those with the lengthiest compositions tended to have less organization and more musical rambling. Restrictions placed on length might enhance tonal and rhythmic structure. Conversely, those with the shortest compositions needed much elongation for any examination of musical characteristics to occur. Directions on limiting or lengthening the compositions' duration might lead to better compositional development, as is pointed out by Reinhardt (1990) as a particular problem in her research.

**Implications for Research**

Research studies that examine students' original compositions are rare. Even more unusual are studies which look at developmental characteristics in high school aged students.

The method of song analysis used in this research needs some refinement before being attempted by others. Further revision of definitions and rating scales used by the independent judges may lead to higher reliability figures in future research. Dynamic complexity should perhaps be eliminated from such a rating sheet, because
judges may have difficulty in hearing differences on tapes of compositions, and
students with no keyboard experience may have problems with the action of the piano.

Future studies that examine original compositions could encompass various
strategies. 1) The present study could be replicated using different subjects and judges.
This could carry substantial weight toward supporting or refuting the findings reported
here. 2) The whole developmental spectrum of 15 to 18 year olds could be further
investigated due to the dearth of information on creativity projects for this age group.
3) A longitudinal study using original compositions could be examined where subjects
would compose periodically during their high school years with emphases on differing
aspects of tonality, meter, phrasing, and motivic characteristics placed at each step. 4)
Other art forms, such as painting, writing, or theatrical presentations could be
incorporated into multi-art studies for comparison of creative problem-solving abilities
in high school students. 5) Music could be used as a catalyst for creativity projects in
these other art forms. For example, students could create an art work in any medium
they chose from the hearing and studying of a known composition.

The importance of creativity and divergent thinking cannot be overstated in the
development of innovative music curricula. It is in this type of restructured creative
programming that music education may find a truly defensible reason to exist. It is the
hope of this researcher that others will examine the original musical products of high
school students in an effort to expand the foundation of creativity research in music.
APPENDIX A

Letter of Permission

Dear Student and Parent:

During my tenure at Valley Forge as orchestra director, I have taken a great interest in creativity in the classroom. I am presently conducting research in creativity that is associated with my doctoral work at Case Western Reserve University, and I would like to have your permission to give your son or daughter two simple music tests. The tests will take a maximum of three periods to complete. Then each student will set up a time with me to come to the music department to compose a composition at the piano. It does not matter whether he/she is involved in music or knows anything about music. In fact, if he/she does not know how to play piano, it may enhance my results.

Mr. Roberts and Mr. Zilka, our principal and deputy principal, as well as our counselors, have offered their cooperation with this project. The results of these tests will be kept entirely confidential, and they will not affect your child's grades in any way. They will, however, advance the body of research in creativity and may lead to an improved curriculum for everyone. If you wish, I will be happy to share the findings with you.

Please complete the bottom portion of this sheet, and have your son or daughter return it to school on or before May 10, 1991. Thank you very much.

Sincerely,

Mr. Rand Laycock

-----------------------------------
Student's Name____________________

Student's Birthdate (mo./day/year)_____/______/_______

Student's lunch or free periods (if any)__________

Has your child taken music lessons on an instrument or voice for more than one year? (circle one) Yes No

May I give your child these tests? (circle one) Yes No

Your Signature __________________________
APPENDIX B

Student Questionnaire

Name __________________________

Grade ____ Age ____  Date of Birth (Mo.) ____ (Day) ____ (Yr.) ____

Your school grade average ___ I participate in the following:

E to D ____  ___ School band
D to C ____  ___ School orchestra
C to B ____  ___ School choir
B to A ____  ___ Church choir

___ Private lessons
___ Other musical activity

I have played or sung solos in church or public programs

___ Yes  ___ No

132
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133-135

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APPENDIX D

Composition Rating Sheet

Composition Number

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<td>Meter</td>
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<td>Originality</td>
<td>______</td>
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<td>Complexity</td>
<td></td>
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<td>(1 - 7)</td>
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<td>d) dynamics</td>
<td>(1 - 7)</td>
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<td>Motive</td>
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<td>______</td>
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<td>b) Number of developed melodic patterns</td>
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</tr>
<tr>
<td>c) Number of repeated rhythmic patterns</td>
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136
REFERENCES


