THE DEVELOPMENT AND INVESTIGATION OF A SEMANTIC DIFFERENTIAL INSTRUMENT FOR USE WITH MUSIC

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This is to certify that the

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ABSTRACT

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By

Arthur Robert Buss

This study was an investigation of the potential use of the semantic differential (SD) technique as a method for measuring attitudes toward music. The SD technique is described in The Measurement of Meaning by Osgood, Suci, and Tannenbaum and provides a means by which an individual's or a group's reaction to some object or concept could be measured on three or more dimensions. Osgood, et al., found that in most studies three distinct dimensions appeared: EVALUATION, POTENCY, and ACTIVITY.

In this study, the assumption was made that if individual attitudes about music differed, there would be corresponding differences in the way each individual ranked music on the semantic factors. An SD could then be used as an instrument for measuring attitudes toward music if such differences among ratings could be detected.

The investigation involved two problems. First, SD's had been used primarily with verbal symbols or visual objects. The subjects might respond differently to music, which is both non-verbal and non-visual. Thus, some question existed about the usefulness of the three dimensions defined by Osgood et al. Therefore, the first

problem was to find the semantic factors that people did use to define music. The second problem was to determine if differences among various groups could be measured by the use of factor scores, and if these differences could be related to musical attitudes. If the instrument used in this study were to effectively measure these attitudes, it had to be sensitive enough to register known group differences.

For this study, an instrument labeled the Musical Semantic Differential (MSD) was developed. This instrument consisted of twenty-four bipolar adjectival scales and ten pieces of music randomly chosen from A Dictionary of Musical Themes by Barlow and Morganstern. The reliabilty of the instrument was estimated for a period of twenty-four hours under test--retest conditions. The correlations were: Factor One, r=.90; Factor Two, r=.90; Factor Three, r=.72; and Factor Four, r=.86.

Four factors were established and accounted for a total of 53 percent of the variance. The first factor was related to Osgood's EVALUATION factor, but the factor seemed to include some degree of affective response. The EVALUATION was the strongest with 20 percent of the variance. The second factor confirmed Osgood's POTENCY dimension and contained 13.5 percent of the total variance. Osgood's third dimension--ACTIVITY--was not confirmed and two other dimensions appeared instead. The third dimension was labeled NOVELTY; it was the weakest of the four with only 8 percent of the variance. The final dimension was labeled COMPLEXITY and

may have been related to Osgood's ACTIVITY factor. The COMPLEXITY factor accounted for 11 percent of the total variance.

The subjects (N=434) participating in the study represented six different groups. Four of these groups were selected to represent "normal" attitudes toward music in that they were assumed to include subjects with all degrees of attitude toward music. Two additional groups were selected to represent strong positive attitudes toward music. One of these latter groups consisted of subjects who had enrolled in Evening College class on the symphonies of Beethoven. The second group included graduate students in music education.

Even though differences in attitude apparently existed, the differences could not be demonstrated by an analysis of variance of the group means. No differences could be shown for predicted differences among the groups across all the factors. The EVALUATION and NOVELTY factors did evidence some group differences, but these differences were not demonstrably related to attitude.

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A. R. B.

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CHAPTER I

INTRODUCTION

> One of the important goals of teaching is to prepare the student to use the skills and knowledge he has learned and to prepare him to learn more about the subjects he has been taught. One way of reaching this goal is to send the student away from the learning experience with a tendency to approach, rather than avoid, the subject of study [Mager, 1968, p. 5; italics are his].

Music education, by definition deals with the process of teaching an art form; thus, music education is aesthetic education. Without positive or, at least, neutral student attitudes, little can be done to develop aesthetic experiences within the student. Therefore, the music teacher cannot be solely concerned with the development of cognitive knowledge and psycho-motor skills, but must also attempt to promote affective learning within his students, e.g., aesthetic judgment and musical values.

> There is considerable agreement that the attitudinal and relevant factors of aesthetic experience are not found on universal responses in tonal materials, but acquired through education. Proof for this lies in the tendency for the trained listener to objectify musical meanings (to explain in technical terms) and the untrained listener to subjectify (to explain in sensuous terms). In other words, if the aesthetic experience occurs as an interaction between the listener and the musical work, the value of the experience depends on both the preparation of the subject to perceive and the intrinsic value of the object to yield. It is in the cultivation of desirable attitudes, of experience through interaction with aesthetic . . . objects, that education makes its contribution. The paramount task for music education is not only to nurture the improvement of taste and discrimination, but also to develop the latent aesthetic reasons or criteria for such behavior. [Schwadron 1967, p. 15-16; parentheses are Schwadron's, the italics were added.]

The "cultivation of desirable attitudes" is necessary; yet, if the effectiveness of the cultivation is not measured, how does a teacher know if it has occurred? As a result, the development of instruments which measure such change becomes important.

Educational objectives which deal with attitudes and attitude change fall within the affective domain, as defined by Bloom (1956), and Krathwohl, Bloom, and Masia (1964). Objectives which fall within the affective domain are more difficult to measure than those of either the cognitive or psycho-motor domains. This difficulty is due to what Eiss and Harbeck (1969) called a "credibility gap." The gap is the difference between the actual goal achievement of a student and what is indicated by the instrument used to measure that achievement.

This credibility gap is least in the psycho-motor domain because a psycho-motor objective generally deals with a student demonstration of some physical skill; the desired goal and required task are one and the same. In the cognitive domain, the gap is somewhat greater because cognitive objectives are measured by asking the student to make the correct response from a set of potential responses. The teacher cannot be certain that the correct responses were not due to some other cause than the desired learning (such as chance or dishonesty) nor that any incorrect responses were not due to misunderstanding of the task by the student rather than failure to achieve the desired objective.

The credibility gap is greatest in the affective domain, for although there are many overt responses which may signal affective response, no one behavior or pattern of behaviors is a valid indicator

for all individuals. Furthermore, once a student is aware of a desired behavior, he will often seek to emulate that behavior whether or not affective learning has acutally occurred. Thus, he may act in the manner desired by the teacher out of respect for the teacher or merely to receive a higher mark in the class. In any event, the potential validity of any test of attitude may be open to question.

Nevertheless, if teachers are to know the effectiveness of procedures used to strengthen positive attitudes, they must have some means for measuring those attitudes. In the light of the foregoing discussion, it becomes apparent that an instrument which could accomplish the task must be both nonreactive and objective. It should be nonreactive because if the students knew what the tests were for, they might not give honest answers. The instrument should be objective, because subjective evaluation may change drastically from one rater to another. The semantic differential is proposed as a means for developing an instrument which meets both of these qualifications.

I. PURPOSE OF STUDY

The purpose of this study is to test a semantic differential technique as a means for providing a nonreactive instrument for testing attitudes toward music. To do this, two objectives must be achieved. First of all, semantic differential techniques must be shown to be appropriate for use with music. Secondly, the responses of people with strong positive attitudes toward music must be shown to be different from the responses of subjects with normal or low positive attitudes.

II. HYPOTHESES TO BE TESTED

These hypotheses will be expanded and stated in testable form in Chapter IV.

Hypothesis I: Semantic differential techniques are appropriate for use with musical examples.

Hypothesis II: The semantic factors which appear conform to factors found in related studies.

Hypothesis III: Factor scores of the dimensions shall reflect differences due to the variable of attitude toward music.

III. DEFINITION OF TERMS

Several terms, some already used extensively, must be defined. For the purpose of this study:

Affective response means the emotional reaction of a person to a given stimulus. In this case, the stimulus is to be a musical excerpt or excerpts.

"An attitude is a learned predisposition to respond positively or negatively to a given class of objects [McGrath, 1964, p. 21]."

The term concept, when used in connection with a discussion of semantic differential techniques or with the instrument constructed for use with this study, refers to the object to which subjects respond on a semantic differential. In this study, the subjects respond to musical excerpts, therefore, those excerpts are termed "concepts."

A dimension refers to a factor and is used synonymously with it.

"A factor is a construct, a hypothetical entity that is assumed to

underlie tests and test performance [Kerlinger, 1965, p. 650]."

Factor analysis is a mathematical method for determining the number and nature of factors or underlying variables among a number of measures.

Loadings are the numerical representations of the relative strength of each measure or variable within a given factor. Loadings range from -1.00 to +1.00. In this study, a strong loading is defined as any loading of $\pm$.40 or greater. A high loading is at least $\pm$.40 and .2 larger than the loading on any other factor.

Musical taste is the attitude or set of attitudes which enables an individual to express a preference for any one piece or class of music over another. Musical taste is a value structure.

Music appreciation is a term which has been used indiscriminately to describe a variety of affective and cognitive responses to music. Therefore, the term will be used only when necessary to discuss writings which do use the term.

The term variable, when used in connection with a discussion of factor analysis or with semantic differential techniques, refers to the measures upon which the factor analysis is based. In this case, the variables will be adjectival scales as described later.

IV. THE SEMANTIC DIFFERENTIAL

In recent years a new tool for research in the behavioral sciences has found wide usage. This technique, the semantic differential (later in this document referred to as SD) has been widely used for research in the areas of linguistics, communications, cross-cultural studies,

and attitude evaluation. A recent book (Snider and Osgood, 1969) lists over forty pages of bibliography devoted to articles dealing with the SD.

Although often referred to as "the" SD, there is no one instrument in general use. Most researchers have developed their own instruments in response to the peculiar needs of each study. The diversity of potential uses denies the possibility of one instrument serving every need.

SD technique provides a means for the development of an objective instrument for measuring subjective responses. An SD instrument is objective because the data gathered is readily converted to numerical terms and may be submitted to mathematical analysis. On the other hand, the subject must make subjective decisions about various concepts. In addition, when a mathematical analysis is completed, the interpretation of the results remains subjective.

In actual practice, an SD is simple to take and to administer. (Both an instruction sheet and a sample response sheet are provided in Appendix A.) When an SD is given, the subjects are asked to respond to a specific concept by marking each of a series of bipolar adjectival scales for direction and intensity. The concept may be any one of a number of things. In the original usage, nouns or proper nouns were generally used as a stimulus. Other studies involved the use of such things as paintings, sonar sounds, and, in at least three cases, musical excerpts.

The adjectival scales or variables consist of two opposing adjectives placed at the ends of a line. This line is segmented into

seven divisions. The subject responds to a concept by indicating the position on each scale which best represents that concept. By placing a mark close to one of the poles, he indicates that that adjective is highly descriptive of the concept. Less strong reactions would be indicated by marks close to the center. A mark on the middle segment indicates a neutral reaction. An example of the traditional format of an SD would be:

good ____ : ____ : ____ : ____ : ____ : ____ bad

strong ____ : ____ : ____ : ____ : ____ : ____ weak

active ____ : ____ : ____ : ____ : ____ : ____ passive

The number of such scales used for each concept may range from less than ten to fifty or more. A smaller number of scales may be used when an investigator is sure of the connotations for each scale. Larger numbers of variables are often used when an investigator wishes to define factors.

It is easy to see that SD techniques allow the generation of a large amount of data within a short period of time. The task for the subject is relatively simple; yet if he responds on 20 or more scales to each of 10 concepts, he has made 200 decisions. Osgood et al. (1957) claim that a 100 item test takes about 15 minutes to administer (p. 80); therefore, in this example, the subject should be able to make 200 decisions in one half hour or less.

Once the data have been collected, they must be analyzed. Osgood et al. primarily used factor analysis in their studies. They found that seven factors could be identified and an eighth which seemingly

was a specific factor. Of those seven factors, three dimensions seemed to be particularly important and have occurred in many studies. The first and most important factor was labeled EVALUATION. The evaluation factor had loadings on scales which were evaluative in nature such as good-bad, beautiful-ugly, and sweet-sour. The second dimension was called the POTENCY factor because the variables here seem to refer to strength such as: large-small, strong-weak, and heavy-light. The third dimension appeared to be related to ACTIVITY with such scales as fast-slow, active-passive, and hot-cold.

Osgood et al. and others have used primarily written verbal concepts such as the names of objects, ideas, or persons. Tucker (1955) used paintings as concepts and found that the factor structure used to describe abstract paintings differed from the usual three dimensions.

In the present study, it seems that an investigation of the semantic factor structure used to describe music would be in order. Music is both non-verbal and abstract; therefore, it will be of interest to know if the same dimensions are used to describe both verbal and non-verbal concepts.

To this point the discussion of the SD has touched on many aspects of the technique except the main question: "What does it measure?" Unfortunately, this question is not easily answered. Osgood et al. claim that it measures "meaning," but they do not provide a concise definition of that term. "Meaning" in their usage seems to involve the connotative aspects of a given concept.

Guilford (1967) rejects the idea that the SD measures either the denotative meaning or the connotative aspects of a word. Instead he

states:

> Examination of the three dimensions that Osgood found suggests that they are actually dimensions of feeling. With slight change in terminology, evaluation becomes pleasant-unpleasant; power or strong-weak becomes tense-relaxed; and active-passive becomes excited-calm. Old-timer [sic] psychologists should recognize these as Wundt's three dimensions of feeling. It thus appears that Osgood's factors represent only the affective connotations in the context of a word . . . [p. 234].

If Guilford's view of the nature of the SD is correct, it may be logical to assume that persons who differ in their affective connotations for music should also have differing attitudes about that music. Then, the overt behavior of response to an SD may well be an indicator of attitude. If this connection can be established, the SD may prove to be a valuable tool for measuring attitude and attitude change.

V. ASSUMPTIONS AND LIMITATIONS

A. Assumptions

There are some basic assumptions about this investigation and some limitations to it which should be stated.

1) All groups involved use the same factor structure. No attempt will be made to determine if any group used it's own unique factors.

2) The various groups involved represent normal distributions.

3) Each group, though not randomly selected, is representative of a real population larger than the sample used.

4) All "real" factors are represented in the instrument used.

B. Limitations

1) The musical excerpts were limited to portions of instrumental art pieces.

2) The subject groups involved only college students and adults within the state of Michigan.

3) Musical excerpts rather than complete works were used.

4) Five place rather than seven place scales were used.

5) No attempt was made to find low attitude groups.

VI. OVERVIEW

The next chapter is a review of literature pertinent to this investigation. The chapter contains an examination of research and writings dealing with aesthetics, musical taste and preference, affective response to music, and the use of factor analysis with music.

The third chapter gives a description of the instrument construction and the selection of subjects involved in the study. Attention is also given to the procedures used for the development of adjectival scales and musical excerpts.

The fourth chapter contains a review of the design of the study and the analysis procedures used. Included in this chapter is a discussion of an attempt to confirm the validity of the instrument.

The fifth chapter is a presentation and discussion of the findings.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The purpose of this chapter is to review the literature dealing with attitudes toward music and affective responses to music. An extensive body of literature exists which bears on these topics, but most of these studies relate only indirectly to the present investigation. Nevertheless, a discussion of other authors' theories and findings may help define the nature of the present study.

Some psychologists and aestheticians are concerned with "why" humans respond to music. What purpose does music serve? The first section of this chapter contains the theories of several modern scholars about the function of music and why people respond to it.

Section two contains a review of the literature dealing with the emotional and mood effects of music. Researchers have attempted to deal with the emotional or mood producing effects of music. They wanted to establish what emotions can be identified in music, the musical components which suggest those emotions, the physiological changes brought about by music, or the categorization of specific compositions by their emotional content. Because most studies in this area use some type of semantic approach, the results have direct implications for the present study.

A number of other studies deal with musical taste and preferences. Investigators who wished to determine the factors that contribute to musical taste, commonly investigated age, sex, intelligence, socio-economic status, and musical training. The third section of the chapter encompasses a discussion of several studies bearing on musical taste.

Surprisingly, the area of attitudes toward music in general has been relatively untouched. The Hevner-Seashore Test of Attitude Toward Music stands virtually alone in this field. Section four involves a discussion of this test and attitude testing in general.

Since factor analysis plays an important role in the present study, some discussion about the past uses of factor analysis with music is present in section five.

The semantic differential technique has been widely used, and, in a few studies, applied to musical and other auditory stimuli. Section six encompasses a discussion of these latter studies and an evaluation of the findings.

The final section is a summary of the information present in the literature. Conclusions are drawn about the nature of musical attitudes.

It should be noted that the writer has limited his review to literature dating from approximately 1925 to the present.

I. THEORIES OF MUSICAL RESPONSE

Each of the disciplines of aesthetics and psychology encompasses a wide range of investigation. Their jurisdictions overlap in at

least one area--affective response to music. Theoreticians from the two fields have developed several contradictory theories to account for this response.

Music seems to have a unique relationship with emotional response. Cohen states:

> It appears to be the case that responses to music tend to be more emotional than responses to visual art. The emotional responses to gay wedding songs, funeral marches, or martial tunes are usually more marked than responses to visual banners of any description. This may be partly due to the fact that the visual stimulus remains outside the observer, something existing independently of him, whereas the auditory stimulus becomes part of him. Unlike the painting on the wall, the concert symphony is "taken away" by the audience. The visual stimulus exists in space as well as time; the auditory stimulus exists only in time. The distinction corresponds to Kant's differentiation between the inner and outer sense [Cohen, 1952, p. 104].

Mursell's (1937) views resemble those of Cohen. Mursell based much of his argument on the James-Lange theory.[1] He noted that the inner ear provides the sense of balance for the body. Thus, a basic physiological process occurs in the same organ as auditory function: hearing has a direct route to the physiological processes, not available to the other senses. Musical stimuli, therefore, affect the bodily functions and produce emotion (pp. 20-21).

Other writers rejected the idea of such a direct connection of emotion to musical stimuli. Lundin (1967), for example, distinguished between affective response and emotional response. In his terms, emotion "is reserved for the special kind of action in which the organism is temporarily 'psychologically frozen' following some intense

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[1]James and Lange independently developed the theory that physiological change produces emotion rather than emotion inducing physiological change.

stimulus. Emotional activities are often disorganized and temporarily disrupting kinds of behavior [Lundin, p. 51, fn. 1]." He admits that most writers do not make this distinction between affective and emotional response.

Meyer (1956) rejected Mursell's physiological explanation of emotion in music:

> In the light of present knowledge it seems clear that physiological adjustments are probably necessary adjuncts of affective responses; they cannot be shown to be sufficient causes for such responses and have, in fact, been able to throw very little light upon the relationship between affective responses and the stimuli which produce them [Meyer, 1958, p. 12].

Instead, Meyer proposed a "psychological" theory of emotion. According to this theory, "Emotion or affect is aroused when a tendency to respond is arrested or inhibited [p. 14]." Music arouses emotions because listeners develop expectations of musical occurrences. For example, in eighteenth century music, a listener, hearing a dominant seventh chord, expects a tonic triad to follow. When a composer delays in bringing about the expected consequent, or presents a novel consequent, the expectation is denied and emotion is aroused.

Pratt (1968) approached the problem of emotion and music in a different manner:

> Music perhaps more than any other art is filled with tertiary qualities which duplicate very closely the tertiary qualities of muscle and viscera. Music sounds as though it were saturated with mood and feeling, and for that reason has for centuries been called the language of emotion. But music speaks of emotion only by way of tonal patterns which at the level of form are indistinguishable from the patterns of bodily reverberations. <u>Music sounds the way emotions feel</u> [Pratt, 1968, xxv; italics are Pratt's].

Thus, music does not, in itself, cause emotions. Humans respond to music because they find in it a vicarious emotional experience.

Susanne Langer (1951), one of the most influential modern aestheticians, amplified Pratt's theory by use of her theory of symbolism:

> If music has any significance, it is semantic, not symptomatic. Its "meaning" is evidently not that of a stimulus to evoke emotions, not that of a signal to announce them; if it has an emotional content, it "has" it in the same sense that language "has" its conceptual content--symbolically. It is not usually derived from affects nor intended for them; but we may say, with certain reservations, that it is about them. Music is not the cause or the cure of feelings, but their logical expression; though even in this capacity it has a special way of functioning that makes it incommensurable with language, and even with presentational symbols like images, gestures, and rites [Langer, 1951, p. 185].

A complete discussion of the nature of emotional response is beyond the scope of this paper. However, the few authors quoted here represent some modern major viewpoints in the field and deserve mention in at least a minimum way. Cohen and Mursell seem to believe the auditory stimuli of music cause a basic physiological response which visual stimuli do not. Music affects the body physically and causes emotional reactions. Lunden and Meyer accept the idea of physical reactions to aural stimuli, but reject the idea that such physical affects can be directly equated to emotion. Meyer calls the emotional response to music one of psychological expectation. Pratt equated tonal patterns to bodily reverberations and thus explains emotional response. Langer says that music, like language, depends on learned symbolic concepts for its emotional affect.

II. THE MOOD AND EMOTIONAL EFFECTS OF MUSIC

Several authors have attempted to study the relationship between music and emotions or moods. These studies tend to be ambiguous, for

one does not always know if the writers consider mood to be a quality of the music or the response of the listener.

A. Musical Components and Emotions

One category of investigation includes studies which probe the relationship of musical components and apparent emotions.

Both Heinlein (1928) and Hevner (1935) explored the affective character of major and minor modes. Heinlein conducted his investigation through the use of isolated chords of varying intensities. He found that the subjects discriminated between major and minor chords, but the intensity of the chords also affected response. Loud chords, whether major or minor, were not "soothing" while some soft minor chords were described as soothing. With the use of actual musical compositions, the subjects described some pieces in the major mode as "sad" while some works in minor were "happy."

Hevner (1935) disliked Heinlein's use of isolated chords, for as she stated in a slightly later article:

> Since we are looking for elements of music we must be sure that the material provided for observation represents real music and not merely elements trimmed down for experimental purposes to such an extent that all the music has been left out [Hevner, 1936, p. 248].

In the 1935 study, Hevner had subjects listen to various melodies and to indicate the mode of each melody. She found that most subjects were able to distinguish major from minor. The subjects with musical training performed better than the non-musicians, but the differences were not great.

On the surface Heinlein's and Hevner's results seem contradictory. Heinlein found major melodies which the subjects classified as minor,

while Hevner found that subjects could make accurate discriminations between major and minor melodies. Yet, other factors may have been the cause of the discrepancies. Bartlett (1969) has noted that out of eleven possible discriminations of musical structure, subjects used discrimination of mode least (p. 23). Therefore, it seems that discrimination of mode is relatively unimportant to most people.

Tempo may be a more important aspect of musical mood. Rigg (1940) investigated the effect of tempo on the mood of a composition. He found that a change of speed was related to a change of mood. To the subjects, a fast tempo indicated a happy mood, while a slow tempo showed a somber mood. Each piece of music used in the experiment seemed to have threshholds of tempo. The "happiness" of a piece of music increased along with tempo only to a certain point. After this, increased speed had no apparent effect on mood, and a similar effect occurred in the opposite direction. Hevner (1937) also conducted research into the effects of tempo on mood.

B. Music and Physiological Change

Several authors have been interested in the physiological changes induced by music. Pulse, respiration, galvanic skin response, and blood pressure were some of the bodily processes used in measuring response to music.

Hyde (1927) indicated a strong relationship between physiological reactions and musical stimuli:

> We may conclude from the results of this study that most people are unfavorably affected psychologically and physiologically by music that is characterized by tragic, mournful tones and favorably affected by gay, rhythmical, rich-toned harmonic melodies. Individual differences in native endowment and training are accompanied by individual differences in physiological reactions to certain musical compositions [p. 197].

Later investigators did not find such clear results. Phares (1934), for example, found that the available psychogalvanic reflex techniques of the time were inefficient in specific analysis of music appreciation. The responses of subjects were too inconsistent and the analysis procedure too inadequate to make conclusive statements.

More recently, Zimmy and Weidenfeller (1963) found definite differences in galvanic skin response (GSR) for three types of music: exciting, calming, and neutral. The heart rate was not affected significantly.

Ries (1969) found a relationship between GSR and liking for music. Breathing amplitude, however, proved to be a better measure, because the more a subject liked a piece of music the deeper the breath became.

C. Identification of Emotion in Music

Several authors have tried to classify the various emotions which may be found in music. Because these studies involved the use of adjectival lists, they resembled the Musical Semantic Differential and may have had similar results.

Campbell (1942) produced an interesting, though suspect, study in regard to emotions in music. She established seven categories of emotion that could be found in music. This reader, at least, could not determine from the report how she established these categories. Apparently, Campbell based the categories on her personal reactions to music. The categories were: gaiety, joy, yearning, sorrow, calm, assertion, and tenderness.

On the basis of the seven categories, Campbell selected several pieces of music as representatives for each particular emotion. The subjects listened to the music and indicated on a test form the category and adjectives within each category which best described the music. She found that the subjects were able to discriminate four of the seven categories. The remaining three--yearning, tenderness, and calm--were subject to confusion. Campbell explained this confusion by stating that some of the compositions did not actually express the category intended and that these three emotions were more difficult to differentiate than the other four.

Nowhere did Campbell admit the possibility that her categories might be wrong, ambiguous, or even incomplete, even though the evidence suggests these possibilities. Yet, even though Campbell was not willing to consider changes in her categories, she was quite willing to suggest changes in Hevner's (1936) work.

Campbell's study does produce some significant results. She found consistent agreement on categories, but little general agreement on specific adjectives within the categories. Therefore, it seems that general moods may be identified but finer classifications are a matter of personal reaction. Also, musical training seemed to have no effect on judging emotions in music.

Hampton (1945) and Rigg (1939) tested the hypothesis that listeners could detect the specific emotion the composer intended for his music. Hampton found that the degree to which listeners could make such identification varied with the degree to which the piece was programmatic. Little correlation existed between the familiarity of a

work and ease in identification of emotion. Rigg noted that subjects are able to make gross discriminations of emotions, but could not identify specific concepts in the music. Thus, both authors confirm Campbell's (1943) finding that subjects were agreed on general descriptions of music but not specific descriptive associations.

Hevner has made a major contribution to the investigation of mood effects. She (1936) developed an adjective check-list of 67 adjectives. These adjectives were classified into eight categories; each category contained from six to eleven adjectives. Each category of adjectives represented a slightly different mood quality. Hevner placed the adjectival categories in a circular arrangement, much like a clock face, with the supposition that adjacent categories were more similar than non-adjacent categories. Therefore, as one proceeded around the circle the categories became less like the starting cluster. Opposite clusters were opposite in meaning. Subjects, listening to musical examples, indicated their responses by checking the adjectives which best described the music.

Farnsworth (1954) performed correlations among Hevner's adjectives and on this basis modified the structure of the list. He claimed that the new arrangement contained clusters with more consistency than the original categories. In the process, Farnsworth used ten categories instead of eight, replaced the circular arrangement with a column and row arrangement, and reduced the number of adjectives from 67 to 53.

Both Farnsworth and Hevner used somewhat limited statistical techniques. Factor analysis might have produced results with better consistency than that claimed by either writer.

D. Music With Emotional Content

Capruso (1952) attempted to find a number of musical works which conveyed specific emotions. Using a large number of subjects and of musical compositions, Capruso identified 61 compositions which received 50 percent or better agreement among the subjects as to the specific emotional content. Capruso was interested in the therapeutic value of music and he desired to find music to induce emotions.

Farnsworth (1958, pp. 94-95) discussed a study, similar to that of Capruso, carried out under the direction of Thomas A. Edison. Out of 589 available recordings, 112 pieces could be labeled as "mood music." The investigators segregated the music into twelve categories.

In concluding this section, an article by Gregson (1964) should be mentioned. Gregson criticises most studies of aesthetic response. He claims they are obsolete and incomplete because the authors have attempted to develop typologies for the evaluation of subjects and responses prior to the experiment. A better method, according to Gregson, would have been to establish matrices of all possible responses. One could then record subject reactions within a larger framework and establish a clearer picture of aesthetic response. Gregson, however, offered no specific examples of his technique.

III. MUSICAL TASTE AND PREFERENCE

A number of investigators have studied various factors which may contribute to musical taste and preferences. Most of these factors are psychological or sociological, such as intelligence, musical training, and socio-economic status.

From the outset, it should be recognized that the testing of musical preference involves some difficulties which are not found or are not so serious in other studies. For example, a subject can make judgments about two or more paintings simply by referring from one to the other. In music the process is not so simple, for music exists in time and the memory must be used to make comparisons. The hearing of a new melody may blur the conceptions of a previously heard melody. Interference of this type grows greater as the number of selections grows.

Secondly, the number of items in any test must be limited to fit the available administration time. With musical tests, this limitation becomes very serious, as a complete piece may last several minutes and often longer. Excerpts from pieces rather than whole works sometimes are used to allow more items within the time limits.

Finally, if the test is given to a group, the individual cannot work at his own speed or in his own order. The musical examples must be presented at a rate acceptable to the whole group; the fast subjects must wait for the slow to finish.

These limitations are mentioned because they do affect the design of such studies, and procedures which are useful in other areas may not be acceptable in musical studies.

A. Tests of Musical Taste by Comparing Distorted Melodies

Adler (1929) conducted a pioneer study in musical taste. Basing his work on that of Abbott and Trabue in art appreciation, Adler selected a small number of melodies and constructed three alternative versions of each melody. He considered the original version to be the best.

Each of the three alternate versions was a distortion of the original. In one version, Adler eliminated any element in the original which provided surprise or color. For example, any unusual chord or colorful melodic movement was replaced by more conventional harmonic or melodic usage. Adler labeled this version of the music "dull." The second variant contained unwarranted elaborations of the original music. Tremolos and ornaments were added by Adler. This he called the "sentimental" version. The final alternative contained incongruous changes of meter and key along with displaced measures. Adler called this version "chaotic."

In the test, the subjects listened to the four versions of the melody and chose the one they liked best. The order of presentation was changed for each group of excerpts.

Adler found that untrained subjects generally preferred the "sentimental" version. In the one instance where they preferred the original version, the "sentimental" version was the primary distractor. The subjects exhibited an overwhelming choice for the "sentimental" version of a French folk song. Adler commented that this version resembled "a popular-songlike type of composition, almost 'Jazzy.'" He further states, "the sentimental version just happened to hit the nail of popular taste squarely on its head [pp. 28-29]."

The experiment also included an "expert" population, a group of graduate music students. The choices of these subjects differed significantly from the average subjects. In most cases, the music students preferred the original version with the "dull" version in second place. Adler points out that the dull version is closest to the original (p. 28).

At virtually the same time that Adler was working at Columbia University, Hevner (1930) was doing parallel research at the University of Minnesota. In apparently independent projects, both based their work on Abbott and Trabue. The early Hevner study was very similar to that of Adler and does not merit further discussion here.

Hevner, however, was not content with her first work. She felt that the four versions were too confusing and then developed a new test with only the original and one mutilated version of each musical excerpt (Hevner, 1931). In the new test, Hevner was able to use forty-eight excerpts with two versions, while the previous test had included twenty-four items with four versions. The new test became the well-known Oregon Music Discrimination Test (Hevner, 1934).

The Music Discrimination Test included a new feature. The subjects were asked to choose a version and also to indicate the nature of the change: rhythm, harmony, or melody. This feature served to increase the reliability of the measure and presumably the validity. Hevner shows good reliability (r=.86 at the adult level) but does not make a strong case for validity (Hevner, 1934, pp. 124-30).

Recently, Newell Long (1969) updated and revised the Oregon Music Discrimination Test and carried out extensive studies in the United States and England to standardize the test.

Cowell (1967) criticized tests of the type developed by Hevner and Adler:

> One must admit that the mutilated versions are not unmusical, but in reality the instrument fails to measure discrimination between two versions of the same work, measuring rather discrimination between two different works. For, in altering the compositions, Hevner makes changes which create sounds and effects markedly different from the original--in effect composes new pieces

> of music. Here . . . familiarity with the original music would give the listener an advantage, for the version sounding "sort of" familiar would readily be chosen over the one sounding "kind of strange" (p. 78).

Colwell makes a good case, yet one might wonder if he would consider the Goldberg Variations a series of thirty-one different melodies, or if a popular song performed by two different artists is in reality two pieces of music.

Colwell developed a test which used completely original compositions in Baroque, Classical, Romantic, Contemporary, and Popular styles. He used two versions of each composition. Both versions were played correctly in regard to notation; the differences were in tempo, phrasing, accents, balance, rubato, and tone quality. Six competent pianists recorded the compositions in both versions. A jury of experts chose the most musical and unmusical rendition of each composition.

Colwell found that there seems to be an age threshold for discrimination of music. "Ninth grade students were the youngest who could give a majority of correct answers . . . . Fourth grade students scored as high as seventh grade students." (p. 82) Music training also seemed to aid in discrimination.

B. Ways of Responding to Music

Another aspect of musical taste is the way a subject responds to music. In an early article, Myers (1927) found four categories of musical response:

1) The intra-subjective response--sensory and emotional experience with music. e.g., "The music makes me sad."

2) The associative response--associations with extra-musical events or ideas. e.g., "The music sounds like 'waves beating on a shore.'"

3) The objective response--consideration of the value or use of specific music as an object. e.g., "The music would be good for dancing."

4) The character response--animation of the music. e.g., "The music seems to be running."

Myers stated that people may react in more than one of the ways and may even change types of responses as the nature of the music changes. Professional and other highly-trained musicians tended to use objective responses although they did make some associations and characterizations. Unmusical people had primarily sensory intra-subjective responses and few associations.

Ortmann (1927) approached musical response in a different way. He considered response to music to be a developmental process. The lowest category of response was sensorial; this type of response was primarily physiological.

> Sensorial response is characterized by a minimum amount of mental effort; and the pleasure of the effect is within as easy reach of the moron as of the intellectually superior. This distinction explains why the average non-musical person finds pleasure in listening to music which the musician terms banal and commonplace [p. 51].

Ortmann categorized the next level of response as perceptual. At this level the listener was able to perceive various musical stimuli in relation to each other. Perceptual response involved active attention by the listener.

> And since artistic music demands a perceptual process for an adequate appreciation, the layman is uninterested in classical music which he cannot "understand." It is not because the layman

> could not understand, but because the effort in active attention required to understand is greater than that employed by this type of subject [p. 60].

The highest level of response, according to Ortmann, was the imaginal type. This level included not only the association of pictures with music but images of musical environment, e.g., the ability to mentally supply harmony for a single melodic line.

Ortmann felt that experience and training influenced the development of musical response.

In a more recent study, Yingling (1962) postulated four types of musical response: sensory, emotional, intellectual, and associative. He found that subjects used all four types of responses and that untrained subjects reacted primarily with associative and emotional responses. Yingling also found that the main effect of a specific "music appreciation" course was to emphasize intellectual responses and to lessen the other types of responses.

Lifton (1961) developed a music reaction test for measuring "aesthetic sensitivity." In his terms:

> An aesthetic response is one which reflects the properties of the stimulus as it causes feelings, ideas, desires, etc., to be experienced by the perceiver. The greater aesthetic response is seen as one which produces a greater range and intensity of ideas and emotions in the perceiver [Lifton, 1961, p. 158].

Using a small sample of music education students, Lifton was able to compare each student's reaction to music with peer-group assessment of that student. Thus, he determined the differences in response between aesthetically sensitive and non-aesthetically sensitive students. Lifton produced a scale for measuring the aesthetic empathy of statements about music. Associational and emotional responses were

considered to be the strongest and received a score of "+2." The next category of responses included statements of emotional evaluation and received "+1." Lifton assigned a score of "0" to technical or objective statements. If the statement was a denial of feeling, it received a "-1."

C. Sociological Aspects of Musical Taste

Baumann (1960) examined the musical tastes of adolescents and made comparisons by social status, sex, age, geographical region, and musical training. He found that geographical region and social status seemed to cause some differences. He noted that most differences were ones of degree rather than completely different tastes.

One should be somewhat suspicious of Baumann's statements because he used a large number of Chi-square tests in evaluation, and the relatively few significant differences he found may have been due to chance.

Schuessler (1948) found significant differences in musical preference which were related to socio-economic levels. He also found age, musical training, and sex to be factors associated with taste.

A Dutch sociologist (de Jager, 1967) conducted a poll among subscribers to an orchestral concert series. He found that most of the patrons were upper and middle class people. De Jager also found evidence of a cultural lag, for most of the respondents expressed a dislike or an indifference to "modern composers." Highly educated people, young people, and persons with instrumental music training expressed the most tolerance for modern music.

Johnstone and Katz (1957) investigated the effect of social status on musical tastes among adolescent girls. The authors categorized current popular songs according to text subjects. Johnstone and Katz found that the most popular girls, as measured by dating activity, preferred one category of songs while the less popular girls preferred songs in another category. This phenomenon was consistent across two economically differing neighborhoods. Even though the pattern remained consistent, the categories of music did not. Therefore, the music preferred by the popular girls of one neighborhood might be the same category preferred by unpopular girls in the other neighborhood.

D. Labels and Musical Taste

The labels or titles applied to music seem to affect subject response to that music.

Fisher (1951) played unfamiliar "classical type compositions" for students of varying socioeconomic, age, and sex classifications. There were no significant differences among the groups and Fisher concluded:

> In general, it would appear that the factors usually operating to produce differences in preference reaction to classical type music whose identity is known do not operate appreciably in unstructured situations where the identity of such compositions is unknown [p. 152].

Moore (1921) found that both majority and expert opinion could influence musical judgments, but the influence of these two types of opinion was more effective in changing judgments about speech patterns or moral values. In altering musical judgments, majority opinion was as effective as expert opinion.

Rigg (1948) investigated the effect of propaganda on musical taste. Three groups of subjects listened to the same music on two separate

occasions. Between hearings, the first group received favorable information about the music and its composer (Wagner). The second group served as a control group and received no information. The third group learned that the test music was enjoyed by Hitler and was associated with Nazism. (The study took place shortly after World War II.)

Rigg found a gain in acceptance of the music by the control group. He attributed the gain to familiarity with the music. The group receiving favorable information scored a gain twice that of the control group, while the group receiving unfavorable information made a very small gain. Analysis of Covariance showed significant differences among the three groups.

Geiger (1950) conducted a unique study of the effect of labels on musical taste. Shortly after World War II, Denmark had only one radio system, that of the state; except for a few small areas of the country, if a person in Denmark was listening to the radio, he could only hear the state radio.

The Danish radio engineers had developed a device which could monitor the number of radio receivers operating in any given area. This device provided a means of estimating the listening audience at any one time.

Geiger scheduled two musical programs on successive Saturday evenings. The two programs were identical in content, featuring Eighteenth and Nineteenth Century music. Yet, the first program was announced on the air and in program listings as "popular" music. The second program was listed as "classical" music.

The audience for the "popular" music was twice as large as that of the "classical" music. More importantly, there was only a minor drop in audience throughout the duration of the "popular" program.

Geiger concluded that a "reverse snobbism" operates on musical tastes. Many people were willing to listen to classical music when they thought it was popular music; only a few disliked the music enough to turn it off. Nevertheless, a great number of people would not turn on the radio when they knew they would hear "classical" music.

E. Repetition and Musical Preference

A number of researchers had investigated the effects of repetition upon musical preferences. In an early study, Gilliland and Moore (1924) found that over several repetitions within a short period of time, interest in two pieces of classical music increased while interest in two pieces of popular music remained the same.

Verveer, Barry, and Bousfield (1933) concluded that immediate repetition increases pleasure for a few trials, but with continued repetition, pleasure decreases. Pleasure increased after rest periods or the presentation of music other than the test selection.

Evans (1965) and Getz (1966) have shown an increased liking of classical music among subjects when the pieces have been repeated. In the Getz study, the subjects listened to the music on a weekly basis. Preference ratings increased steadily to about the eighth week, then began to fall off. Getz continued the study for only eleven weeks.

Bartlett (1969) demonstrated that repetition of classical pieces in nine sessions over a period of three weeks brought about increased

positive affective evaluation of those pieces. Under the same conditions, the subjects indicated negative affective shifts on pieces of popular music even though these pieces had been the subjects' "best liked" choices.

F. Other Aspects of Musical Taste

Evans (1965), Duerksen (1968), and Bartlett (1969) each investigated the relationship between discrimination of musical structure and affective response to music. Evans found little or no relationship between awareness of structure and affective response among junior high school students. Duerksen found similar results among high school and college students. He did find a statistically significant but low correlation between preference for classical music and recognition skill. Bartlett discovered that there was "no important relationship between discrimination of structural elements in popular music and preference for the music [p. viii]."

Keston and Pinto (1955) studied the relationship of several abilities and personality characteristics to musical taste. Intellectual introversion, music recognition, and musical training were strongly associated with musical taste, while, intelligence, sex, age, and masculinity-femininity were negligible factors.

IV. MUSICAL ATTITUDE

A. Scales of Musical Attitude

The Tests for Attitude Toward Music, by Kate Hevner (1934) and Robert Seashore, constitute the only widely recognized scales constructed for this purpose. The test consisted of two scales of twenty-five statements each. The subjects were asked to note their agreement

or disagreement with each of the statements. The users of the test could use the whole form or either of the scales. Hevner claimed a reliability of r=.90 for the whole test, with r=.79 for the first half and r=.81 for the second (p. 141). The validity of the instrument was not tested.

Farnsworth (1963) restandardized the Hevner and Seashore attitude test after thirty years and found that most of the items had remained stable although a few items had changed significantly. Farnsworth (1949) also developed rating scales of his own. He developed five statements which could be used with any category of music. He found that girls expressed higher interest in both serious and popular music than did boys.

Two standardized tests of vocational interests, Kuder Preference Record-Vocational and Strong Vocational Interest Blank, although not primarily designed to measure musical attitudes for their items dealing with music may be useful in research. For example, Gowan and Seagoe (1957) correlated musical scales of the Kuder Preference Record with scores on the Seashore Measures of Musical Talent. They found low correlations in all cases.

B. Attitude Measurement

A number of methods for measuring attitudes exist. A very common procedure is that of polling, as for political opinion. The popularity of recordings and books are measured by their sales and length of time they are listed as "hit tunes" or "best-sellers." Such means of determining attitudes, while important, are not of concern in this discussion. Although these methods are useful in determining opinion

and attitude on a widespread basis (e.g., national political view), they are of little use in determining the attitude of small groups.

Therefore, the discussion in this section is limited to five procedures more suitable to classroom procedures. To be sure, the techniques mentioned here may also be used in polling, but the procedures of sampling populations used by polls have limited pertinence to this discussion. The information presented is based mainly on Edwards (1957).

a. Paired Comparisons

Thurstone made several procedural contributions to attitude testing. Among his first contributions (1927a, 1927b) was the law of comparative judgment. This law constituted the basis for the technique known as Paired Comparisons.

Basically, the researcher interested in measuring attitudes would collect a number of statements about a specific topic. A number of judges compared each statement with each of the remaining statements and decided which of each pair was the most favorable to the topic. The experimenter could then rank each statement by the number of "favorable" ratings it received. He then assigned scale values to each statement--high ranked scores received large values.

Once a set of statements and their scale values had been established, the experimenter was able to test individuals on their attitude toward the subject of interest. The subjects with favorable attitudes would indicate agreement with favorable statements and persons with unfavorable attitudes would agree with unfavorable attitudes.

By computing the median scale value for the statements with which a subject agreed, the experimenter scored each person's attitude.

b. Equal-Appearing Intervals or Q-Sort

Thurstone, along with Chave (1929), made another significant contribution to attitude measurement. This technique was known as the method of Equal-Appearing Intervals or often Q-sort Techniques. This procedure differed from paired comparisons in that the judges were required not to compare the statements with each other but to sort them into one of eleven piles. The first pile was labeled "most favorable" and the eleventh pile labeled "least favorable." The middle pile was reserved for "neutral" statements.

On the basis of the judges' ratings, the experimenter computed the median score and the quartile deviation (Q value) of each statement. He then selected twenty to twenty-five statements, such that the statements were equally spaced from most to least favorable. Statements receiving large Q values were eliminated as being ambiguous. The experimenter rated subject responses by finding the median value of the statements with which the subject agreed.

Seashore and Hevner (1933) used a variation of the Q-sort technique in the development of their Test for Attitude Toward Music. Instead of separating statements into piles of eleven categories, the judges ranked each statement on a scale from one to eleven. This procedure proved to be very consistent with the Thurstone method and less time consuming.

C. Successive Intervals

Edwards (1957) described a method of Successive Intervals. This method was very similar to the method of equal appearing intervals. The main differences between the two procedures were in means of analysis of data.

With the equal-appearing interval method, a researcher sorted the statements into intervals-categories. He had to assume that each of these intervals were equal in width, but there was no way to check that assumption. By using the successive interval method of analysis, he was able to establish the width of each interval and have a more precise estimate of the results. Edwards described procedures for this method . (1957, pp. 120-148.)

d. Summated Ratings or Likert Scales

Likert (1932) developed a simpler system for making attitude scales. He found that one could have subjects indicate their degree of agreement or disagreement with statements on a five point continuum, e.g.,

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree

Thus, the subject indicated both direction and the strength of his decision for rating each response. A simple assignment of weights (i.e., 4 strongly agree, 3 agree, 2 uncertain, 1 disagree, and 0 strongly disagree) proved to be adequate. To determine a subject's score, the researcher computed the mean of all the responses.

The Likert scales had a disadvantage when compared to the Q-sort method. The Q-sort provided an absolute scale value for each score;

thus, one could determine the location of each person's attitude score on the psychological continuum.

Likert scales could only locate a person's score in relation to the frequency distribution of scores for a specific population. Standard scores could be established but not absolute values. This limitation did not cause difficulties in many types of research. For example, if one wished to compare the mean attitude scores of two groups, the summated rating method was as effective as the equal-appearing interval method.

The summated rating method provided a relatively easy method for developing an attitude test.

e. Scaleogram Analysis

When one has constructed an attitude scale, it is useful to know if the scale is unidimensional, that is, if the scale measures only one factor.

> In the case of attitude statements, we might say that this means that a person with a more favorable attitude score than another person must also be just as favorable or more favorable in his response to every statement in the set than the other person. When responses to a set of attitude statements meet this requirement, the set of statements is said to constitute a unidimensional scale [Edwards, 1957, p. 172; Italics are his].

Guttman (1944) has done a great deal of work in testing the unidimensional aspect of scales. Therefore, scales which fit this qualification have been called Guttman scales.

Guttman (1947) developed the "Cornell technique" for testing unidimensionality of scales. Basically this technique consisted of constructing a table containing a rank ordering of subjects. Each subject's response to every statement was also listed. An investigation

could then determine if the conditions stated by Edwards had in fact occurred. Guttman provided a technique for estimating the unidimensionality of a scale even if the results were not perfect.

f. Unobtrusive Measures

Each of these methods of developing or testing attitude scales deals only with the estimate of attitude by verbal means. There are many ways of testing attitudes which do not involve a formalized verbal test. A fine book which discussed many potential techniques is Unobtrusive Measures by Webb, Campbell, Schwartz, and Sechrest (1966).

Some potential measures of attitude toward music are record listening and buying habits, radio listening habits, and concert attendance. The best indicators of attitude are probably the behaviors of a person outside of a formalized setting and when he does not feel he is being observed.

V. FACTOR ANALYSIS AND MUSIC

Factor analysis is a multivariate statistical technique used to establish the relationship or communality of three or more testing instruments which have measured the same subject. A full discussion of the procedure would be beyond the scope of this study and, indeed, the writer. Readers wishing to know more about factor analysis should consult Fruchter's Introduction to Factor Analysis (1954) and Harman's Modern Factor Analysis (1967).

Several authors have used factor analysis in attempts to determine the nature of musical ability. Karlin (1942) conducted an extensive study of auditory function. He administered a battery of 32 tests to 200 high-school age students. The majority of these tests measured

auditory skills, both musical and non-musical. He found nine factors, of which eight were interpretable. He labeled them: A) Pitch quality, B) Loudness, C) Auditory integral, D) Auditory resistance, E) Speed of closure, F) Auditory span, G) Memory span, and H) Incidental. These factors did not substantiate the normal assumptions of musical factors: melody, harmony, rhythm, timbre, and dynamics.

Wing (1941) conducted a factoral study of an early form of his Musical Aptitude Test. The battery contained seven tests and Wing found that they measured three factors. He considered the first factor to be a general musical-ability factor. The second factor indicated a division in the type of tests used. The tests in which the subjects had to judge the best of two versions constituted one group. In the other tests, the subjects had simply to detect change. The third factor seemed to involve harmony.

Gundlach (1935), as part of a larger study, used factor analysis on the subject responses to forty musical phrases. The musical examples were instrumental in nature, representing largely Seventeenth through Nineteenth Century compositions. Apparently, Gundlach chose the music to be "fairly diverse" and analysed the music after it had been chosen.

In conjunction with the musical examples, Gundlach used seventeen adjectives to describe the music. On the basis of several intercorrelations, Gundlach was able to identify four factors and to interpret three of them. He labeled the first factor as the dynamical phase of music. The factor was related strongly to tempo and smooth rhythms, and less strongly to loudness. The second factor reflected the tonality characteristics of the music. It was correlated with melodic and

orchestral ranges, pitch levels, and intervals. Gundlach called the third factor, a factor of "motility." The factor seemed to be influenced by large intervals and rough rhythms. The final factor was not interpretable.

Henkin (1955) rejected the use of adjectives as he felt they established biases in the responses of the subjects. Instead, Henkin conducted a study in which the subjects expressed preferences. He selected music to emphasize each of four basic elements of music: melody, rhythm, color, and harmony. Henkin had difficulty finding examples which represented primarily harmony.

He found two definite factors which represented melody and rhythm. A third factor, orchestral color, also appeared--but not clearly. On a later rotation of the factors, Henkin (1957) found the original factors became better defined and new melodic factors also appeared.

Cattell and Saunders (1954) factor analysed 120 pieces of music and found eight clear factors with four other possible factors. The authors did not attempt to label these factors.

Hornyak (1964) used thirty unfamiliar musical examples as a basis for factor analysis. The examples were selected to represent various components of music. The subjects evaluated each musical example on a seven step Likert-type preference scale.

Hornyak found eight factors in each of two groups. Five factors were held in common by both groups: 1) consonance-dissonance, 2) voice color, 3) harmonically controlled polyphonic melodic, 4) melodic ornamentation, and 5) consonant triadic harmonic factors.

Crickmore (1968a) used factor analysis in checking subject reaction to music on the basis of seven scales. Each scale measured on aspect of response. An eighth scale was added which indicated the number of "complete syndromes" achieved by the students. On the basis of these eight scales, Crickmore established five factors of music appreciation: 1) sustained interest, 2) desire for silence, 3) relaxation, 4) absence of mental pictures, and 5) a syndrome of all the previous factors with a feeling of increased happiness.

In a second article, Crickmore (1968b) explored the relationship of his factors with tests of personality, musical ability, and intelligence. He found that music appreciation as measured by his test, was independent of intelligence, musical ability, or personality characteristics.

Crickmore developed an interesting method of measuring affective response to music, but one could criticize his findings on the basis that his factors were not well defined. Harman (1967) states that a reasonable solution to factor analysis generally limits the number of factors from one-sixth to one-third that of the number of variables (p. 198). Crickmore used eight variables, enough for two or possibly three factors. His findings of five factors are hard to justify.

VI. THE SEMANTIC DIFFERENTIAL AND MUSIC

As indicated in Chapter I, a large number of studies have involved the use of the semantic differential (SD). A few of these studies have dealt with music and with aural stimuli. A review of the entire body of literature dealing with the semantic differential

is beyond the scope of this paper. Therefore, the discussion is limited to studies having direct bearing on music.

The most significant study of the subject to date was done by Pallett (1967). Pallett set forth two goals for his study: "1) to describe the internal dimensional structure of the connotative meaning of music; and 2) to establish associations between music elements and connotative elements [p. 33]." To achieve these goals, he administered an SD containing twenty-six scales and eighteen melodic patterns to seventy-nine women students at Michigan State University.

Pallett found four independent factors: 1) aesthetic evaluation, 2) mood-emotion, 3) stability-tautness, and 4) dynamism. A fifth factor was not labeled by the author.

One may have some serious questions about Pallett's work, and most musicians would certainly question Pallett's use of musical examples. His examples consisted of single line melodies containing from one to about forty tones. One-half of the examples used three or fewer pitches (p. 49). Pallett argued that the harmonic factor was related strongly to the melodic factor and therefore not significantly independent. Melody intersected with rhythm and therefore rhythm was sufficiently sampled (pp. 43-44). As a result, only melodies, very restricted ones, were used.

Hevner's comments on this type of research bear repeating:

> Since we are looking for elements of <u>music</u> we must be sure that the material provided for observation represents real <u>music</u> and not merely <u>elements</u> trimmed down for experimental purposes to such an extent that all the <u>music</u> has been left out. The outline of a rhythm pattern . . . , tapped out with a hard wooden stylus, is but the bare skeleton of a rhythm, rattling its dry bones in vast emptyness, and far different from the living,

> throbbing rhythm that pulsates through the whole body of a musical composition [1936, p. 248].

Secondly, as Fitzpatrick (1970) pointed out, Pallett neglected some standard considerations of instrument construction. In particular, Pallett did not attempt to assess the reliability of his instrument.

In Pallett's defense, it should be pointed out that a reliability estimate is difficult to obtain for an SD. Osgood, Suci, and Tannenbaum (1957) dealt extensively with the problem and still failed to put forth a completely satisfactory solution (pp. 126-140); they claimed that SD instruments are too reliable to be tested by standard procedures (p. 127).

Thirdly, the population which Pallett sampled was too limited to provide reliable generalization. The sample consisted of only women, nineteen to twenty-six years of age, majoring in elementary education at Michigan State University (Pallett, p. 77). The confounding variables of sex, age, interest, and educational experience are immediately obvious.

Pallett's work was a preliminary step in finding the connotations of music. It is unfortunate that the work was marred by so many flaws.

Accurso (1967) also investigated the use of the semantic differential with music. He compared the responses of sixteen psychology students to those of eight graduate music students. The instrument contained fifty adjective scales and twenty musical compositions--ten classical pieces and ten popular pieces. Accurso expected that

the two groups would differ in their use of terms in response to classical music, but to use terms in the same way for popular music. He found the opposite to be true, however.

Accurso claimed to find four factors. However, his results must be suspect because of the small sample sizes. This writer has found from personal experience that small samples do not provide stable factors, particularly with a large number of variables.

Kiel and Kiel (1966) conducted a cross-cultural study involving Indian music, Afro-American, and one selection by Bach. They found two strong factors which they labeled "flexibility" and "atmosphere." These factors seemed to be related to evaluation. A third factor was labeled "agitation," and was related to "activity," "chaos," and "tautness."

Van de Geer, Levelt and Plomp (1962) used the semantic differential to compare intervals produced by two sine waves. They used ten scales of twenty-three intervals for only ten subjects. Three factors were found: pitch, evaluation, and fusion.

Nordenstreng (1968) compared the results of a semantic differential to similarity ratings of musical examples. He found that the two methods produced almost exactly the same results. Therefore, similar pieces of music would tend to produce similar results on a semantic differential.

Solomon (1958) investigated the results of a semantic differential used with sonar sounds. He found eight factors, seven of which could be interpreted.

Tucker (1955), using the semantic differential with representational and abstract paintings, found the three factors of evaluation, potency, and activity used for representational paintings. However, for abstract paintings a completely different structure appeared. For artists, a single large evaluation factor appeared; for non-artists, Tucker found two large uninterpretable factors, a type of "semantic chaos [p. 243]."

Semantic differential techniques have been used with music and related fields. The results, at best, are tentative and open to further investigation.

Summary

This chapter has included brief discussions of a large number of studies and articles which dealt with some aspect of affective response to music. It is difficult to further condense the material presented in order to provide a summary. However, this section will be used to present a few general conclusions from the literature.

First of all, music is related to emotion and is a stimulus for affective response. This much was generally accepted. Unfortunately, various authors disagreed about the nature of the relationship between music and emotion. Several of the major modern theories were presented in this review. (Mursell, 1937; Langer, 1951; Myers, 1956; and Pratt, 1968).

Secondly, musical preferences or tastes showed the results of a variety of influences, many of which were not musical influences. It was true that musical training had some affect on musical taste as measured by Adler (1929) and Colwell (1967), yet influences such

as socio-economic status (Schuessler, 1948 and Baumann, 1960), peer group status (Johnstone and Katz, 1957), opinion of other people and experts (Moore, 1921), the labels or information given about music (Rigg, 1948 and Geiger, 1950), and familiarity with the music (Gilliand and Moore, 1924; Verveer, Barry, and Bousfield, 1933; Evans, 1965; Getz, 1966; and Bartlett, 1969) all influenced musical preference to some degree.

Thirdly, to some extent subjects were able to determine emotions or moods in music. In general, subjects agreed only on emotional categories (Rigg, 1939; Campbell, 1942; and Hampton, 1945). Interestingly, musical training seemed to have little effect upon this type of ability (Campbell, 1942).

A fourth conclusion is that attitudes toward music can be measured. Hevner and Seashore's Tests for Attitude in Music led the way, but has had few followers.

Fifthly, several authors indicated that the traditional elemental classifications of music (melody, harmony, rhythm, timbre, and dynamics) were not adequate to describe the nature of musical perception. Factor analysis of subject response to musical examples included varying results in each study (Gundlach, 1935; Karlin, 1942; Cattell and Saunders, 1954; Henkin, 1955; and Hornyak, 1965).

Lastly, the semantic differential has been used successfully with music (Kiel and Kiel, 1966; Accurso, 1967; Pallett, 1967; and Nordenstreng, 1968). However, the results to date have been tentative in nature and the studies flawed in design or reporting.

In conclusion, it seems evident that much work remains before an adequate method for measuring attitudes toward music can be developed. The Hevner-Seashore approach has been, perhaps, the closest to the answer, but the Test for Attitude Toward Music has at least two major weaknesses. First, it dealt with music as an abstract concept and not as actual sound. Second, the test could be easily deciphered by subjects and thus open to false responses.

It is hoped that both of these difficulties may be remedied by the use of SD techniques. A subject, responding to the MSD, heard musical examples. In addition, he should have found it difficult to determine the "correct" answers because many of the adjectival scales were not obviously positive or negative descriptions of the music.

The review of the literature has included a number of studies which have incorporated one or more of the techniques essential to this study, i.e., the use of adjectives to describe music, factor analysis of responses to music, and the use of SD instruments with musical examples as concepts. Thus, the groundwork has been laid for a study to determine if attitudes toward music can be measured by the use of an SD.

CHAPTER III

INSTRUMENT CONSTRUCTION AND ADMINISTRATION

Introduction

In this chapter, the construction and administration of the Musical Semantic Differential (MSD) is discussed. The first section is an account of the procedures used to select adjectival scales and musical excerpts. The second section presents descriptions of the test booklet and the tape recording. Section III contains a discussion of the population samples used and their characteristics. Section IV refers to the test administration procedures. A summary of the chapter constitutes the last section.

I. CONSTRUCTION OF THE INSTRUMENT

A. Selection of Scales

In any type of adjective testing, the test-maker must select his test items from a universe of potential determiners. Rarely can he use all possible items because of the practical aspects of administration: time, subject fatigue, and test format. Most tests must be limited so that they may be completed within some specific period of time. Rarely does a person, such as a psychologist or educator, have unlimited access to subjects or free use of subject time. Even if unlimited time were available, subjects tire during extended

sessions and the resulting fatigue can cause them to react differently from their normal performance. Finally, the test itself must be constructed in such a way that it does not become unwieldy. If the test-maker does not carefully limit the items on the test, the sheer quantity of items may induce negative reaction on the part of the subject. For example, a large number of questions may seem threatening to some subjects, while other subjects might feel the effort required to complete such a test would not be worth whatever reward was involved.

A test's reliability is related to its length because when more items are added there is a corresponding reduction in error variance. Yet this advantage may be fruitless if new variance is added by the factors already cited, which are unrelated to the variable measured by the test. Therefore, the test-maker must find a compromise which will allow the most reliability without adding unwanted variance.

In the construction of a semantic differential (SD), the number of items used must be carefully considered--as with any other test--because there are a great number of potential adjectival scales. Theoretically, any combination of antonyms might be used. Osgood et al. (1957) have done extensive work in scale selection. Tucker (1955), Solomon (1958), Accurso (1967) and Pallett (1967) have all constructed SD's using non-verbal concepts as the subject of investigation; the last three used sounds or musical examples. From the lists of adjectival scales investigated in these prior studies, this writer selected a number of scales which had been strong factor-indicators and which seemed to be descriptive of music. In

this selection, it was hoped that ambiguous and non-relevant scales could be eliminated. With the help of his doctoral committee and on the basis of some preliminary investigation, the writer narrowed the number of scales to 24. (For the list, see the answer sheet in Appendix A.) This prior investigation included the use of a form of the MSD in testing the reaction of sophomore music students to three pieces of contemporary music. By investigating the mean scores for each scale, it was possible to eliminate several scales as being non-polar. If a scale was ambiguous or irrelevant, the mean of scores should fall close to the center of the continuum. A strong deviation in either direction should indicate that the scale had been used to describe the music.

Using this procedure, the writer attempted to build on previous work and eliminate a great deal of preliminary effort. The short cut may not have been worthwhile. For reasons better explained in Chapter V, the writer believes that the present set of scales, while adequate for the investigative purposes of this study, needs revision and modification before further use. It may be sufficient to state at this point that the factors produced have not been as strong and clear as one might have wished.

The writer, in selecting the scales, sought to find adjective pairs which could be used to describe music, but he avoided selection of technical musical terms and clearly cognitive terms. Thus, cre-scendo--decrescendo would be a potential descriptive scale; however, not all subjects would understand the definition of these terms and, therefore, could not use the scale accurately. On the other hand,

fast--slow would be understood and used accurately by most subjects, yet it was excluded because the determination of "fast" or "slow" is largely a cognitive process. Active--passive is admittedly related to fast--slow, yet to this writer at least, active--passive contains more affective connotations than does fast--slow. The scales, selected in this way, allowed most people to describe music in terms they understood and on a basis other than pure cognition.

B. Selection of Musical Examples

Some practical aspects were also considered in the selection of the musical examples, as well as of the adjectival scales. The subjects needed sufficient time to react to the music because each subject had to indicate a response on all twenty-four scales for each musical example. The example or concept, however, could not be of such length that the piece changed in character, for example, the differences between the first and second themes of a sonata form. Thus, the musical excerpts were limited to one and one-half minutes in duration. In addition, the number of examples to be used was limited to ten. These limitations allowed the test to be given in less than 45 minutes, including administration, explanation, and response time between selections.

A major consideration, however, involved the method of selecting specific musical excerpts. In virtually all studies of musical taste or preference, the investigators have selected compositions as typical of the characteristics under investigation. Campbell (1942), for example, selected pieces of music which she felt demonstrated one of the categories of emotion. Some experimenters--

Bartlett (1969), for example--attempted to strengthen the validity of their selections by a panel of judges. These procedures were legitimate, yet the writers seem to ignore one vital consideration: generalization cannot be carried out to musical selections not included in the test. Randomization is necessary to allow inferences beyond the sample.

A true random sample of a large population or universe is difficult to achieve whether that population is made up of people, events, or objects. The universe of music embraces a large number of works and the sampling problems are formidable. First of all, one must limit the term "music," for there is no way to assemble all of the music which has been composed in written or unwritten form; too much material is inaccessible or simply lost. Second, because music is a living art, the body of works is in a state of flux. Composers continue to write new music, and old music is either dropped or altered in some way. This refers particularly to "folk" or popular music. If the population of "all music" could be sampled at any one point in time, that sample would soon become obsolete and nonrepresentative. Finally, a random sample of "music" would contain a portion of obsolete compositions and styles which might not be of interest to an experimenter.

Even though a random sample of all music was not feasible nor necessarily desirable, it was possible to draw a random sample from a limited population of music. The writer, somewhat reluctantly, eliminated "popular" music from the study because the category is too fluid for representative sampling.

Secondly, vocal music was also eliminated from consideration because it presents a special problem not found in instrumental music. Vocal music combines both verbal and non-verbal elements. It is possible that subjects could react to the verbal message rather than the musical stimulus, or some type of interaction between the two elements. Because purely musical effects were the major concern, the writer chose to eliminate these potential sources of experimental contamination.

The remaining category of music encompasses serious instrumental music from the seventeenth century to the present time. Even with these limitations, the category is quite large and would be very difficult to assemble. The writer found a solution in Barlow and Morgenstern's Dictionary of Musical Themes (1948). Although all possible compositions are not listed, a great number are, all from the category of interest. By use of a random number table, the writer selected twenty compositions from the Dictionary. (A listing of all twenty compositions is presented in Appendix B.)

The Barlow and Morgenstern Dictionary provides a unique feature in that it is more than a listing of compositions, for in addition, all the principal themes of extended compositions are included. Random selection, therefore, not only established the pieces to be used but also the starting point of each excerpt, for by the use of a random numbers table, it was possible to select specific themes within compositions. The shorter works or movements which had only one listed them were recorded from the beginning of the piece.

II. FORMAT OF THE INSTRUMENT

A. Construction of Test Booklet

The test booklet comprised 10 identical pages. Each page (listing the 24 adjectival scales) was used with one musical excerpt. The pages were IBM 551 data sheets with overprinting. The appendix contains a reproduction of the original form.

B. Construction of the Recording

As mentioned previously, the random sample included 20 compositions, more than were actually used. The main purpose for selecting this many pieces was to assure enough excerpts. Because a piece was mentioned in Barlow and Morgenstern did not guarantee that it was recorded, nor that, if recorded, it was accessible. This problem was solved by consulting Mr. Kenneth Beachler, the program director of the Michigan State University radio station WKAR, who graciously provided access to WKAR's extensive record collection. The WKAR record library contained fifteen of the twenty original selections, and all fifteen were recorded. The first ten, however, were the only ones used. Table 3.1 contains a list of these ten selections.

III. DESCRIPTIONS OF SAMPLES

This study incorporated six population samples with a total of 434 individuals participating in the test.

The largest single group of subjects was students enrolled in Music 135, a music fundamentals class offered at Michigan State University (MSU). The students in this course were for the most part freshmen and sophomore women interested in becoming elementary

TABLE 3. 1.

EXCERPTS USED AS MUSICAL CONCEPTS IN THE MUSICAL SEMANTIC DIFFERENTIAL

	Barlow and Morganstern Theme Number	Composer	Composition and Theme	Artist	Recording
1	R 85	Rameau, J. P.	Suite from Dardanus, Rigaudon No. 1	Collegium Aureum Reinhard Peters, Conductor	RCA Victrola VICS 1333
2	V 126	Visee, R. de	Suite in d minor for Guitar, Gigue	Siegfried Behrend	Deutsche Grammophon
3	H 331	Haydn, F. J.	Quartet in F, Op. 3, No. 5, First Movement 2nd Theme	Allegri String Quartet	Westminster XWN 19111
4	B 1343	Brahms, J.	Concerto No. 1 in d minor, Op. 15 Third Movement 2nd Theme	Rudoph Serkin, Piano Cleveland Orch. George Szell, Conductor	Columbia MS 7143
5	H 202	Harris, R.	Symphony No. 3 6th Theme B	Minneapolis Symphony Orchestra Antal Dorati, Conductor	Mercury SR 90421

TABLE 3. 1. (cont'd.)

	Barlow and Morganstern Theme Number	Composer	Composition and Theme	Artist	Recording
6	C 234	Chopin, F. F.	Mazurka, No. 19 Op. 30, No. 2	Alexander Brailowski Piano	Columbia ML 5802
7	M 687	Mozart, W. A.	Quintet in E-flat K. 452 First Movement Introduction	Vladimer Ashkenazy, Piano London Wind, Soloists	London CS 6494
8	B 393	Bach, J. S.	WTC Book II Fugue No. 22	Wanda Landowska, Harpsichord	RCA Victor LM 6801
9	R 103	Rameau, J. P.	Concert in Sextour No. 5 "La Cupis"	Stuttgart Baroque Ensemble Marcel Couraud, Conductor	Mercury MG 50402
10	E 55	Elgar, E.	Sonata for Violin and Piano in e minor, Op. 82 First Movement 2nd Theme	Alan Loveday, Violin Leonard Cassini, Piano	Dover Publications ST 7011

teachers. This group (N=322) took the MSD near the beginning of the winter term of 1970. A random sample was drawn from the Music 135 group and this smaller group (N=97) responded on the MSD again at the end of the term, eight weeks later than the pretest. The results of the posttest were used to estimate the reliability of the instrument and were not incorporated into the analysis.

The second group of subjects was much smaller (N=14), but was again from a Music 135 class. This time the students were enrolled in the spring term session, and were tested twice on the MSD with an interval of 24 hours between administrations. The purpose of repeated administration was again to estimate reliability. Only the results of the first session were included in the analysis. In both this and the previous instances only one set of data was used to insure independence within the subjects.

In order to investigate the effects of a college upon responses, the writer administered the MSD to a class similar in nature to Music 135 at Central Michigan University (CMU). This third group (N=30) was again primarily women interested in elementary education.

A fourth group tested was a section of Music 271 at MSU. This was also a class in music fundamentals; however, Music 271 was open to students in the University as a whole and represented about an equal balance of men and women students (N=29). This course fulfilled part of the fine arts requirement for graduation.

Because an end goal of this study was to determine the usefulness of the MSD as an attitude measurement, the writer attempted to find groups of people who demonstrated strong positive attitudes by

their actions. One group selected for this purpose was a class in the non-credit, adult education program of the evening college of MSU. The course in question was entitled "The Nine Symphonies of Beethoven" and met once a week in the evening for two hours. The class session included some analysis of the works and presentation of the main themes.

It seems logical to assume that a group of people who would pay a fee and brave a Michigan winter evening, once a week for eight weeks for no credit, would have strong positive attitudes toward serious instrumental music. A comparison of this group's (N=24) reactions with the reactions of other sample groups to the MSD would provide some idea about the validity of the MSD as an attitude test.

The sixth sample was taken among graduate music education students enrolled in Music 803 at Michigan State University. This group of subjects (N=10) consisted of master's and doctoral candidates in music. These men and women possess a high degree of musical training and thus represent a unique population.

On the whole, all the groups were from white, middle class backgrounds within the state of Michigan. Most of the subjects were women and all groups represented mainly college students or university graduates.

IV. ADMINISTRATION OF THE TEST

Each subject received a test booklet, a no. 2 pencil, and a sheet of instructions. The writer administered the test to all the

subjects. The instructions were read by the subjects and the writer gave a brief oral resume of the instructions. He answered questions about marking procedures. At no time did he attempt to define the adjectives in musical terms.

At the outset, the writer had planned to allow four minutes for the subjects to listen to the music and mark their papers. From the first administration, it was apparent that four minutes was too much time. Not only had most students completed the tasks, but they became restless. Therefore the writer dropped the time limit and played each example when all the subjects had completed the previous task.

In a previous pilot study the four minute time period had been necessary because the testing format was more complicated than the present form. The pilot version of the test required the subject to refer to a printed list of adjectival scales and then to mark the responses on an answer sheet. The present format incorporated the adjective scales onto the answer sheet and allowed quicker responses with apparently less confusion on the part of the subjects.

The instructions for the final version stated that the subjects were required to use all twenty-four items for each musical example. The subjects were allowed to and did answer the items in any order they chose. Most followed the numerical order presented, but by observation it was apparent that not all did.

V. RELIABILITY

If any test is to be useful for measuring group or individual differences, it must be consistent or reliable. Therefore, it was necessary to estimate the reliability of the MSD. As mentioned in Chapter II, p. 43, Osgood et al. (1957) discussed the problem of reliability at length and found no completely satisfactory solution. The reliability estimates used here were not without fault but did provide some information about the stability of the factors.

Two means of estimating reliability were used. The first method was a test-retest situation where fourteen Music 135 students took the MSD on successive days. By correlation of the scores, an estimate of the reliability over twenty-four hours could be obtained.

This procedure was somewhat more complicated than it might appear as factor scores were available for only the first test. The second test had not been included in the factor analysis in order to maintain independence among all subjects.

By summing each subject's score across all the highly-loaded variables for each factor and across the ten pieces of music and dividing by the number of variables used, it was possible to produce a quasi-factor score for each individual. Tests of the correlation between the factor scores and quasi-factor scores for the first test produced correlations of:

Factor 1; r=.95
Factor 2; r=.94
Factor 3; r=.70
Factor 4; r=.91.

On the basis of this correlation, the quasi-factor scores were used

to test the correlation of the factors across the two tests with the following results:

Factor 1; r=.90
Factor 2; r=.90
Factor 3; r=.72
Factor 4; r=.86.

A second method of testing the reliability of the MSD was to compare scores over a period of ten weeks. The main group of Music 135 students (N=322) took the MSD at the beginning of the winter term of 1970. At the end of the term, students (N=97), randomly selected from the large group, again responded to the MSD. Because of some time limitations, the students heard only the first eight items during the second test administration.

The reliability of each factor was computed by testing the correlation of the factor-indicating variables. The mean scores of each highly-loaded adjectival scale were compared between the groups for each piece of music. Therefore, if a factor had four highly-loaded variables, comparison was made between two sets of thirty-two scores; only the first eight pieces of music were used for each set. The results were:

Factor 1; r=.98
Factor 2; r=.93
Factor 3; r=.81
Factor 4; r=.93

Therefore, each factor appeared to have adequate reliability for the investigative purposes of this study.

Summary

A Musical Semantic Differential (MSD) was developed by the writer which consisted of a test booklet and a tape recording of musical examples. The test booklet contained ten identical pages, one page for each example. The main body of each page consisted of twenty-four adjectival scales drawn from lists used by other authors in related studies. Ten musical examples were used. All the examples were serious instrumental works randomly drawn from the Dictionary of Musical Themes by Barlow and Morganstern (1948). Each excerpt was less than two minutes in length.

As the subjects listened to a musical example, they indicated their response on each of the adjectival scales. The subjects gave 24 responses for each of 10 pieces of music, a total of 240 decisions. Ample time was allowed between musical examples for the subjects to complete their responses.

Six groups were used in the study. The subjects were college students or graduates and most had little musical training and exhibited no special interest in music. Some groups, however, were chosen for their positive attitudes or musical training.

A total of 434 subjects took the MSD.

The reliability was tested in two independent instances, and was found to be reliable over a period of 24 hours and over eight weeks. The reliability of four factors were computed in each case the correlation coefficient was over $r=.70$ and on factors one, two, and four over $r=.90$.

CHAPTER IV

DESIGN OF THE STUDY

Introduction

This study had two purposes: 1) to find the semantic factors which subjects use to describe music. Once these factors were found, they were identified and the adjectival scales which contributed most to those factors were located. 2) to test the consistency of the response from the various subject groups to the music presented. If differences in response did occur, they were investigated to see if there was a relationship between those differences and attitudes toward music.

The first main section of this chapter contains a statement of the hypotheses which were tested. There are two groups of hypotheses: one group relates to the definition of semantic factors, and the second refers to analysis of between-sample differences. In the second section, the procedures used for analyzing the factors are presented. The third section is a presentation of the procedures used to analyze differences among subject groups, and includes predictions of differences, methods of analysis, and a discussion of the methods used to determine the validity of the Musical Semantic Differential (MSD) as an instrument for measuring attitudes toward music.

I. HYPOTHESES

A. Hypotheses about Semantic Factors

Ho_a: There was no consistency among all subjects in the use of adjectival scales to describe "serious" instrumental music. This would be shown if more than seven factors were needed to account for 51 percent of the variance.

$H1_a$: The subjects were able to describe consistently serious instrumental music in seven factors or less.

Ho_b: There was no rotation which could both account for a majority of the variance and have each factor account for a large part of that variance. If no rotation could account for 51 percent of the variance and have all factors contribute 7.5 percent or more, the hypothesis would be accepted.

$H1_b$: Such a rotation did occur.

Ho_c: Osgood's factor of EVALUATION did not appear since less than three of the four adjectival scales usually associated with this dimension did not have high loadings on the same factor. The four scales were: ugly--beautiful, pleasant--unpleasant, uninteresting--interesting, and insincere--sincere.

$H1_c$: The EVALUATION dimension indicated by Osgood did appear.

Ho_d: Osgood's factor of POTENCY did not appear since less than two of the three variables associated with this dimension did not have high loadings on the same factor. The three scales were: feminine--masculine, gentle--violent, and rugged--delicate.

$H1_d$: The POTENCY dimension did appear.

Ho_e: Osgood's dimension of ACTIVITY did not appear since less than three of the four scales associated with this factor did not have high loadings on the factor. The scales were: active--passive, complex--simple, calming--exciting, and restful--busy.

$H1_e$: The ACTIVITY factor did appear.

Ho_f: No other interpretable factors appeared since no factors other than the three stated appear containing high loadings on two or more variables.

$H1_f$: One or more additional interpretable factors appeared.

B. Hypotheses about Differences among Groups

Ho_g: There was no difference in the mean factor scores on the MSD between groups selected as "normal" and groups selected for positive attitude.

$H1_g$: There was a difference between "normal" and positive attitude of the groups' mean factor scores.

Ho_h: There was no difference between the means of groups of Michigan State University (MSU) students and those of students enrolled at Central Michigan University (CMU).

$H1_h$: There was a difference between the means of the two groups.

Ho_i: There was no difference between the means of students enrolled as elementary education majors and those of students enrolled in curricula other than elementary education.

$H1_i$: There was a difference between the mean factor scores of these groups.

Ho_j: There was no difference between the means of subjects selected as having positive attitudes toward music, but not professional involvement and subjects who were professionally involved with music.

$H1_j$: There was a difference between the two groups' mean factor scores.

Ho_k: There were no other differences among the groups' means.

$H1_k$: Other differences occurred.

Ho_1: There was no Group-by-Factor interaction

$H1_1$: Group-by-Factor interaction occurred.

In some cases, if a null hypothesis was rejected it was necessary to form new sub-hypotheses and to test these sub-hypotheses. Such instances will be presented in Chapter V.

II. DESIGN AND ANALYSIS: FACTORS

A. Organization of Data

As a result of the data-gathering procedures described in Chapter III, this study involved the analysis of 104,160 observations. Representatives of six populations, 435 subjects, made 24 observations on each of 10 pieces of music. A graphic representation of the data cube is presented in Figure 4.1.

Because the music was chosen randomly, it was possible to collapse the data cube to a data matrix which allowed simpler analysis. The random selection process meant that each piece of music represented all of the pieces of music of the original population. Yet a summing of the scores for all ten pieces of music provided a more reliable estimate of individual reaction to the type of music

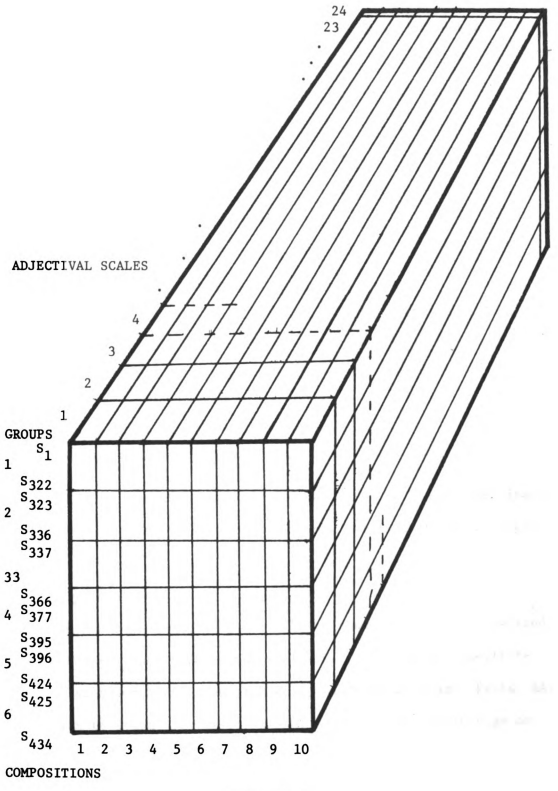

FIGURE 4.1

MATRIX OF DATA GATHERED ON THE MUSICAL SEMANTIC DIFFERENTIAL

under investigation than did the score for any one piece. By summing over the scores for each person on every variable, the subject's total score on any one scale represented his evaluation toward all music on that variable, and error due to the unique qualities of a any one piece was reduced. Thus, if subject A responded as shown in Table 4. 1, his score for variable one was 27, variable two was 29 and variable three was 26.

TABLE 4. 1

SAMPLE SUMMATION OF INDIVIDUAL SCORES

Scales	1	2	3	4	5	6	7	8	9	10	Total
1. Ugly--Beautiful	2	4	1	5	3	2	2	5	2	3	27
2. Expected--Surprising	3	1	4	4	2	5	1	4	3	2	29
3. Repetitive--Varied	1	1	3	3	5	4	5	3	2	1	26

The final result of this procedure was to reduce a three dimensional figure to two dimensions. The new matrix is shown in Figure 4. 2.

B. Analysis of Data

The new arrangement of data allowed them to be factor analyzed on the Control Data 6500 computer at MSU. The Computer Institute for Social Science Research at MSU supplied the program: Factor AA. A varimax rotation provided solutions from two factors through as many factors as could meet the pre-set Kiel-Wrigley criterion of k=2. That is, there were no rotations presented which would have less than two high-loaded variables on the last factor.

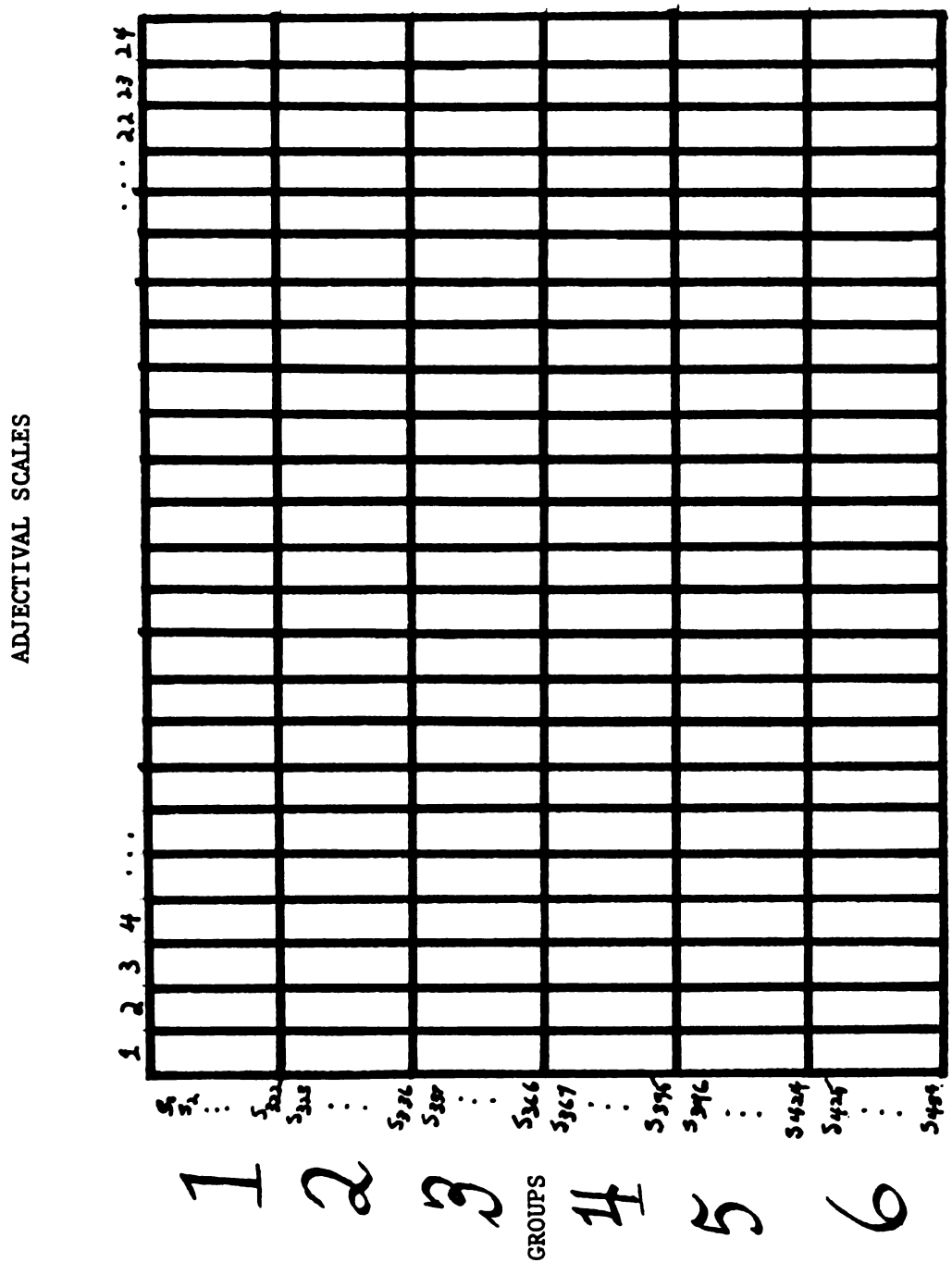

FIGURE 4. 2

MATRIX OF DATA SUMMED OVER MUSICAL EXAMPLES

C. Interpretation of Data

It has been generally agreed that the interpretation of a factor analysis is a difficult and somewhat subjective problem. Unlike many statistical procedures, most factor analyses are not limited to one possible solution, whereby a researcher accepts or rejects his hypothesis according to a decision rule. Instead computer programs generally allow for rotations of the factors; each rotation provides a separate potential solution to the problem. A researcher therefore has to study the various rotations and, with the aid of external criteria, choose the solution which seems to be the simplest and yet is sufficiently comprehensive.

Sometimes the work done by other investigators in related fields provides some basis of external criteria. Osgood's (1957) three dimensions--EVALUATION, POTENCY, and ACTIVITY--have been well established for verbal concepts. One could assume that these three factors would also appear in the present study, and therefore accept a three-factor solution. However, since the concepts, namely musical examples, were non-verbal rather than verbal, the possibility existed that the factor structure might be radically different from the usual findings. Tucker's (1955) findings of only two uninterpretable factors with non-representational paintings lent some weight to this possibility. Pallett (1967) and Accurso (1967) each found four factors when using musical examples as concepts.

Several decision rules were formed as an aid to interpretation. First of all, an acceptable solution must have fewer factors than variables. In the unlikely case that each adjectival scale was

completely independent of the others, a twenty-four factor solution would be the correct choice, but the results would be uninterpretable. The point of factor analysis is to reduce the complex pattern of variable intercorrelations to simpler terms. The arbitrary limit of seven factors was imposed as the maximum number of dimensions which could be interpretable.

Secondly, an acceptable solution had to account for a majority of the variance present in the data. That is, the error variance could not be larger than the sum of the factor variance.

Thirdly, each factor had to represent a sizeable amount of the total variance.

The fourth and most important consideration for the selection of a rotation was the "interpretability" of the factors. It is possible to find mathematical factors which have no seeming logical relationship among the highly loaded variables. To be interpretable, each factor of the accepted rotation had to have high loadings on related adjectival scales. A high loading was defined as a score of $\pm$ .40 or higher and a minimum of difference of .20 higher than the loading on any other factor. It was felt that a scale had to measure at least .40 in order to be representative of that factor and that the difference of .20 showed that the scale was not ambiguous. The "logical relationship" was admittedly a subjective judgment.

Once the rotation was selected the factor scores for each individual were punched on computer cards and this data was submitted for further analysis. The factor score was each person's standardized score for every factor.

D. Decision Rules

Some discussion is in order about the decision rules used for the testing of hypotheses and the interpretation of factors. Obviously, the rules stated in the previous section do not follow conventional estimates of statistical significance. In the present situation such estimates would be difficult to achieve and in fact might not be meaningful if they were accessible. These rules were stated as a guide for interpretation.

Statistical significance and practical significance are not always the same thing. It is possible to achieve statistically significant differences which are of no practical importance. The reverse is equally possible. There is nothing mystical about the .05 or .01 levels of significance that made them the best decision levels for all cases. As Hays (1963) states:

> In short, psychology uses much of the terminology of statistical decision theory without its main feature, the choice of a decision-rule having optimal properties for a given purpose. Instead, the psychologist uses conventional decision-rules, completely ignoring questions of the loss involved in errors and the degree of prior-certainty of the experiments. These conventional rules can be justified by decision theory in some contexts, but they are surely not appropriate to every situation [p. 263].

In the present situation, there would not be a great loss involved if the decision rules presented caused a "true" factor to be overlooked or a factor which did not exist to be included. In either case, the factors which were correct would remain stable with only minor changes in loadings. Therefore, the decision rules used here are practical rather than statistical in nature. In the section about the comparisons of group differences, estimates of statistical

significance seemed more appropriate and, therefore, the decision rules were stated in more conventional terms.

III. ANALYSIS OF GROUP DIFFERENCES

The second primary purpose of this study was to determine if the MSD could measure differences between samples. If so, did such differences reflect disparity in attitude among the groups or some other independent variable? The groups of subjects measured in this study were chosen because there were hypothesized differences between those groups. If the MSD did measure attitudes toward music, it was possible to make some predictions about where those differences occurred. Thus, four possibilities existed: 1) no differences appeared between any groups, 2) differences appeared as predicted, 3) differences appeared but not as predicted, and 4) differences appeared partially supporting the predictions. In only Case 2 could the MSD be accepted as a measurement of attitude although Case 4 could indicate that the MSD tested some variable related to attitude. Before stating predictions, it is necessary to describe the design of the study.

A. Design of the Study

Six groups of subjects participated in the study: four groups were considered to represent "normal" attitudes toward music in that there seemed to be no reason to suspect strongly negative or positive attitudes for the groups as a whole; two groups represented strongly positive attitudes toward music. Within the two main categories some other differences existed. Of the normal groups,

two were assumed to represent the same population. The first group was the large group of Music 135 students (N=322) who took the MSD during the winter term of 1970. The second group was again a group of Music 135 students (N=14), but this group took the MSD during the spring term of 1970. The purpose of including the second group was to estimate instrument reliability as previously discussed. The third group was the group of students from Central Michigan University. These students were included in the study to check the possibility that the results were in some way affected by the educational institution. Finally, the fourth group was the group of students enrolled in Music 271. Their presence in the analysis allowed the testing of the hypothesis that results were due to the subjects' field of study.

There was also a difference between the two groups which had been selected for their positive attitudes. The first group showed its positive attitude by enrolling in the non-credit evening college course on Beethoven. The interest of this group was avocational rather than professional. The last group included the students enrolled in Music 803, a graduate course in music education. These people showed positive attitudes by being professionally involved in music.

Four main comparisons and one general comparison among the groups were of primary interest. First and most important: did the "normal" groups and the positive-attitude groups differ in their response to the MSD? Second: did the Music 135 subjects'

responses differ from those at Central Michigan University? Third: did the responses of students enrolled in Music 135 differ from those of students in Music 271? Finally: did the professionally involved subjects differ in their responses from those for whom music was an avocation? In addition, it was necessary to ask if any variables other than attitude toward music could account for differences in response.

Since the MSD was a multi-dimensional test, it was possible that only one or two factors actually measured changes among the groups. If this were so, a group-by-factor interaction would have resulted, therefore, a test of the interaction was also necessary. If the interaction did exist, steps were to be taken to determine its nature.

B. Analysis of Data

The Factor AA program provided individual factor scores and these factors were used as the data for the repeated measures analysis. This program was Program Profile and was supplied by the MSU College of Education Office of Research Consultation. The program was run on the Control Data 6500 Computer at MSU.

C. Predictions of Differences

If scores on the MSD did reflect attitudes toward music, it would be possible to make predictions about some of the differences. The first prediction was that the four "normal" groups, as a whole, would differ from the positive groups. The second prediction was that the MSU Music 135 students would not differ from the CMU students in their attitudes. The school attended should not have any

great effect on student attitudes toward music. In the same way, the Music 135 subjects should not have differed greatly in their responses from students in the Music 271 class. If there were differences, one would expect the Music 271 group to exhibit more positive attitudes toward music, as their class membership was not required.

It was difficult to formulate a prediction about the differences in attitude between the two high attitude groups. The professional group had more commitment to music but may have become jaded in their response to the art. On the other hand, for the avocational group, music might be only one of many interests and the attitude, therefore, might not be as strong as for the other group. If group differences exist, the Music 803 persons probably should have indicated the strongest positive attitude toward music as they had a more complete commitment to music.

Another concern was Group-by-Factor interaction. Predictions in these areas were difficult to make without prior knowledge of the factors. The main concern was first to find out if such interaction actually occurred and then to find out which groups and factors caused it. One potential cause of such interaction could have been the evaluation factor if it had appeared. Other than that possibility, other predictions seemed inappropriate.

D. Method of Analysis

In order to analyze the data and test the previously discussed predictions, a new arrangement of the data had to be organized. The

factor analysis program (discussed in Chapter IV, Part 2) provided factor scores for each subject, and each subject was a member of a group. Figure 4. 3 is a graphic representation of the new data.

An analysis of variance was the means of analyzing this data. Although the groups and factors were crossed and the subjects were nested within the groups, the subjects were not nested within the factors but were crossed with them. As a result, a basic assumption of the analysis of variance was violated--that of independence among the individuals both within and across treatment combinations.

To deal with similar problems, statisticians have developed a modified form of the analysis of variance known as a profile analysis or repeated-measure analysis of variance. The methods of computation remained the same as with the standard analysis variance, but some changes were necessary for determining the degrees of freedom necessary to test the significance of the $\underline{F}$ ratio.

Box (1954 a,b) has demonstrated that a constant ε may be used to correct the degrees of freedom. Unfortunately, ε was laborious to compute but Greenhouse and Geiser (1959) have shown that ε could never be smaller than $\frac{1}{p-1}$ where "p" was the number of repeated measures--the factors, in this instance. Therefore, it was possible to use this ratio as a "conservative" test of significance.

Table 4. 2 represents an analysis of variance table for the data under consideration.

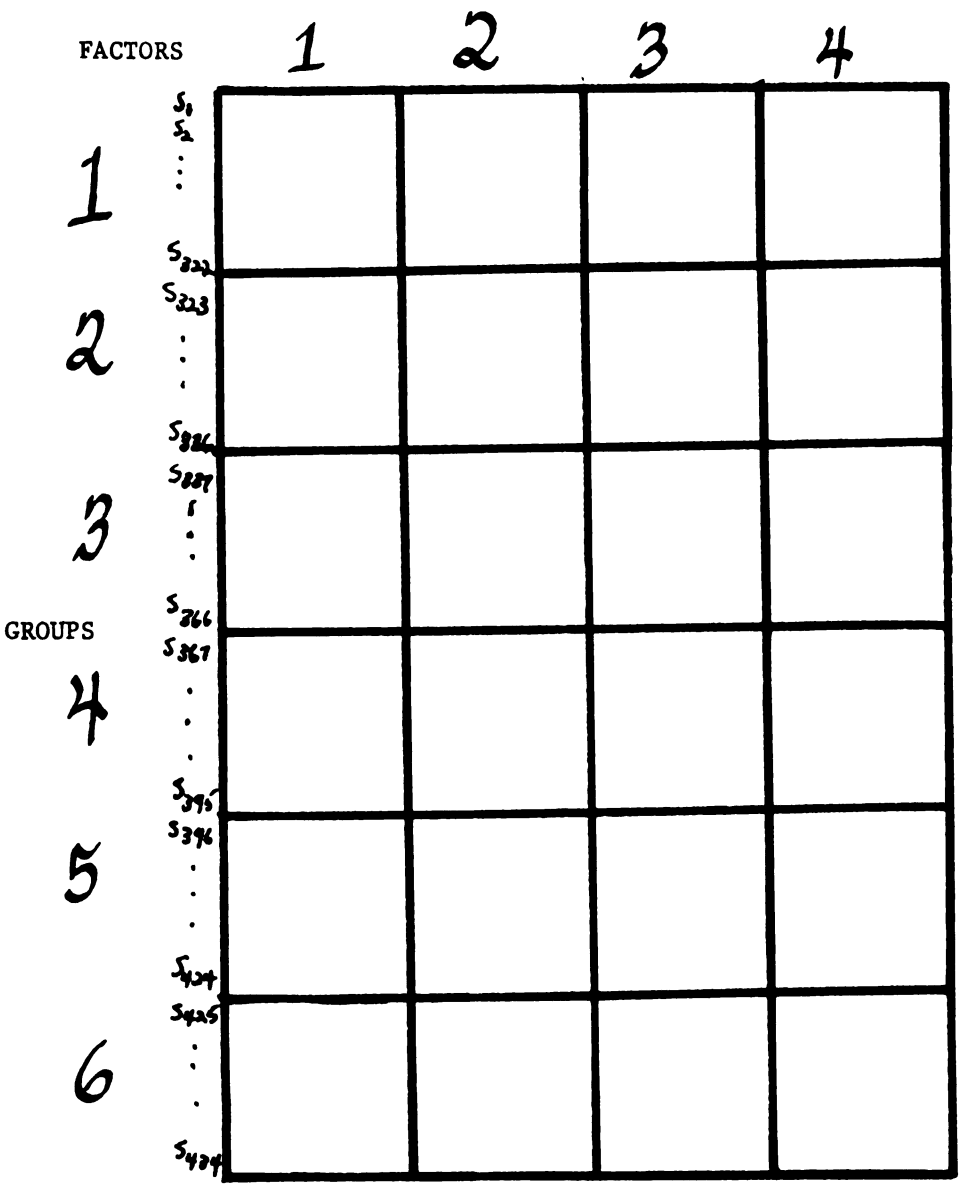

FIGURE 4. 3

MATRIX OF DATA IN THE FORM OF FACTOR SCORES

TABLE 4. 2

ANALYSIS OF VARIANCE MODEL

Sources	df	MS	Ratio
Factors	f-1	MS_F	$MS_F/MS_{SF:G}$
Groups	g-1	MS_G	$MS_G/MS_{S:G}$
Subjects within Groups	N-1	$MS_{S:G}$	
Factors X Group Interaction	(f-1)(g-1)	MS_{FG}	$MS_{FG}/MS_{FS:G}$
Factor X Subject within Groups Interaction	(f-1)(N-1)	$MS_{FS:G}$	
Total	Nf-1		

Note: F = Factors
G = Groups
S = Subjects
f = Number of Factors
g = Number of Groups
N = Total of Subjects

Of the three possible "omnibus" F tests available as shown in the table, only one was actually used. The test for factor differences was meaningless as the varimax rotation guaranteed orthogonal or independent factors and, furthermore, the observations were factor scores. Since the factor scores were standardized scores, there could not be a difference in means. The test of group differences was rejected in favor of the more powerful method of "planned comparisons." Only the F ratio for Factor-by-Group interaction was computed. The last two situations require more discussion.

For computing between-group differences the planned comparison method was used instead of the omnibus F test for two reasons. First, the planned comparison method allowed the comparisons of interest to be tested directly. More importantly, this method was more powerful than either the omnibus test or the Sheffé post-hoc procedures described later (Hays, 1963, p. 489).

Hays (1963) described the method of computing planned comparisons and indicated some of the limitations of the method. First of all, only J-1 comparisons could be made, where J equals the number of groups under investigation. Thus, in this study only five comparisons were permissible. Secondly, all comparisons must be non-redundant or orthogonal. Finally, because multiple tests were performed, the probability of one test showing difference due to chance increased with each test performed (pp. 462-483).

To meet these problems, there were only four comparisons made; the fifth allowable comparison was used to test for any other differences among groups. Secondly, all the comparisons were orthogonal and finally the .01 level of significance was chosen for the decision rule. Over five comparisons, there was still only a .05 probability that one result was due to chance.

For the purposes of analysis, the large section of Music 135 was labeled group 1, the small section of Music 135 was labeled group 2, the group from CMU was group 3, the Music 271 class was group 4, the Beethoven class was group 5, and the Music 803 class was group 6.

The comparisons made in accord with the predictions made on pages 75 and 76 were:

1. Does the average mean score of groups 1, 2, 3, and 4 differ from that of groups 5 and 6?

2. Does the mean score of group 1 differ from the mean of group 3?

3. Does the mean score of group 1 differ from the mean of group 4?

4. Does the mean of group 5 differ from that of group 6?

These comparisons could be carried out by normal procedures for planned comparisons with unequal observations as there was independence among the subjects for all the groups.

When the Group-by-Factor interaction was tested, different techniques became necessary. It was difficult to anticipate where differences might occur, but the only meaningful differences were those which might occur on one or more of the factors. Therefore, an omnibus *F* test for all possible differences was conducted at the .05 level of significance. If this test indicated between cell differences, it was then necessary to find out if the differences might occur on any of the factors. Thus, four one-way analyses of variance could be performed, one on each factor. Because four *F* tests were performed, it was necessary to decrease the chance of error to the .01 level. If any of the factors showed significant differences, Sheffé *post-hoc* procedures could be used to find where the differences occurred.

The degrees of freedom used in the evaluation of the overall F test were modified according to the Greenhouse and Geiser (1959) "conservative test" as discussed previously. The four tests of the within-factor differences did not require conservative treatment because between group independence could be assumed.

E. Validity

The most serious challenge to this study has been the question of validity. Even if group differences occurred as predicted, some other variable could be confounded with attitude to produce these differences. Within the scope of this study, it has not been possible to eliminate all possible confounding variables. Nevertheless, some steps were taken to test the validity of the MSD as a measure of attitude.

During the summer session of 1970 at Michigan State University, twenty-eight students who were enrolled in Music 135 took the MSD. In addition to the regular testing, they also responded to a Likert-type scale of preference for each musical example.

Like 1 2 3 4 5 Dislike

The responses on this scale were summed over all ten examples. The total represented the individual's score on preferences of music as used in this study.

After the students took the MSD with the additional scale, they indicated their attitudes toward music on the Seashore-Hevner Test of Attitude Toward Music scale B. A panel of twenty-one judges (music education faculty members and graduate students at MSU) scaled the test.

By the correlation of subject scores on the MSD with their scores on the Likert-type scale and Seashore-Hevner test, an estimate of criterion-related validity could be obtained.

Summary

Six groups of subjects responded to the Musical Semantic Differential (MSD). From this data two separate problems could be tested. The first problem was an attempt to determine the semantic factors the subjects used to describe music. Null and alternate hypotheses were stated about the appearance of each of Osgood's (1957) three dimensions of EVALUATION, POTENCY, and ACTIVITY. There was discussion of the factor analysis program and the decision rules for interpreting the solution.

The second problem was to determine if there were differences among the groups and if these differences could be related to attitudes toward music. Four predictions of results were stated as well as other hypotheses about the nature of the results.

The data for the second problem consisted of factor scores for each subject and was analysed by an analysis of profile with unequal observations within groups. Planned comparisons were used to test within-group differences and the omnibus F test combined with four one-way F tests and Scheffé's post-hoc procedures were used to analyze the Group-by-Factor interaction.

Some effort was directed toward establishing the criterion-related validity of the MSD as a measurement of attitude toward music. Subjects took the MSD with the addition of a Likert-type

preference scale and the Hevner-Seashore Test of Attitude Toward Music Scale B. Correlations then could be drawn between the MSD and these measures of attitude.

CHAPTER V

FINDINGS OF THE STUDY

Introduction

This chapter is a presentation of the findings of this study. In the first section, the hypotheses are restated in the null form along with a statement of acceptance or rejection for each hypothesis. The second section includes a discussion of the findings, first of the factors found and then of the tests for group differences. Finally, the summary contains a condensation of the findings.

I. HYPOTHESES TESTED

A. Hypotheses About Factors

Ho_a: There was no consistency among all of the subjects in the use of adjectival scales to describe instrumental art music. If a rotation of seven factors or more was required to account for 51 percent of the variance, the hypothesis would be accepted.

The rotation containing four factors accounted for 52.8 percent of the variance. Therefore, this hypothesis was rejected. (See Table 5. 1, also Appendix C.)

Ho_b: There was no rotation which could both account for a majority of the variance and have each factor account for a large part of that variance. If no rotation could both account for 51

percent of variance and have all factors contribute 7.5 percent or more, the hypothesis would be accepted.

The four factor solution accounted for 52.8 percent of the variance and the smallest factor was 8.4 percent. Therefore, this hypothesis was rejected. (See Table 5. 1)

TABLE 5. 1

PROPORTION OF VARIANCE EXPLAINED BY EACH FACTOR OF THE FOUR FACTOR ROTATION, AND THE CUMMULATIVE PROPORTION OF VARIANCE

Factors	1	2	3	4
Prop. Var.	.2002	.1353	.0844	.1084
Cum. P. V.	.2002	.3356	.4200	.5284

Ho_c: Osgood's dimension of EVALUATION did not appear since less than three of the four adjectival scales associated with this dimension did not have high loadings on the same factor. The four scales were: ugly--beautiful, unpleasant--pleasant, uninteresting--interesting, and insincere--sincere. (High loadings, for the purpose of this study, were scores of $\pm$.40 or higher with a difference of at least .20 larger than any other factor loading on that scale.)

Table 5. 2 indicates that high loadings appeared on all four key scales in Factor One, therefore, the EVALUATION factor did appear and was Factor One. Hypothesis Ho_c was rejected.

Ho_d: Osgood's factor of POTENCY did not appear since less than two of the three variables associated with the potency dimension did

not have high loadings on the same factor. The three scales were: feminine--masculine, gentle--violent, and delicate--rugged.

TABLE 5. 2

SCALES DENOTING THE EVALUATION FACTOR

Factors	1	2	3	4	h^2
Ugly--Beautiful	.78*	-.18	-.05	.15	.67
Unpleasant--Pleasant	.77*	-.23	-.04	.12	.67
Uninteresting--Interesting	.81*	-.05	.10	.19	.70
Insincere--Sincere	.73*	.02	-.11	.03	.55

* Indicates high loading. h^2 Indicates communality of the scale.

Note: In this and the following tables some of the scales have been reversed from the direction presented in the answer sheet. When the scales have been changed, the signs for the factor loadings have also been reversed. It is hoped that this alteration will make the presentation of the data more comprehensible.

TABLE 5. 3

SCALES DENOTING THE POTENCY FACTOR

Factors	1	2	3	4	h^2
Feminine--Masculine	.02	.70*	-.17	-.16	.55
Gentle--Violent	-.12	.78*	.09	.03	.63
Delicate--Rugged	-.23	.62*	-.02	-.11	.45

* Indicates high loadings.

Table 5. 3 demonstrates that high loadings occurred on Factor Two for all three scales. Thus, the POTENCY scale did occur and was Factor Two. Hypothesis Ho_d was rejected.

Ho_e: Osgood's dimension of ACTIVITY did not appear since less than three of the four scales associated with this factor did not have high loadings on the same factor. The scales were active--passive, complex--simple, exciting--calming, and busy--restful.

TABLE 5. 4

SCALES DENOTING THE ACTIVITY FACTOR

Factors	1	2	3	4	h^2
Active--Passive	-.38	-.02	-.07	-.52	.41
Complex--Simple	-.13	-.05	-.21	-.77*	.66
Exciting--Calming	-.06	.73	.14	-.21	.60

* Indicates high loading.

All the variables except exciting--calming show strong loadings in Factor Four, but just two have the highest loading in that factor. Only complex--simple shows a clear high loading in Factor Four. Thus, the null hypothesis cannot be rejected.

Ho_f: No other interpretable factors appeared since no factors other than the three stated appear with high loadings on two or more variables.

Tables 5. 5 and 5. 6 demonstrate that two factors other than the original three did appear. Therefore, this hypothesis was rejected.

TABLE 5. 5

SCALES CONTAINING HIGH LOADINGS ON FACTOR 3

Factors	1	2	3	4	h^2
Expected--Unexpected	.01	.07	.61*	.24	.43
Repetitive--Varied	.08	.03	.64*	.21	.45
Austere--Lush	.11	-.03	.55*	.07	.32

* Indicates high loading.

TABLE 5. 6

SCALES CONTAINING HIGH LOADINGS ON FACTOR 4

Factors	1	2	3	4	h^2
Complex--Simple	-.13	.05	-.21	-.77*	.66
Fancy--Plain	-.18	.06	-.18	-.71*	.58

* Indicates high loading.

B. Hypotheses about Differences among Groups

Ho_g: There was no difference in the mean factor scores between the groups selected as "normal" and groups selected for positive attitudes. (Comparison 1)

TABLE 5. 7

ANALYSIS OF VARIANCE TABLE OF GROUP DIFFERENCES

Source	df	Sums of Squares	Mean Square	F
Groups	5	6.7619	1.3528	
Comparison 1	1	1.1828	1.1828	1.18
Comparison 2	1	1.8896	1.8896	1.89
Comparison 3	1	.9240	.9240	.93
Comparison 4	1	1.0480	1.0480	1.05
Remainder	1	1.7175	1.7175	1.72
Subjects within Groups	428	427.2389	.9982	
Factors	3	.0000	.0000	
Factor by Group Interaction	15	48.5943	3.2396	3.32*
Factor by Subject within Group Interaction	1284	1253.4065	.9762	
Total	1735	1736.0016		

* Significant at the .05 level.

Table 5. 7 shows that the F ratio of 1.18 for comparison 1 was not significant at the .01 level and, therefore, this hypothesis was not rejected.

Ho_h: There was no difference between the means for a group of Michigan State University (MSU) students and those for students enrolled at Central Michigan University (CMU) (Comparison 2).

The F ratio for this comparison was 1.89, as shown in Table 5. 7. This ratio was not significant at the .01 level for 1 and 428 degrees of freedom. The hypothesis was not rejected.

Ho_i: There was no difference between the means of a group of students enrolled in an elementary music curriculum and a group of students enrolled in curricula other than elementary education. (Comparison 3)

Table 5. 7 shows that the F ratio for this comparison was .93. At the .01 level for 1 and 428 degrees of freedom, this ratio was not significant. The hypothesis was not rejected.

Ho_j: There was no difference between the means of a group of subjects selected as having positive attitudes toward music, but not professional involvement, and a group of subjects who were professionally involved with music. (Comparison 4)

As shown in Table 5. 7, the F ratio of comparison 4 was not significant. Thus the hypothesis was not rejected.

Ho_k: There were no other differences among the groups. (This comparison is shown in the test for the remainder of variance.)

This hypothesis was not rejected as the F ratio was not significant as shown in Table 5. 7.

Ho_1: There was not Group-by-Factor interaction.

The results are shown in Table 5. 7. The resultant F ratio of 3.32 is significant at the .05 level with 5 and 426 degrees of freedom, a conservative test prescribed by Greenhouse and Geiser (1957). Thus Ho_1 was rejected.

II. DISCUSSION OF FINDINGS

A. Factors

By and large, the results of the factor analysis confirmed the experimental hypotheses. The relatively few factors needed to fulfill the stated requirement indicated that the subjects were able to use the scales of the Musical Semantic Differential (MSD) with consistency. The solution to the factor analysis of the data included seven rotations--a two-factor rotation through and eight-factor rotation. (See Appendix D.) Of all these rotations, only the four-factor solution met both the qualification of explaining 51 percent of the variance and also having at least 7.5 percent of the variance included in each factor. Therefore, the four-factor rotation was selected as the best description of the data.

The first factor appeared to be related to Osgood's dimension of EVALUATION. Table 5. 8 contains all the scales with high or strong loadings on Factor One.

TABLE 5. 8

FACTOR LOADING OF ALL SCALES REPRESENTING THE EVALUATION DIMENSION

	Factors	1	2	3	4	h^2
High	Uninteresting--Interesting	.81*	-.05	.10	.19	.70
	Ugly--Beautiful	.78*	-.18	-.05	.15	.67
Loadings	Unpleasant--Pleasant	.77*	-.23	-.04	.12	.67
	Cold--Warm	.74*	-.19	.19	-.14	.64
	Insincere--Sincere	.73*	.02	.11	.03	.55
	Colorless--Colorful	.71*	.01	.14	.34	.63

TABLE 5. 8 (cont'd.)

	Factors	1	2	3	4	h^2
Strong	Awkward--Graceful	.55	-.48	-.13	.26	.62
Loadings	Stiff--Elastic	.53	-.15	.46	-.28	.59

* Indicates high loadings.

The first factor clearly involves EVALUATION, but the inclusion of such scales as cold--warm and colorless--colorful tends to modify the dimension. Osgood et al. found a cold--hot scale was usually included in an ACTIVITY dimension, while colorless--colorful denoted RECEPTIVITY, a relatively minor dimension. The presence of these scales in the EVALUATION factor may indicate a degree of aesthetic response in this dimension.

The second factor was related to the dimension of POTENCY as described by Osgood et al. and in Chapter I. The scales with high or strong loadings on this factor are presented in Table 5. 9.

The interpretation of the third factor was more ambiguous than that of the first two factors. Table 5. 10 shows the scale with high and strong loadings on factor three.

Repetitive--varied, expected--unexpected, and ordered--chaotic all seemed to have a logical relationship with each other, but the relationship of austere--lush is obscure. It may be that austere--lush measures some dimension not represented by any other scale. Investigation of the rotations with six through eight factors showed that this variable was in fact isolated from the other three variables

TABLE 5. 9

FACTOR LOADINGS OF ALL SCALES REPRESENTING THE POTENCY DIMENSION

	Factors	1	2	3	4	h^2
High	Gentle--Violent	-.12	.78*	.09	.03	.63
Loadings	Calming--Exciting	.06	.73*	.14	.21	.60
	Feminine--Masculine	.02	.70*	-.17	-.16	.55
	Delicate--Rugged	-.23	.62*	.02	-.11	.45
Strong	Relaxed--Tense	-.31	.54	-.06	.47	.61
Loadings	Restful--Busy	-.09	.54	.13	.45	.51
	Loose--Tight	-.26	.48	-.24	.35	.63

* Indicates high loadings.

TABLE 5. 10

FACTOR LOADINGS OF ALL SCALES REPRESENTING THE NOVELTY DIMENSION

	Factors	1	2	3	4	h^2
High	Repetitive--Varied	.08	.03	.63*	.21	.45
Loadings	Expected--Unexpected	.01	.07	.61*	.24	.43
	Austere--Lush	.11	-.03	.55*	.07	.32
Strong	Ordered--Chaotic	-.41	.18	.57	-.13	.55
Loadings						

* Indicates high loadings.

(see Appendix D). On the other hand, the scale itself might not reflect true opposites and the subjects could have been responding to only one of the two adjectives.

The two dimensions of repetitive--varied and expected--unexpected seemed to indicate a dimension of NOVELTY. Osgood et al. mention the possibility of this dimension, but it is not generally as strong as the three primary factors (p. 64). The ordered--chaotic scale seems to support the idea of a novelty dimension. This scale has a stronger loading on the third factor than does the austere--lush dimension, .57 as opposed to .55. However, ordered--chaotic seems to have strong evaluation overtones and the loading could not be considered a high loading.

The final dimension presented the greatest difficulty in interpretation. Table 5. 11 shows the scales with high and strong loadings on Factor Four.

TABLE 5. 11

FACTOR LOADINGS OF SCALES REPRESENTING THE COMPLEXITY DIMENSION

	Factors	1	2	3	4	h^2
High	Complex--Simple	-.13	-.05	-.21	-.77*	.66
Loadings	Fancy--Plain	-.18	.06	-.18	-.71*	.58
Strong	Active--Passive	-.36	-.02	-.07	-.52	.41
Loadings	Tense--Relaxed	.39	-.54	.06	-.47	.61
	Restful--Busy	-.09	.54	.13	.45	.51

* Indicates high loadings.

It may be that this factor should not have been accepted since it had only two highly loaded variables. However, because the

factor was relatively strong--it accounted for 11 percent of the variance--and due to the preliminary nature of this investigation, it was accepted and labeled COMPLEXITY. Factor Four seems to have some relationship to the ACTIVITY factor.

This list of four factors may not represent all of the possible factors used to describe music. For example, a five factor rotation drew out a factor which could have been termed EMOTION, but this factor did not contribute sufficiently to the solution and thus the rotation was rejected (see Appendix D).

The scales used in this study were not completely satisfactory for the task at hand, as may be shown in several ways. First of all, there is much unexplained variance--47 percent. Therefore, each scale, to some extent, may have been measuring its own unique factor and not contributing to the primary factors, particularly in Factors Three and Four. This unexplained variance may also have been the result of the testing procedure as students who were bored or disenchanted with the test may have given answers unrelated to any type of musical response.

Secondly, not enough scales were present to define adequately all the factors. If other factors did exist, they were not adequately represented; in fact, even Factors Three and Four could have been more clearly defined.

Third, the polarity of some scales might be questioned. For example, austere--lush may have been non-linear. Logically, austere--lush should have fallen into the complexity dimension, if austere was a synonym of "plain" or "simple." However, if one defined

austere as "restricted" then lush may have become "non-austere." In this case austere--lush would fit in the novelty factor.

Finally, some scales may not have been appropriate for use with music, as these scales were ambiguous in their factor loadings. For example, loose--tight had factor loadings of .20 or greater in all four factors (-.26, .48, -.24, and .35). Tense--relaxed had loadings at .30 or greater on three factors (.31, -.54, .06, and -.47).

B. Between Group Differences

Most of the null hypotheses in regard to between group differences were accepted. The only hypothesis to be rejected was the statement of Group-by-Factor interaction. By rejecting this hypothesis, the formulation of four new sub-hypotheses was required.

Because interaction existed, it was necessary to find if the interaction was related to attitude. Therefore, the primary interest was to find if the groups differed within any one of the factors. Differences which might occur between two groups on different factors would be uninterpretable and not pertinent to the study.

Ho_m: There were no differences among mean factor scores on the EVALUATION factor.

Ho_n: There were no differences among mean factor scores on the POTENCY factor.

Ho_o: There were no differences among mean factor scores on the NOVELTY factor.

Ho_p: There were no differences among the mean factor scores of the COMPLEXITY factor.

To test these hypotheses, four one-way analyses of variance were performed. Table 5. 12 shows the results of those tests.

TABLE 5. 12

ANALYSES OF VARIANCE FOR BETWEEN GROUP DIFFERENCES ON EACH FACTOR

Sources	df	SS	MS	F
Factor 1				
Between groups	5	16.7077	3.3415	3.44*
Within groups	428	416.2282	.9725	
Total	433	432.9359		
Factor 2				
Between groups	5	7.5712	1.5142	1.48
Within groups	428	438.5369	1.0246	
Total	433	446.1081		
Factor 3				
Between groups	5	26.5564	5.3113	5.53*
Within groups	428	410.6908	.9596	
Total	433	437.2472		
Factor 4				
Between groups	5	7.5433	1.5087	1.50
Within groups	428	431.7200	1.0087	
Total	433	439.2633		

* Significant at .01 level.

Of the four F tests, the tests for the EVALUATION factor and the NOVELTY factor showed significant differences, indicating that some differences did exist. Not all differences were of interest; only the comparison of predicted attitude difference was tested for each significant factor.

The Scheffé *post hoc* comparison method as described by Hays (1963, pp. 483-487) was used to test the differences of mean factor scores between the groups selected as "normal" and groups selected for positive attitudes. The confidence interval for this comparison on Factor One was $-.501 \pm .647$; for Factor Three, the confidence interval was $.502 \pm .643$. The confidence intervals in both cases represented an α level of .01. In both cases the confidence interval included "0" and, therefore, the null hypothesis could not be rejected.

III. VALIDITY MEASURES

In all cases where there was an attempt to show differences of attitude between the groups, the null hypotheses could not be rejected; therefore, it was impossible to demonstrate that the MSD did measure attitudes. Thus, it was unnecessary to test the validity of the instrument and no such tests were performed.

Summary

The purpose of this chapter was to present the findings of this study. Two sets of hypotheses were tested. The first set of hypotheses referred to the factor analyses results of the data. The second set of hypotheses was conjectures about the differences among subject groups in the study.

Four factors were found: aesthetic EVALUATION, POTENCY, NOVELTY, and COMPLEXITY. Each factor accounted for at least 8.4 percent of the variance and together they explained 52.8 percent

of the variance. Two of Osgood's (1957) factors appeared--EVALUATION and POTENCY--but the ACTIVITY factor did not.

There were no differences demonstrated among the groups in this study. All the main null hypotheses other than the null hypothesis about Group-by-Factor interaction were accepted. Four sub-hypotheses about group difference within each factor were developed and were tested by four one-way analyses of variance. Two factors--EVALUATION and NOVELTY--showed that group differences did exist within these factors. Investigation showed that there were no differences between the means of the "normal" groups and those of the "high attitude" groups.

No attempt was made to test the validity of the MSD (Musical Semantic Differential) as the relationship of the mean scores on the MSD to attitudes could not be demonstrated.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

Introduction

This final chapter contains the concluding statements about this study. The first section is a summation of the procedures and findings of the study. In the second section, conclusions resulting from the study are stated. The third section is a discussion about the adequacy of the semantic differential as used with music and deals with the implications for further research.

I. SUMMARY

The purpose of this study was to investigate the potential use of the semantic differential (SD) technique as a method for measuring attitudes toward music. The SD technique was developed by Osgood as is described in The Measurement of Meaning by Osgood et al. (1957). The technique provided a means by which an individual's or a group's reaction to some object or concept could be measured on three or more dimensions. Osgood et al. found that in most studies, three distinct dimensions appeared: EVALUATION, POTENCY, and ACTIVITY.

In this study, the assumption was made that if individual attitudes about music differed, there would be corresponding differences in the way each individual ranked music on the semantic factors. An SD could then be used as an instrument for measuring attitudes toward music if such differences among ratings could be detected.

This investigation involved two problems. First, SD's had been used primarily with verbal symbols or visual objects. The subjects might respond differently to music which is both non-verbal and non-visual. Thus, some question existed about the usefulness of dimensions defined by Osgood et al. One purpose of the study, then, was to find the semantic factors that people did use to describe music.

The second problem under investigation was to determine if differences among various groups could be measured by the use of factor scores. If the instrument used in this study were to effectively measure attitudes toward music, it had to be sensitive enough to register known group differences.

For this study an instrument labeled the Musical Semantic Differential (MSD) was developed. This instrument consisted of twenty-four bipolar adjectival scales and ten pieces of music randomly chosen from A Dictionary of Musical Themes by Barlow and Morganstern (1964). The reliability of the instrument was estimated for a period of 24 hours under test-retest conditions. The correlations were: Factor One, r=.90; Factor Two, r=.90; Factor Three, r=.72; and Factor Four, r=.86.

Four factors were established and accounted for a total of 53 percent of the variance. The first factor was related to the EVALUATION factor as defined by Osgood. The scales of colorful--colorless and cold--warm received high loadings on this dimension. Therefore, in this investigation, some degree of affective response seemed to be included in the EVALUATION dimension. This factor accounted for 20 percent of the variance.

The second factor confirmed the POTENCY dimension as defined by Osgood et al. with high loadings on the feminine--masculine, gentle--violent, calming--exciting, and rugged--delicate scales. The POTENCY dimension contained 13.5 percent of the total variance.

Osgood's third dimension--ACTIVITY--was not confirmed and two other dimensions appeared instead. The new third dimension was labeled NOVELTY because expected--surprising, repetitive--varied, and austere--lush each had high loadings on this dimension. Another variable received a strong loading--ordered--chaotic. The NOVELTY dimension was the weakest of the four: it contained only eight percent of the variance.

The final dimension was labeled COMPLEXITY, because this factor had high loadings on the complex--simple and fancy--plain adjectival scales. The COMPLEXITY dimension may have been related to Osgood's ACTIVITY dimension for strong loadings appeared on active--passive, restful--busy, and tense--relaxed. The COMPLEXITY dimension accounted for 11 percent of the variance.

The subjects (N=434) participating in the study represented six different groups. The largest group (N=322) was from a group of elementary education students enrolled in a basic music class at Michigan State University (MSU). These students were tested during the winter term of 1970. The second group was much smaller (N=14) but from the same general population. These students, however, were enrolled during the spring term of 1970. They were included in the sample as part of an attempt to establish the MSD's reliability.

A third group of MSU students (N=30) were tested. These students were enrolled in a basic music course open to students from all phases of the university curriculum. The course was offered to satisfy part of a university requirement in fine arts. This group of students was included to test the possibility that fields of specialization might have some effect on the data.

The fourth group (N=29) was again elementary education students enrolled in a basic music course, but this time Central Michigan University students were tested. The inclusion of this subject group allowed the testing of the effect of colleges upon results.

These first four groups were assumed to represent the "normal" population. That is, the groups should have included subjects with all degrees of attitude toward music, and have had normal distributions. To test differences of attitude, two additional groups were selected. These groups demonstrated strong positive attitudes toward music in one of two ways.

The first of these groups consisted of 29 subjects who had enrolled in a Michigan State University Evening College class entitled "The Nine Symphonies." The subjects met in class for eight sessions of two hours each to hear and study the Beethoven symphonies. The class cost $15.00 per student, and took place during the winter quarter. It fulfilled no university requirement nor offered any university credit.

There was apparently no reason to attend this class other than individual interest in the music. These subjects indicated strong positive attitudes toward music as an avocation.

The final group (N=10) consisted of MSU graduate students in music education. These subjects demonstrated their attitude toward music by choosing to be professionally involved in music.

Even though differences in attitude apparently existed, the differences could not be demonstrated by an analysis of variance of the group means. No differences could be shown for predicted differences among the groups across all the factors. The EVALUATION and NOVELTY factors did evidence some group differences, but these differences were not demonstrably related to attitude.

II. CONCLUSIONS FROM THE STUDY

The primary purpose of this study was to investigate the potential use of a semantic differential as a measurement of attitudes toward music:

1. The musical semantic differential, developed for use in this study,could not be shown to detect differences in attitude.

A secondary purpose of this study was to establish the factors which subjects used to describe music. The following conclusions relate to that purpose:

2. The subjects used the adjectival scales in a consistent manner to describe the music.

3. Four semantic factors were found to be used by the subjects.

4. The first factor was related to Osgood's EVALUATION dimension.

5. The second factor was related to Osgood's POTENCY dimension.

6. The third factor found seemed to be a NOVELTY dimension.

7. The fourth factor found appeared to be a COMPLEXITY dimension and some relationship to Osgood's ACTIVITY dimension was noted.

8. Osgood's dimension of ACTIVITY did not directly appear.

III. DISCUSSION AND IMPLICATIONS FOR FURTHER RESEARCH

The primary hypothesis of this study was rejected, yet evidence did exist that the MSD was measuring some aspect of music or response to music. That the responses were not indicative of attitude simply eliminates one possibility of an explanation and does not eliminate semantic differential techniques as a potentially useful tool in the study of affective response to music. One could conclude, however, that further research is necessary to determine what a semantic differential does actually measure.

At this point, several implications seem to be quite clear.

1. The series of adjectival scales needs extensive revision.

The inadequacies of the scales have been discussed somewhat in Chapter V. It is clear that if some of the ambiguous scales were eliminated or changed less variance would be attributed to error. For example, austere--lush was a weak item for two reasons. First of all, it had a low communality of .32 and, therefore, it was very unreliable as an item as there was much unexplained variance for this scale. Secondly, lush may not be the best antonym for austere. The subjects seemed to define austere as "strict" or "rigid" and, therefore, lush seemed to mean "non-strict."

In a similar way, ordered--chaotic had strong evaluation overtones. Perhaps if chaotic had been replaced by non-ordered or random, the evaluation tendency would not have been so strong. Gentle--violent, calming--exciting, restful--busy, and cold--warm might also be subject to revision.

2. The factors used to describe music need further clarification and identification.

The EVALUATION factor and the POTENCY factors were quite clearly defined, but the nature of the NOVELTY and COMPLEXITY could be questioned. In addition, there must be further work into the testing of more adjectival scales to find items which are strong indicators of the third, fourth, and potential fifth factors.

3. Some investigation is necessary to account for the differences among the various categories of music as measured by a semantic differential.

Only one rather narrow category of music was used in this study--that of instrumental art music--and no differences were considered among the examples used. Some investigation is necessary to see if the factor structure would vary with differing categories of music or would remain the same.

4. Investigation should be carried out to determine if the factor structure differs from one subject group to another.

In this study, it was assumed that all the groups used the same dimensions, but in reality the factor structure might vary considerably. As it was, the factor structure was primarily that of the largest group. There were not enough subjects in the positive

attitude groups to provide meaningful separate factor analysis. An analysis of the responses of one hundred or more students to the MSD or a similar instrument would indicate if the factor structure differed between musicians and non-musicians.

5. The differences in factor scores for each piece of music should be investigated.

Although the MSD results did not distinguish between known attitude differences, tests of this type may be able to distinguish between various musical compositions and to rate these objectively according to the various factors.

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APPENDICES

APPENDIX A

APPENDIX A

TEST MATERIAL

On the following page is a series of adjective pairs. In between each set of adjectives are five numbers, for example:

1. Thick 1 2 3 4 5 Thin

You will be asked to make one judgment for each adjective pair. If, to you, the music seems very "thick," but not extremely so, mark "2" on the answer sheet.

However, if the music seems somewhat "thin," you would mark "4" on the answer sheet.

Mark "5" when the music seems very "thin."

It may seem to you that "Thick--Thin" is not relevant to this piece of music. Or, you may be unable to choose between the two. In either case, mark "3." This means undecided or irrelevant.

There are no right or wrong answers for this questionnaire. The best response is what you feel appropriate. Please answer all of the items. Do not linger over any items; first impressions are usually the best. But, do not be careless in marking the items. We are interested in what the music means to you.

MUSICAL EXAMPLE

1 2 3 4 5 6 7 8 9 10

BE SURE YOUR MARKS ARE HEAVY AND BLACK
ERASE COMPLETELY ANY MARK CHANGED

1	Ugly	1	2	3	4	5	Beautiful
2	Expected	1	2	3	4	5	Surprising
3	Repetitive	1	2	3	4	5	Varied
4	Pleasant	1	2	3	4	5	Unpleasant
5	Sad	1	2	3	4	5	Happy
6	Uninteresting	1	2	3	4	5	Interesting
7	Feminine	1	2	3	4	5	Masculine
8	Gentle	1	2	3	4	5	Violent
9	Calming	1	2	3	4	5	Exciting
10	Loose	1	2	3	4	5	Tight
11	Colorful	1	2	3	4	5	Colorless
12	Tense	1	2	3	4	5	Relaxed
13	Restful	1	2	3	4	5	Busy
14	Complex	1	2	3	4	5	Simple
15	Stiff	1	2	3	4	5	Elastic
16	Cold	1	2	3	4	5	Warm
17	Active	1	2	3	4	5	Passive
18	Insincere	1	2	3	4	5	Sincere
19	Ordered	1	2	3	4	5	Chaotic
20	Fancy	1	2	3	4	5	Plain
21	Austere	1	2	3	4	5	Lush
22	Humorous	1	2	3	4	5	Serious
23	Graceful	1	2	3	4	5	Awkward
24	Rugged	1	2	3	4	5	Delicate

APPENDIX B

APPENDIX B

RANDOM SELECTION OF MUSIC

Barlow and Morganstern Theme Number	Composer	Composition and Theme
R 85	Rameau	Dardanus, Rigaudon No. 1
V 126	Visee	Petite Suite in d minor for Guitar Gigue
H 331	Haydn	Quartet in F, Op. 3, No. 5 First Movement, Second Theme
B 1343	Brahms	Piano Concerto No. 1 Third Movement, Second Theme
*C 553	Couperin	Les Folies Francaise Fifth Movement, La Fidelite
H 292	Harris	Symphony No. 3 Sixth Theme, B
C 234	Chopin	Mazurka No. 19, Op. 30, No. 2 Introduction
M 687	Mozart	Quintet in E-flat, K. 452 First Movement, Introduction
B 393	Bach	WTC Book II Fugue 22
R 103	Rameau	Pièces de Clavecin en Concert No. 5, La Cupis
*V 146	Vivaldi	Concerto in g minor Second Movement
*H 142	Handel	Sonata in G for Flute, Op. 1, No. 5 First Movement

Barlow and Morganstern Theme Number	Composer	Composition and Theme
*G 137	Gluck	Iphigenia in Aulis Act II, March
E 55	Elgar	Sonata in e minor for Violin and Piano, Op. 82 First Movement, Second Theme
H 800	Holst	The Planets Second Movement, Venus First Theme
C 296	Chopin	Preludes, Op. 28, No. 11
M 826	Mozart	Sonata in C for Violin and Piano K. 296 Third Movement
V 27	Vaughn Williams	London Symphony Third Movement, Second Theme
H 202	Handel	Suite No. 2 in F Third Movement
*B 518	Bax	Sonata for Viola and Piano Second Movement, First Theme

* These works were not in the record library of WKAR, the Michigan State University radio station. Therefore, they were not recorded nor included in the study.

APPENDIX C

APPENDIX C

VARIMAX ROTATION ANALYSIS.

ROTATED FACTOR LOADINGS

		1	2	3	4	COMM.
UGLY	1	.7853*	-.1773	-.0505	.1519	.6738
EXPECTED	2	.0147	.0729	.6059*	.2485	.4305
REPETITI	3	.0783	.0315	.6381*	.2119	.4491
PLEASENT	4	-.7755*	.2288	.0433	-.1253	.6713
SAD	5	.3252*	-.0022	.2139	-.2508	.2144
UNINTERE	6	.8075*	-.0471	.0975	.1859	.6983
FEMININE	7	.0193	.7028*	-.1662	-.1598	.5475
GENTLE	8	-.1190	.7763*	.0884	.0342	.6258
CALM-NG	9	.0567	.7256*	.1448	.2139	.5964
LOOSE	10	-.2650	.4806*	-.2419	.3487	.4814
COLORFUL	11	-.7067*	-.0077	-.1385	-.3437	.6354
TENSE	12	.3095	-.5400*	.0632	-.4665	.6089
RESTFUL	13	-.0913	.5358*	.1381	.4480	.5131
COMPLEX	14	-.1279	-.0506	-.2150	-.7721*	.6605
STIFF	15	.5283*	-.1512	.4556	-.2882	.5898
COLD	16	.7402*	-.1858	.1865	-.1397	.6368
ACTIVE	17	-.3576	-.0246	-.0603	-.5236*	.4074
INSINCER	18	.7347*	.0220	-.1147	.0275	.5542
ORDERED	19	-.4124	.1823	.5723*	-.1352	.5491
FANCY	20	-.1803	.0600	-.1841	-.7115*	.5762
AUSTERE	21	.1059	-.0341	.5467*	.0684	.3160
HUMOROUS	22	.2158	.1004	-.2567*	.2285	.1748
GRACEFUL	23	-.5534*	.4821	.1260	-.2622	.6233
RUGGED	24	.2316	-.6176*	-.0175	.1057	.4466
HI.LOAD.	25	.8075	.7763	.6381	-.7721	
PROP.VAR	26	.2002	.1353	.0844	.1084	
CUM.P.V.	27	.2002	.3356	.4200	.5284	

APPENDIX D

VARIMAX ROTATION ANALYSIS.

ROTATED FACTOR LOADINGS — Two-Factor Solution

		1	2	COMM.
UGLY	1	.5240	.5919*	.6249
EXPECTED	2	-.1502	.3360*	.1355
REPETITI	3	-.0820	.3434*	.1246
PLEASENT	4	-.5650*	-.5629	.6360
SAD	5	.2281*	.1362	.0706
UNINTERE	6	.4157	.7007*	.6639
FEMININE	7	-.4321*	.0580	.1901
GENTLE	8	-.6734*	.1351	.4717
CALM*NG	9	-.5974*	.3654	.4904
LOOSE	10	-.6134*	.0828	.3831
COLORFUL	11	-.2729	-.7436*	.6274
TENSE	12	.7219*	-.1748	.5517
RESTFUL	13	-.5956*	.3554	.4810
COMPLEX	14	.2171	-.6299*	.4439
STIFF	15	.4633*	.2568	.2806
COLD	16	.5875*	.4346	.5340
ACTIVE	17	-.0152	-.5889*	.3471
INSINCER	18	.3958	.5234*	.4307
ORDERED	19	-.3612*	-.2136	.1761
FANCY	20	.0674	-.5838*	.3454
AUSTERE	21	.0299	.2262*	.0521
HUMOROUS	22	.0087	.2524*	.0638
GRACEFUL	23	-.6026*	-.4050	.5272
RUGGED	24	.5676*	.0624	.3261
HI.LOAD.	25	.7219	-.7436	
PROP.VAR	26	.1982	.1759	
CUM.P.V.	27	.1982	.3741	

VARIMAX ROTATION ANALYSIS, Three-Factor Solution

ROTATED FACTOR LOADINGS

		1	2	3	COMM,
UGLY	1	,7686*	-,2557	,0264	,6569
EXPECTED	2	,0259	,0547	,6528*	,4298
REPETITI	3	,0512	-,0115	,6616*	,4405
PLEASENT	4	-,7619*	,2991	-,0014	,6700
SAD	5	,1564	-,2101*	,1342	,0866
UNINTERE	6	,7921*	-,1509	,1580	,6751
FEMININE	7	,0139	,5219*	-,2112	,3172
GENTLE	8	-,1148	,6744*	,1033	,4787
CALM+NG	9	,0886	,6596*	,2450	,4911
LOOSE	10	-,0635	,6684*	-,1018	,4611
COLORFUL	11	-,7572*	,0236	-,2397	,6313
TENSE	12	,0773	-,7489*	-,0762	,5727
RESTFUL	13	,0538	,6228*	,3037	,4831
COMPLEX	14	-,3964	-,3241	-,4493*	,4640
STIFF	15	,2660	-,4624*	,3462	,4044
COLD	16	,5651*	-,4389	,1682	,5402
ACTIVE	17	-,5546*	-,1917	-,1473	,3660
INSINCER	18	,6790*	-,1430	-,0250	,4821
ORDERED	19	-,5483*	,0710	,5030	,5587
FANCY	20	-,4040	-,1659	-,4293*	,3751
AUSTERE	21	,0012	-,1490	,5751*	,3503
HUMOROUS	22	,3095*	,1418	-,1051	,1270
GRACEFUL	23	-,6102*	,4049	-,0001	,5363
RUGGED	24	,2231	-,5399*	,0474	,3435
HI,LOAD,	25	,7921	-,7489	,6616	
PROP,VAR	26	,1971	,1612	,0976	
CUM,P,V,	27	,1971	,3583	,4559	

VARIMAX ROTATION ANALYSIS. Four-Factor Solution

ROTATED FACTOR LOADINGS

		1	2	3	4	COMM.
UGLY	1	.7927*	-.1738	-.0164	.0844	.6660
EXPECTED	2	.0555	.0971	.6312*	.1548	.4348
REPETITI	3	.1005	.0557	.6509*	.1141	.4499
PLEASENT	4	-.7860*	.2243	.0379	-.0732	.6749
SAD	5	.2904*	-.0062	.1977	-.2459	.1839
UNINTERE	6	.8275*	-.0341	.1091	.1101	.7100
FEMININE	7	.0628	.6975*	-.1916	-.1615	.5533
GENTLE	8	-.1245	.7533*	.0784	.0612	.5928
CALM*NG	9	.0565	.7061*	.1838	.1967	.5742
LOOSE	10	-.2281	.4975*	-.2081	.3623	.4741
COLORFUL	11	-.7241*	.0071	-.1461	-.2947	.6326
TENSE	12	.2764	-.5267*	.0607	.5020	.6094
RESTFUL	13	-.0694	.5150*	.1914	-.4206	.4836
COMPLEX	14	-.1761	-.0373	-.2560	-.7462*	.6547
STIFF	15	.4841*	-.1528	.4460	-.3605	.5866
COLD	16	.7141*	-.2036	.2123	-.2031	.6377
ACTIVE	17	-.4202	-.0537	-.0103	-.4704*	.4008
INSINCER	18	.7363*	.0050	-.0486	.0220	.5444
ORDERED	19	-.4641	.1494	.5675*	.1269	.5758
FANCY	20	-.1983	.1208	-.2503	-.7010*	.6080
AUSTERE	21	.0442	-.1075	.5740*	.0860	.3504
HUMOROUS	22	.2403*	.0852	-.1697	.1882	.1293
GRACEFUL	23	-.5426*	.5182	.0751	-.2541	.6331
RUGGED	24	.1918	-.6581*	.0273	.1091	.4825
HI.LOAD.	25	.8275	.7533	.6509	-.7462	
PROP.VAR	26	.2020	.1360	.0882	.1006	
CUM.P.V.	27	.2020	.3380	.4262	.5268	

VARIMAX ROTATION ANALYSIS, Five-Factor Solution

ROTATED FACTOR LOADINGS

		1	2	3	4
UGLY	1	.7935*	-.1574	-.0329	.1054
EXPECTED	2	.0689	.0879	.6592*	.1458
REPETITI	3	.1136	.0482	.6683*	.1173
PLEASENT	4	-.7848*	.2068	.0657	-.1039
SAD	5	.2594	.0108	.0439	-.0798
UNINTERE	6	.8287*	-.0190	.0997	.1299
FEMININE	7	.0537	.7091*	-.1653	-.1776
GENTLE	8	-.1392	.7490*	.0929	.0561
CALM-NG	9	.0295	.7072*	.1506	.2383
LOOSE	10	-.2519	.4936*	-.2031	.3421
COLORFUL	11	-.7186*	-.0052	-.1293	-.3156
TENSE	12	.3084	-.5215*	.0806	-.5057
RESTFUL	13	-.0984	.5127*	.1545	.4544
COMPLEX	14	-.1654	-.0335	-.2638	-.7254*
STIFF	15	.4994*	-.1448	.4202	-.3045
COLD	16	.7219*	-.1887	.1803	-.1515
ACTIVE	17	-.3874	-.0662	.0728	-.5414*
INSINCER	18	.7478*	.0173	-.0104	-.0435
ORDERED	19	-.4433	.1307	.6154*	-.1542
FANCY	20	-.1841	.1216	-.2274	-.7092*
AUSTERE	21	.0416	-.1097	.5230*	.1503
HUMOROUS	22	.2748	.0787	-.0114	.0289
GRACEFUL	23	-.5401*	.5054	.1118	-.2789
RUGGED	24	.1953	-.6523*	-.0137	.1396
HI.LOAD.	25	.8287	.7490	.6683	-.7254
PROP.VAR	26	.2029	.1334	.0853	.1014
CUM.P.V.	27	.2029	.3363	.4215	.5230

ROTATION SOLUTION TIME= .376 SECS.

Five-Factor Solution (cont'd.)

5	COMM.
-.0030	.6666
-.0815	.4748
-.0296	.4765
-.0418	.6755
.6963*	.5606
-.0204	.7144
-.0633	.5559
-.0303	.5931
.1302	.5974
-.1055	.4765
.0274	.6335
.0194	.6296
.0884	.5107
.2007	.6645
.2167	.5866
.1623	.6385
-.2005	.4930
-.1674	.5895
-.0695	.6209
.0723	.6086
.2438	.3693
-.7207*	.6021
-.0286	.6382
.1070	.4948
-.7207	
.0550	
.5780	

VARIMAX ROTATION ANALYSIS, Six-Factor Solution

ROTATED FACTOR LOADINGS

		1	2	3	4
UGLY	1	,7995*	-,1580	-,0076	,0989
EXPECTED	2	,0812	,0275	,7773*	,1622
REPETITI	3	,1074	,0256	,6860*	,1340
PLEASENT	4	-,7945*	,2129	,0261	-,1021
SAD	5	,2440	,0361	-,0494	-,1039
UNINTERE	6	,8415*	-,0428	,1768	,1116
FEMININE	7	,0659	,6508*	-,0604	-,2686
GENTLE	8	-,1420	,7639*	,0831	-,0308
CALM-NG	9	,0191	,7730*	,0591	,1464
LOOSE	10	-,2333	,5411*	-,1887	,2792
COLORFUL	11	-,7341*	-,0119	-,1618	-,2968
TENSE	12	,2745	-,5574*	,0069	-,4445
RESTFUL	13	-,1015	,6049*	,0538	,3901
COMPLEX	14	-,1875	-,1006	-,2735	-,7246*
STIFF	15	,4485	-,1262	,2428	-,2924
COLD	16	,6804*	-,1436	,0036	-,1505
ACTIVE	17	-,4188	-,1074	,0200	-,5108*
INSINCER	18	,7329*	,0326	-,0594	-,0674
ORDERED	19	-,4736	,1216	,5385*	-,1320
FANCY	20	-,1873	,0079	-,1203	-,7201*
AUSTERE	21	-,0187	,0220	,1903	,1676
HUMOROUS	22	,2575	,1118	-,0745	,0224
GRACEFUL	23	-,5319*	,4271	,2279	-,3152
RUGGED	24	,1578	-,5364*	-,2699	,2047
HI.LOAD,	25	,8415	,7730	,7773	-,7246
PROP.VAR	26	,2002	,1336	,0751	,0959
CUM.P.V.	27	,2002	,3338	,4090	,5049

ROTATION SOLUTION TIME= .475 SECS.

Six-Factor Solution (cont'd.)

5	6	COMM.
.0151	*.0136	.6745
.0358	.0329	.6402
.0238	*.1492	.5235
*.0716	*.0166	.6930
.6558*	*.2377	.5606
.0331	.0408	.7565
*.0506	.2228	.5559
*.0676	*.0090	.6162
.0556	*.1750	.6565
*.1218	*.1403	.4953
*.0187	*.0144	.6607
*.0204	*.2196	.6323
.0268	*.1671	.5599
.1997	.0072	.6707
.1225	*.4934*	.6200
.0575	*.4342	.6981
*.2523	*.1020	.5223
*.2181	*.1388	.6132
*.0928	*.2610	.6233
.0993	.2083	.6215
.0752	*.7135*	.5799
.7961	*.0832	.7255
.0232	.2063	.6597
*.0229	*.4568	.6366

*.7961	*.7135
.0333	.0666
.5582	.6248

VARIMAX ROTATION ANALYSIS, Seven-Factor Solution

ROTATED FACTOR LOADINGS

		1	2	3	4	5
UGLY	1	.7958*	-.1329	.0419	.1248	.0120
EXPECTED	2	.0443	.0823	.7856*	.1845	.0325
REPETITI	3	.1195	-.1204	.8012*	-.0116	.0271
PLEASENT	4	-.7868*	.1505	-.0150	-.1437	-.0686
SAD	5	.2916	-.1415	.0548	-.2269	.6594*
UNINTERE	6	.8238*	.0106	.2066	.1794	.0278
FEMININE	7	.0560	.7031*	-.1597	-.1028	-.0559
GENTLE	8	-.1616	.6192*	-.0121	.0664	-.0786
CALM-NG	9	.0427	.3650	.0903	.0543	.0496
LOOSE	10	-.1428	.0505	-.0142	-.0418	-.1062
COLORFUL	11	-.6849*	-.0497	-.1505	-.4198	-.0061
TENSE	12	.2528	-.2261	-.0377	-.3089	-.0235
RESTFUL	13	-.0868	.1629	.0947	.2548	.0210
COMPLEX	14	-.1301	.0703	-.2476	-.7324*	.1727
STIFF	15	.3754	.0776	.1032	-.0350	.0997
COLD	16	.6510*	-.1009	-.0309	-.0330	.0426
ACTIVE	17	-.3554	-.0957	.1053	-.6537*	-.2367
INSINCER	18	.7476*	-.0362	-.0013	-.0723	-.2209
ORDERED	19	-.5296*	.2041	.4220	-.0169	-.1047
FANCY	20	-.1222	.2019	-.0713	-.7425*	.1174
AUSTERE	21	-.0599	-.2035	.1414	.1711	.0551
HUMOROUS	22	.2778	-.0291	-.0198	-.0536	-.7951*
GRACEFUL	23	-.5387*	.5358	.1443	-.2233	.0249
RUGGED	24	.1877	-.7396*	-.1549	.0099	-.0215
HI.LOAD.	25	.8238	-.7396	.8012	-.7425	-.7951
PROP.VAR	26	.1914	.0902	.0711	.0881	.0531
CUM.P.V.	27	.1914	.2816	.3527	.4408	.4939

ROTATION SOLUTION TIME= ,742 SECS,

Seven-Factor Solution (cont'd.)

6	7	COMM,
*.0128	-.1116	,6811
-,0262	-,0187	,6619
-,1029	,1584	,7072
-,0128	,1675	,6955
-,1798	,1601	,6523
-,0068	-,0814	,7610
,0475	,2379	,5955
-,1369	,4574	,6482
-,1817	,7007*	,6727
,2968	,7348*	,6642
,0538	,0477	,6756
-,2658	-,5949*	,6370
-,1164	,6690*	,5696
-,0122	-,2081	,6929
-,6424*	-,3304	,6905
-,4826	-,1794	,7030
-,0370	-,0530	,6341
-,1356	,0366	,6336
-,3624	-,0433	,6447
,1685	-,1536	,6779
-,6859*	,1398	,5874
-,0290	,1624	,7407
,0742	,1145	,6672
-,2476	-,0887	,6759

-,6859	,7348
,0682	,1033
,5621	,6654

VARIMAX ROTATION ANALYSIS. Eight-Factor Solution

ROTATED FACTOR LOADINGS

		1	2	3	4	5
UGLY	1	.8446*	-.1387	.0095	.0660	-.0362
EXPECTED	2	.0383	.0551	.7931*	.1879	.0447
REPETITI	3	.1129	-.0604	.8041*	.0221	-.0637
PLEASENT	4	-.8443*	.1772	.0190	-.0733	-.0320
SAD	5	.1705	-.0877	.0839	-.0994	.2307
UNINTERE	6	.8623*	-.0006	.1797	.1267	-.0234
FEMININE	7	.0167	.7347*	-.1441	-.0773	-.0746
GENTLE	8	-.1440	.7522*	-.0048	.0876	-.0542
CALM-NG	9	-.0345	.5842*	.1215	.1889	-.1827
LOOSE	10	-.0567	.2818	-.0169	-.0117	-.1221
COLORFUL	11	-.6762*	-.0375	-.1421	-.4074	.0495
TENSE	12	.1646	-.3878	-.0422	-.3181	-.0847
RESTFUL	13	-.1990	.3638	.1404	.4225*	-.2121
COMPLEX	14	-.1624	.0030	-.2487	-.7363*	.0933
STIFF	15	.2645	.0161	.1059	-.0029	-.0575
COLD	16	.5540*	-.1050	-.0349	.0091	-.1745
ACTIVE	17	-.3069	-.0834	.0862	-.6933*	-.1433
INSINCER	18	.6038*	-.0032	.0128	.0208	-.4622
ORDERED	19	-.5107*	.2049	.4223	-.0356	.0319
FANCY	20	-.1304	.1276	-.0732	-.7639*	.0897
AUSTERE	21	.0596	-.0521	.1004	.1152	.0942
HUMOROUS	22	.1261	.0328	.0040	.0562	-.8517*
GRACEFUL	23	-.4633	.5363*	.1418	-.2773	.1979
RUGGED	24	.1223	-.6996*	-.1547	.0751	-.1960
HI.LOAD.	25	.8623	.7522	.8041	.7639	-.8517
PROP.VAR	26	.1730	.1139	.0714	.0947	.0530
CUM.P.V.	27	.1730	.2868	.3582	.4529	.5059

ROTATION SOLUTION TIME= .839 SECS.

Eight-Factor Solution (cont'd.)

6	7	8	COMM.
-.0651	-.0876	.0028	.7582
.0392	-.0838	.0163	.6796
-.1405	.0559	-.1335	.7081
.0342	.1095	-.0047	.7643
.0149	-.1374	-.7681*	.7159
-.0156	-.1133	-.0041	.8055
.1512	.0240	-.0199	.5963
-.1839	.1778	-.0059	.6626
-.1820	.2622	-.3900	.6803
-.1144	.7838*	-.0792	.7316
-.0293	.1661	.0146	.6760
.0246	-.6350*	.0129	.6545
-.0840	.2783	-.3855	.6482
.0812	-.1618	-.1468	.6953
-.2677	-.7188*	-.1764	.7042
-.2363	-.4945	-.2311	.7034
-.1909	.1025	.1731	.6887
.0664	-.2102	-.1805	.6599
-.3139	-.1832	.1711	.6448
.2100	-.0367	-.0620	.6795
-.8794*	-.0798	-.0128	.8182
.0687	.0211	.2018	.7915
-.0017	.1365	.1639	.6839
-.2377	-.1066	-.2038	.6818
-.8794	.7838	-.7681	
.0538	.0901	.0511	
.5597	.6497	.7008	

Note: The tables in Appendix D were based on a larger population than was actually used in this study. The original design had included subjects of junior high school age. Unfortunately, the responses of these subjects (N=13) proved to be ambiguous and had to be eliminated from the final factor analysis. It was felt that the removal of this data did not alter the factor structure to any appreciable degree. The reader may wish to compare the four-factor rotation used in the study (Appendix C) with the four-factor solution which reflects the larger population (Appendix D, p. 132). The tables in Appendix E are the intercorrelation matrix, list of Eigenvalues, and principal axis matrix of the factor analysis used in the study.

APPENDIX E

INTERCORRELATION MATRIX

SETUP AND CORRELATION SOLUTION TIME= 7.803 SECS.

		1	2	3	4	5	6	7	8	9	10
UGLY	1	1.0000									
EXPECTED	2	.0511	1.0000								
REPETITI	3	.0493	.4131	1.0000							
PLEASENT	4	-.7464	-.0200	-.0817	1.0000						
SAD	5	.1558	.0119	.1134	-.2062	1.0000					
UNINTERE	6	.7012	.1602	.1980	-.6704	.1540	1.0000				
FEMININE	7	-.1357	-.0571	-.0972	.1766	-.0171	-.0785	1.0000			
GENTLE	8	-.2433	.0882	.0465	.2898	-.1161	-.1524	.4627	1.0000		
CALM-NG	9	-.0715	.1620	.1141	.1071	.0283	.0092	.3285	.5276	1.0000	
LOOSE	10	-.1943	-.0546	.0257	.2367	-.1461	-.1295	.2077	.3920	.3549	1.0000
COLORFUL	11	-.5415	-.2011	-.1785	.5462	-.1058	-.6705	.1090	.0563	-.0071	.1391
TENSE	12	.2080	-.1136	-.0043	-.2711	.1896	.1869	-.2262	-.3962	-.1481	-.3028
RESTFUL	13	-.1288	.1334	.1286	.1552	-.0095	-.0923	.2129	.3364	.3897	.3381
COMPLEX	14	-.1725	-.2609	-.2819	.1487	.1039	-.2718	.0121	-.1008	-.1402	-.1369
STIFF	15	.2933	.1065	.1386	-.2986	.1902	.3768	-.1727	-.1243	-.0499	-.4152
COLD	16	.5279	.0067	.0641	-.5102	.2467	.4971	-.1481	-.2065	-.0859	-.3145
ACTIVE	17	-.3007	-.1241	-.0898	.2760	-.1116	-.3253	.0293	-.0126	-.1102	.0140
INSINCER	18	.4896	-.0289	.0862	-.4573	.1509	.5285	.0051	-.1234	-.0884	-.1464
ORDERED	19	-.3249	.2417	.2083	.3781	-.0981	-.2826	.0735	.1923	.1389	.0045
FANCY	20	-.1987	-.1470	-.1495	.2069	.0263	-.2449	.0649	.0116	-.1803	-.0533
AUSTERE	21	.0981	.1012	.2201	-.1112	.1077	.1220	-.0887	.0897	.0896	-.0453
HUMOROUS	22	.1398	-.0124	.0190	-.1152	-.1696	.1538	.0632	.0480	.0884	.0897
GRACEFUL	23	-.5111	.0135	-.0189	.5378	-.1273	-.4100	.3080	.3556	.1793	.2788
RUGGED	24	.2915	-.0812	-.0137	-.2483	.1229	.1806	-.3770	-.4108	-.2421	-.1864

		11	12	13	14	15	16	17	18	19	20
COLORFUL	11	1.0000									
TENSE	12	-.0700	1.0000								
RESTFUL	13	-.0693	-.4978	1.0000							
COMPLEX	14	.3502	.2736	-.3147	1.0000						
STIFF	15	-.3082	.3694	-.1331	.0208	1.0000					
COLD	16	-.4399	.3407	-.1605	-.0384	.5671	1.0000				
ACTIVE	17	.4114	.0948	-.2098	.4022	-.1185	-.1990	1.0000			
INSINCER	18	-.4662	.1801	-.0507	-.1196	.2895	.5200	-.1884	1.0000		
ORDERED	19	.2474	-.1247	.1056	.0189	.0154	-.1710	.2026	-.2685	1.0000	
FANCY	20	.3628	.1530	-.2516	.5578	-.0377	-.1255	.4257	-.1439	.0970	1.0000
AUSTERE	21	-.1065	.0302	.0710	-.1375	.2407	.1996	-.0496	-.0277	.1584	-.2168
HUMOROUS	22	-.1564	.0153	.0341	-.1426	-.0380	.0599	-.0165	.2944	-.0707	-.1785
GRACEFUL	23	.3948	-.2953	.1399	.1912	-.2504	-.4482	.2590	-.3953	.4441	.2481
RUGGED	24	-.1082	.3195	-.2377	-.0282	.2018	.3451	-.0790	.1840	-.2134	-.1060

		21	22	23	24
AUSTERE	21	1,0000			
HUMOROUS	22	-,0778	1,0000		
GRACEFUL	23	-,0472	-,1344	1,0000	
RUGGED	24	,1363	,0220	-,5107	1,0000

PRINCIPAL AXIS ANALYSIS,

PRINCIPAL AXES SOLUTION TIME= 1.402 SECS.

EIGENVALUES,

1	5.6919	2	3.4577	3	1.9028	4	1.6289	5	1.2368	6	1.0889
7	.9511	8	.8613	9	.7852	10	.6575	11	.6196	12	.6016
13	.5690	14	.4943	15	.4632	16	.4297	17	.4152	18	.3977
19	.3728	20	.3388	21	.3105	22	.2982	23	.2358	24	.2223

PRINCIPLE AXIS MATRIX,

		1	2	3	4	5
UGLY	1	,7825	,1438	-,1665	-,1189	-,0255
EXPECTED	2	,0643	,3672	,5330	,0882	-,2872
REPETITI	3	,1373	,3401	,5592	,0639	-,2177
PLEASENT	4	-,7950	-,0921	,1461	,0997	-,0091
SAD	5	,2706	-,0567	,1961	-,3155	,5330
UNINTERE	6	,7592	,2917	-,0521	-,1847	-,1371
FEMININE	7	-,3441	,2992	-,2434	-,5295	-,0448
GENTLE	8	-,4506	,5159	-,0183	-,3952	-,0066
CALM-NG	9	-,2453	,6597	-,0117	-,3176	,1781
LOOSE	10	-,4290	,4357	-,3195	,0780	,0871
COLORFUL	11	-,6699	-,4250	,0390	,0693	,0930
TENSE	12	,4640	-,5908	,1679	-,1281	-,1258
RESTFUL	13	-,2571	,6683	-,0116	,0181	,2546
COMPLEX	14	-,2086	-,6516	-,0564	-,4389	,0782
STIFF	15	,5337	-,0726	,4255	-,3444	,0154
COLD	16	,7297	-,0165	,1161	-,3089	,0700
ACTIVE	17	-,3755	-,4734	,0742	-,1917	-,2819
INSINCER	18	,6242	,1575	-,2309	-,2941	-,2062
ORDERED	19	-,4113	,0771	,6088	-,0572	-,2424
FANCY	20	-,2949	-,5425	-,0467	-,4390	-,0428
AUSTERE	21	,1654	,1830	,5051	-,0027	,2426
HUMOROUS	22	,1492	,2054	-,3316	,0189	-,6011
GRACEFUL	23	-,7291	,0400	,1754	-,2435	-,1076
RUGGED	24	,5002	-,2760	,0255	,3480	,2168
HI.LOAD,	25	-,7950	,6683	,6088	-,5295	-,6011
PROP.VAR	26	,2372	,1441	,0793	,0679	,0515
CUM.P.V;	27	,2372	,3812	,4605	,5284	,5799

6	7	8	9	10	11	12
-,0847	,0687	,2571	-,0227	,1052	,2096	-,0872
-,3807	,1182	-,0565	-,1755	-,2243	,3342	-,0254
-,1791	,4248	-,0705	,1893	-,1158	-,3219	,0171
,1344	-,0674	-,2485	-,0648	-,1155	-,1614	-,0878
-,2155	,2695	-,3414	,3836	,1272	,1204	,0429
-,1474	,0580	,2381	,0199	,0499	-,0290	-,0470
,0110	-,2086	-,0366	,3300	-,2624	,1715	-,2836
,1655	-,0472	,1140	-,0275	-,3385	-,0675	,0551
,1085	,1413	-,1231	-,2809	-,0295	,1633	,0864
,1014	,4311	,2193	,0110	,0250	-,2134	-,1376
,1432	,1064	-,0877	,0751	-,0641	,0775	-,1109
,0502	-,0782	-,1190	,2858	-,1948	-,0466	,1312
,0628	,0378	-,2501	-,1885	,2287	,0300	,1421
,0027	,1351	,0129	-,1409	,0840	,0962	,1550
,1968	-,2225	-,0970	-,2083	-,0329	-,2092	,0841
,2298	-,0484	-,0591	-,1425	,0495	-,0916	-,1884
,1869	,3567	,1538	-,0923	,1501	,1468	-,0540
,0966	,1046	-,2263	,0185	,1363	-,1920	-,2141
,1571	-,1195	-,0464	,0102	,3143	,1402	-,2912
-,1983	,2724	,0864	-,2521	-,1228	-,0704	,0482
,5072	,0526	,4098	,2285	-,0379	,0861	,2014
,3779	,1550	-,3024	,1512	,0355	,1462	,2911
-,0879	-,1024	,1315	,1210	,2411	-,1275	-,0290
,3382	,2788	-,1254	-,1982	-,2215	,1189	-,3051
,5072	,4311	,4098	,3836	-,3385	,3342	-,3051
,0445	,0396	,0359	,0387	,0874	,0258	,0251
,6244	,6641	,6999	,7327	,7601	,7859	,8109

13	14	15	16	17	18	19
.0347	.1889	-.0368	.0209	-.1198	.0032	-.0514
.0804	-.2294	-.1410	.1296	.0722	-.1133	-.0810
-.1554	.2447	-.0182	-.0826	-.0082	-.0819	.1177
.0552	-.1670	-.0547	.0221	.1190	.1138	.0280
.1464	-.1812	.0941	.0262	-.1160	.0796	-.0125
.0714	.0286	.0965	.1051	.1057	.1382	.0094
-.1920	.1076	-.0424	.1653	.1203	-.0117	.0869
.1154	-.1008	.1136	-.2252	-.1542	.0043	-.1782
.0492	.1587	.1638	-.1621	.0581	.0075	.2175
.2608	-.0392	.0735	.2823	.0763	-.1627	-.1985
-.0495	.1755	-.1190	.1404	-.2773	-.1920	.0831
.0418	.1671	.1835	.0013	.2222	-.0348	-.2051
-.3027	.1403	-.0743	.1606	.1348	.0355	-.2008
.1601	.0813	-.1546	-.1090	.2685	-.2565	.0788
.0220	-.0087	.1398	.2932	-.0926	-.0168	.1350
.0277	-.0851	-.0807	.0584	-.1037	-.2030	-.1869
-.3536	-.2297	.3076	.0309	.0196	-.0046	.0120
-.1197	-.1841	-.2433	-.1986	.0674	.0055	.0108
.1688	.1745	.0510	-.1540	-.0548	.0538	-.1502
-.0300	.1005	-.2061	.0466	-.1453	.3138	-.1328
-.0781	-.0888	-.2510	-.0089	.0590	.0645	.0150
.1859	.0238	-.0658	.1157	-.0953	.0644	.0303
.2059	.0047	-.0608	.1486	.1291	.1553	.1850
.1182	.0897	.0183	.0193	.1480	.1961	.0580
-.3556	.2447	.3076	.2932	-.2773	.3138	-.2851
.0237	.0206	.0193	.0179	.0173	.0166	.0195
.8346	.8552	.8745	.8924	.9097	.9263	.9419

20	21	22	23	24	COMM.
	-.0485	.1543	-.1777	-.2681	1.0000
-.0401	.0259	.0139	.0342	-.0039	1.0000
-.0709	-.0170	.0624	-.0230	-.0280	1.0000
.1260	-.0150	-.0440	-.3398	-.1126	1.0000
.0161	-.0426	.0008	-.0158	-.0069	1.0000
.0169	-.0503	-.0448	-.2042	.2842	1.0000
-.0895	-.0515	-.0757	.0422	-.0287	1.0000
.1155	-.1055	.2293	-.0099	.0675	1.0000
-.0150	.2187	-.1294	-.0071	-.0453	1.0000
-.1281	-.0452	-.1463	.0529	-.0652	1.0000
-.0435	.0343	.0591	-.0796	.1254	1.0000
-.2771	.1468	-.0282	-.0183	-.0436	1.0000
-.1895	-.0582	.1160	-.0240	.0592	1.0000
.0087	-.1775	.0562	-.0401	.0415	1.0000
.0958	-.1950	-.0140	.0759	-.0779	1.0000
-.0741	.2891	.0165	-.0679	.0687	1.0000
.2485	.0154	.0605	-.0166	-.0174	1.0000
.0168	-.0419	.0018	.0666	-.0290	1.0000
-.2689	-.1167	-.1330	.0240	.0301	1.0000
.0279	.0427	-.1290	.0412	-.0031	1.0000
.0452	.0180	-.0872	-.0045	-.0172	1.0000
-.0468	-.0019	.0023	-.0045	.0116	1.0000
.0912	.2018	.2737	.0850	-.0224	1.0000
-.0541	-.0352	.1672	.0864	.0369	1.0000
.0454					
	.2891	.2737	-.3398	.2842	
-.2771	.0129	.0124	.0898	.0088	
.0141	.9689	.9813	.9912	1.0000	
.9560					