

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN PREFERENCES  
FOR NATURAL AND SYNTHESIZED TIMBRES

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An Investigation of the Relationship Between Preferences  
for Natural and Synthesized Timbres

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The purpose of the study was to investigate the relationship between preferences for natural music instrument timbres and preferences for synthesized timbres. The problems of the study were: 1) to compare the reliabilities of the nine (natural music instrument timbre) subtests of the Timbre Preference Measure (TPM) and the seven (synthesized timbre) subtests of the Instrument Timbre Preference Test (ITPT) and 2) to investigate the relationship of preferences for each of the TPM subtests to preferences for each of the ITPT subtests.

In both tests, each timbre was recorded using the same musical phrase. The nine TPM natural music instrument timbres include the flute, clarinet, oboe, bassoon, alto saxophone, trumpet, French horn, trombone, and tuba. The seven ITPT synthesized timbres represent the flute, clarinet, double reeds, saxophone/French horn, trumpet, low brass, and tuba.

The two tests of timbre preference were administered to three hundred eleven students in grades four, five, and six. Students were asked to respond to the recorded test items of each test by indicating on an answer sheet which

one of two timbres they preferred. The two testing sessions for the same group of students were separated by one week.

The means, standard deviations, and reliabilities of each of the timbre subtests in both tests were compared. Intercorrelations, corrected correlations, and uncorrected correlations among the subtests were calculated by grade and for all grades combined.

Reliabilities for the TPM and ITPT subtests were comparable. There were fewer strong relationships among preferences for synthesized timbres than there were strong relationships among preferences for natural music instrument timbres.

The highest correlations, after correction for attenuation, among preferences for natural and synthesized timbres were between the flute, oboe, and synthesized flute; and the trombone, tuba, and synthesized tuba. The overall absence of high (above .60) correlations among the TPM and ITPT subtests indicates a lack of strong relationships between preferences for natural music instrument timbres and their supposed synthesized timbre representations.

It was concluded that, at most, there is a relationship between preferences for synthesized and natural music instrument timbres only for extreme ranges.

## TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS.....	iv
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
Chapter	
ONE. PURPOSE OF THE STUDY.....	1
Introduction.....	1
Timbre and the Prediction of Success in Music.....	1
Defining Natural Timbre through the Creation of Synthesized Timbre.....	12
Purpose and Problems.....	15
TWO. RELATED STUDIES.....	16
Perception of Music Instrument Timbre.....	16
Perception of Natural and Synthesized Timbre.....	19
Preferences for Music Instrument Timbres.....	24
Preferences for Synthesized Timbres.....	28
The Content and Construction of the <u>Instrument Timbre Preference Test</u> .....	28
The Nature of Timbre Preferences as Identified from <u>ITPT</u> .....	30
Reliability and Item Intercorrelation Studies of <u>ITPT</u> .....	31
Comparison of the Gordon <u>ITPT</u> Studies to the Present Study.....	35
A Critical Analysis of the Use of Synthesized Timbres.....	36
THREE. DESIGN AND ANALYSIS.....	38
The Rationale, Content, and Construction of the <u>Timbre Preference Measure</u> .....	38
Sample.....	43
Procedure.....	44
Analysis.....	45

## TABLE OF CONTENTS - Continued

Chapter	Page
FOUR. RESULTS AND INTERPRETATION.....	47
Preliminary Study Results.....	47
Results of the Present Study.....	52
Means and Standard Deviations of the <u>TPM</u>	
Subtests.....	52
Reliabilities of the <u>TPM</u> Subtests.....	53
Means and Standard Deviations of the <u>ITPT</u>	
Subtests.....	55
Reliabilities of the <u>ITPT</u> Subtests.....	56
Intercorrelations Among the Nine Subtests	
of <u>TPM</u> .....	58
Intercorrelations Among the Seven Subtests	
of <u>ITPT</u> .....	61
A Comparison of the Intercorrelations	
Among the Subtests of <u>TPM</u> with the	
Intercorrelations Among the Subtests of	
<u>ITPT</u> For All Grades Combined.....	64
Correlations Among the Subtests of <u>TPM</u>	
and <u>ITPT</u> .....	69
Correlations Among the Subtests of <u>TPM</u>	
and <u>ITPT</u> for Grades Four, Five, and Six	
Combined.....	73
FIVE. SUMMARY AND CONCLUSIONS.....	78
Purpose and Problems.....	78
Design and Analysis.....	78
Results.....	80
Conclusions.....	82
Recommendations for Future Research.....	82
SELECTED BIBLIOGRAPHY.....	84

## CHAPTER ONE

### PURPOSE OF THE STUDY

#### Introduction

##### Timbre and the Prediction of Success in Music

The prediction of success in music has been a continuing concern of music educators. Many predictive music tests have been written for that purpose.<sup>1</sup> Although the diversity of the content of those tests is of interest, the fundamental practical consideration is the extent to which the tests have been shown to have predictive validity. The best method for determining how well a music aptitude test predicts future music achievement is through a longitudinal predictive validity study. Neither reliability nor subjective validity can serve as a substitute for longitudinal predictive validity.

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<sup>1</sup>For example, see Carl E. Seashore, Don Lewis, and J. G. Saetveit, Seashore Measures of Musical Talents: Manual (New York: The Psychological Corporation, revised ed., 1939); Herbert D. Wing, Standardised Tests of Musical Intelligence. Ref. 660. (Sheffield, England: City of Sheffield Training College, 1961); and Edwin Gordon, Musical Aptitude Profile Manual (Boston: Houghton Mifflin Company, 1965).

Stanton was the first to complete a longitudinal study of the predictive validity of a music aptitude test.<sup>2</sup> She attempted to predict the degree of success of incoming students at the Eastman School of Music by using scores on the 1919 version of the Seashore Measures of Musical Talent. The subtests included in that battery were Pitch, Intensity, Time, Consonance, and Tonal Memory.<sup>3</sup> In addition to scores on the Seashore Measures of Musical Talent, Stanton collected students' case histories and their scores on a tonal imagery test and an intelligence test. Those data were collapsed into five predictive classifications: "discouraged, doubtful, possible, probable, and safe."<sup>4</sup>

Stanton investigated the relationship between the students' predictive classifications, and whether or not they graduated from the Eastman School of Music four years after matriculation. She found that 60 percent of the students in the "safe" classification graduated and that a sequentially decreasing percentage of students in the

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<sup>2</sup>Hazel M. Stanton, Measurement of Musical Talent: The Eastman Experiment, Vol. II of Studies in the Psychology of Music (Iowa City, Iowa: University of Iowa Studies, 1935).

<sup>3</sup>Carl E. Seashore, Manual of Instructions and Interpretations of Measures of Musical Talent (Chicago: C. H. Stoelting, 1919).

<sup>4</sup>Stanton, Measurement of Musical Talent, p. 69.

remaining four classifications graduated. Only 17 percent of the students in the "discouraged" classification graduated.<sup>5</sup> Stanton concluded that scores on the Seashore Measures of Musical Talent can be an effective aspect of a guidance program.

Although the Stanton study was objective and produced consistent results, it is unfortunate that graduation from the Eastman School of Music was the sole criterion for success in music. There are many non-musical factors that could have deterred an excellent musician from graduation. If Stanton had chosen, for example, musical performance as a criterion, her conclusions might have been based more on musical than on extra-musical factors.

Using information gleaned from studies by Stanton and other music researchers, Seashore revised his music aptitude battery.<sup>6</sup> One of the revisions was the addition of a timbre subtest. According to Seashore, the purpose of the non-preference Timbre subtest was to measure the "ability to discriminate between complex sounds which differ only in harmonic structure."<sup>7</sup> The Timbre subtest

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<sup>5</sup>Ibid., pp. 77-78.

<sup>6</sup>Carl E. Seashore, Don Lewis, and J. G. Saetveit, Seashore Measures of Musical Talents: Manual (New York: The Psychological Corporation, revised ed., 1939).

<sup>7</sup>Ibid., p. 4.

includes pairs of single tones that were produced electronically on a special generator.<sup>8</sup> The tones differ only in the intensity of two harmonics. Seashore created the tones for his Timbre subtest based upon the prevalent, but since refuted, theory that timbre is represented accurately in a spectrum of the relative strengths of certain harmonics of a tone.

It is of interest that Seashore was one of the first to propose that music stimuli developed in a laboratory, in this case, electronically produced and altered timbre, could be relevant for use in a school. Unfortunately, no specific information is available on the predictive validity of the Timbre subtest.

Although several music aptitude tests have been written since 1939, the next longitudinal predictive validity study of a test was not completed until 1967. Gordon constructed the Musical Aptitude Profile (MAP), a music aptitude test for children in grades four through twelve, and conducted a three-year predictive validity study of the test battery.<sup>9</sup> Approximately 250 students in grades four and five participated in the research. Gordon

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<sup>8</sup>Ibid., p. 4.

<sup>9</sup>Edwin E. Gordon, A Three-Year Study of the Musical Aptitude Profile (Iowa City, Iowa: University of Iowa Press, 1967).

hypothesized that scores on MAP would predict the future music achievement of students in beginning instrumental music.<sup>10</sup>

Prior to instrumental instruction, MAP was administered to all students. At the end of each of the first three years of instruction, the students' music achievement was evaluated and correlated with their pre-instructional music aptitude scores. The criteria used to assess success in music were a written music achievement test battery, three tape-recordings of students' performances, and teachers' evaluations of students' progress.<sup>11</sup> Gordon found that approximately 56 percent of the reason or reasons students are successful in beginning instrumental music can be accounted for by scores on MAP.<sup>12</sup>

MAP consists of seven subtests: Melody, Harmony, Tempo, Meter, Phrasing, Balance, and Style.<sup>13</sup> All of the subtests in MAP include pairs of recorded music phrases

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<sup>10</sup>The MAP national standardization procedure was conducted prior to the predictive validity study. The standardization sample included 12,809 students in grades four through twelve. See Edwin Gordon, Musical Aptitude Profile Manual (Boston: Houghton Mifflin Company, 1965), p. 46.

<sup>11</sup>Gordon, MAP Manual, p. 69.

<sup>12</sup>Gordon, A Three-Year Study, p. 35.

<sup>13</sup>Gordon, MAP Manual, p. 4.

which are performed on the violin and cello by professional musicians. Gordon took care to insure that "the performance and reproduction of the test battery . . . be of the highest technical quality obtainable under practical conditions."<sup>14</sup>

Twenty years elapsed before Gordon, like Seashore, attempted to increase the predictive power of his music aptitude test through the use of a timbre test. Gordon, however, chose the format of a preference test for his timbre test, the Instrument Timbre Preference Test (ITPT).<sup>15</sup> He hypothesized that, with MAP accounting for 56 percent of the variance associated with success in beginning instrumental music, some of the remaining 44 percent of the variance could be accounted for by timbre preference. Further, he hypothesized that if a student begins instruction on an instrument for which he has a timbre preference, the student will perform with higher achievement on that instrument than on one for which he does not have a timbre preference.

ITPT includes seven synthesized timbres. All of the synthesized timbres are presented in the context of the

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<sup>14</sup>Ibid., p. 6.

<sup>15</sup>Edwin E. Gordon, Manual for the Instrument Timbre Preference Test (Chicago: GIA Publications, Inc., 1984).

same short musical phrase. Each timbre within ITPT was created and performed by the test author using a Moog Opus 3 Synthesizer. The different timbres were produced "by changing and combining footages [octaves] and by modifying tone color through filtering."<sup>16</sup> Gordon states that each of the derived synthesized timbres is "intended to represent" the timbres of the following brass and woodwind music instruments:

The first timbre represents the flute; the second, the clarinet; the third, the saxophone and the French horn; the fourth, the oboe, English horn, and bassoon; the fifth, the trumpet and cornet; the sixth, the trombone, baritone, and French horn; and the seventh, the tuba and Sousaphone.<sup>17</sup>

Gordon did not create the synthesized timbres for ITPT from a model based on one of the prevalent theories for the analysis and synthesis of timbre. Instead, he chose to create timbres by audiating natural timbres and then subjectively moving dials on a synthesizer until a satisfactory aural match was achieved.

Gordon investigated the criterion-related validity of those synthesized timbres by asking two groups of professional musicians to associate a music instrument, other than the synthesizer, with each of the synthesized

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<sup>16</sup>Ibid., p. 1.

<sup>17</sup>Ibid.

timbres. Although most persons associated more than one instrument with each timbre, the majority of persons in the study associated the synthesized timbres Gordon had created to represent the intended natural timbres.<sup>18</sup>

Gordon conducted a two-year predictive validity study of ITPT in which 168 students in grade five participated.<sup>19</sup> Prior to instrumental instruction, students were administered ITPT, MAP, and the Otis-Lennon Intelligence Test. Fifty-seven of the 168 students volunteered or were recruited to study an instrument suggested by their ITPT scores. The remaining 111 students studied an instrument that was not suggested by their ITPT scores.

Recorded performances of three etudes were the criteria used to assess the students' music achievement each year. The rating scale for the three etudes consisted of four dimensions: Tonal, Rhythm, Tone Quality, and Expression.<sup>20</sup> More advanced etudes were used in the second

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<sup>18</sup>Ibid., pp.26-27.

<sup>19</sup>A retest reliability study of ITPT was conducted prior to the predictive validity study. The sample included 600 students in grades four through eight. See Gordon, Manual for ITPT, pp. 22-49.

<sup>20</sup>Gordon, Manual for ITPT, p. 44. As a clarification of terms, Gordon refers to the melodic aspects of a performance as "tonal" and he refers to the subjective quality of the student's sound as "tone quality."

year of the study.<sup>21</sup>

After both the first and second years of the study, Gordon found a significant mean difference between the ratings for students who were playing an instrument suggested by their ITPT scores and the ratings for students who were not playing an instrument suggested by their ITPT scores. The mean scores for students who were playing an instrument suggested by their ITPT scores were significantly higher than the mean scores for students who were not playing an instrument suggested by their ITPT scores.

At the end of each year of instruction, the students' music achievement was correlated with their MAP Composite scores.<sup>22</sup> Gordon reported predictive validity coefficients for two groups. The first group consisted of students who were playing an instrument suggested by their ITPT scores. The second group consisted of a combination of all of the students in the first group and all of the students who were playing an instrument not suggested by their ITPT scores. More than half of the students in the combined

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<sup>21</sup>Edwin E. Gordon, "Final Results of a Two-Year Longitudinal Predictive Validity Study of the Instrument Timbre Preference Test and the Musical Aptitude Profile," Council for Research in Music Education 89 (Fall 1986):13.

<sup>22</sup>Gordon, Manual for ITPT, p. 47.

group were playing an instrument not suggested by their ITPT scores. The intent of using a combined group was to approximate an average instrumental ensemble in which some students would be playing an instrument with a timbre which they preferred and some students would be playing an instrument with a timbre which they did not prefer.

Sixty-six percent of the variance associated with instrumental achievement was accounted for by scores on ITPT and MAP combined for students who performed for one year on an instrument suggested by their ITPT scores. That is, "more than 65 percent of the reason for students' success in beginning instrumental music is a result of both their music aptitude and of their playing an instrument for which they have a timbre preference."<sup>23</sup> The scores of students in the first group accounted for 29 percent more of the variance than did the scores of students in the combined group. After two years, 72 percent of the variance associated with instrumental achievement was accounted for by scores on ITPT and MAP combined for students who performed on an instrument suggested by their ITPT scores. That is, "at least 72 percent of the reason for students' success in beginning instrumental music is a result of a combination of their music aptitude and

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<sup>23</sup>Gordon, "Final Results," p. 14.